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THE LEADING INDICATOR APPROACH TO ECONOMIC FORECASTING -- RETROSPECT AND PROSPECT

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ABSTRACT

For many years a system of leading, coincident, and lagging economic indicators, first developed in the 1930s by the National Bureau of Economic Research (NBER), has been widely used in the United States to appraise the state of the business cycle. Since 1961 the current monthly figures for these indicators have been published by the U.S. Department of Commerce in Business Conditions Digest. Similar systems have been developed by government or private agencies in Canada, Japan, the United Kingdom, and more recently in many other countries. A few years ago the Organization for Economic Cooperation and Development (OECD) set up a working party to develop this type of analysis and most of the member countries participated. The Center for International Business Cycle Research at Rutgers University has given guidance in this field to some fifteen countries during the past three years, in Europe, Asia, the Middle East, Africa and South America.

Our purpose in this paper is to explain briefly the theory and rationale underlying this approach to economic forecasting, describe the more important statistical procedures used, and review the evidence on how the indicators have performed in practice. The tests of performance concentrate on data not used in the selection of the indicators, in the United States and nine other countries. We conclude with some suggestions for future research and development, including the application of the approach to the analysis of inflation.

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Introduction and Summary

For many years a system of leading, coincident, and lagging economic indicators, first developed in the 1930s by the National Bureau of Economic Research (NBER), has been widely used in the United States to appraise the state of the business cycle. Since 1961 the current monthly figures for these indicators have been published by the U.S. Department of Commerce in Business Conditions Digest. Similar systems have been developed by government or private agencies in Canada, Japan, the United Kingdom, and more recently in many other countries. A few years ago the Organization for Economic Cooperation and Development (OECD) set up a working party to develop this type of analysis and most of the member countries participated. The Center for International Business Cycle Research at Rutgers University has given guidance in this field to some fifteen countries during the past three years, in Europe, Asia, the Middle East, Africa and South America.

Our purpose in this paper is to explain briefly the theory and rationale underlying this approach to economic forecasting, describe the more important statistical procedures used, and review the evidence on how the indicators have performed in practice. The tests of performance concentrate on data not used in the selection of the indicators, in the United States and nine other countries. We conclude with some suggestions for future research and development, including the application of the approach to the analysis of inflation.

The Indicator System: Rationale and US Experience

The leading, coincident, and lagging indicators cover a wide variety of economic processes that have been found to be important in business cycles. The leading indicators are for the most part measures of

anticipations or new commitments. They have a "look-ahead" quality and are highly sensitive to changes in the economic climate as perceived in the marketplace. The coincident indicators are comprehensive measures of economic performance, pertaining to output, employment, income, and trade. They are the measures to which everyone looks to determine whether a nation is prosperous or depressed. The lagging indicators are more sluggish in their reactions to the economic climate, but they serve two useful functions. First, since they are usually very smooth, they help to confirm changes in trend that are first reflected in the more erratic leading and coincident indicators. Second, their very sluggishness can be an asset in cyclical analysis, because when they do begin to move, or when they move rapidly, they may show that excesses or imbalances in the economy are developing or subsiding. Hence the lagging indicators frequently provide the earliest warnings of all, as when rapid increases in costs of production outstrip price increases and threaten profit margins, thus inhibiting new commitments to invest, which are among the leading indicators.

The procedure in selecting and classifying indicators, therefore, is one in which economic theory and empirical observation closely interact. The indicator that has a near-perfect record of performance during a business cycle, but whose behavior cannot be explained, will not command or warrant much attention, since faith depends on understanding. On the other hand, the indicator that is suggested by theoretical considerations but has not been tested or does not perform as theory predicts will not command much attention either, since faith depends on performance. With these precepts in mind let us look at the classification of U.S. indicators

that we have been using for some years in our work in developing an international system of business cycle indicators (Table 1).

The first column on the left lists six broad types of economic process, of the kind that figure in most theories of the business cycle. Most of the variables that are employed in econometric models can be found under one or another of these categories. There are, however, some important exceptions. Foreign trade is not shown explicitly, although it is implicit in the second group (production, income, consumption and trade). Taxes and government expenditures do not appear explicitly either, although they are conspicuous in most models. Here the reason is not that government has no impact on the business cycle, but rather that most measures of its activity have not performed very consistently as indicators. The same comment could be made about agricultural production.

The indicators in the body of the table were selected from the six types of economic process, again with a view both to their contribution to theory and empirical performance. Performance has been judged primarily with respect to the consistency with which the measure has conformed to business cycles and led, coincided or lagged behind the cycles' turning points. An indicator can have too many cycles or too few; one-to-one correspondence is preferable. An indicator can lead on some occasions and lag at other times; uniformity in timing is preferable. Other criteria play a role too. Comprehensive coverage of the economy is preferable to narrow coverage. Prompt availability of current figures is important and coupled with that, monthly figures are preferred to quarterly.

Table 1
CROSS-CLASSIFICATION OF U.S. INDICATORS BY ECONOMIC PROCESS AND CYCLICAL TIMING

Economic Process	Cyclical Timing		
	Leading	Roughly coincident	Lagging
Employment and unemployment	Average work week, manufacturing. New unemployment insurance claims, inverted	Nonfarm employment. Unemployment, inverted	Long-duration unemployment, inverted
Production, income, consumption, and trade	New orders, consumer goods and materials*	Gross national product* Industrial production Personal income* Manufacturing and trade sales*	
Fixed capital investment	Formation of business enterprises Contracts and orders, plant and equipment* Building permits, housing		Investment expenditures, plant and equipment*
Inventories and inventory investment	Change in business inventories*		Business inventories*
Prices, costs, and profits	Industrial materials price index Stock price index Profits* Ratio, price to unit labor cost, nonfarm		Change in output per man-hour, manufacturing, inverted
Money, credit and interest rates	Change, consumer installment debt*		Commercial and industrial loans outstanding* Bank interest rates, business loans

* In constant prices.

Note: The list and classification is substantially the same as that prepared in 1966 and published in Geoffrey H. Moore and Julius Shiskin, *Indicators of Business Expansions and Contractions* (New York: National Bureau of Economic Research, 1967). The chief modification is that those series marked with * are converted to constant prices. The timing classification for each series is the same as shown in *Business Conditions Digest* for all turns (see Table 1, column 1, in any recent issue), except as follows: Unemployment is unclassified (*U*) at all turns in BCD because it leads at peaks and lags at troughs, but here it is classified roughly coincident, as in the 1966 list. Four series that here are in constant prices are shown in BCD only in current prices: change in consumer installment debt, investment expenditures for plant and equipment, commercial and industrial loans outstanding, and change in output per man-hour, manufacturing, inverted, which is the constant price equivalent of labor cost per unit of output. The constant price series are assigned the same classification as the current price series.

Within each of the economic process groups, reading across the table, are indicators that lead as well as those that coincide or lag. That is one reason for thinking of them as processes. The activities represented normally follow a sequence. The average workweek, for example, is one of the first variables pertaining to employment that manufacturing enterprises change, either by increasing or reducing the amount of overtime work or by changing the number of persons working short hours or fewer days per week. Changes in the number employed usually occur a few months later, because such changes are less easily reversed and are more expensive to accomplish.

Every entry in Table 1 has been supported by detailed studies showing that the indicators not only behave in the manner specified by the classification but also that there are cogent economic reasons for this behavior. These studies have considered not only the sequences across columns but also the more or less simultaneous relationships among the indicators within each column: how stock prices are related to profits, materials prices to inventory investment, production to employment, sales to income, etc. Finally, these studies have developed the reasons for and evidence underlying a relationship not explicitly shown in the table--a relationship that helps to explain why one business cycle tends to generate the next one.

This relationship has to do with the influence of the lagging indicators upon the subsequent movements of the leading indicators. An increase in the level of inventories, especially in relation to sales, if it proceeds far enough is likely to cause buyers to cut back their

orders. Here a lagging indicator, inventories, has an inverse effect upon a leading indicator, new oders. Similarly, a rapid increase in expenditures for new plant and equipment may, as output and capital utilization rates build up, result in a cutback in contracts for new plant construction. Likewise, an increase in interest rates on business loans may at some stage trigger decisions to reduce orders for machinery and equipment and to reduce the rate at which inventories of materials are accumulated. In short, there are feedback relationships running from the lagging indicators to the subsequent, opposite turns in the leading indicators. These relationships, too, have been documented empirically, as we shall see.

The hardest test for a theory or system of indicators to meet, as with any other economic theory or system, is one that requires it to perform on data that were not available when it was formulated. The U.S. indicators have experienced many such tests. One that covers a twenty-five year span, based on data not available when a set of indicators was selected and classified in 1950, is contained in Table 2.

The empirical evidence used to select and classify indicators in the 1950 study covered periods of varying length but ending in 1938, i.e., before World War II. Twenty-one indicators were selected as the end-product of a study covering some 800 series. Eight of the twenty-one were classified as leading, eight coincident, and five lagging. Fifteen of the twenty-one are still shown currently in Business Conditions Digest and close equivalents of the other six are also in that publication. From these twenty-one series in BCD we recently constructed composite indexes, using a method developed in the late 1950's, covering the period

Table 2.

LEADS AND LAGS AT GROWTH CYCLE PEAKS AND TROUGHS:
TWO SETS OF TREND-ADJUSTED COMPOSITE INDEXES, 1948-1975

A. Lead(-) or Lag(+) in months at Growth Cycle Peaks

Growth Cycle Peak	Indexes based on 1950 List of Indicators: Lagging inverted	Leading	Coincident	Lagging	Indexes based on 1975 List of Indicators: Lagging, inverted	Leading	Coincident	Lagging
July 1948	n.c.	-6	+1	+1	n.c.	-6	-1	+1
Mar. 1951	-15	-2	-2	-1	-12	-7	-2	n.c.
Mar. 1953	-12	n.c.	+2	+3	n.c.	0	0	+6
Feb. 1957	-28	-17	0	+7	-22	-17	-14	+7
Feb. 1960	-17	-10	-9	+2	-15	-10	-8	+4
May 1962	-13	-5	-3	+5	-5	-3	n.c.	n.c.
June 1966	-19	-5	0	+3	n.c.	-3	+4	+7
Mar. 1969	-17	+2	0	+5	-17	-2	+7	+7
Mar. 1973	-9	-1	+17	+17	-13	-1	+8	+18
Mean	-16	-6	+1	+5	-14	-5	-1	+7
St. Dev.	6	6	7	5	6	5	7	5
Correlation with Leads in Leading Index	+.76			+.11	+.64			+.31

Table 2 (continued)

B. Lead(-) or Lag(+) in months at Growth Cycle Troughs

Growth Cycle Trough	Indexes based on 1950 List of Indicators				Indexes based on 1975 List of Indicators			
	Lagging inverted	Leading	Coincident	Lagging	Lagging, inverted	Leading	Coincident	Lagging
Oct. 1949	-14	-4	0	+2	-14	-4	0	+5
July 1952	-17	n.c.	0	-4	n.c.	-8	0	n.c.
Aug. 1954	-14	-8	0	+2	-11	-7	0	+8
Apr. 1958	-7	0	0	+5	-7	-3	+1	+7
Feb. 1961	-10	-2	0	+2	-8	-2	0	+10
Oct. 1964	-24	-24	0	+1	n.c.	-28	n.c.	n.c.
Oct. 1967	-13	-10	0	0	-9	-8	-3	0
Nov. 1970	-15	-2	0	+19	-13	0	0	+15
Mar. 1975	-7	0	0	+20	-6	-1	0	+21
Mean	-13	-6	0	+5	-10	-7	0	+9
St. Dev.	5	8	0	8	3	8	1	7
Correlation with Leads in Leading Index	+.89			+.49	+.09			+.79

n.c. = no timing comparison.

Source: Geoffrey H. Moore, The Forty-Second Anniversary of the Leading Indicators, in Contemporary Economic Problems, 1979, William Fellner, ed., American Enterprise Institute, 1980, pp. 428-9.

1948 to 1975. The indexes have been adjusted for long-run trend, using a method developed in the 1970's. The turning points in the trend-adjusted series are compared in Table 2 with the peaks and troughs in a chronology of growth cycles, a concept of the business cycle that has come into use in many countries only in recent years, which we shall discuss more fully below.

The test in Table 2, therefore, not only confronts the twenty-one indicators with data not available when they were chosen, but also with methods of analysis not then available either. The results, recorded in the left-hand section of the table, show that the expected sequence among the three groups of indicators occurred at almost every turn throughout the period. The lagging indicators not only lag as expected but also lead the opposite turns in the leaders, which is also as expected.

Even though the indicators selected in 1950 turned in a good record during the next twenty-five years, research on indicators and business cycles did not stand still. We have already referred to some of the changes in methodology. In addition, the indicators themselves have improved. More of them are available in deflated form, more are published in seasonally adjusted form, some are available more promptly, there is better coverage of inventories and of price/cost relationships, and so on. In 1975 the Department of Commerce established a new list of indicators, and its record during the preceding twenty-five years is shown on the right-hand side of Table 2. The results are similar, on the whole, to those achieved by the 1950 list, partly because the content overlaps to a considerable extent. The user of indicators would, however, not hesitate a moment in opting for the 1975 list in view of its improved coverage of significant variables.

From this brief review of U.S. experience we would contend that the conceptual framework underlying the indicator approach to business cycle forecasting has stood up well under repeated tests on subsequent data. Much room for error and uncertainty remains, as witness the current uncertainty about the prospects for recovery from the current U.S. recession. But we know much more about the merits and limitations of the system than we did thirty years ago.

Another kind of test of the system, which has both scientific value and practical advantages, is to examine comparable data from other countries and apply similar techniques of analysis to them. If indicators that have proved to lead or lag consistently in U.S. experience could be shown to have a similar temporal relationship in other countries, the case for indicators--both in theory and in application to forecasting efforts--would be strengthened. This was the task which we set ourselves in 1973 when we launched the work on international economic indicators at the National Bureau of Economic Research and are continuing today at the Rutgers Center for International Business Cycle Research.

Internationalizing the Indicator System

The 1973 study began by developing growth cycle chronologies for the major market-oriented economies. Most of the work on indicators for the United States has been done in terms of the business cycle--or classical cycle--concept. This concept involves an absolute rise and fall in aggregate economic activity. In the 1950's and 1960's, however, many countries did not experience actual declines in activity but did experience varying rates of growth. To examine these growth cycles, therefore, methods of measuring and eliminating long-run trends were developed.

From the trend-adjusted data chronologies of growth cycles were derived in the same manner that had been used, in the United States, to derive the business cycle chronology. The growth cycle, then, is simply a trend-adjusted business cycle. The expansion phase is a period when the short-run growth rate of aggregate economic activity is greater than the long-run rate, whereas in the contraction phase the short-run growth rate is less than the long-run rate.

Problems arise, of course, in deciding precisely what the long-run growth rate of an economy is, especially on a current basis. Historically there are fewer difficulties, and the growth cycle chronologies have proved to be quite robust against variations in techniques of trend-adjustment, etc. This is especially true of the number and identity of the cycles, less true of the precise turning dates. For analyzing sequences among indicators, however, variations in the reference turning points with which the indicator turns are compared are not crucial.

Table 3 presents the growth cycle chronologies that have been developed at the Rutgers Center for thirteen market-oriented economies. They are based on substantially the same measures of the physical volume of economic activity in each country, covering output, employment, unemployment, real income and real volume of trade. The growth cycle peak and trough dates represent the concensus among the turning points of these indicators after adjustment for long-run trend.

It is interesting to note that a very old tendency for the United States to exhibit more cycles than other market-oriented economies is visible in the growth cycle chronologies for the last thirty years as

Table 3. GROWTH CYCLE CHRONOLOGIES, 13 COUNTRIES (REVISED May 1982)

	United States	Australia	Belgium	Canada	France	Italy	Japan	Korea	Netherlands	Sweden	Switzerland	United Kingdom	West Germar
P	7/48												
T	10/49										2/50		
P	3/51	8/51		4/51					7/50		3/51	3/51	2/5
T	7/52	9/52		12/51					6/52		2/53	8/52	
P	3/53			3/53			12/53						
T	8/54			10/54			6/55						2/5
P	2/57	8/55		11/56	8/57	10/56	5/57		10/56		6/57	12/55	10/5
T	4/58	1/58		8/58	8/59	7/59	1/59		5/58		9/58	11/58	4/5
P	2/60	9/60		10/59					3/61			3/61	2/6
T	2/61	9/61		3/61									
P	5/62			3/62	2/64	9/63	1/62						
T	10/64			5/63	6/65	3/65	1/63		2/63			2/63	2/6
P	6/66	4/65	10/64	3/66	6/66		7/64		11/65	2/65	4/64	2/66	5/6
T	10/67	1/68	7/68	2/68	5/68		2/66	8/66	8/67	7/67	5/68	8/67	8/6
P	3/69	12/70	9/70	2/69	11/69	8/69	6/70	1/69	11/70	7/70	5/70	6/69	5/7
T	11/70	1/72	7/71	12/70	11/71	9/72	1/72	3/72	8/72	7/72	11/71	2/72	12/7
P	3/73	2/74	7/74	2/74	5/74	4/74	11/73	2/74	8/74	6/74	4/74	6/73	8/7
T	3/75	5/75	10/75	10/75	6/75	5/75	3/75	6/75	7/75		8/75	8/75	5/7
P		11/76		5/76		12/76		7/76	9/76				
T		12/77		7/77		10/77			11/77	7/78			
P	12/78		6/79	9/79	8/79	2/80	2/80		12/79			6/79	2/8
T				6/80									

Note: The absence of a recent date does not necessarily mean that one has not occurred, since the dates for all the countries are not kept up-to-date regularly.

Source: Center for International Business Cycle Research, Rutgers University, Newark, N.J. 07102

well. While there was a period of time--roughly the twenty years 1955-1975 when the growth cycles of the countries included in the table were largely synchronous, there has in recent years been more disparity again in the timing of growth cycle peaks and troughs. But generally the behavior of the indicators which enabled us to produce these chronologies is convincing evidence that market-oriented economies, whatever their differences, still have much in common and are afflicted with a roughly comparable tendency to cyclical instability.

This conclusion is strengthened considerably by the results of our efforts to develop leading and lagging indicators of growth cycle turns in other economies by analyzing the behavior of rough equivalents of the U.S. leaders and laggers. This constitutes a test of the indicator system of a fairly high order. The list and the classification were established on the basis of the behavior of indicators in the United States prior to 1966. The test is based on the behavior of comparable indicators in other countries during the period 1950 to 1980. Note especially that the indicators are classified into the three groups on the basis of their U.S. behavior, not their behavior in the respective country.

A convenient way to obtain a summary view of the behavior of the indicators is provided by Table 4. This shows the median lead or lag for composite indexes derived from the leading indicators, the roughly coincident indicators, and the lagging indicators for each of the ten major market-oriented economies we have studied. The medians have, of course, the well-known virtue of not being unduly influenced by extreme values. What the table shows, therefore, is how the composite indexes in each country behave at peaks, at troughs, and at all growth cycle

turning points. The table shows the timing of the lagging indicators in both positive and inverted form. As noted earlier, one of the most useful properties of lagging indicators is that if they are considered in inverted form the turns tend to lead the subsequent growth cycle turn by a longer period of time than do the leading indicators. Thus the trough in the lagging indicators precedes the peak in the leading indicators, and the peak in the laggers precedes the trough in the leaders. This tendency is throughly grounded in business cycle theory, as noted in our discussion of the U.S. indicators.

Concerning the composite indexes whose behavior is summarized in Table 4, there are two sorts of question we might ask. The simplest is whether the composite index for each group of indicators in each country exhibits the timing vis-a-vis growth cycles that we would expect. That is, do the leaders lead, do the roughly coincident indicators turn within a few months of the growth cycle turns, and do the laggers lag? The table shows that among all ten countries there are but six exceptions to these requirements: in France the composite leading index exhibits coincident (0) timing at peaks, troughs, and all turns; in Sweden and the Netherlands the leading index is coincident at troughs; and in Belgium the coincident index shows a six-month lead at peaks. Apart from these six exceptions all the other entries conform to the timing expectations we derived from the behavior of series equivalent to these in the United States.

A second question we can ask is whether, regardless of the timing vis-a-vis growth cycles, the sequence among the groups of indicators is at least what is expected. Even, for example, were all the composites

TABLE 4. SUMMARY OF LEADS AND LAGS, COMPOSITE INDEXES, TEN MARKET-ORIENTED ECONOMIES

	Median Lead(-) or Lag(+) in Months, at Growth Cycle Turns											
	Inverted Lagging Index			Leading Index			Roughly Coincident Index			Lagging Index		
	P	T	P&T	P	T	P&T	P	T	P&T	P	T	P&T
United States, 1948-81	-15	-11	-15	-2	-2	-2	+1	0	0	+5	+6	+6
Canada 1948-81	-13	-16	-15	-2	-4	-2	0	0	0	+5	+4	+5
United Kingdom, 1952-81	-24	-19	-22	-10	-9	-10	0	0	0	+7	+8	+8
West Germany, 1950-81	-12	-18	-15	-7	-2	-5	0	0	0	+2	+4	+3
France 1951-81	-12	-16	-17	0	0	0	+2	0	+2	+2	+5	+5
Italy, 1956-81	-14	-7	-13	-9	-6	-9	0	+3	0	+8	+10	+8
Japan, 1954-81	-14	-14	-14	-4	-5	-4	-1	0	0	+5	+8	+6
Sweden, 1961-81	-12	-15	-15	-2	0	-2	0	-1	0	+19	+10	+14
Netherlands, 1950-1981	-20	-13	-13	-3	0	-2	0	0	0	+2	+4	+2
Belgium, 1955-81	-16	-14	-14	-6	-3	-3	-6	+1	0	+6	+4	+5
Average, Ten Countries	-14	-14	-15	-4	-2	-2	0	0	0	+5	+6	+6

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for a given country to exhibit a lead, we would find it useful to know that the leaders turn first, followed (i.e., with a shorter lead) by the roughly coincident indicators and (with the shortest lead) by the lagging indicators. Examining the evidence in this way we find only five exceptions, and four of the five involve coincidence in timing rather than a reversal. The exceptions are in France, Sweden, the Netherlands and Belgium.

In short, there are clearly very few cases of perverse behavior. If identical timing for two groups of indicators were not considered "perverse" Sweden would be the only case of perverse sequential behavior, where the leading index is coincident at troughs and the coincident index leads by one month. We do not claim too much, therefore, when we suggest that our experiment in duplicating equivalents of U.S. indicators in other market-oriented economies has a favorable outcome.

This is not, of course, to say that the indicator system cannot or should not be improved in all countries. The U.S. list for classical cycle analysis has already been revised a number of times over the years.

In searching, therefore, for ways to improve the performance of indicator systems one must consider not just composite indexes but how individual indicators behave in various countries at growth cycle peaks and troughs. In our ongoing work we have, of course, carefully examined this behavior turn by turn. Here it will be sufficient to refer briefly to the median leads and lags of all the indicators for which we have found rough equivalents to the U.S. series in the other nine countries.

On this indicator-by-indicator basis there are very few cases where the median timing at growth cycle turns in other countries fails to conform to the timing one would expect on the basis of timing at U.S. growth cycle turns. Among the roughly coincident indicators there are three countries in which employment fails to turn within three months of the growth cycle turns. Two countries exhibit lags longer than three months (France and Italy) and one (West Germany) exhibits a lead longer than three months. These findings are interesting because of a widespread belief that employment is either a lagging indicator or is becoming one. Even in the United States at recent classical cycle turns there has been a slight tendency for employment to lag, apparently because employers are increasingly inclined to make marginal employment adjustments before making major adjustments. In most other countries the median timing for employment is a lag of a month or two but no more.

The other case where three countries exhibit roughly coincident turns more than three months from the growth cycle turns occurs in connection with retail sales, where France, Belgium, and Japan exhibit quite long median leads. The increasing use of credit to make retail

purchases maybe a factor, since consumer credit change has long been a leading indicator. If its use is spreading (as it is), it may be producing leads in retail purchases by making consumers less dependent upon income in making decisions about purchasing.

Finally we may note that in one country (Belgium) the index of industrial production shows a long lead in its median timing. This is noteworthy because of the widespread use of that index as the primary measure of aggregate economic activity. We have long argued that no single measure, no matter how aggregative or pervasive, ought to be relied on in dating business cycles. It is, of course, precisely those cases in which the major measures of aggregate economic activity fail to turn in symnchronous fashion that we have the greatest difficulty in placing business cycle turning points. In Belgium, sole reliance on industrial production would result in earlier turning points than most of the other evidence suggests.

Among the leading indicators in the overwhelming majority of cases the indicators in other countries conform in timing to the U.S. experience. One of the exceptions, the ratio of price to unit labor cost--a measure that reflects profit margins--fails to lead in Canada and the Netherlands. Industrial materials prices lag in their median timing at growth cycle turns in the United Kingdom and in the Netherlands, and are coincident in Canada and France. New orders for durable goods unaccountably lag in Canada, and contracts for plant and equipment lag in West Germamy. In all other cases, the median timing in other countries conforms to the leading classification these indicators merit in the U.S.

The lagging indicators also generally conform well to the U.S.-based classification. There is but one exception. Business loans outstanding lead instead of lag in their median timing at German growth cycle turns.

Overall, therefore, the median timing of the indicators and the composite indexes conforms to our expectations. It is clear that there is room for improvement, and the same factors that have led to periodic revision of the short list of U.S. indicators suggest that the next order of business in our international work must be to secure such an improvement. But the results we have described demonstrate that indicator systems established on a comparable basis in many countries are likely to have similar properties.

Recent Developments in Practical Application

One possibility for improving the ability to forecast growth cycles with leading indicators which we have already explored has involved the use of so-called "qualitative" indicators. Survey results dealing, for example, with what entrepreneurs think about their sales possibilities are now regularly collected both in the United States and in many other countries. We have already explored some of the possibilities for augmenting the quantitative indicators with the results of these surveys. The survey results are available in what is called "net balance" form. In case of sales, for example, the percent of respondents who think profits are increasing less the percent who think they are decreasing gives the "net balance" of respondents with respect to sales. Using survey net balances presents difficulties. How the questions are worded, for example, determines precisely what the net balances mean and dictates whether

cumulating the net balances or taking their first differences may be necessary in some cases before they can be related to the quantitative indicator to which they pertain.

Surveys have the advantage of being available often before the equivalent quantitative measure. While our preliminary investigations have suggested that the turning points in survey net balances do not customarily lead turning points in their quantitative equivalents their greater promptness opens some possibilities for increasing our ability to forecast by using surveys along with or as proxies for these quantitative measures.

Another area which we have explored has been an outgrowth of the trend-adjustment necessary for growth cycle analysis. We customarily construct composite indexes of leading, and roughly coincident indicators for the major countries we have been monitoring. An early decision involved the question whether to trend adjust the components and then construct the composite index or whether to utilize the components in unadjusted form and then trend adjust the composite index. We decided on the latter because it is useful to have the composite indexes in both adjusted and unadjusted form. A major use to which we put the indexes in unadjusted form is to calculate their short-run growth rates on a continuing current basis. In this way one can observe growth cycles and yet avoid the uncertainty about what the long-run trend is currently. Charts 1 and 2, taken from a bi-monthly report prepared by the Rutgers Center and published by the Conference Board, illustrate the use of these growth rates. Their value in comparing the recent changes in each country against growth rates over a long period as well as in comparing

CHART 1.

A Bimonthly Report from The Conference Board

INTERNATIONAL ECONOMIC SCOREBOARD

The Conference Board

JUNE 1982

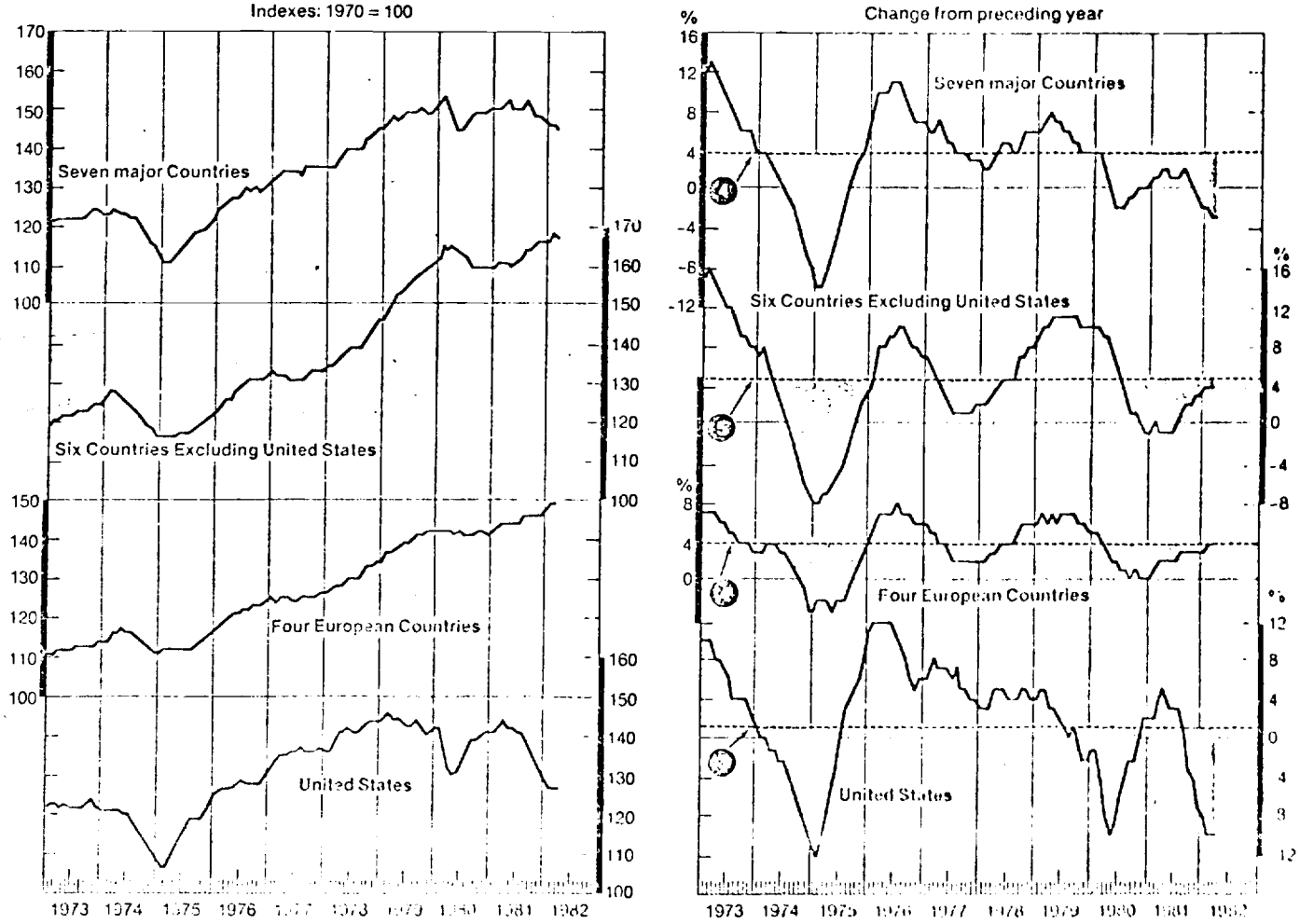
STATUS OF THE LEADING INDEXES

Summary: Weakness in the leading indicators still prevails in North America, but signs of recovery are appearing in Europe and Japan.

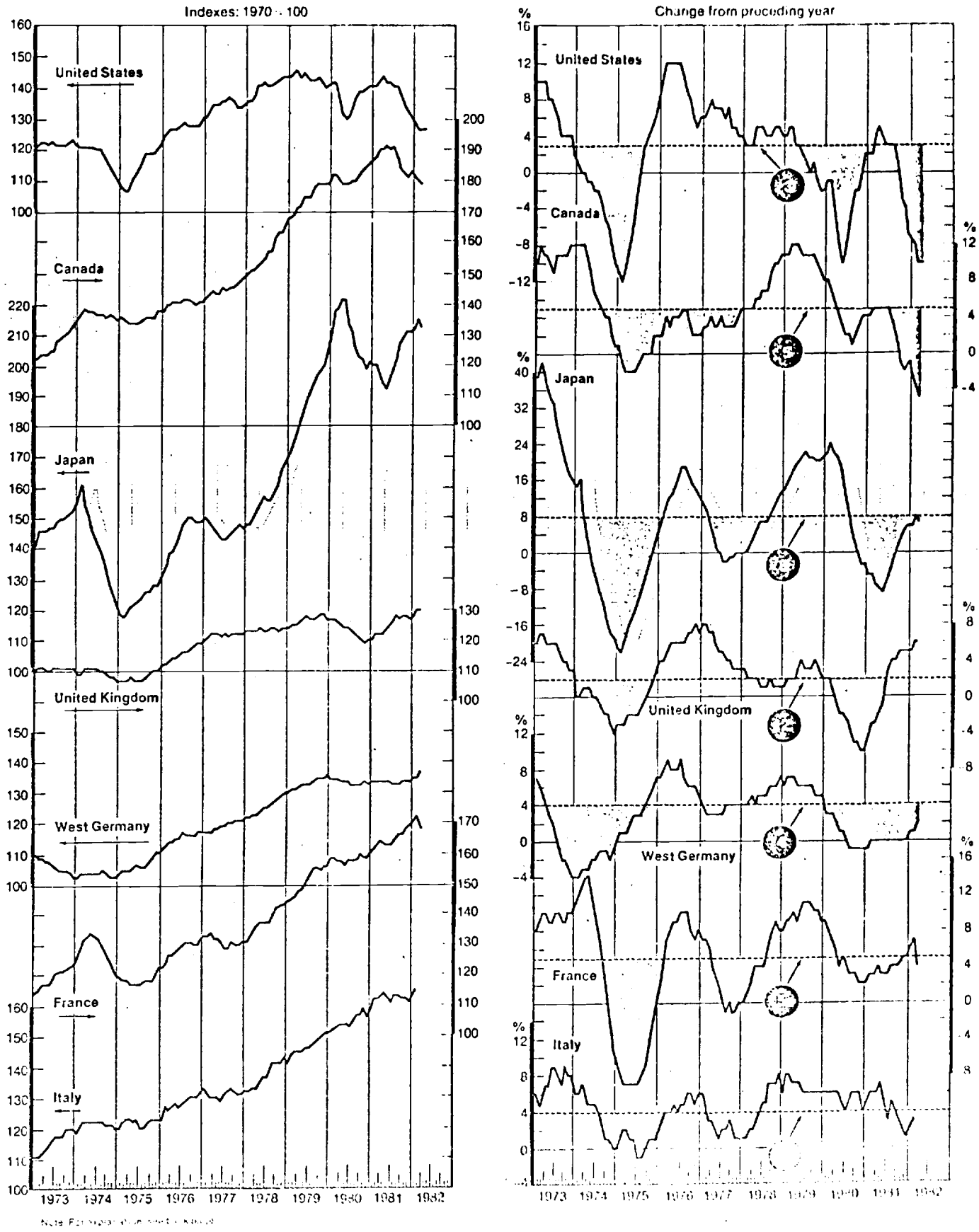
	Ten-year Growth Rates	Recent rates of change* 6 mo. ago	3 mo. ago	Latest		Current reading
		(annual rates, percent)				
United States	3	−9	−13	−11	(Apr.)	Contraction slowing.
Canada	5	−3	− 3	− 7	(Mar.)	Contraction continuing.
Japan	8	8	10	8	(Mar.)	Recovery continuing.
United Kingdom	2	7	4	6	(Mar.)	Recovery continuing.
West Germany	4	0	0	4	(Mar.)	Recovery beginning.
France	5	5	6	3	(Mar.)	Expansion continuing.
Italy	4	4	1	3	(Feb.)	Expansion resuming.
6 countries ex. U.S.	5	4	4	4	(Mar.)	Modest recovery continuing.
7 countries	4	0	− 4	− 5	(Mar.)	U.S. recession prevails.

*Annual rate based on ratio of current month's index to average index over the preceding 12 months.

Leading Business Cycle Indexes



Leading Business Cycle Indexes



recent developments in one country against those in other countries will be readily apparent.

It might be noted that we find combining composite indexes for several countries a useful way to monitor growth cycle developments as well. The charts just presented illustrate several multi-country composite leading indexes. Customarily we consider the European countries alone, the European countries plus Canada and Japan, and all seven countries together. This has proven particularly useful in recent years when the tendency of the major countries to exhibit fairly synchronous cyclical behavior (in the 1950s and 1960s) has been replaced by considerable divergence. In these composites each country's index is weighted by its GNP in 1970, measured in dollars. For some purposes, such as forecasting exports, the use of export weights would be desirable. Chart 3 shows how the six-country leading index, weighted by U.S. exports to those countries, compares with total U.S. exports in constant dollars. In Chart 4 the year-to-year changes in U.S. exports are shown in relation to the end-of-preceding-year rate of change in the six-country leading index. The r^2 is .84 , which indicates that the growth rate in the leading index at the end of the year gives a useful clue to the forthcoming growth of exports. This technique can readily be extended to other countries and used to monitor both imports and exports.

We have experimented as well with leading and coincident indicators that are focused on a particular economic process, such as employment. Our leading employment index for the United States includes five leading indicators that reflect marginal employment adjustments (the average workweek, overtime hours, part-time employment, layoffs, and initial

CHART 3

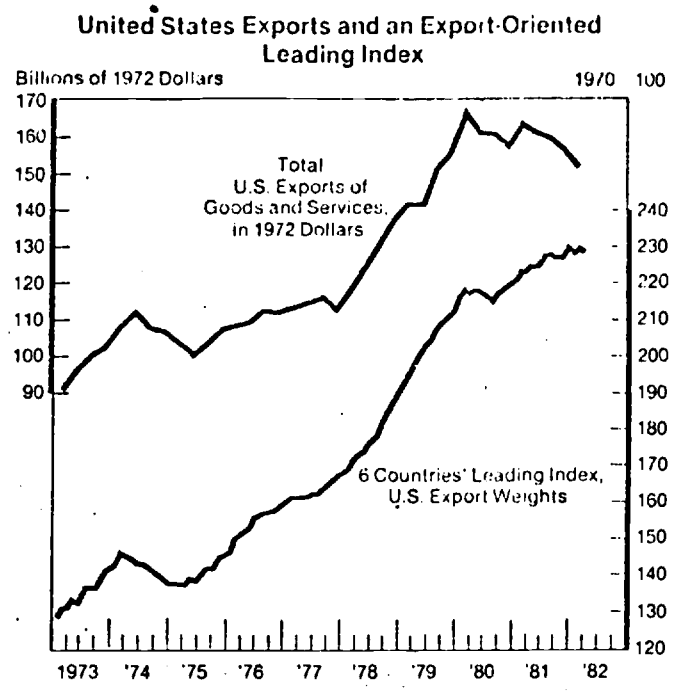
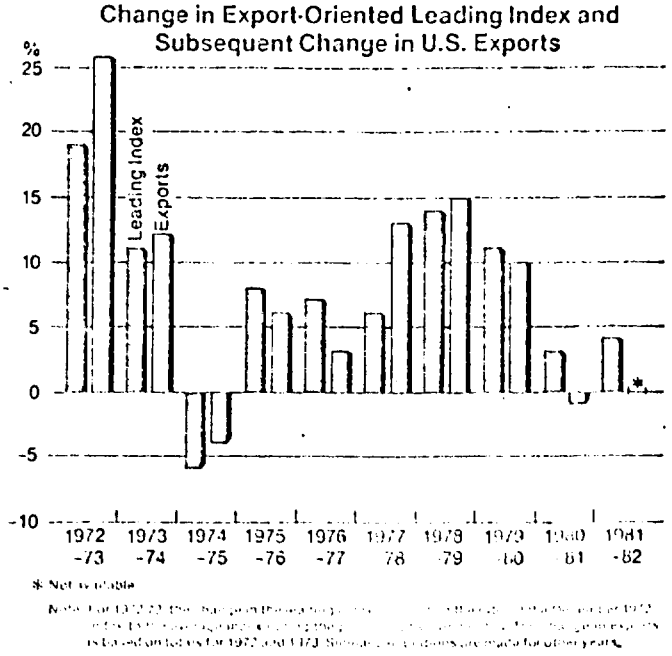


CHART 4



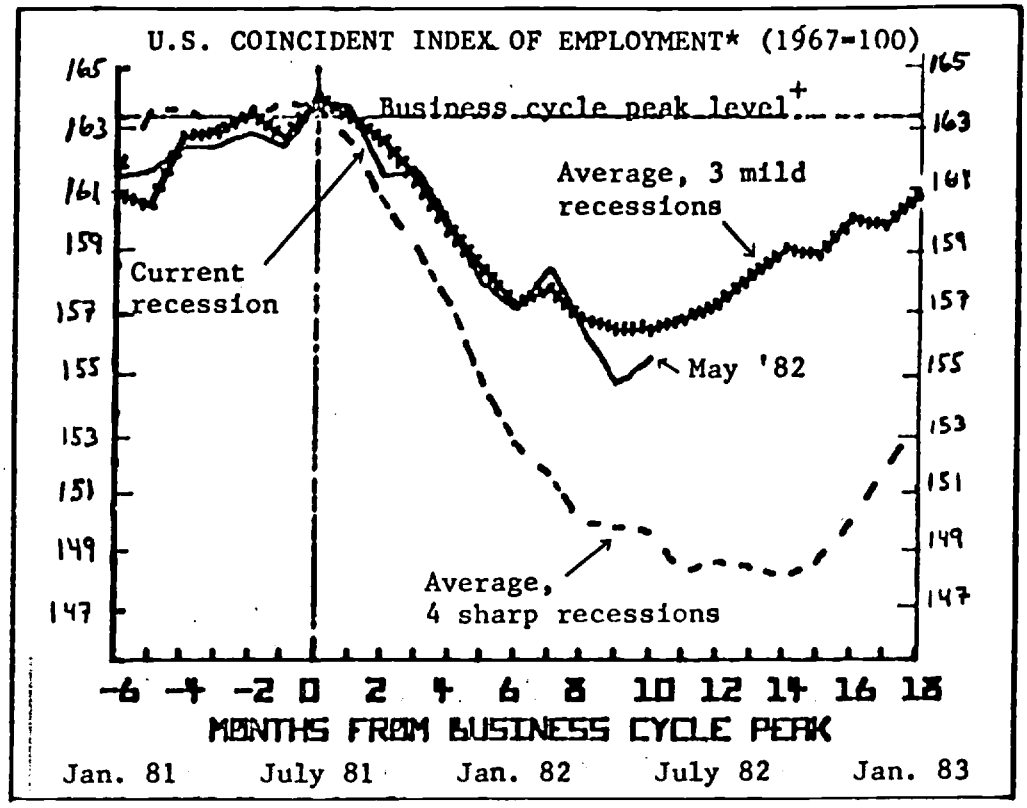
unemployment insurance claims. The coincident employment index includes five series on employment and unemployment. Both indexes use all three of the major sources of information on employment: the household survey, the establishment survey, and the unemployment insurance system. This adds to their reliability and smooths away some of the erratic movements.

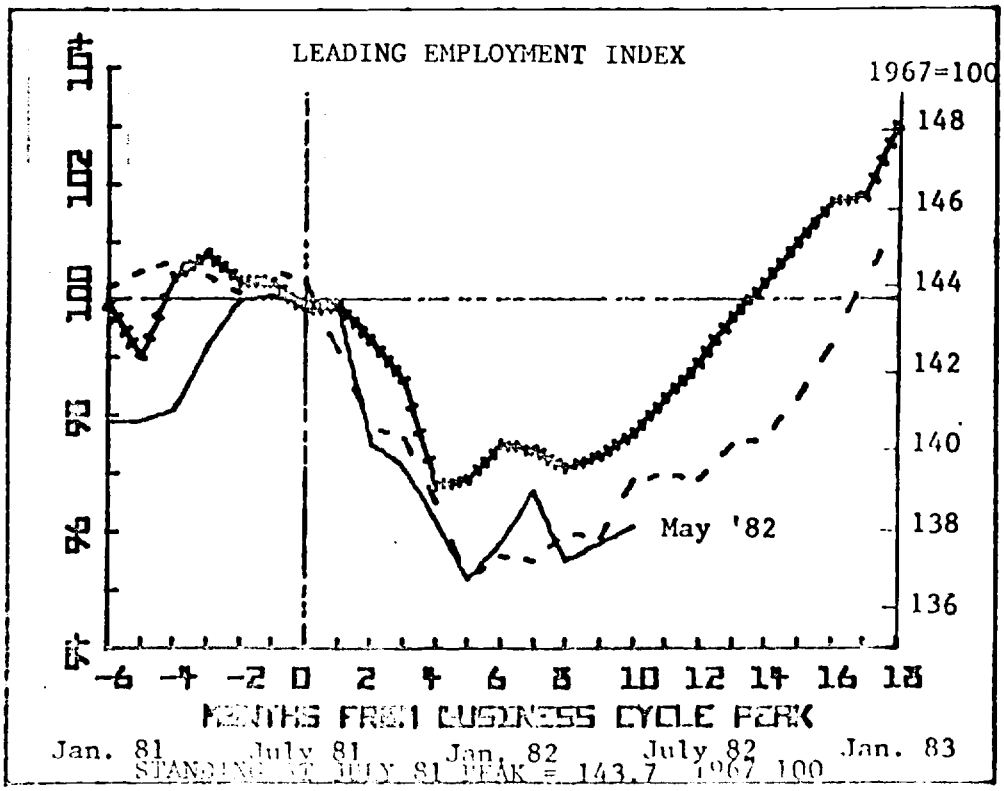
Chart 5 shows these two indexes during the current recession (solid line), starting six months before the business cycle peak of July 1981. This is compared with the average patterns during three preceding mild recessions and four preceding sharp recessions. The leading tendency of the leading employment index is clearly evident in these recession-recovery patterns, as we call them. The course that the indexes have taken during previous recessions and the ensuing recoveries can readily be used in evaluating a recession as it unfolds and in judging the prospects for recovery. The method can, of course, also be applied to indicators for other countries, using the growth cycle chronologies described earlier.

The final application of indicator analysis that we shall discuss is a sequential signal system for identifying the beginning and ending dates of recessions. The system has been developed at the Rutgers Center using growth rates in the U.S. leading and coincident indexes. The current rates are compared with certain target rates to determine when they reach certain critical levels defined in advance. This results in a sequence of three signals: preliminary, intermediate, and final. The preliminary signal of recession gives an early warning but has sometimes marked only a slowdown in the economy rather than a recession. When the preliminary is followed by the intermediate signal the recession is both

CHART 5.

PATTERNS OF RECESSION AND RECOVERY





closer at hand and more likely to occur. The third and final signal signifies with almost complete certainty that a recession has begun. A similar set of signals is defined for the upturns at the end of recessions.

The method invokes several principles to gain reliability. One is to use two indexes jointly rather than a single index. Another is to allow for the possibility of a false signal by using the sequential design. If the system were to be used to trigger certain policy actions such as the release of government funds for public works or public employment, the amount as well as the reversibility of the action can be governed according to whether the signal is preliminary, intermediate or final. Equally important are the signals of recovery, which allow anti-recession policies to be terminated by degrees, depending on how definite the signals are.

The historical record of the third signals of business cycle peaks (P3) and troughs (T3) is compared with the unemployment rate in Chart 6 and with the inflation rate in Chart 7. Since neither unemployment nor inflation was taken into account in defining the signals, this provides a strong test. The results are quite impressive, since when the signals of recession are on (shaded areas) unemployment is generally rising and inflation declining.

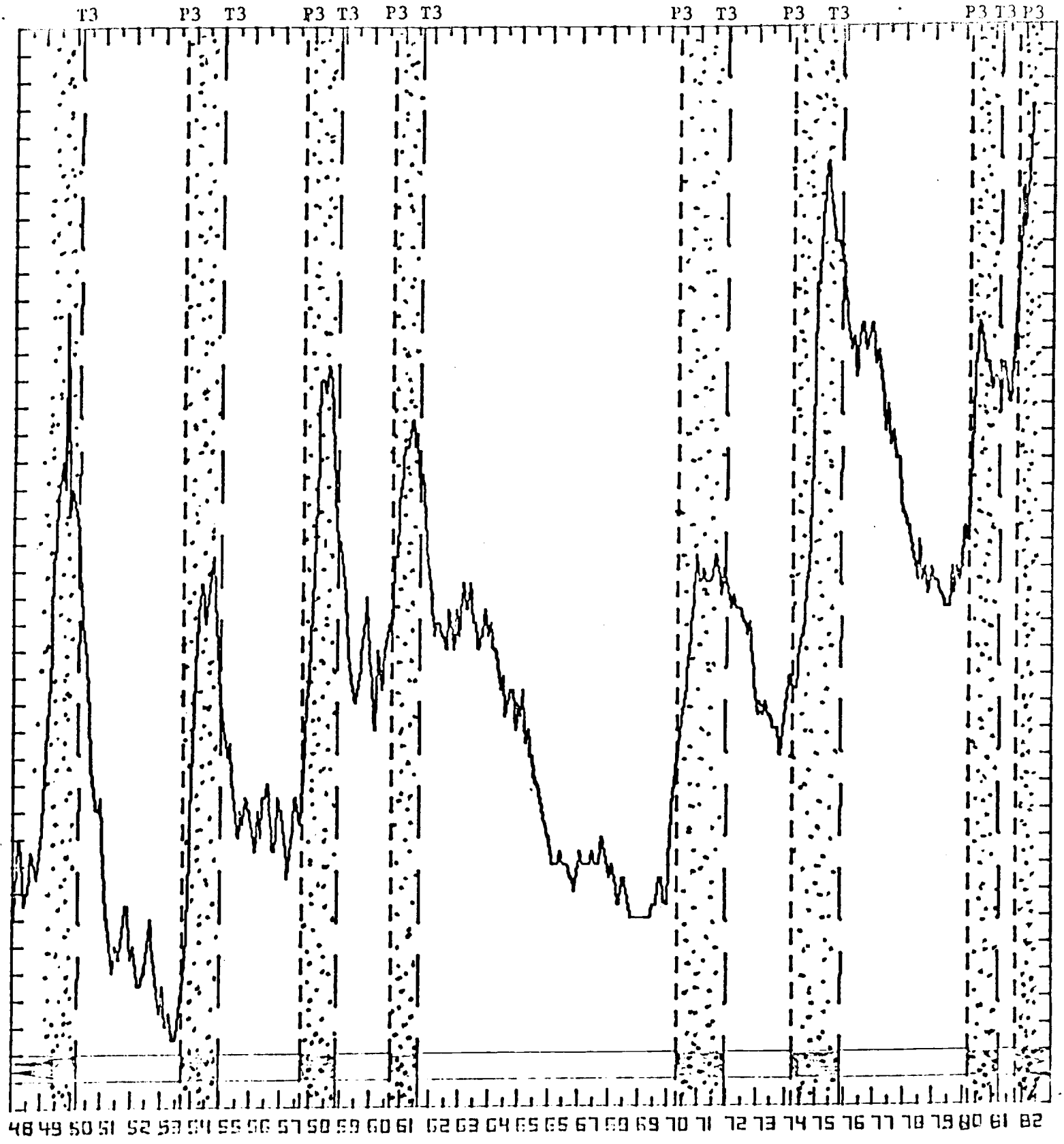
New Research Directions

In conclusion, we should like to suggest some directions that indicator analysis might take in the future.

First, there is the continuing need for improved data. Many of the indicators we are now using in our current international reports did not exist in their present form before we compiled them a few years

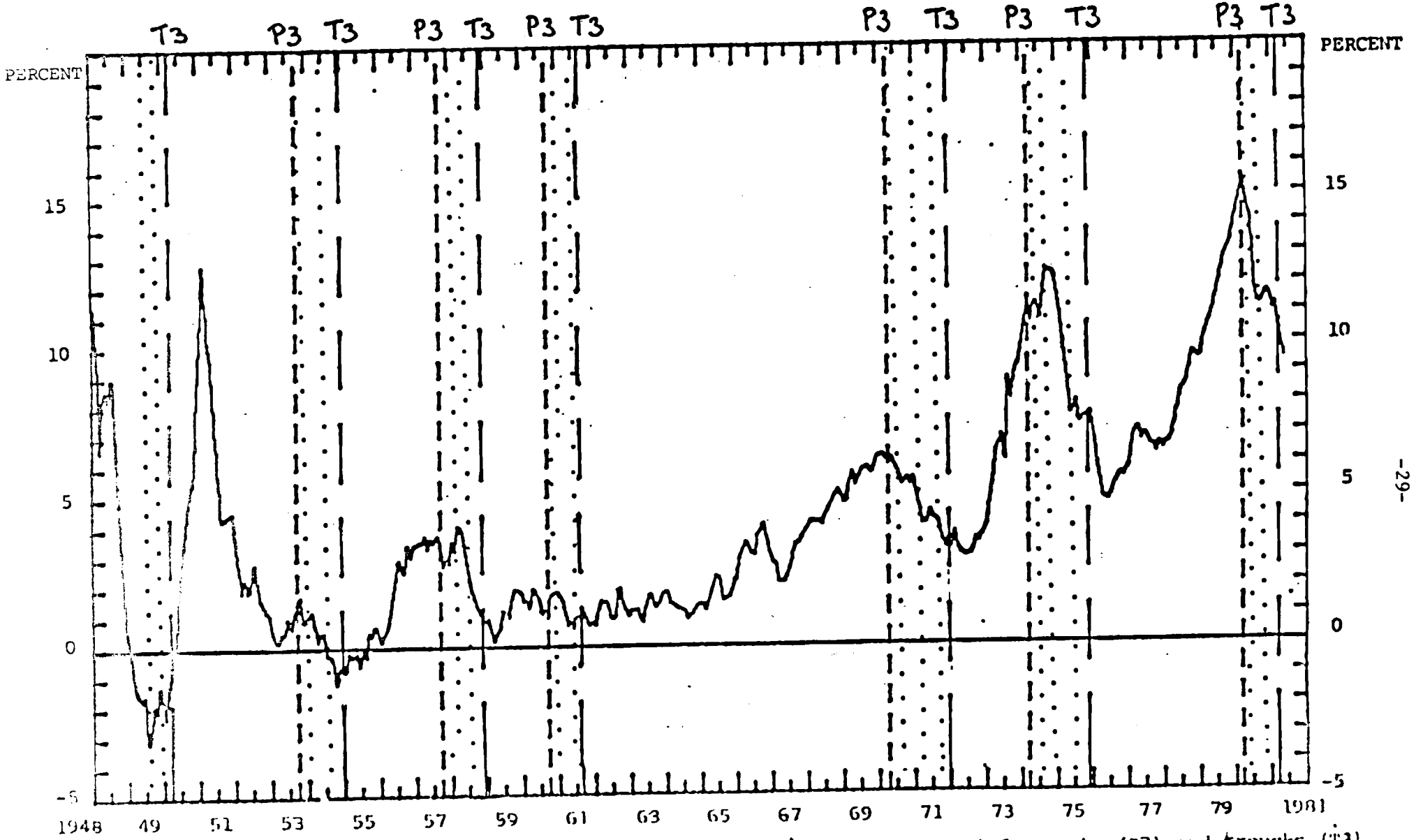
CHART 6.

SEQUENTIAL SIGNALS OF RECESSION AND THE
U.S. UNEMPLOYMENT RATE



P3 - Third signal of business cycle peak (L≤0; C≤2.3).
T3 - Third signal of business cycle trough (L>4.3; C>4.3).
Center for International Business Cycle Research, Rutgers University, Newark, N.J.

CHART 7. RATE OF INFLATION (CPI) AND THIRD SIGNALS OF PEAKS AND TROUGHS



Shaded areas are business cycle recessions as indicated by the third signal for peaks (P3) and troughs (T3), using the "band approach" (Tables 7 and 8). The CPI rate is the "six-month smoothed percentage change at annual rate", as determined from the ratio of the current month's index to the average index for the

ago. Some were not seasonally adjusted, some were not deflated, some were not available as continuous series, some required processing to enhance their properties as leading indicators. In many countries the coverage of indicators available on a monthly or even quarterly basis is very limited. Timeliness often does not get a high priority. Business survey data may not be in most appropriate form or may not cover the most appropriate questions. In the United States, even though indicator analysis has been pursued for more than forty years, we continue to find both needs and opportunities for new and better data.

Second, the development of leading, coincident and lagging indicators of inflation is a wide open field. We need to quicken our awareness of new inflationary trends, or disinflationary trends. What are the most reliable indicators for this purpose, and how reliable are they? Can available measures be improved? The Rutgers Center is carrying on some research in this field in connection with the new bi-monthly report, Inflation Watch, but we have barely scratched the surface.

Third, an organized effort to develop business cycle indicators in the countries in the Pacific area is warranted. In Europe, the OECD and the EEC have been engaged in such an enterprise for several years. This has stimulated many member countries to undertake research and development programs, to exchange results and discuss techniques. In the Pacific area, on the other hand, Japan has pursued this subject for many years, and more recently Australia, New Zealand, South Korea, Taiwan and Malaysia have engaged in such studies. But an organized effort among these and other countries of the region might bring benefits

to all through the exchange of information and methods. One of the surest routes to progress is to demonstrate and disseminate results.