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FORECASTING WITH STATISTICAL INDICATORS

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THIS paper will deal with the use of National Bureau statistical indicators for short-term forecasting. As the relationship of economic theory to the National Bureau business-cycle research has frequently been questioned, a few introductory comments will be offered on this topic. The second section will deal with the use of this research for identifying current developments, both at business-cycle peaks, and—using the NBER findings concerning rates of change—during other phases of a cycle. The final section will be concerned with the problems involved in using the indicators for forecasting, including the need to be explicit about the time horizon and the expected degree of accuracy to make the forecast useful to the intended audience.

The present set of statistical indicators grew out of earlier work by Wesley Clair Mitchell and Arthur Burns. Recent work in this area has been carried forward by Geoffrey Moore and Julius Shiskin.¹

The current set of statistical indicators for the United States is the fourth complete reworking of the indicator selection: the first list being compiled in 1938 by Wesley C. Mitchell and Arthur F. Burns; the second and third lists by Geoffrey H. Moore in 1950 and 1960;

¹ The major references to the earlier work are Wesley Clair Mitchell, *Business Cycles*, Berkeley, University of California Press, 1913; Wesley Clair Mitchell, *Business Cycles and Their Causes*, Berkeley, University of California Press, 1941 (a reprint of Part III of *Business Cycles*, now available in paperback); Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, New York, National Bureau of Economic Research, 1946; A. F. Burns and W. C. Mitchell, *What Happens During Business Cycles: A Progress Report*, Cambridge, The Riverside Press for NBER, 1951; and Geoffrey H. Moore, ed., *Business Cycle Indicators*, Princeton, Princeton University Press for NBER, Vol. 1, 1961.

and the fourth, in 1967, by Geoffrey H. Moore and Julius Shiskin.² The last two revisions reflect an enlarged program initiated at the Bureau of the Census and extended to the National Bureau in 1957 at the request of Raymond J. Saulnier, Chairman of the Council of Economic Advisers. Since October, 1961, the Bureau of the Census has published a comprehensive monthly report with a wide range of series, classified so as to point up their historical cyclical timing experience. Since 1967, a further classification by economic process has been introduced along the lines put forward in the latest Moore-Shiskin set of indicators.

A number of factors contribute to the present desirability of reviewing the use of statistical indicators for forecasting. Currently, statistical indicators are readily available in published form, and computer programs permit low-cost adaptations to particular applications. Second, there has been more study of the economic rationale of the behavior of individual indicators, and greater discussion of their interaction within a more complete system. Third, a number of studies of forecasting records have been compiled, permitting an appraisal of the statistical forecasting record of the National Bureau indicators as compared with other techniques. Fourth, the group of indicators selected on the basis of United States experience has been duplicated for other countries, including Canada, Japan, and Australia, where they are used for purposes similar to those for which the NBER indicators have been employed in the United States.

THE ECONOMIC RATIONALE OF THE APPROACH

MOST economists would argue that there should be some basis in economic theory for individual statistical series representing economic processes. With this, I would concur. Historical conformity to business cycles is a necessary, though not sufficient, condition for confident use

² Wesley C. Mitchell and Arthur F. Burns, *Statistical Indicators of Cyclical Revivals*, Bulletin 69, New York, NBER, 1938, reprinted in Geoffrey H. Moore, ed., *Business Cycle Indicators*, Princeton University Press for NBER, 1961, Vol. 1, Chap. 6; Geoffrey H. Moore, *Statistical Indicators of Cyclical Revivals and Recessions*, Occasional Paper 31, New York, NBER, 1950, reprinted in *Business Cycle Indicators*, Vol. 1, Chap. 7;

by analysts. An appreciation of the theoretical rationale increases user confidence and gives a better indication of possible cautions and modifications in applying the system to changed circumstances—either within a country, or in other countries.

Some discussion, even brief, on this point seems desirable for several reasons. For one, a significant number of economists have reservations about the economic theory underlying National Bureau work on business cycles and statistical indicators.³ However, the early work by Mitchell grew out of a desire to test a variety of business-cycle theories against the quantitative evidence of history in the major industrialized countries. There was a stage in the business-cycle work at the National Bureau when the assembly of basic data and its processing for various purposes (seasonal adjustment, dating specific and reference cycles, measuring average cyclical experience, and so on) took a large part of the Bureau's resources. Researchers became less explicit about the underlying economic rationale. Fortunately, work since the late 1950's has been much more explicit about the economic rationale; some of the literature will be highlighted to bring this change to the attention of the critics and sceptics.

Perhaps a personal note can provide a useful perspective on my own views. For many years I was engaged in preparing short-term forecasts of the Canadian economy. The approach followed was eclectic, using the national accounts as a framework for analysis and presentation, but also employing surveys of business plans and expectations, as well as an econometric model initiated by L. R. Klein in 1947. During the mid-1950's, W. A. Beckett suggested the duplication of Moore's 1950 list of indicators for Canada. The initial results of his analysis were encouraging, and statistical indicators have been used fairly consistently in Canada ever since. They were particularly helpful at the 1957 business-cycle peak, and, for about fifteen years, have been

Geoffrey H. Moore, *Business Cycle Indicators*, Vol. 1, Chap. 3, "Leading and Confirming Indicators of General Business Changes"; Julius Shiskin, *Signals of Recession and Recovery*, Occasional Paper 77, New York, NBER, 1961; and Geoffrey H. Moore and Julius Shiskin, *Indicators of Business Expansions and Contractions*, New York, Columbia University Press for NBER, 1967.

³ T. J. Koopmans, "Measurement Without Theory," *Review of Economic Statistics*, August, 1947, reprinted in R. A. Gordon and L. R. Klein, *Readings in Business Cycles*, Homewood, Illinois, Richard D. Irwin, 1965, pp. 186–203, and subsequent comments, reply, and rejoinder by Rutledge Vining, pp. 204–231.

of service in identifying changes in the early stages of cycles. As a result of using the National Bureau indicators side by side with an econometric model, I have become more impressed by the similarities than by the differences in approach and operation.⁴

In commenting on the economic rationale of statistical indicators, four areas will be touched on: (1) seasonal adjustment; (2) the rationale for individual indicators; (3) the properties of a diffusion index; and (4) the rationale of the complete system.

1. Seasonal adjustment. The need for seasonal adjustments is almost taken for granted by most economists and statisticians. Electronic computers have sharply reduced the costs of calculating moving averages, making working day and trading day adjustments, and making both rough and final charts of the results. Consequently, a tremendous range of seasonally adjusted series for the economy as a whole is now available in many of the industrialized countries. These are widely used by the professional analyst.

However, as one moves away from the national aggregates and toward a finer level of industrial and regional detail, a number of things happen. For one thing, the quantitative importance of seasonal and irregular factors increases.⁵ Furthermore, seasonally adjusted data are less readily available, and more difficult to prepare (partly because of the greater extent of irregular factors and special considerations). In the financial press there are frequent comparisons of current reports by business firms with the same month or quarter of the previous year—figures for orders, sales, profits, and other factors. If such year to year comparisons are regarded as relating to the end of the comparison, rather than to the middle of the year, this will contribute to belated recognition of cyclical comparisons. Although more large companies now use seasonally adjusted data to analyze the operating results for their own firm and industry, many large companies and most small ones rely on unadjusted data. Insofar as this is the case, it contributes to an

⁴ These views on the indicators have been clarified by the writings of, and discussions with, Geoffrey Moore, Julius Shiskin, W. A. Beckett, L. Lempert and Derek White.

⁵ D. J. Daly, "Seasonal Variations and Business Expectations," *Journal of Business*, July, 1959, pp. 259–261.

accentuation of inventory fluctuations as the companies respond to their reading of the surrounding economic climate. This procedure will also contribute to the poor forecasting experience of surveys of short-term business expectations.⁶

The National Bureau consistently tests for the prevalence of seasonality as part of their procedure, and Julius Shiskin has played an active role in the development and testing of computer methods of seasonal adjustment.⁷

2. *Individual indicators.* It is impossible to deal here with the rationale of each indicator, as the 1966 list of indicators is comprised of eighty-eight. However, reference to some studies covering this area will further the discussion of the underlying theory and rationale. A number of series are roughly coincident indicators (25 series in the 1966 list); these include all the main comprehensive series on employment and unemployment, production, income, consumption and trade, prices and money and credit that any current analyst would use. A number of the leaders are noncontroversial, relating to new investment commitments such as contract awards, new orders, housing starts, and building permits. Many contemporary analysts—those with a Keynesian background—would use these indicators in conjunction with surveys of capital expenditure plans in appraising the investment area.

Special studies have been made of a number of other individual series or economic processes, almost always including some discussion of the economic rationale for their behavior. Examples of such studies are included in Part Two of *Business Cycle Indicators*, Volume 1, covering such topics as the diffusion of corporate profits, business failures, new incorporations, new orders, average number of hours worked, and the cyclical pattern of the variety of indicators relating to the labor market.⁸ Note should be taken of the work of Milton Fried-

⁶ *Ibid.*, pp. 265–267.

⁷ Julius Shiskin, *Electronic Computers and Business Indicators*, Occasional Paper 57, New York, NBER, 1957; Julius Shiskin, *Signals of Recession and Recovery*, Occasional Paper 77, New York, NBER, 1961, and OECD, *Seasonal Adjustment on Electronic Computers*, Paris, 1961.

⁸ *Business Cycle Indicators*, Vol. 1, Chapters 11 to 16, pp. 325–513.

man and others on the influence of monetary factors and the rate of change in the money supply as a leading indicator.⁹

3. *Diffusion indexes.* With the wide variety of series used, based on quite different units of measurement, a method of combining the individual series would be helpful, especially as some of the individual series involved are irregular in their month to month movement. Two methods have been developed for this purpose. One, developed historically, was the diffusion index, which in its basic form is a simple percentage expanding from one month to the next.¹⁰ A further method is to prepare "amplitude-adjusted" composite indexes. These were first developed in the early 1960's, and are now being published regularly.¹¹

A critic of diffusion indexes provided valuable light on their properties.¹² Broida, the economist in question, emphasized the problems encountered in producing a diffusion index from current data, and showed the similarities between the rates of change of the U.S. index of industrial production and a diffusion index of the twenty-six seasonally adjusted industry group components. At a business-cycle peak, the economy is subject to conflicting tendencies, as many industries showing declines as increases, and earlier rates of increase in the total have been checked. On the other hand, the most rapid rates of increase in the aggregates are associated with widespread increases in the individual components. Working empirically, Shiskin has tested this with a wide range of components and aggregates, using a standardized percentage rate of change. His charts give strong evidence of the

⁹ Milton Friedman and Anna Jacobson Schwartz, *A Monetary History of the United States, 1867-1960*, Princeton, Princeton University Press for the NBER, 1963; Friedman and Schwartz, "Money and Business Cycles," *Review of Economics and Statistics*, Feb., 1963 Supplement; Milton Friedman, "The Monetary Studies of the National Bureau," *National Bureau Forty-Fourth Annual Report*, June, 1964, pp. 7-25, and Milton Friedman, "A Theoretical Framework for Monetary Analysis," *Journal of Political Economy*, March, 1970, pp. 193-238 and other references therein.

¹⁰ One variant of this procedure is to prepare the diffusion indexes from series that have been smoothed by moving averages. Another refinement is to prepare a distribution of rates of change, using the computer, but, to my knowledge, this has not been used in practice to any significant extent.

¹¹ Julius Shiskin, *Signals of Recession and Recovery*, Occasional Paper 77, New York, NBER, 1961, Appendix A, and Julius Shiskin, "Reverse Trend Adjustment of Leading Indicators," *R.E. Stat.*, Feb., 1967. Since November, 1968, these have been published in the expanded publication *Business Conditions Digest*.

¹² Arthur L. Broida, "Diffusion Indexes," *The American Statistician*, June, 1955, pp. 7-16.

relationships between diffusion indexes and rates of change.¹³ The costs of preparing a simple diffusion index are very low, and many points about the current situation can easily be clarified by doing so. On many occasions of rapid expansion in certain series, a particular analyst has suggested that the expansion was largely due to some special industry (which was admittedly increasing rapidly), while a diffusion index would indicate that the expansion was both more widespread and more deep-seated. The improved understanding of the relationship between aggregates and diffusion indexes, and the low cost of preparing the latter, should reduce the possibility of future misinterpretations.

4. *The complete system.* It seems to me that there are three essential elements in the National Bureau system of indicators, catching key elements of both contemporary business-cycle theory and the real world; namely, the key role of profits in business decision-making, the importance of lags in response, and the role of uncertainty. These are the central aspects of the indicators. The broader historical study of business cycles on which they are based, and some of the character of the work, will be suggested for each point in turn.

Mitchell put the importance of profits in business decision-making in a central position.

Since the quest of money profits by business enterprises is the controlling factor among the economic activities of men who live in a money economy, the whole discussion must center about the prospects of profits. On occasion, indeed this central interest is eclipsed by a yet more vital issue—the avoidance of bankruptcy. But to make profits and to avoid bankruptcy are merely two sides of a single issue—one side concerns the well-being of business enterprises under ordinary circumstances, the other side concerns the life or death of the same enterprises under circumstances of acute strain.

Whatever affects profits and solvency, then, comes within the sweep of the analysis. And we already know the factors of chief significance: the prices that constitute business receipts and the prices that constitute business expenses, the volume of sales af-

¹³ Shiskin, *Signals of Recession and Recovery*, Appendix A: "Technical Notes on Amplitude-Adjusted General Indexes, Adjusted Rates of Change, and Diffusion Indexes," pp. 123-137.

fects at the prevailing margins of profit, the need of having currency to make payments and of obtaining loans in adequate amount from banks and investors. But to know what these factors are, and even to know what fluctuations they undergo in severalty, is only half the battle. The other and the harder half is to follow the interactions of these factors through all the permutations that brighten or darken the prospects of profits and make easy or difficult the maintenance of solvency.¹⁴

This is also quite explicit in the 1913 comments:

The preceding theory of business cycles is concerned mainly with the pecuniary phases of economic activity. The processes described relate to changes in prices, investments, margins of profit, market capitalization of business enterprises, credits, the maintenance of solvency, and the like—all relating to the making of money, rather than to the making of goods or to the satisfaction of wants. Only two nonpecuniary factors command much attention—changes in the physical volume of trade and in the efficiency of labor—and even these two are treated with reference to their bearing upon present and prospective profits.¹⁵

Prices, costs, and profits play an important part in the 1966 list of indicators, while Hultgren and Zarnowitz did a number of studies in this area during the 1950's.

The importance of lags is the second key feature in the complete system of indicators. Differences in the timing of various economic processes in relation to the business cycle are central to the set of statistical indicators. Lags reflect the tendency for decisions and developments in one economic process to influence the development and rate of change in another sector, or process, at a later period. Illustrations of these differences in timing can be seen in the accompanying Table 1, taken from Arthur Burns' introduction to W. C. Mitchell's *What Happens During Business Cycles: A Progress Report*. This table graphically summarizes typical response-patterns of various statistical indicators over the course of business cycles. Another illustration is provided in Chart 1, which shows a variety of composite indicators with different cyclical-timing patterns.

¹⁴ Wesley Clair Mitchell, *Business Cycles and Their Causes*, Preface, pp. xi and xii.

¹⁵ *Ibid.*, p. 187.

In light of the emphasis that Mitchell put on profits and the interrelationships with prices and costs, Table 2 is especially interesting. The comprehensive wholesale price indexes move roughly in time with the business cycle. On the other hand, sensitive commodity prices typically move in advance of that cycle. The series on profits and profit margins also move early, while, contrariwise, unit labor costs (reflecting changes in labor earnings and output per unit of labor input) and some interest rates move late. These characteristic changes can be used to illustrate the later stages of an expansion. Upward movements in costs accelerate and become more widespread at this stage; simultaneously, slackening in the rate of increase in demand in a growing number of firms and industries leads to a wide-scale erosion of profit margins. The declines in profits eventually lead to caution on inventory policy and investment decisions, but this process can begin while increases in wage rates, prices, and interest rates are still under way.¹⁶

A third element is the role of uncertainty. This is reflected in the emphasis on the absence of complete conformity to business cycles on the part of a number of statistical indicators, and on variations between cycles as to duration and amplitude. This is somewhat analogous to the random disturbances in the individual structural equations and in the complete system of an econometric model.

Milton Friedman summarized the significance of uncertainty and timing lags in Mitchell's work as follows:

At the very broadest level of generality, persistent self-generating fluctuations in economic activity can occur only in a world characterized by both uncertainty (in the sense of unpredictable change) and lags in response (in the sense of different timing of response). . . . Lags in response are the central elements in theories of this type. . . . The lags in response must be pervasive, they must operate on a broad range of activities, these activities must be linked to one another and to the remainder of the system, and the whole must display consistent, though not identical responses in successive cycles.¹⁷

¹⁶ D. J. Daly, "Cyclical Movements in Prices and Costs," paper given to the Ottawa Chapter of the Canadian Political Science Association, November 19, 1958.

¹⁷ Milton Friedman, "The Economic Theorist" in Arthur F. Burns, *Wesley Clair Mitchell: The Economic Scientist*, New York, National Bureau of Economic Research, 1952, pp. 259-260.

TABLE

Characteristic Direction of Twenty-Six

Series	Expansion			
	Trough to First Third	First to Middle Third	Middle to Last Third	Last Third to Peak
Bonds sold, N.Y. Stock				
Exchange	+	-	-	-
R.R. bond prices	+	+	-	-
Business failures; liabilities, inv.	+	+	+	-
Common stock prices	+	+	+	-
Shares sold, N.Y. Stock				
Exchange	+	+	+	-
Corporate security issues	+	+	+	-
Construction contracts, value	+	+	+	-
Deposits activity	+	+	+	-
Bank clearings or debits, N.Y.C.	+	+	+	-
Incorporations, no.	+	+	+	+
Bank clearings or debits, outside N.Y.C.	+	+	+	+
Bank clearings or debits, total	+	+	+	+
Imports, value	+	+	+	+
Industrial production, total	+	+	+	+
Fuel & electricity production	+	+	+	+
Pig iron production	+	+	+	+
R.R. Freight ton miles	+	+	+	+
Factory employment	+	+	+	+
Factory payrolls	+	+	+	+
Income payments, total	+	+	+	+
Corporate profits	+	+	+	+
Business failures, no., inv.	+	+	+	+
Department store sales, deflated	+	+	+	+
Wholesale trade sales, value	+	+	+	+
Wholesale commodity prices	+	+	+	+
R.R. bond yields	-	-	+	+

NOTE: A plus denotes rise; a minus denotes fall. The two series on failures are inverted here. Bond prices are treated as the inverted replica of bond yields.

SOURCE: A. F. Burns and W. C. Mitchell, *What Happens During Business*

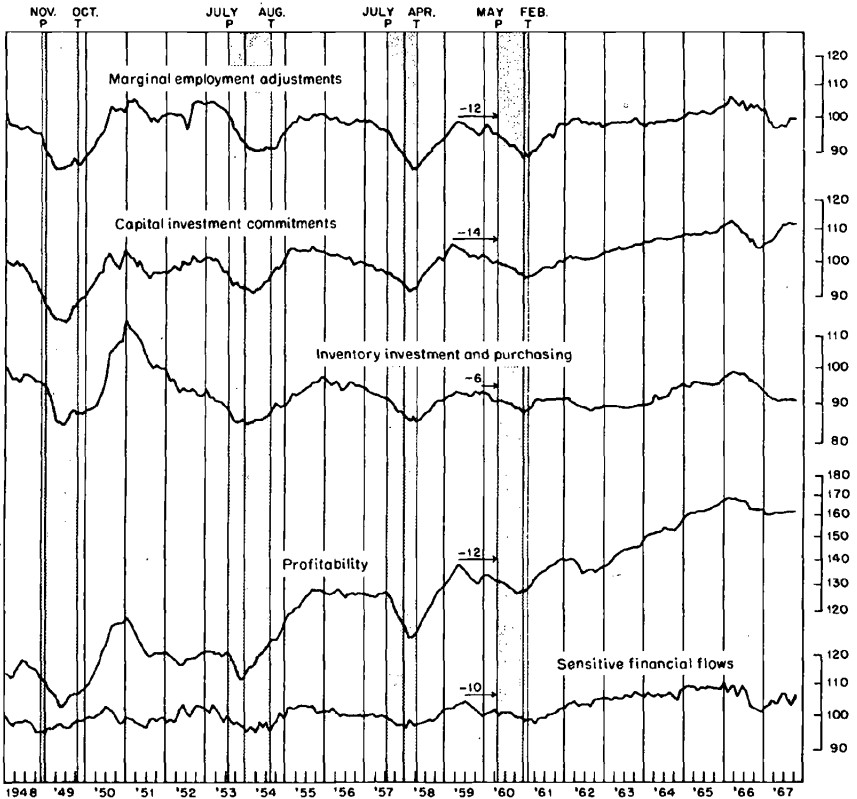
"Comprehensive" Series During a Business Cycle

Contraction				Number of Business Cycles Covered	Percentage of Conforming Movements, Series Said to:	
Peak to First Third	First to Middle Third	Middle to Last Third	Last Third to Trough		Rise	Fall
-	-	+	+	14	86	79
-	+	+	+	19	65	74
-	-	+	+	14	86	100
-	-	-	+	16	94	82
-	-	-	+	16	94	88
-	-	-	+	8	100	75
-	-	-	+	7	86	75
-	-	-	+	16	94	88
-	-	-	+	18	100	89
-	-	-	+	19	84	80
-	-	-	+	14	100	79
-	-	-	+	14	100	93
-	-	-	+	16	94	75
-	-	-	-	5	100	100
-	-	-	-	5	100	100
-	-	-	-	16	100	100
-	-	-	-	9	100	89
-	-	-	-	6	100	100
-	-	-	-	5	100	100
-	-	-	-	4	100	50
-	-	-	-	4	100	100
-	-	-	-	16	75	88
-	-	-	-	4	100	75
-	-	-	-	3	100	100
-	-	-	-	11	82	91
+	-	-	-	19	74	65

Cycles: A Progress Report, Studies in Business Cycles, No. 5. Cambridge, Mass., The Riverside Press, 1951. Data presented here is derived from Table 31, Section A.

CHART 1

Composite Indexes of Leading, Coincident, and Lagging Indicators
 A. *Leading Indicator Subgroup Indexes (January 1948 = 100)*



NOTE: Numbers entered with arrows indicate months of lead (-) or lag (+) from business-cycle peak and trough dates at top of chart. Shaded areas are business-cycle contractions; white areas are expansions.

CHART 1 (concluded)

B. Leading, Coincident, and Lagging Indexes (January 1948 = 100)

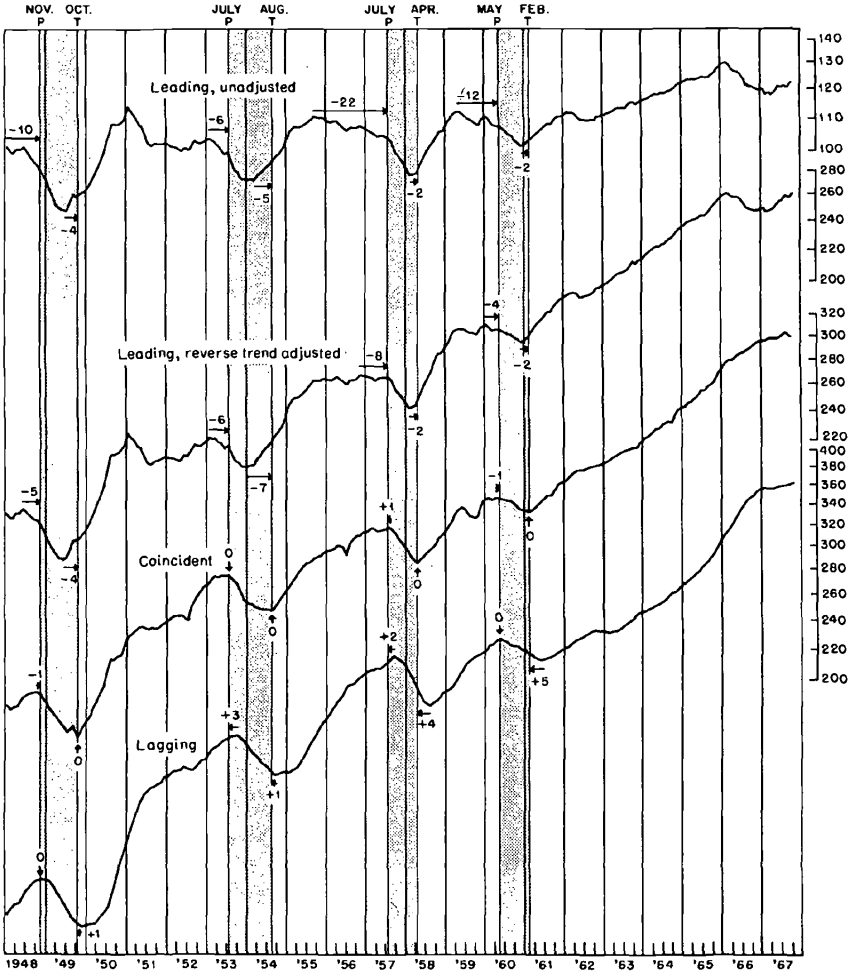


TABLE 2
Median Lead or Lag of Selected Group Summaries
 (months)

Classification and Number of Series	Median Lead (−) or Lag (+) at Peaks and Troughs	
	Unadjusted	Adjusted for MCD Span
Sensitive commodity price indexes (1)	−2	−2
Profits and profit margins (4)	−5	−4
Comprehensive wholesale price indexes (2)	0	0
Unit labor costs (2)	+8	+8
Interest rates on business loans and mortgages (4)	+4	+5

SOURCE: Moore and Shiskin, *Indicators of Business Expansions and Contractions*, Appendix E, p. 112.

IDENTIFYING CURRENT DEVELOPMENTS

IN CONSIDERING the use of statistical indicators for analysis of the current economic situation and the short-term economic outlook, it is important to determine how much one can realistically expect. Geoffrey Moore, who has been a leading developer and user of this framework for the last two decades, describes the results of the use of indicators in the 1953–54 and 1957–58 recessions and revivals in this way:

They do not mean that one can get much advance notice that a general business contraction is beginning or is coming to an end. They do help one to recognize these events at about the time they occur. Even then there is some risk of error.¹⁸

This may seem like a modest claim, but appraisals of forecasting accuracy suggest that contemporaneous recognition of a peak or a

¹⁸ Moore, *Business Cycle Indicators*, Vol. 1, p. 79.

trough would be a more effective development than most forecasters have achieved in the past.¹⁹

The 1966 list of statistical indicators for the United States has been selected on the basis of past experience (some of it going back to well before World War II). Its use on a current basis assumes a significant continuity between past experience and current performance, an assumption which is also accepted in econometric forecasting models. The individual indicators, classified by economic process, are summarized by broad timing relationships in the form of diffusion indexes and composite indexes (both with and without reverse trend adjustment). The individual leaders, and the summaries on which they are based, give early warning of developing changes in the coincident indicators. Unfortunately, the length of the leads is variable, and the month to month movements are irregular. It would be inappropriate to use the leaders and their summary measures in isolation, for the changes in the lagers (partly reflecting the emphasis on prices and costs) may have an intimate causal connection with changes in the leaders.²⁰ However, although recent data indicate a continuation of the historical timing relationships, the postwar forecasting of turning points provided by two services using statistical indicators has not been outstanding.²¹

Making a judgment—even a tentative one—on the current state of the business cycle is an important step. Any judgment about the present immediately implies what to watch for in the months and quarters ahead. A study of emerging developments in relation to an earlier tentative cyclical dating enables the confirmation of earlier views, and suggests the sensitive areas of change in direction or vigor that may be expected to take place.

¹⁹ Victor Zarnowitz, *An Appraisal of Short-Term Economic Forecasts*, New York, Columbia University Press for the NBER, 1967; Rendigs Fels and C. Elton Hinshaw, *Forecasting and Recognizing Turning Points*, New York, Columbia University Press for the NBER, 1968; and Geoffrey H. Moore, "Forecasting Short-Term Economic Change," *Journal of the American Statistical Association*, March, 1969, pp. 1-22. See also the earlier appraisals of business expectations surveys by Hultgren, Ferber, Modigliani, Hastey and Hartle referred to in Daly, "Seasonal Variations and Business Expectations."

²⁰ Geoffrey H. Moore, "Generating Leading Indicators from Lagging Indicators," *Western Economic Journal*, June, 1969, pp. 137-144 and Part 4 of the last section on "The Complete System."

²¹ *Forecasting and Recognizing Turning Points*, pp. 39-45.

Although the forecasting and current dating of cyclical turning points are important, the question of the duration and extent of current change is also critical. In my opinion this is not always given sufficient attention in forecasting appraisals.

Three features of the historical business-cycle experience are to be borne in mind in short-term forecasting. One of them is that, historically, the sharpest rates of increase in the coincident indicators typically occur in the early stages of expansions.²² However, this evidence has apparently not been incorporated into the forecasts appraised by Zarnowitz; most of them tend to underestimate rates of increase in the first year of expansions.²³ A considerable improvement in forecasting the early stage of an expansion would occur if the implications of the historical experience were more definitely recognized. The extent of idle resources available at the start of an expansion might provide some impression of the potential increase. Though it is sometimes hard to visualize the areas of final demand, which might provide the source of demand strength at this stage of the cycle, a swing in inventory investment is usually a critical factor. This volatile segment of demand is notoriously difficult to forecast on a short-term basis.

A second historical phenomenon during business cycles relating to rates of change is the fact that the expansion typically undergoes a sharp but general period of retardation in the middle stages of expansions.²⁴ Since World War II such retardations have occurred in 1951, 1956 and 1966-67. During each of these periods the leading indicators showed weakness, and there were clear retardations in the rates of increase in the major coincident aggregates. However, the weakening was insufficient to be regarded as a period of cyclical decline for the economy as a whole.

It is a matter of judgment whether a particular decline in the leaders reflects a pause in the vigor and extent of the expansion, or a cyclical recession. These retardations appear to be related to the subsycles in inventory investment explored by Ruth Mack.²⁵ A more

²² *What Happens During Business Cycles*, Table 31, pp. 260-261, and p. 302.

²³ *An Appraisal of Short-Term Economic Forecasts*, pp. 5-6, 27-29, and 51.

²⁴ *What Happens During Business Cycles*, Table 31, pp. 260-261, and p. 302.

²⁵ *Consumption and Business Fluctuations: A Case Study of the Shoe, Leather, Hide Sequence*, New York, NBER, 1956.

general awareness of the historic tendency for a business-cycle expansion to undergo a significant retardation would alert analysts of the current economic situation to the possibility, encouraging an initial caution in regarding every period of weakness in the leaders as an indicator of cyclical weakness.

The indicators can also be helpful in appraising, during its early stages, whether a recession will be mild or severe. Moore summarized the use of the leaders for early appraisal in this way:

We find that even as early as the third month after the peak the declines in many of the leading series begin to differentiate the more severe from the less severe recessions. . . . As a group, the leaders provide a more reliable indication of severity than the aggregates during the first six or possibly nine months of recession.²⁶

In a subsequent addendum Moore evaluated his experiment like this:

It should be observed that this experiment in measuring the severity of a recession while it was in progress did not pinpoint the magnitude of the decline. At best, it defined a broad range within which it might fall. Moreover, it was only partly successful in indicating the duration of the period of "depressed activity," i.e., the interval from the business cycle peak to the time when activity regains its pre-recession level.²⁷

Derek White has found some evidence that the rates of increase in costs and prices in the twelve months preceding a cyclical peak bear some relationship to the subsequent severity of a recession. Other studies, likewise, have explored rates of change and cyclical magnitudes.²⁸

²⁶ Geoffrey H. Moore, "Measuring Recessions," *Journal of the American Statistical Association*, June, 1958 (NBER Occasional Paper 61), reprinted in *Business Cycle Indicators*, Vol. 1, p. 138.

²⁷ *Business Cycle Indicators*, pp. 160-161.

²⁸ Pao Lun Cheng, "Statistical Indicators and Cyclical Amplitudes," presented at the Midwest Economics Association, Des Moines, Iowa, April 19, 1958, and Pao Lun Cheng and Leonard H. Lempert, "Rates of Change and Cyclical Magnitude," *Proceedings of the Business and Economics Statistics Section, American Statistical Association*, Dec. 1958, pp. 142-149.

APPLICATION TO OTHER COUNTRIES

MOST of the work with statistical indicators has been done in the United States. In addition, the National Bureau lists of indicators have been adopted in a number of other industrialized countries. They were duplicated in the Economics Branch of the Department of Trade and Commerce in the mid-1950's, and subsequently have been used in several government agencies, by the Economic Council of Canada, and by economic consultants in the United States and Canada.

Some of the main conclusions from the Canadian experience are relevant here:

In general, the same activities that lead reference cycle turning points in the United States also lead in Canada and by about the same margin; the same general correspondence applies to roughly coincident and lagging indicators.

Diffusion indexes based on Canadian statistical indicators trace out a time path very similar to those for the United States: these indexes lead the reference cycle turning points.

Finally, the indicators and diffusion indexes have proved extremely helpful in current economic analysis and in short-term forecasting.²⁹

More than ten years of experience with the use of these statistical indicators in Canada have transpired since this appraisal was written, fully confirming the initial conclusions. These business-cycle indicators have not been used in isolation by government analysts but along with an econometric macro model, surveys of capital-spending plans, employment expectations by firms, and a review of economic developments in the United States and the main European economies, which reflects the importance of international factors in Canadian economic developments.³⁰

The Economic Planning Agency in Japan produces a regular publication *Business Cycle Indicators*, containing reference cycle

²⁹ W. A. Beckett, "Indicators of Cyclical Recessions and Revivals in Canada," in *Business Cycle Indicators*, Vol. 1, pp. 295 and 297.

³⁰ OECD, *Techniques of Economic Forecasting*, Chapter II, "Canada: Short-Term Forecasting in the Federal Service," pp. 37-62 and Bibliography, p. 169.

dates for the three postwar Japanese business cycles. The publication includes charts and data for 25 selected series and 144 principal economic indicators, with sources of basic data, methods of seasonal adjustment, and comments in English, as well as in Japanese. The diffusion index of the leaders has had a long lead at three postwar peaks (the extent of the lead ranging between 18 and 30 months), with a shorter lead at troughs (ranging between 6 and 9 months).³¹

In Australia, the Reserve Bank has selected a group of series appropriate for its economy, using the procedure discussed in *Indicators of Business Expansions and Contractions*. The bank chose 92 series from an initial list of 135 series, based on the 1950 to 1967 period. In the published reports thus far, the emphasis has been placed on the identification of business cycles and on the use of a diffusion index in recognizing turning points. The lead of the diffusion index over the reference-cycle peak has ranged between 13 and 27 months, and between 4 and 7 months at troughs.³²

PROBLEMS IN USING STATISTICAL INDICATORS FOR FORECASTING

EARLIER I have suggested that statistical indicators provide an important contribution in identifying cyclical turns at about the time they occur, thus creating a basis for postulating the direction and rough order of magnitude of changes in the main aggregates. Necessary though this step may be, there are many instances in which an indication of developments further ahead would be extremely valuable. This problem will be considered first.

1. *The time horizon for forecasts.* Economic forecasts are produced and used in both business and government, and their adequacy should

³¹ Economic Planning Agency, Japanese Government, *Business Cycle Indicators*, 1969, I, p. 8.

³² M. G. Bush and A. M. Cohen, *The Indicator Approach to the Identification of Business Cycles*, Sydney, Australia, Reserve Bank of Australia, 1968, Table 11, p. 40.

be evaluated in relation to user needs. Though for some purposes an identification of changes in the economy at about the time they occur may be quite sufficient, for a number of important purposes a longer forecast seems necessary. Several examples will illustrate this.

Business firms must make decisions about major capital expansions. These might be made more rationally in the light of developments in the economy as a whole and for the particular industry and products over a span of years ahead, instead of from primarily shorter-term developments. Cyclical indicators were not designed to meet these areas of interest, and they must be tackled with other tools if they are to be met at all.

It is often suggested that another important objective for cyclical indicators should be assistance in the use of monetary and fiscal policy for economic stabilization. If the aim of monetary and fiscal policy was to be the moderation, or offsetting, of cyclical changes in the economy, significant practical problems would be encountered, owing to the length of the lags in the operation of policy relative to the duration of past cyclical changes—particularly the short duration of recessions. A brief summary of some of the implications of other work may be helpful at this point.

Monetary policy can be adjusted flexibly once the need to adjust is recognized. However, it takes quite a long time for such changes to have an effect on expenditure decisions as a result of the length of the outside lag. The time required for business to initiate and modify investment plans is comparatively long. On the fiscal side, the prolonged discussions of proposed changes in tax rates in the United States during the 1960's provide recent evidence of the timing problems in this area. Changes in expenditures can also be slow, especially if they require changes in legislation or significant change in organization to bring them about. Once changes in government receipts and expenditures have been brought about, they have a fairly rapid effect on consumer expenditure but a decidedly slower effect on business capital-spending. For countries in which international trade is important, changes in the exchange rate can have an important effect on their competitive and trading position, and the length of the lags can be very great. For example, the 1960-62 Canadian devaluation was still having a significant stimulating effect on the exports of finished manufactured products seven years later, while prices of many

manufactured goods in Canada had still not been adjusted upward by the full amount of the devaluation. The length of these lags appears great in relation to the typical duration of the postwar contractions in North America (10.5 months) and expansions (35.5 months: excluding the extended expansion beginning in 1961).³³

The need to mobilize political support is a further limitation on the pursuit of a discretionary fiscal policy, especially in view of the frequency of policy adjustment involved. If stabilization policies were to be adjusted for each business-cycle turn, past North American experience would suggest that shifts in the emphasis of stabilization policies would be required about five times each decade! Whether the public and the politicians who represent them place sufficient priority on short-term stabilization to support policy adjustments with this degree of frequency is questionable. Also, it may be questioned whether such policy adjustments would be as necessary in the first place if different fiscal and monetary strategies were pursued.

The evidence suggests that statistical indicators provide a basis for recognizing changes at about the time they occur, while users need forecasts for much longer periods in order to implement effective stabilization policies. Zarnowitz summarizes the evidence for forecasting accuracy over various time spans in this fashion:

The evidence shows clearly that the average errors of short-term forecasts increase as the span increases. . . . The progression to larger errors appears in all summary measures (means, standard deviations, and root mean square errors) and in forecasts of variables with quite different characteristics. . . . There can be no doubt that the predictions are considerably more accurate, in absolute terms, over the next three months than over the next six, and more accurate again over six months than over nine or twelve.³⁴

³³ For a fuller discussion of the evidence, see John Kareken and Robert M. Solow, "Lags in Monetary Policy," in *Stabilization Policies*, Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963; *Conference on Stabilization Policies*, Ottawa, Queen's Printer for the Economic Council of Canada, 1966; Derek A. White, *Business Cycles in Canada*, Economic Council of Canada, Staff Study No. 17, Queen's Printer, Ottawa, 1966; D. J. Daly and Derek A. White, "Economic Indicators in the 1960's," *Proceedings of the Business and Economics Statistics Section, American Statistical Association*, Aug., 1967, pp. 64-75; and D. J. Daly, "The Post-War Persistence of the Business Cycle in Canada," in Martin Bronfenbrenner, ed., *Is the Business Cycle Obsolete?* New York, John Wiley & Sons, 1969, pp. 45-65.

³⁴ Zarnowitz, *op. cit.*, p. 60.

In the light of the gap between forecasting needs and attainabilities, there are only four options open:

(a) to improve the accuracy of forecasts a number of quarters ahead;

(b) to significantly modify the political and administrative constraints on policy flexibility;

(c) to eliminate or modify the causes of inventory swings; or

(d) to lower the objectives of short-term stabilization.

Either of the first two options are likely to be difficult to achieve.

2. *Cycles, potential output and growth.* Business cycle indicators have been selected and used to assist in the current appraisal of business cycles, as defined by the National Bureau. Though the indicators are extremely helpful for that purpose, it has never been claimed—and it would be unrealistic to expect—that this approach can meet the necessary conditions for a variety of other analytical or policy purposes. Two examples will illustrate this point.

The Council of Economic Advisers introduced the notion of potential output and the gap between actual and potential output in President Kennedy's administration, early in the 1960's.³⁵ Even should the economy undergo a business-cycle expansion, there can still be an undesirably large gap between actual and potential output from the economic, social, and political points of view. The statistical indicators cannot throw much light on the size of the gap (although they can be helpful in indicating whether the gap is likely to narrow or widen in the period immediately ahead), nor can the estimates of the size of the gap throw much light on the emerging business cycle. It seems to me that both types of data and analysis are necessary components of a comprehensive view of the current economic situation.³⁶ Quarterly estimates of actual and potential output and the size of the gap (in real terms) are now published regularly in *Business Conditions Digest*.

³⁵ *Economic Report of the President, January 1962*, Washington, G.P.O., 1962, pp. 49–56, and Arthur J. Okun, "Potential GNP: Its Measurement and Significance," *Proceedings of the Business and Economics Statistics Section of the American Statistical Association*, 1962.

³⁶ I, personally, would regard Arthur Burns' initial critical comments on the estimates of the size of the gap as an extreme position. Arthur F. Burns, "A Second Look at the Council's Economic Theory," *The Morgan Guaranty Survey*, August, 1961.

The Economic Council of Canada has made estimates of actual and potential output in the course of its work, and has used its knowledge of differing timing relations over the cycle in analyzing the performance of the economy.

It should be noted that the high underlying rates of growth in potential output in the North American and European economies have probably had an influence on the duration and extent of the postwar expansions and on the short, mild recessions. In the United States and Canada, the underlying rate of growth in the labor force has been well in excess of historical experience. In most of the individual European economies, and in Japan, the increases in output have been well in excess of the rates of growth in employment and other inputs experienced historically in those countries, or currently prevailing in North America.³⁷ However, most observers would agree that the business cycle is not as yet obsolete.³⁸

At a more technical level, it should be noted that any weakening in demand can be reflected in an emerging gap between actual and potential output and in increasing unemployment—even though the major production aggregates may still be increasing (although at a slower rate). Some reappraisal of the earlier methods of dating cycles may be appropriate in dealing with this possibility.

3. *The problem of uncertainty.* Earlier on, the role of uncertainty in the theory and application of cyclical indicators has been under discussion. At this stage the problem of uncertainty in using the indicators for current economic analysis will be summarized under three headings:

- (a) variations in conformity and timing;
- (b) retardations during expansions; and
- (c) the influence of the nonconformers.

³⁷ Edward F. Denison, assisted by Jean-Pierre Poulhier, *Why Growth Rates Differ—Postwar Experience in Nine Western Countries*, Washington, The Brookings Institution, 1967, and D. J. Daly, "Why Growth Rates Differ: A Summary and Appraisal," *Review of Income and Wealth*, March, 1968, pp. 75–93.

³⁸ Martin J. Bronfenbrenner, ed., *op. cit.*, p. 507. This volume is based on a conference sponsored by the SSRC Committee on Economic Stability. Geoffrey Moore has considered this in relation to the application of the NBER methods to the rapidly growing European economies. Milton Friedman has modified the application of these methods to the rate of change in the money supply by dating the rate of change at the end of a period reflecting closely similar changes. This permits the use of the indicators during periods of prolonged rapid growth, a point raised by Dr. Firestone in his comments.

(a) *Variations in conformity and timing.* The historical work on business cycles and the discussion of business cycle indicators emphasize the variations in historical experience of the conformity and timing patterns of individual statistical indicators.³⁹ There is some variation in the conformity and timing scores of many of the indicators, especially among the leading and lagging series. These are the ones that would be of most help in giving early warning signals of emergent changes.

(b) *Retardations during expansions.* Some discussion of the typical retardation during expansions was provided earlier. This phenomenon has recurred during 1951, 1956, 1962, and 1966–67, during postwar expansions, and advance warnings of these retardations are typically provided by the leading indicators and their summary measurement. The occurrence of “false signals” in the leaders has been considered in previous appraisals of the forecasting possibilities in the leading indicators.⁴⁰

(c) *The influence of the nonconformers.* Of the 794 monthly and quarterly series for the United States used by Mitchell in *What Happens During Business Cycles*, 85 were classified as irregular in cyclical timing. Almost half of these represent output, prices, inventories, or international trade in agricultural products and foods. Others represent government construction contracts, sticky prices (railway rates, street-car fares, certain wage rate and earnings data, and so forth).⁴¹ It is of some interest that the behavior of these irregular economic processes sometimes offsets, and sometimes intensifies, the cyclical fluctuations

³⁹ Burns and Mitchell, *Measuring Business Cycles*, Chapter 11 on “Cyclical Changes in Cyclical Behavior”; Wesley C. Mitchell, *What Happens During Business Cycles*, Chapter 8, “Cycle-by-Cycle Variability in Cyclical Behavior”; and Moore and Shiskin, *Indicators of Business Expansions and Contractions*. “Appendix D, Conformity and Timing Scores for 1948–65,” illustrate this, without attempting complete documentation.

⁴⁰ Sydney S. Alexander, “Rate of Change Approaches to Forecasting—Diffusion Indexes and First Differences,” *Economic Journal*, June, 1958, pp. 288–301; Alexander Sachs, “The Cyclical Indicator Approach,” *The Conference Board Business Record*, June, 1955, pp. 7–16; Arthur M. Okun, “On the Appraisal of Cyclical Turning Point Predictors,” *Journal of Business*, April, 1960, pp. 101–120.

⁴¹ *What Happens During Business Cycles*, pp. 56–60. Some series closely related to those classed as irregular on the basis of their historical timing relation are carried regularly in *Business Conditions Digest* in the section “Other Key Indicators.”

occurring in the rest of the economy. For example, during severe business-cycle depressions, these nonconformers also decline.

These three important types of variability in historical experience illustrate the role of uncertainty in the economy. Some of these empirical results may reflect imperfections in the data or in the methods of seasonal adjustment, and there is undoubtedly room for further improvement in the basic data. However, a significant part of the material is a reflection of developments in the real world.

Similar indications of the importance of uncertainty in the real world are to be found in the major econometric models for the United States and Canada. The size of the error terms in individual structural and reduced-form equations, and the errors of the complete system of equations, reflect this. The difficulties in developing satisfactory structural and predictive equations for such cyclically sensitive series as corporation profits and inventory change are well recognized. Furthermore, the list of series treated as exogenous in some of the main econometric models is very similar to that of series classified as nonconformers in the National Bureau presentation. In one appraisal of the forecasting record of the Canadian econometric model, it was suggested that the problems involved in forecasting the exogenous variables were a key factor in the poor results for that year.⁴² Many years of using that model would confirm this conclusion for other years.

The forecasting record of a variety of approaches suggests that the problem of uncertainty about the future is not peculiar to those using historical experience and economic theory as a basis of prediction.

If this view regarding statistical indicators and other approaches to short-term forecasting is essentially correct, there are important implications for attempts to use economic forecasts as a basis for discretionary monetary and fiscal policy aimed at the task of economic stabilization.

⁴² T. M. Brown, "A Forecast Determination of National Product, Employment and Price Level in Canada from an Econometric Model," in *Models of Income Determination*, Conference on Research in Income and Wealth, Vol. 28, 1964, pp. 59-86.

DISCUSSION

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Don Daly has presented us with a useful and comprehensive review of the uses to which the National Bureau of Economic Research statistical indicators—and similar data in other countries—can be put for short-term forecasting purposes. He has drawn on some twenty years of experience as a successful forecaster in the service of the Government of Canada and as a researcher in the field of economic behavior, seeking the best means of measuring and anticipating economic change.

His presentation is well documented and his conclusions are couched in careful academic terms. Hence, the main points a commentator can put forward, beside acknowledging the professional quality of the report, are not so much in reference to what he says but to what he omits to say. In choosing this form of comment, the limitations of a short paper have been carefully considered.

The comments cover five points. The first is of a general nature and deals with the application of indicators to business-cycle and economic-growth analysis. The next three items relate to specific matters raised in the paper, including the role of judgment, seasonal adjustments, and the application to other countries. The last item deals with Daly's conclusions.

APPLICATION TO BUSINESS CYCLE AND ECONOMIC GROWTH ANALYSIS

The primary objective of statistical indicator techniques, the leaders, the concurrent, and the lagging series, is to facilitate the recognition of economic change, if possible, in both direction and extent of general economic activity. The use of indicators as a forecasting device is an outgrowth of business-cycle analysis. Daly refers to the work of Mitchell, Burns, Moore, and Shiskin, among others, as pioneers in the work of selecting and testing relevant statistical series, grouping them in a statistically meaningful way so that their proven behavior

over a long period of time might be used to foreshadow upward or downward changes in economic activity.

Daly does not take sides on the issue of whether business-cycle examination is, or is not, an outdated form of economic analysis. But he does suggest that statistical indicators, with all their limitations, have a place in forecasting a change in economic activity. He refers to the use of diffusion indexes as a "method of combining the individual series . . . [to] be helpful" (p. 1164).¹

If one examines the variety of series that make up a diffusion index based on leaders, one finds a cross-section of statistical series: those reflecting economic flows, e.g., housing starts and *GNP* inventory change; those reflecting working conditions, e.g., average hours worked and layoff rate in manufacturing; those reflecting entrepreneurial initiative or lack of business success, e.g., net new enterprises established or failure liabilities; and those reflecting the working of the market system—industrial-material prices, and common-stock prices. A diffusion index based on such a conglomerate of statistical series "relates to 'indicators of activity' rather than to an economically significant total. . . . Obviously, these indicators all pertain to general economic conditions, but do not comprise an economically significant group."²

If variations in total economic activity are measured in terms of changes in real *GNP*, a question arises: What is the relationship of such statistical indicators to *GNP*? A theoretical link of some of these series to *GNP* can be established. But, in other cases, the relationship is either tenuous or farfetched.³

Daly acknowledges that the historical conformity to the business cycle is not sufficient ground to instill confidence in the use of statistical indicators as a forecasting device, and he refers to both positions: the criticism of the inadequacy of a theoretical framework (e.g., by Koopmans), and the defense (e.g., by Vining). Daly claims that "the work since the late 1950's has been much more explicit about the economic rationale" and he appears to suggest that the work speaks

¹ He also mentions another method, the "amplitude-adjusted" composite indexes (p. 7).

² *Business Cycles and Forecasting*, by E. C. Bratt. Homewood, Illinois, Richard D. Irwin, Inc., 1961, p. 390.

³ Bratt makes a good case for the economic rationale of most series included among the leading indicators (*ibid.*, pp. 385-390).

for itself as an answer to “the critics and sceptics” (p. 1161). One cannot help but wonder whether this is really the case.

Wesley Mitchell was not only a pioneer researcher in this field but he also had a great feeling about the relationship between business-cycle analysis and macroeconomic analysis. He commented about the selection of indicators in their relationship to *GNP*: “A series that influences our choice of reference dates appreciably because it is comprehensive is a series that represents an appreciable fraction of aggregative activity; its peaks and troughs therefore contribute to what we are seeking to find—the peaks and troughs in aggregate activity itself.”⁴

In using leading indicators as a forecasting device, what is really being forecast: a change in the direction of economic activity, either up, recovery or upswing—or down, recession or downswing? If so, is a change in economic activity to be measured in its most comprehensive form, an increase or a decrease in real *GNP*? If this is the intent, what happens if the leading indicators suggest a possible decline, but all that happens is the slowdown in the rate of growth of the real *GNP*? Daly would say, as would others, that the leading indicators showed only “weakness,” reflecting a “retardation” in economic growth, such as has occurred in the United States in 1951, 1956, and 1966–67 (p. 1174).

But a slowdown in the rate of economic growth may be accompanied by an increase in the number of unemployed and by rising prices. There are a number of reasons for this. Productivity may rise and the number of hours worked per week may be up. Hence, fewer people can produce a greater output. If at the same time the labor force is growing fairly rapidly, and this has been the North American experience in recent years, unemployment may rise significantly at the same time that the *GNP* continues to expand. And further, there may be great regional variations, so that a national “above average” unemployment ratio may range all the way from moderately below full employment to serious unemployment levels which may be socially undesirable and politically unacceptable.

⁴ *What Happens During Business Cycles: A Progress Report*, by Wesley C. Mitchell, National Bureau of Economic Research. Cambridge, Mass., The Riverside Press, 1951, pp. 277 and 278.

With unemployment rising, prices may continue to increase. This may be the case not only because of the customary lag effect, but also for other reasons—the continuity of cost-push pressures, the result of the economic power of big business and big unions inadequately restrained by government policies.

Daly acknowledges that statistical indicators cannot throw much light on the economic gap, the difference between actual and potential *GNP* (p. 1180). It is the under-utilization of manpower (unemployment and underemployment) and of other resources (physical capital and natural resources) that contribute to the widening of the economic gap.

There is another limitation. Though statistical indicators may serve as an effective forecasting tool in foreseeing a change in the direction of economic activity, they are only indicative of the symptoms of change (say business activity), however defined. They do not explain the fundamental factors contributing to that change. The economist, however, is not only concerned with finding out what change is in the offing but also why. For if he is not satisfied with the reasons explaining the change in economic activity, either up or down, he may mistrust statistical indicators, treating them as what they are: a mechanical tool not to be relied upon without an economic rationale.

Another use to which statistical indicators can be put for forecasting purposes is in throwing some light on the question of “the duration and extent of current change,” a subject that “is not always given sufficient attention in forecasting appraisals” (p. 1174).

Two suggestions are put forward for further discussion. First, if statistical indicators are assumed to be closely related to business-cycle analysis, what happens if countries like the United States and Canada are in a stage of more or less continuous economic expansion, such as the period 1961–69, unparalleled in peacetime history for a century? During these nine years, problems encountered were those of a temporary slowing down in the rate of economic growth, accompanied by rising unemployment and persistent inflationary pressures. How effective have statistical indicators been in throwing light on the length of the period of economic expansion, or on the strength and continuity of the upthrust of wages and prices on a broad front?

Second, if statistical indicators are used to signify changes in

over-all economic activity, i.e., variations in the real *GNP*, either up or down, do they really provide an adequate tool for assisting government to formulate effective economic policies designed to maximize economic growth and social welfare? The argument here is that they do not. (This point will be expanded in the conclusions.)

As Lempert explains, indicators are nothing "more than the product of a *particular way of looking at the economy we live in.*"⁵

ROLE OF JUDGMENT

"It is a matter of judgment whether a particular decline in the leaders reflects a pause in the vigor and extent of the expansion, or a cyclical recession" (p. 1174). This is in part the problem of "false signals," and Daly refers to the writings of Alexander, Sachs, and Okun in elaborating on the hazards the analyst faces in distinguishing correct from false signals (footnote 40, p. 1182).

The remedy suggested by Daly is "initial caution in regarding every period of weakness in the leaders as an indicator of cyclical weakness" (p. 1175).

All good forecasters are cautious. If they are not, they are likely to get their fingers burnt and their professional reputation tarnished. But caution is no substitute for judgment; statistical procedures exist to help in the formulation of judgment, not to substitute for it.

It would be useful if this subject could be pursued at the present conference. On what should judgment be based when statistical indicators are used as an economic forecasting device? Should the judgment be concerned first with recognizing where the economy stands as it takes off into the future to be predicted? Would it not be wise to heed Moore's advice: competent use of statistical indicators would enable us to "reduce the usual lag in recognizing revivals or recessions *that have already begun*"?⁶

⁵ "Leading Indicators," by Leonard H. Lempert, in *How Business Economists Forecast*, W. F. Butler and R. A. Kavesh, eds. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1966, p. 38.

⁶ *Statistical Indicators of Cyclical Revivals and Recessions*, by Geoffrey H. Moore, Occasional Paper 31, National Bureau of Economic Research, New York, 1950.

Should judgment, in the second instance, take account of the results obtained by other means of forecasting? Should the analyst wait for such results before formulating his judgment? Other means might include econometric forecasts; anticipatory surveys; integrated forecasts within a national accounts framework—supported by sector, industrial, and regional outlook appraisals; forecasts within an output-input framework; and within a financial-flow system.

In considering the results obtained through these other means of forecasting, the analyst may want to bear in mind that many of the aggregative measurements, particularly the *GNP* model, do not lend themselves to the effective detection of turning points in economic activity. Recourse must then be taken to sector examination and statistical indicator analysis as more reliable means of establishing the finer points of economic change, which may be glossed over in broad aggregates.

Nonetheless, judgment depends on many other things beside measurable economic forces. There is the understanding of economic theory, as well as qualitative considerations. The latter may be economic, e.g., possible policy changes; psychological, e.g., consumer or business attitudes; social, e.g., pressures to aid the underprivileged; political, e.g., a forthcoming election; and international, e.g., national responses to changes in the Cold War.

Judgment presumes insight into the workings of the social system and into the motivations that shape economic behavior. The main point here is that there is no substitute for good judgment in classifying and assessing the variables that will exert the greatest influence in a given situation. This view should not be interpreted as meaning that the economic forecaster relies largely on intuition. On the contrary, scientific analysis plays an important part in economic forecasting. But this scientific approach has to be blended with an understanding of human motivation and the possibility of both rational and irrational reaction to given situations. Thus the economic forecaster must not only be a social scientist, but also a student of human nature, transcending the areas covered by the social sciences.

In this connection, one might recall Bernard Baruch's definition of judgment. He was asked: "What is the secret of your success at

being economic adviser to seven Presidents of the United States?" He replied: "It's rather simple. People ask my advice because I have good judgment. Good judgment comes from experience. Experience—well, that comes from bad judgment."

SEASONAL ADJUSTMENTS

Seasonal adjustments of statistical indicators are "almost taken for granted by most economists and statisticians" (p. 1162), though Daly acknowledges the difficulties encountered in obtaining such data "partly because of the greater extent of irregular factors and special considerations" (p. 1162), and the "imperfections . . . in the methods of seasonal adjustments" (p. 1183).

There is little doubt that deseasonalized series provide better indications of economic change than do seasonally unadjusted data. The question is not whether to use adjusted or raw data for forecasting purposes, but whether seasonal adjustments may create distortions greater than the shortcomings inherent in the use of unadjusted data.

Some testing has been done in this field, suggesting that deseasonalization may produce results that go beyond its stated objective, also bringing about: (1) elimination of components that are not seasonal; (2) introduction of components that are not seasonal; and (3) distortion of temporal relations among series.

Larry Klein, in presenting his paper on "Short and Long Run Simulations of the Wharton Model" at this Conference, made the point that his investigations showed that the deseasonalized series introduced new seasonal factors.

Nerlove has examined two methods of seasonal adjustments—the Bureau of Labor Statistics method and the so-called "residual" method. He has tested by means of spectral and cross-spectral analysis⁷ some 75 time series on employment, unemployment, and labor force (in-

⁷"In somewhat oversimplified terms the basic idea behind these types of analysis [spectral and cross-spectral analysis] is that a stochastic time series may be decomposed into an infinite number of sine and cosine waves with infinitesimal random amplitudes. Spectral analysis deals with a single time series in terms of its frequency 'content'; cross-spectral analysis deals with the relation between two time series in terms of their respective frequency 'contents.'" "Spectral Analysis of Seasonal Adjustment Procedures," by Marc Nerlove, *Econometrica*, Vol. 32, No. 3, July, 1964, p. 241.

cluding many subseries), regularly collected by the U.S. Bureau of Labor Statistics.

This examination led Nerlove to two conclusions regarding the effects of the BLS seasonal-adjustments procedures:

First, these procedures remove far more from the series to which they are applied than can properly be considered as seasonal. Second, if the relation between two seasonally adjusted series in time is compared with the corresponding relation between the original series in time, it is found that there is a distortion due to the process of seasonal adjustment itself. Both defects impair the usefulness of the seasonally adjusted series as indicators of economic conditions, but, of the two, temporal distortion is the more serious defect.⁸

In this context, the analyst using statistical indicators for forecasting purposes has four choices: (1) he can ask for improvements in the deseasonalization process to reduce the distortions that apparently plague presently available adjusted data;⁹ (2) he can call for more comprehensive tests of deseasonalization procedures so as to obtain some quantitative indication of the statistical bias introduced by such procedures; (3) he can consider the possibility of making increasing use of raw data in economic analysis, bearing in mind that many business decisions are made on the basis of quantitative evidence, unadjusted for seasonal factors; and (4) he can allow for the defects of deseasonalized indicators in using them to formulate his economic forecast. This last may involve—to the extent that statistical verification is incomplete—taking into account qualitative factors in the formulation of judgment as to the validity, comprehensiveness and meaningfulness of the data used. If I may make a suggestion to the Conference Executive Committee: perhaps this subject of problems faced in deseasonalization may be dealt with at a future conference.

⁸ *Ibid.*

⁹ In another paper, Daly stresses the importance of the economic forecaster and the statistician working more closely together: "Much could be gained from better two-way communication between economic theorists and short-term forecasters, on the one hand, and the developers and users of statistical indicators, on the other." "Economic Indicators in the 1960's," by D. J. Daly and Derek A. White, *Proceedings of the Business and Economics Statistics Section, American Statistical Association*, August, 1967, pp. 64-75.

APPLICATION TO OTHER COUNTRIES

"Most of the work with statistical indicators has been done in the United States" (p. 1176). This is true. Daly proceeds to refer also to some work undertaken in this field in Canada, Australia, and Japan (pp. 1176 and 1177). To round out these references, it might have been helpful to mention the investigations undertaken in this field by the Institut für Konjunktur Forschung (Deutsches Institut für Wirtschafts Forschung) in Berlin, dating back to the late 1920's; and similar work undertaken by the IFO Institut für Wirtschafts Forschung in Munich, founded in 1949; business-cycle analysis undertaken at the University of Louvain, particularly the pioneering work of Prof. L. H. Dupriez since the early 1930's; and the more recent investigations conducted in France by the SEDES (Service des Etudes Economiques et Financières), and in the Netherlands by the CPB (Central Planning Bureau).

CONCLUSIONS

While a great deal of work can be done to reduce the imperfections of the data and to strengthen the theoretical framework, Daly makes the point that statistical indicators have earned their honored place in the arsenal of short-term forecasting techniques and that this has "important implications for attempts to use economic forecasts as a basis for discretionary monetary and fiscal policy aimed at the task of economic stabilization" (p. 1183).

If one may be permitted to extrapolate what Daly may have in mind, his thinking appears to run parallel to the views held by Arthur F. Burns, who took over the chairmanship of the Federal Reserve Board on January 31, 1970. As former President of the National Bureau of Economic Research, and close collaborator with Wesley C. Mitchell, Burns looks with some favor at the indicator approach to economic forecasting.

As a former Chairman of the Council of Economic Advisers, Burns is also mindful of the limitations of short-term forecasting as an effective means of guiding economic policy, and he holds that "fine

tuning” of the economy—that is, rapid changes in economic policy, quick turns to expansion followed by equally rapid turnaround toward deflation—is not workable in an economy like that of the United States. Applying this position to the workings of the Federal Reserve Board, Burns observed: “I think that abrupt shifts by the Federal Reserve Board have been too frequent in our nation’s history. Our monetary authorities . . . need to learn how to forecast better” or “recognize that oscillations of monetary policy may easily prove destabilizing.”¹⁰

This sounds like Milton Friedman (though Burns might go further in the use of fiscal and monetary policy instruments than Friedman); namely, that the Federal Reserve Board should abandon its traditional position of leaning against prevailing economic winds; that is, tightening credit when the economy is buoyant and easing it when the economy is slowing down. Instead, the Federal Reserve Board might usefully concentrate on keeping money supply—defined as currency demand and time deposits in commercial banks—growing at a given rate.

Whether or not Daly subscribes to the thinking of Burns and Friedman,¹¹ the fact remains that the use of statistical indicators as a short-term forecasting device, and the effect of such economic forecast on fiscal and monetary policy formulation in the United States, will depend to some extent on whether this country moves away from the Keynesian compensatory policy approach, as typified by the thinking of Walter W. Heller when he was Chairman of the Council of Economic Advisers (and reflected to some extent in the policy guidance given to the Federal Reserve Board by W. M. Martin, Jr., Chairman of the Board since 1951), and toward views similar to those advanced by Burns and Friedman.

For, if “fine tuning” ceases to be a policy objective, fiscal and monetary policies may be subject to less frequent and less extensive changes than they have been in the recent past. In fact, recognition appears to be growing, both in the United States and in Canada, that there are limitations to fiscal and monetary policies in dealing with

¹⁰ “How Burns Will Change the Fed,” *Business Week*, October 25, 1969, p. 104.

¹¹ The reference to “. . . it may be questioned whether such policy adjustments would be as necessary in the first place if different fiscal and monetary strategies were pursued” (p. 23) is suggestive.

some of the problems of economic growth—particularly, strong inflationary pressures which persist notwithstanding increasingly tougher anti-inflationary measures taken by the governments of our two countries. Voluntary wage and price guidelines have been resorted to. Consideration is also being given to what governments could do should measures of voluntary restraint prove ineffective in the private sector.

In this area, policy thinking in Canada appears to be somewhat ahead of that in the United States. Only recently, the Canadian Prime Minister said in the House of Commons:

I must say, we are determined to continue the fight against inflation by every means available to government. . . . Among the less voluntary measures, we include, of course, fiscal and monetary policies, but the matter of price control is something that the government is considering. . . . If necessary, we will discuss the problem with the provinces to see whether, if needed, price and wage controls can be introduced.¹²

Both countries appear to be moving in the direction of expanding government activities—widening the range of policy measures to deal with the excesses of economic growth (e.g., inflation, industrial concentration, and conglomerates) and its deficiencies (e.g., regional inequality and poverty). As this trend toward wider government participation in economic affairs continues, it will not suffice for economic forecasting to serve merely as “a basis for discretionary monetary and fiscal policy aimed at the task of economic stabilization.”

Rather, economic forecasting may be required to serve the broader policy objectives pursued by governments: to expand economic activity at a rate which makes effective use of the nation’s growing total resources—human, physical, and natural—to the degree that the public is willing to exchange work for leisure; and to spread the benefits from gainful pursuits equitably and widely among the members of society.

¹² Statement by the Hon. Pierre Elliott Trudeau, *House of Commons Debates*, Queen’s Printer, Ottawa, October 28, 1969, p. 159.

HERMAN I. LIEBLING

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I found little to disagree with in Daly's acceptance of the statistical indicators as one convenient way of looking at data to provide, at least in part, the basis for a forecast of economic activity. There is an air of restrained enthusiasm about this scholarly presentation, but I assume that this reflects academic caution (reinforced by Daly's government experience). He does note, in passing, his need to utilize other approaches when he was a government forecaster. As a forecaster of economic developments for the U.S. Treasury, I deeply sympathize with Daly's quite evident judgment that dependence on a single framework increases the probability of error and that pluralism (or eclecticism) is preferable because it bespeaks a well-merited humility concerning the attainments of economic science in this area.

More important, Daly's main thrust differs from that of the protagonists of the indicators approach a decade or so ago. These arguments of the late 1950's were couched in terms of the emergence of a new and powerful device which might replace other forecasting techniques. A decade later, Daly repeats the advantages of the indicators approach (which are by now well-known and generally accepted by all except the irreconcilable dogmatists). Consequently, I will not resurrect the controversies of that time, as Daly does.

Had I written his paper, I would have preferred discussion of current issues and prospects relating to the indicators in the following areas: (1) What progress has been made in the statistical basis of the indicators since the late 1950's, and to what extent has it improved the ability to forecast? (2) Are there limits to further refinement of the classification process of "leaders," "coinciders," and "laggers"? (3) Is there a theoretical framework toward which the statistical-indicators approach is a prior stage, and if so, what might its nature be? (4) What has been the forecasting record of the statistical indicators? (Surely a topic of prime concern at this Conference . . .)

Obviously, within the framework of time and space that a discussant may properly use here, no comprehensive discussion of these topics can be attempted. I would propose that they be the subject, at least in part, of another Income Conference. My present observations

should be regarded as outlining what these issues might be, rather than as providing a rounded treatment of the subject.

STATISTICAL PROGRESS AND DEVELOPMENT

Focusing on the 1950's, Daly fails to provide an account of the advances which have been made over the past decade. Chalk up as important progress (as Daly notes) the adoption of systems of statistical indicators in many countries. Except for those who are *theoretical monists*, I would think this is a noncontroversial advance. Secondly, since the late 1950's, or early 1960's, various of the statistical indicator measures have been refined, improving their utility. Early in the decade (1961), Julius Shiskin published a major work, *Signals of Recession and Recovery*, which provided important progress in making available "amplitude-adjusted" indexes. Possibly that work ought to be credited as a product of the 1950's.

To the 1960's, I credit Shiskin's development of the so-called reverse-trend adjusted index of the leading indicators. The remainder of the work of the 1960's in the statistical-indicators field appears to consist of statistical refinement—notably, the revisions in the list of indicators and the ingeniously derived statistical measures combining existing statistics (e.g., price per unit of manufacturing labor cost; contracts and orders for plant and equipment). Also of this statistical nature was the scoring system for the reliability of the indicators.¹ Finally, the availability of *Business Conditions Digest* (under the direction of Shiskin) on such a current and comprehensive basis must be considered an important asset to forecasters. If I have omitted some additional achievements, they have not yet appeared in *BCD*. Of the improvements just listed, I would single out Shiskin's reverse-trend adjustment as the major development in improving the ability to forecast. In the amplitude-adjusted form, the index of the leading indicators showed a variable lag of from six to twenty months decline prior to the four postwar expansion peaks. The reverse-trend

¹ *Indicators of Business Expansions and Contractions*, Geoffrey Moore and Julius Shiskin, New York, NBER, 1967.

adjustment, which makes allowance for secular trends in the economy, has reduced this lag to four to seven months.²

SCOPE OF FURTHER RESEARCH

The issue I would raise is the establishment of ongoing research of a conceptual nature, directed toward further development of the statistical indicators. In their latest major book (1967), Moore and Shiskin raise the question of what "improvements take place when a revised list of National Bureau indicators is released."³ They conclude that the indexes of change in the postwar period "based upon the 1966 list are virtually the same as the corresponding indexes based upon the 1960 list. This reflects the fact that, on an over-all basis, the new and old lists have many common elements." Apparently, this phase of research needs little further work.

New research effort would appear to require some larger framework of analysis, one going beyond the classification of "leaders," "coinciders," and "lagers." If such exists, its main outlines are obscure or, perhaps, unannounced. Thus, Daly is one phase behind in his defense of the indicators; the dust has settled on the old controversies. At this point, I raise the question: Now that the statistical indicators system has been developed, where do we go from here?

In his description of "the complete system" (p. 1165), Daly has suggested the need for such a theoretical framework, which would include as its essential elements: (1) the key role of profits in business decision-making; (2) the importance of lags in response; and (3) the role of uncertainty. These are important aspects of W. C. Mitchell's view of the business cycle. Perhaps Daly does have some *special*—not yet revealed—manner in which the statistical-indicators approach is *uniquely* related to these elements. Recently, a vast literature has been published in each of these areas, as much connected with large-scale econometric models, or anticipations surveys, as with the indicators. Since it is processes on which W. C. Mitchell would have

² *Review of Economics and Statistics*, February, 1968.

³ *Ibid.*

liked us to focus, I would submit that the Jorgenson-Eisner articles on profits, the distributed-lag relationships developed by Koyck and Almond, and the Milton Friedman work on uncertainty, bear a close relation to the comprehension of processes in *any* framework. Daly does not state how these works are to be integrated into the framework of the statistical indicators. More generally, the question is: How can statistical indicators be organized to accommodate the complete system?

In this connection, I shall briefly note that another type of statistical indicator has emerged to claim recognition as *the* best way to forecast. Dr. Arthur Burns, armed though he has been with statistical indicators and other methods of forecasting, recently warned how poor our forecasts have been (as discussed below). Indeed, the recent work of Leonall Andersen, and others working in the spirit of the so-called monetarist school, points to a new type of statistical indicator, apparently possessing strong predictive power. We are confronted with this problem: If we desire to work with a new framework of analysis of an indicator type, will it be one which concentrates on the monetary variables? Will it be intended to supplement or replace the older indicators approach? If the monetarists are right in stating that money discipline is inescapable in its economic consequences, what place do the nonmonetary indicators have? An unpublished paper by Moore and Shiskin addresses itself to these questions. I hope it will soon find its way into print.

THE FORECASTING RECORD

At an earlier Income Conference it was observed that many who are well equipped with information and techniques cannot produce sound forecasts.⁴ Since that time (September, 1951), considerable work has been invested in developing large-scale econometric models. Nonetheless the observation just introduced remains valid. Econometric models used for forecasting in the earlier post-World War II period failed. Thus, there is an air of *dejà vue* hanging over these

⁴ *Short-Term Forecasting*, Studies in Income and Wealth, Vol. 17. New York, NBER, 1955, p. 45.

Proceedings. Apparently there is no substitute for judgment, balance, and insight in making economic forecasts; econometrics is merely the first of many steps.

At no time was this more aptly illustrated than at the recent critical juncture of mid-1968, when economic policy of the U.S. was misdirected toward economic “overkill” subsequent to June 1968, because all large-scale econometric models advised the same. It may be useful to compare those forecasts with other methods, such as the indicators approach. After all, theoretical deficiencies abound. And, if the indicators method proves itself without such encumbrances, it surely deserves attention. *Indeed, that period appears to be the finest hour for the indicators approach in recent years.*

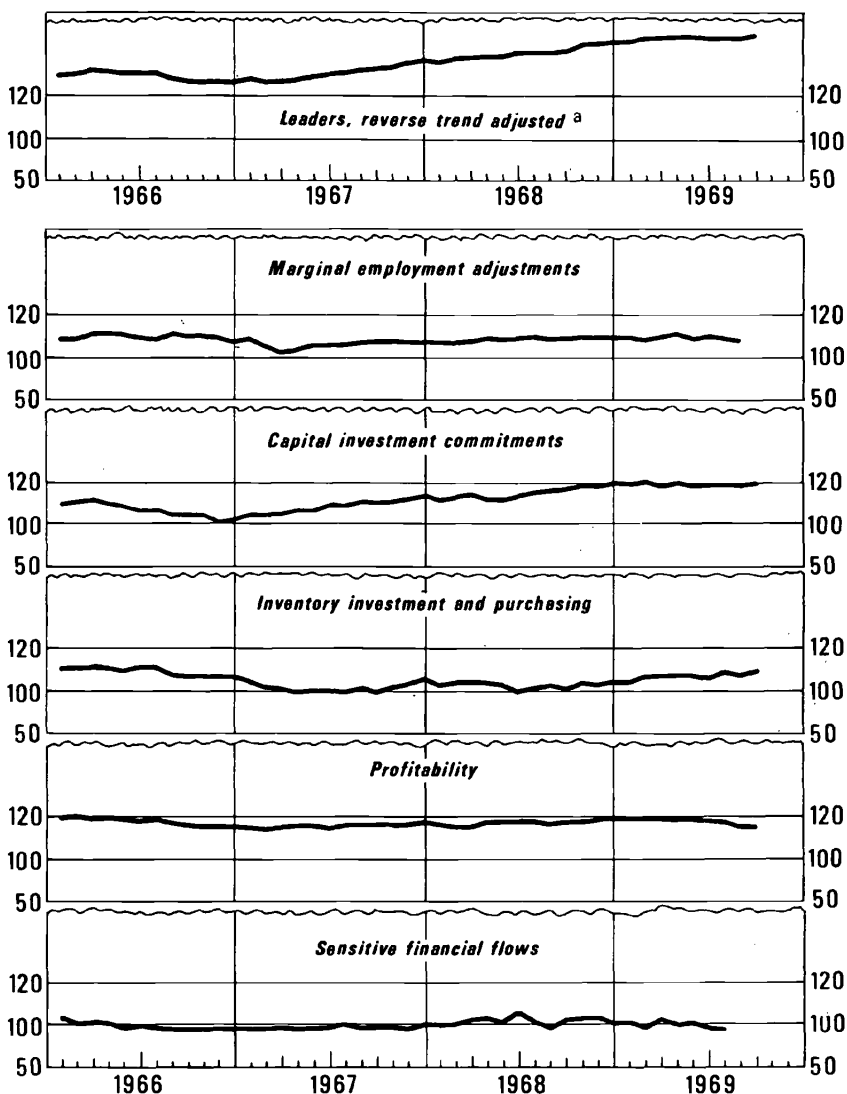
Now, I did not follow that procedure myself in advising the Treasury that “overkill” was *not* a danger—mine was a solitary voice forecasting that the policy measures were not restrictive enough! I do use a small econometric model, but only as a first step, and I also look at the indicators. The comparison of the forecasts in the table with the information in the chart shows that the indicators approach performed creditably.

The chart shows that the summary measure of the leading indicators—the so-called reverse-trend adjusted index—was signaling continued economic expansion during 1968. The index accelerated in pace, pointing to considerable expansion of over-all activity during that period and into the first half of 1969. As a useful summary of measures foretelling economic activity, it served an important purpose.

On the other hand, the total index was more reliable than its parts. The latter are not reverse-trend adjusted. As the chart shows, the marginal employment adjustment series remained fairly flat. Accordingly, this part of any analysis using the indicators must be interpreted much differently at periods of high employment than at other times. Similar is the confusing signal generated by the profitability series, which remained quite flat during 1968. During most of 1968, the inventory investment series clearly lagged, rather than leading. In view of the expansion which did take place, most striking of all was the flat performance of the sensitive financial flows (using measures favored by the monetarists). Only the capital investment commitment series followed the trend comparable to the twelve leading indicators. (I

CHART 1

Trends in the Leading Indicators, 1966-1969 (1963 = 100)



SOURCE: *Business Conditions Digest*, Bureau of Census, U.S. Department of Commerce.

^a Reverse trend-adjusted index of twelve leaders contains the same trend as the index of five coincident indicators.

confess that I am uncertain about the significance of this performance.)

The accurate findings of the reverse-trend adjusted index, showing a strong "plus" on the course of future economic activity, is an accomplishment worth noting, especially as compared with other forecasts of a more intricate and theoretical nature. The table shows the economic forecasts for 1969 made before the Joint Economic Committee in February, 1969, seven months after the forecasts of economic "overkill" had originally been made. (During this period unrepentance prevailed.) Instead of the strong "plus," all forecasters at these hearings performed badly, as compared with the message relayed by the indicators.

Until recently, the indicators method did not provide means of quantification of how strong or how weak future economic activity, as measured by *GNP*, might become. Geoffrey Moore has provided a bridge connecting the two approaches.⁵ More attention should be given to a structural link between the statistical indicators and a forecast of *GNP*. Grateful as we are for a forecast of the correct sign of the future course of economic activity, it would be even more meaningful if, by the use of the "leading indicators," a given volume of *GNP* might be projected, from which the structural elements of the income and product sides could be separated out by subsequent analysis.

Using Moore's regression analysis of annual per cent changes in the index of leading indicators and in the gross national product, the forecast *GNP* for 1969 over 1968 was calculated, employing the information available at the turn of 1968. This method forecast an advance of \$62 billion, or 7.2 per cent. In contrast, most of the forecasts show *GNP* increases centering around \$55 billion or so. Moore's forecast was the highest, about the same as that of George Perry. Nevertheless, the humility which most of these forecasters ought to share is apparent when we compare their figures with a 1969 *GNP* change of around \$67 billion, or over 7.5 per cent. My own views on how these econometric models failed, and why they did, are set forth in an article published in the 1969 *Proceedings of the American Statistical Association*, Business and Economics Section.

Daly indicates no particular preference in his forecasting methods,

⁵ Geoffrey H. Moore, "Forecasting Short-Term Economic Change," *Journal of the American Statistical Association*, March, 1969.

Source of Data	1968	1969		
	Actual	Actual		
	IV	I	II	IIIp
<i>Change in GNP, Billions of Dollars</i>				
The Wharton School	16.1	16.2	16.1	17.5
University of Michigan	16.1	16.2	16.1	17.5
UCLA	16.1	16.2	16.1	17.5
George Perry (University of Minnesota)	16.1	16.2	16.1	17.5
Federal Reserve Policy Model	16.1	16.2	16.1	17.5
<i>Economic Report of the President</i>	16.1	16.2	16.1	17.5
Geoffrey Moore Model	16.1	16.2	16.1	17.5
<i>Per Cent Change in Deflator at Annual Rates</i>				
The Wharton School	4.3	4.9	5.2	5.4
University of Michigan	4.3	4.9	5.2	5.4
UCLA	4.3	4.9	5.2	5.4
George Perry (University of Minnesota)	4.3	4.9	5.2	5.4
Federal Reserve Policy Model	4.3	4.9	5.2	5.4
<i>Economic Report of the President</i>	4.3	4.9	5.2	5.4
Geoffrey Moore Model	4.3	4.9	5.2	5.4
<i>Per Cent Change in Real GNP at Annual Rates</i>				
The Wharton School	3.2	2.6	2.0	2.1
University of Michigan	3.2	2.6	2.0	2.1
UCLA	3.2	2.6	2.0	2.1
George Perry (University of Minnesota)	3.2	2.6	2.0	2.1
Federal Reserve Policy Model	3.2	2.6	2.0	2.1
<i>Economic Report of the President</i>	3.2	2.6	2.0	2.1
Geoffrey Moore Model	3.2	2.6	2.0	2.1

NOTE: p: preliminary; n.a.: not available.

SOURCE: Moore Model projection derived from equation relating percentage changes in GNP to percentage changes in twelve leading indicators, using data available in early Feb., 1969. See *Journal of American Statistical Asso-*

Forecasts for 1969

1969 Projected			1968-1969 Projected	1969 Projected as Per Cent of Actual		
I	II	III		I	II	III
9.5	12.7	13.9	55.3	59	79	79
10.0	8.7	17.9	54.3	62	54	102
11.2	12.5	17.5	60.3	69	78	100
n.a.	n.a.	n.a.	62.0	n.a.	n.a.	n.a.
... 12½	... ^a	n.a.	58-60	... 77	... ^a	n.a.
... 12	... ^a	n.a.	60.0	... 74	... ^a	n.a.
n.a.	n.a.	n.a.	61.8	n.a.	n.a.	n.a.
4.0	4.0	4.0	3.9	82	77	74
3.3	3.3	4.5	3.6	67	63	83
3.3	3.3	3.9	3.5	67	63	72
n.a.	n.a.	n.a.	4.0	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	3-3½ ^b	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	3½ ^a	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
0.4	1.7	2.1	2.4	15	85	100
1.3	0.7	3.4	2.6	50	35	162
1.7	2.3	3.9	3.4	65	115	186
n.a.	n.a.	n.a.	3.0	n.a.	n.a.	n.a.
... 2	... ^a	n.a.	2-3	... 87	... ^a	n.a.
n.a.	n.a.	n.a.	3½ ^a	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

ciation, March, 1969, p. 16. Other projections from *Hearings before the Joint Economic Committee, Congress of the United States, 1969*.

^a Annual increases and half-year average of quarterly rates derived from published statements.

^b Excludes effects of the federal pay raise in the third quarter.

an attitude which I find completely acceptable. However, he might have stressed that in his former work as a forecaster for the Canadian Government, he could not avoid going beyond the statistical indicators in order to forecast tax receipts, for which he would be compelled to use the framework of national income accounts as well.

REPLY

DALY

Dr. Liebling and Dr. Firestone made a number of useful additions and suggestions in their comments and raised a number of important questions. My reply will recapitulate some of the key themes in my paper and speculate on some of the bigger questions raised by the discussants.

First of all, let me recapitulate the highlights of my appraisal of statistical indicators for short-term forecasting—(a) Statistical indicators are an inexpensive forecasting device designed to throw light on short-term changes for the total economy. (b) I would regard them as necessary but not sufficient to deal with all the areas about which one would like information and judgments—even in the short-term. (c) Central to the theoretical rationale present in the indicator approach is the role of lags and differences in timing relationships in parts of the system; the role of uncertainty associated with major shocks (from exogenous policy variables or international developments); and random disturbances (deviations from cyclical conformity for specific cycles); as well as the important role played by prices, profits, costs, and productivity in the recurrent cyclical process. These central elements are present in various forms in every single model discussed at this Conference; I would not regard them as unique to the National Bureau Model. In the light of their importance in both theory and practice, they should be incorporated into other systems, also.

A number of significant questions raised by the discussants merit fuller discussion than can be given here, but some brief comments seem appropriate:

1. Are business-cycle indicators an outdated form of economic analysis? Dr. Firestone raises this question and suggests that I do not take sides on this issue. One of the tests of any forecasting method is how well it does outside the period on which the selection of indicators or estimation of relationships was based. The duplication of the U.S. series from Moore's 1950 paper has caught *all* the cycles in Canada from 1953 to date. Dr. Liebling used Moore's regression analysis of annual per cent changes in the index of leading indicators to forecast *GNP* for 1969. This procedure gave a better guide to subsequent developments than did most of the other forecasts presented at the Joint Economic Committee in February, 1969. A number of the appraisals of the models brought forth at this conference suggest that they have not done well at other key periods, either. Furthermore, a number of them did not even reproduce all the cycles during the period for which they were estimated. These appraisals suggest that the econometric models do not do as well as I, or the builders of the models, would like. The evidence and discussion at the Conference has strengthened my conclusion that business-cycle indicators are *not outdated*.

2. Are business-cycle indicators self-sufficient? Both Firestone and Liebling raise this question, and we would all agree that they are not. I have always used the indicators as a basis for appraising the direction and vigor of aggregative change for the year ahead, and have then followed the indicators on a current basis to see if subsequent developments were in line with expectations. The mode of presentation adopted was a more complete form of national accounts, prices, employment, tax collections, trade, and balance of payments. Investment surveys, government expenditure forecasts, and other sources of information were used, and an econometric model initiated by L. R. Klein in 1947 was also employed. There would be a wide area of agreement on the need to use all these tools in forecasting. The indicators were particularly helpful for the over-all change, and for some evidence on the cyclically sensitive areas, such as profits and inventory change, not usually well handled in other approaches.

There are some things that the indicators were clearly not designed to do. They emphasize the short-term and do not help on long-term projections. Furthermore, they are aggregative, and were not designed

to provide forecasts of industrial and regional detail, or to indicate whether wage and price controls are necessary or desirable. Critical in good judgment is a knowledge of the tools appropriate for particular problems. It would be poor judgment for me, or anyone else, to claim that the indicators can cope with *all* problems.

There is, however, one further area in which I should like to register my dissent. Dr. Firestone raises some questions about seasonal adjustment. One possibility he suggests is the use of raw data, noting that many business decisions are made on this basis. It is true, unfortunately, that many business firms—even large ones—use unadjusted data. That is why their views about short-term developments and the short-term outlook are so frequently unsatisfactory. The procedure chosen accentuates the short-term inventory cycle and contributes to the lack of reliability of short-term business expectations.¹ Nerlove's tests (which Firestone relies on) concentrated on the BLS method. More recent Census seasonal adjustment methods have reduced the sensitivity in the later years of the series, and the results would now be less vulnerable to Nerlove's tests than the method which he tested. I would very strongly advise against the use of raw data for short-term analysis.

3. What implications do our forecasting results have for discretionary stabilization policies? Dr. Firestone raises this question at the end of his comments, and I will attempt a condensed reply, even though the subject really needs a book, rather than a few brief paragraphs. What would happen if one were to run the estimated econometric models for the postwar period with a stable rate of growth in the money supply, stable growth in real government expenditures, and a balanced budget at full employment? I would expect *greater stability* would result than the United States has actually enjoyed. The cutback in defense expenditures in early 1953 had an important effect on the 1953–54 recession—the one that all the models caught—while changes in policy frequently increased, rather than reduced, instability.

The simulations of the model systems presented at this Conference and my appraisal of the indicator framework both emphasize that the economy has a fairly stable system, with important lags and

¹ For a fuller discussion of this view see D. J. Daly, "Seasonal Variations and Business Expectations," *Journal of Business*, July, 1959, pp. 258–270.

considerable uncertainty. The North American economy has been stable over the postwar period in spite of—rather than because of—discretionary policy. Korea and Vietnam have contributed to changes in defense expenditures and there have been wide variations in monetary policy.

To operate discretionary policy effectively, it is important to be able to forecast an extended period ahead with accuracy, taking cognizance of the evidence on the length of all the internal and external lags, in both monetary and fiscal policy. Until we know more about the lags in response to policy and can forecast farther ahead with more assurance, I confess my growing sympathy with the use of rules. (This reflects a shift in my views since the late 1950's.) The papers presented at this Conference provide additional evidence that the forecasting methods and the forecasters are still experiencing real difficulties in passing the tests on forecasting. This state of affairs offers further evidence against the feasibility of attempting short-term stabilization on a discretionary basis.

