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III

Problems of Classification and Presentation

The implementation of the scoring plan described above provides a large amount of data relevant to the classification, presentation, and interpretation of indicators. How should these data be used in reaching decisions on the most effective type of classification and presentation? Let us examine four of the principal problems involved.

1. DIFFERENCES IN TIMING AT PEAKS AND TROUGHS

The National Bureau's classification of indicators that is presently in use ignores differences between timing at peaks and timing at troughs. Thus series in the leading group are so classified because they usually lead at both peaks and troughs; the case is similar with series in the roughly coincident and lagging groups. The 1950 study of indicators revealed, and subsequent studies have confirmed, that a substantial proportion of the economic time series that conform well to business cycles and are fairly regular in their timing do exhibit similar timing at peaks and troughs. In the 1950 study, this proportion was about 60 per cent. Nevertheless, this leaves a fairly large number of series whose timing at peaks is different, in varying degree, from what it is at troughs.

It is clear that many of these differences are statistically valid and economically significant. For example, the unemployment rate has usually reached its cyclical low point and begun to rise prior to business cycle peaks, but has reached its high and turned down only after a business cycle recovery has begun. The average timing at peaks since the 1930's is a lead of 4 months, while the average at troughs is a lag of 2 months. The difference is statistically significant. Leads at peaks have occurred on 4 out of 6 occasions, and at troughs lags have occurred 5 times out of 7. The explanation appears to be that during the advanced stages of a business cycle expansion the labor force continues to rise at a more or less steady rate while employment rises at a decreasing rate, owing to various economic obstacles that impede expansion, such as higher costs or the difficulty of finding skilled personnel. Consequently the gap between the labor force and employment—that is, unemployment or, in relative form, the unemployment rate—starts to rise before employment (or output) starts to decline. At troughs in business activity, unemployment often continues to rise for a time because the continuing growth in the labor force is larger than the initial, usually modest, rise in employment. The recovery in employment is relatively slow partly because an increase in output at this stage can be achieved without a commensurate increase in labor input, and partly because an increase in labor input can be brought about more effectively by lengthening the workweek than by adding new workers.

An example of the opposite type of difference is provided by personal income, which has frequently lagged briefly at business cycle peaks and led by a month or two at troughs. Here the rising trend of relatively stable or even countercyclical types of income is apparently responsible. Shifts in occupational composition toward white-collar jobs have favored relatively stable types of income, and the growth of transfer payments such as unemployment benefits has contributed a stabilizing, countercyclical element. The net result

of these and certain other changes has been to reduce the cyclical swings in total personal income relative to those in output, and to produce short lags at peaks and short leads at troughs.

If differences of this sort were recognized in the classification and arrangement of indicators, the result would be that one classification would apply to peaks and another to troughs. There would, of course, be substantial elements of similarity between the two, since many series behave in broadly similar fashion at both turns. But recognition of the differences would enhance the value of the classification for those who wish to make the best use of the information on timing and adapt it to the current economic situation. During expansions, when indicators are studied with a view to predicting a peak in the business cycle, or at least identifying it when it comes,

it would be helpful to have a classification pertinent to peaks. Similarly, during recessions the most relevant classification would be one pertaining to troughs.

On the other hand, dual classification would be more difficult to justify because less statistical evidence would be available to judge each case and the problem of presentation might be complicated. Thus, even for a fairly long series such as personal income, only 8 timing observations are available at peaks and 9 at troughs. When secular shifts in timing have occurred, only the recent observations will be pertinent for a current classification, and for short series these are all that are available. Inconvenience and confusion might result from shifting from one classification during expansions to another during recessions. This would be particularly serious if an error in recognizing a business cycle turning point occurred.

2. DIFFERENCES IN LENGTH OF LEAD OR LAG

The three categories hitherto used to distinguish types of timing—namely, leading, roughly coincident, and lagging—do not distinguish differences in length of lead or lag, or at best do so crudely. The term roughly coincident has been used to denote leads or lags of three months or less, including exact coincidences. Hence this category overlaps the other two. It fits well those series that match business cycle turns closely, sometimes coinciding and sometimes leading or lagging by a month or two or three. But it produces an ambiguity with respect to series that, say, consistently lead by only two or three months. They might be considered either leading or roughly coincident. As noted earlier, personal income has generally led business upturns, mostly by one or two months. Does it lead at troughs or is it roughly coincident?

The problem is a general one, since leads or lags can be of various lengths, and the differences in length are often significant. The gross accession or hiring rate, for example, has generally led business cycle turns by a longer

interval than has the average workweek, probably because the former pertains to a change in labor input, the latter to the level of input. In other words, the hiring rate can decline for a considerable time; but until it reaches the level of the separation rate, no decline in employment will occur. A drop in the workweek, on the other hand, has an immediate impact on labor input. Again, leads of many series at business cycle peaks have generally been longer, at least in the postwar period, than at troughs. That is to say, a typical lead at peaks has represented a longer span than at troughs. But if length of lead is not recognized in the classification, this difference may pass unnoticed.

The importance of differences in length of lead becomes even clearer when one takes account of the fact that often it makes good economic sense to turn a lagging indicator into a leading indicator by inverting it, and vice versa. That is, instead of observing that the downturn in, say, finished goods inventories lags behind the downturn in business,

one can observe that the downturn in inventories leads the next upturn in business. The inventory decline can be a consequence of the business contraction that it follows, but it also can be a factor contributing to the ensuing business recovery, since the depletion of inventories produces conditions that may lead to an increase in output. Similar considerations apply to interest rates, unit-labor costs, the rate of change in the money supply, and many other series. Whether a series is a leading or lagging indicator, therefore, depends not merely on how it behaves but also on how one regards its role in the cyclical process, and especially on whether causes or effects are being considered.

Decisions with respect to whether timing comparisons should be made on a positive or inverted basis have a bearing on the question whether to classify indicators according to length of lead, because a series with consistently short lags on a positive basis will exhibit long leads on an inverted basis, and vice versa. Thus downturns in such "lagging indicators" as yields on new mortgages, unit-labor costs, and finished goods inventories all typically occur shortly after a business cycle peak has been reached. But these same reversals also frequently precede and in some degree give rise to upturns in such "leading indicators" as housing starts, profit margins, and investment in purchased materials inventories. In this sense, the lagging indicators are among the longest leading indicators.

This instructive way of reversing the order of these types of series was recognized in both the 1938 and the 1950 NBER studies of indicators. In the 1938 study, three series on bond yields were listed among those with the longest lags, but the same series, analyzed on an inverted basis, were also listed among those with the longest leads. In the 1950 study, it was observed that the median trough in a group of lagging series had, during fifteen business cycles between 1885 and 1938, invariably preceded the median peak in a group of leading series. Also, the median peak in the lagging group had, with only one exception, always preceded the median trough in the leading group. The possibility that these sequences reflected causal connections among the indicators was noted.

These phenomena are a manifestation of the continuous round of developments that constitutes the business cycle. They are of vital significance for the business cycle analyst scrutinizing the interconnections between one economic process and another. The question of concern here is whether they can be recognized in a classification of indicators in such a way as to illuminate rather than confuse.[1]

3. A SHORT LIST OF INDICATORS

In each of the three preceding NBER studies of indicators, one of the ultimate products was a fairly short list of indicators: 21 in two studies, 26 in the third. In each case, also, longer lists were appended. The longer lists covered a broader array of economic activities, and also contained some duplication, where two or more series pertaining to a given type of activity complemented one another in some way. *Business Cycle Developments*, since its inception, has identified the series in the short list, and used an adaptation of it in certain charts and tables used to make cyclical comparisons. The short list has also been used in various compilations by private businesses. Are the purposes served by both a short and

[1] An experimental classification that recognized both length of lead and peak-trough differences was published in the National Bureau's 44th Annual Report, New York, June 1964, pp. 99–106. There the 52 indicators then classified in *Business Cycle Developments* as leading, roughly coincident, and lagging were reclassified into twelve groups that distinguish length of lead or lag and differences in timing at peaks and troughs. See also Edgar R. Fiedler, "Long-Lead and Short-Lead Indexes of Business Indicators," *Proceedings of the Business and Economic Statistics Section*, American Statistical Association, 1962.

a longer list sufficiently compelling to warrant their construction in the present review?

Let us describe briefly the principal differences between the short and long lists shown in *Business Cycle Developments* during 1966, consisting of 26 and 80 U.S. indicators respectively. First, the longer list includes 28 series that are not classified as leading, roughly coincident, or lagging indicators, but which nevertheless represent important factors in business cycles. Federal government receipts and expenditures, foreign trade, and various financial and other series are counted here. Some of these series have fairly recently been added to *Business Cycle Developments* and may deserve inclusion in one or another of the timing groups, but have not been so placed pending completion of the present review.

The remaining 52 series in the long list include, of course, the 26 in the short list and 26 others. Several of the latter had not been constructed or investigated at the time the short list was compiled in 1960. Examples are the ratio of wholesale prices to labor cost per unit of output in manufacturing, and the index of labor cost per dollar of real corporate gross national product. The rest are series closely related to those in the short list, but considered to have some disadvantages. An example is the number of persons on temporary layoff, which has a broader industrial coverage and is available more promptly than the layoff rate in manufacturing, but is far more erratic in its month-to-month movements. Another example is the insured unemployment rate, which is available weekly and is smoother than the total unemployment rate, but does not cover all the unemployed. A third example is the change in book value of manufacturing and trade inventories; this series is available monthly but has the conceptual disadvantage of being affected by inventory revaluation, unlike the quarterly GNP component, change in business inventories.

Hence the longer list contains data that are of definite value to the analyst despite their partial duplication of series in the short list.

For some purposes, such as the construction of a monthly composite index based on the indicators, substitutions between the two lists may well be made.

One of the principal reasons why in former years a short list was needed has now become less pressing. With the publication of various private and governmental compilations weekly or monthly on a prompt schedule, the difficulties facing individuals, business firms, and other organizations who wish to keep a substantial collection of economic series up to date have greatly diminished. All the principal indicators are now available in seasonally adjusted form, thanks largely to the advent of electronic computer programs. Whereas fifteen years ago, keeping a list of even 25 indicators seasonally adjusted, up to date, and charted was a substantial burden, today that problem can be solved by the expenditure of a modest subscription fee. A short list is, therefore, no longer so essential for this reason.

Another important consideration, however, is that a short, substantially unduplicated list of principal indicators provides a way of summarizing the current situation and outlook. At least, it is a step toward a summary, from which one may wish to go farther or approach in different ways. The relations among 25 or 30 indicators are more comprehensible than those among two or three times that number. They can be conveyed to management or lay audiences with better hope of understanding. And they can be reviewed more quickly.

Moreover, if a short list were confined to monthly series, i.e., excluding quarterly, it would possess some other advantages. Monthly series are nearly always more up to date than quarterly. The uniformity in the time unit makes it easier to present and interpret tables showing recent changes, and to construct composite indexes based on the current data. Moreover, when such indexes are based on a relatively short list of components, it is easier to trace the proximate cause of their movements.

There are dangers, of course, in making

complicated matters too easy. It would not do, for example, to neglect quarterly series entirely. Gross national product, plant and equipment expenditures, new capital appropriations, change in business inventories, and corporate profits, all of which are quarterly, are far too important. Also, the analyst needs to check his observations and conclusions by inspecting different pieces of evidence, even though they partially duplicate one another. The estimates of nonagricultural employment from the establishment survey, for example, need to be compared with those from the labor force survey, the ratio of prices to unit labor costs needs to be checked against directly reported profit margins, and so on. Clearly, if we have a short list we also need a long list.

4. CLASSIFICATIONS BY TIMING AND BY ECONOMIC PROCESS

The indicators charted in *Business Cycle Developments* are grouped not only in leading, roughly coincident, and lagging categories but also in classes reflecting the kind of economic process they pertain to. Leading series have been classified as (1) sensitive employment and unemployment indicators, (2) new investment commitments, (3) new businesses and business failures, (4) profits and stock prices, and (5) inventory investment, buying policy, and sensitive prices. Similar but not identical economic-process headings appear in the roughly coincident and lagging groups. The purpose of this grouping was primarily to bring closely related series *within a given timing class* under one heading, so as to emphasize their interrelations.

An economic process grouping might also serve a somewhat different purpose. In analyzing business cycles it is necessary not only to examine different processes with substantially the same timing, such as profits and new investment commitments, or raw materials prices and inventory investment, but also to consider similar processes with significantly different timing, such as new investment commitments and actual investment outlays, or the average workweek and the number of persons employed, or unit labor costs and profit margins. These "within process" relationships are sometimes more readily accounted for and more easily comprehended than those between processes. In any case they are fundamental to a broad understanding of business cycles and they play an important role both in forecasting and in policymaking. For this reason, it has been deemed desirable to facilitate comparisons of series with different timing but pertaining to the same economic process by devising a classification adapted to that end.

It is not easy to accommodate the many purposes that a classification and presentation of indicators may serve, or to meet the varied interests and sophistication of the users, or to take into account both the simple and the intricate cyclical relationships among the series, some of which are well known and firmly established, others unfamiliar and perhaps ephemeral. A practical compromise is all that can be expected. The next section describes the compromises we have reached.