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Chapter Author: Frank E. Morris

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## CHAPTER 4

# The Predictive Value of the National Bureau's Leading Indicators

Frank E. Morris

SEVEN years ago, the National Bureau of Economic Research published a monograph by Geoffrey Moore, entitled *Statistical Indicators of Cyclical Revivals and Recessions* [reprinted here, Chapter 7]. This monograph presented the results of the testing of more than 800 statistical series for the stability of their relationship to the business cycle. From this group, twenty-one indicators were selected as being particularly worthy of attention. These twenty-one indicators were classified into three groups according to their typical time sequence in the business cycle: a leading group, a coinciding group, and a lagging group. The monograph suggested that consensus measures of the movements of these groups of indicators would be of value in analyzing cyclical trends in the economy.

### *The Objectives of This Paper*

In this paper, I will attempt to appraise the predictive value of the National Bureau's statistical indicators during the postwar years. This is a rather appropriate time to undertake such an appraisal, since during the first half of 1957 the trend indications given by the leading indicators were quite at odds with prevailing opinion on the prospects for the economy. In the course of making this appraisal, I will (1) note some of the difficulties involved in applying these indicators to forecasting on a current basis and (2) present a new type of consensus measure of the indicators which appears to have some significant advantages over those currently in use.

It is not an easy matter to make an objective evaluation of the usefulness of these indicators in forecasting during the postwar years because the indicators do not, in themselves, constitute a complete basis for forecasting, nor were they intended to do so. The indicators were chosen because they bore a systematic relationship to the business cycle over long periods and changed economic circumstances. They do not, however, cover all of the important variables in the economy. At best, then, they can provide only a partial analysis of business trends. The user must take into consideration other information not reflected (or only partially reflected) in the indicators and modify his conclusions accordingly. This

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being the case, in attempting to judge the effectiveness of this approach, one has to consider, in addition to the behavior of the indicators, what additional, modifying information the user should reasonably be expected to have had—and opinions are certain to differ on this score.

It takes only a glance at a list of the twenty-one indicators to recognize that they comprise some of the most important measures of economic activity. So the question is not whether these indicators will be used by forecasters, but how they should be used and how much emphasis should be given to them.

### *The Validity of the Lead-Lag Classifications*

In making this evaluation, it would seem that the first thing to establish is whether the classification of these indicators into leading, coinciding, and lagging groups, which was based on an analysis of prewar data, is still appropriate in the light of the postwar experience. It might be noted that, although this classification was made on empirical grounds, the logical basis for the timing relationships of at least half of the indicators is sufficiently strong that they would tend to be accepted even in the absence of Moore's impressive empirical support. Few would dispute, for example, that new orders for durable goods should tend to lead changes in the level of output of durable goods, that construction contract awards should tend to lead changes in the volume of construction work and that a manufacturer should tend to adjust the hours worked by his labor force before adjusting the size of his labor force. On the other hand, the logical foundations for some of the relationships (for example, the tendency of inverted business failure liabilities to lead the cycle)<sup>1</sup> are not as strong; and their acceptance as indicators must rest to a greater extent on empirical grounds.

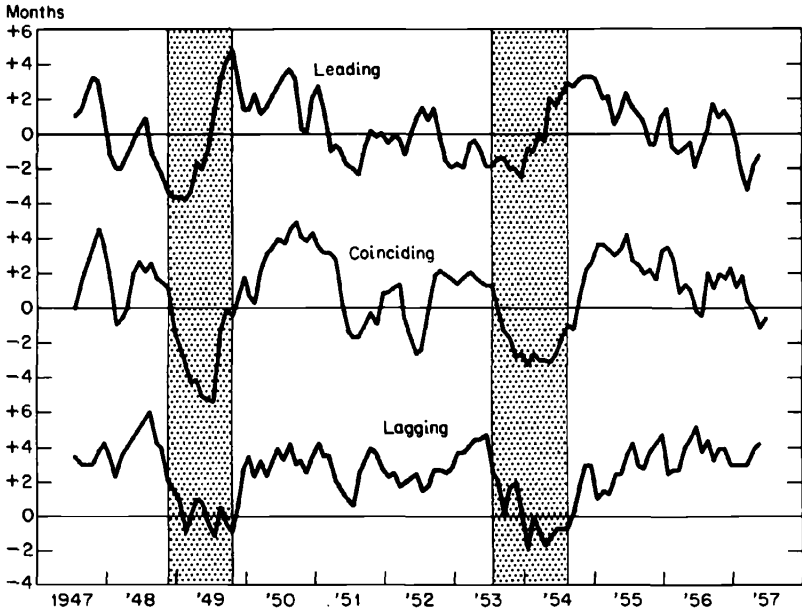
Chart 4.1 shows the average duration of run of the leading, coinciding, and lagging groups during the period from mid-1947 through mid-1957. It should be noted that these are indexes which I have developed for my own use and that they deviate somewhat from those of the National Bureau. I have adapted the indicators to the needs of the investment banking business by removing industrial stock prices and interest rates (which are not very useful as indicators to investment bankers) from the leading and lagging groups, respectively. I have also omitted the gross national product and corporate profit series from the coinciding series, because their availability only on a quarterly basis makes for difficulties in combining these series with other series available on a monthly basis, and because the quarterly data ordinarily are not available as promptly as monthly data. For a reason to be mentioned at a later point, the measure

<sup>1</sup> See, however, V. Zarnowitz and L. Lerner, "Cyclical Changes in Business Failures and Corporate Profits," Chapter 12.

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CHART 4.1

Leading, Coinciding, and Lagging Series, Average Duration of Run, 1947-57



Shaded areas represent business contractions; unshaded areas, expansions.

of nonresidential construction contract awards which I use includes government and public utility construction as well as commercial and industrial construction. Despite these and other, more minor differences, the movements of these indexes are basically very similar to those made by the National Bureau, and any conclusions that may be drawn from the behavior of these indexes are equally applicable to those of the National Bureau.

Time does not permit an examination of the lead-lag performance of the individual statistical series; so my remarks will have to be confined to the performance of the groups of indicators. A study of Chart 4.1 would seem to indicate that the lead-lag relationships which were found to exist during the prewar years have continued to exist, despite the important structural changes in the economy during the wartime and postwar years. In the recessions and revivals of 1948-49 and 1953-54, the leading series index crossed the zero average duration of run line a number of months before the peak or trough was reached. In each instance, the coinciding series index crossed the zero line within one or two months of

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the peak or trough. In the recessions of 1948-49 and 1953-54 the lagging series index crossed the zero line only a number of months after the peaks had been reached. The lagging group did not, however, lag in the revivals from those recessions. This is probably attributable to the very mild character of the postwar recessions.

In general, I think it is reasonable to say that the postwar experience demonstrates that the time-sequence classification of these groups of indicators has continuing validity. This finding, in itself, should increase the value of these indicators to the forecaster and testify to the significance of the classification work done by the National Bureau.

### *The Usefulness of the Indicators in Forecasting*

Let us now attempt to appraise the usefulness of these indicators, and in particular the leading series, in forecasting the course of economic activity during the postwar years. It should facilitate this appraisal to note first some of the difficulties encountered in using the indicators on a current basis. The three principal difficulties are: (1) erratic swings in the data, which cannot be entirely eliminated by smoothing devices; (2) the variability of the lead time given by the leading series; and (3) the fact that the leading series index is sensitive to leveling-off periods and minor cyclical movements as well as to major cyclical trends. These difficulties are illustrated on Chart 4.2, which plots the leading series index against the Federal Reserve industrial production index. In addition, there are two lesser problems encountered in applying the indicators currently, which will only be mentioned here: the lag in obtaining the data and the problems caused by revisions of the data.

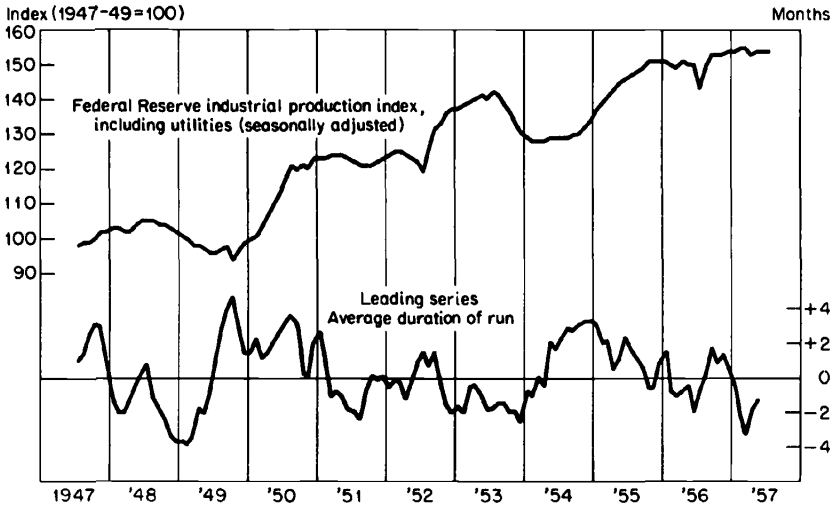
Success in using the leading series index in forecasting will depend, to a considerable extent, on the ability of the user to distinguish between brief, erratic movements in the data and movements which have fundamental cyclical significance. Perhaps it should be noted that this difficulty is not restricted to this approach, but is inherent in any forecasting model that uses current economic data. In retrospect it seems clear that the leading series, which showed a declining trend from October 1947, gave a rather clear indication of the coming recession of 1948-49. Nevertheless, there was a four-month period, April through July 1948, when the index moved counter to this trend. This erratic movement could, undoubtedly, have been troublesome to the forecaster. Other similar situations could be cited, but this is probably the most striking one.

The second difficulty is the variability of the lead time given by the leading series. In the recessions and revivals of 1948-49 and 1953-54, the lead time of the leading series index varied from eight to thirteen months (measured from peak to peak and from trough to trough). The lead time for revivals, during these cycles, was somewhat shorter than the

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CHART 4.2

Federal Reserve Production Index and Average Duration of Run of Leading Series, 1947-57



lead time for recessions. Furthermore, there is no reason to believe that the length of the lead time in future cycles will remain within these limits. Clearly, the behavior of the leading series index does not provide a foundation for pinpointing in advance the precise timing of cyclical turning points. Forecasters using these indicators would have to be content with a much less precise type of forecasting.

Now to consider the third type of difficulty. Chart 4.2 shows that the leading series index has had three complete cycles since mid-1947, but that the economy has had only two. The cycle of the leading series which started in the fourth quarter of 1947 and ran through the third quarter of 1950 was reflected in the recession and revival of 1948-49. The cycle of the leading series which started in the third quarter of 1952 and extended to the first quarter of 1955 was reflected in the recession and revival of 1953-54. However, the cycle of the leading series which ran from the third quarter of 1950 to the third quarter of 1952 was reflected not in a recession, but only in a leveling-off period extending from early 1951 through mid-1952, which was followed by a sharp upturn in output reaching a peak in mid-1953.

The "extra" cycle of the leading series during 1951-52 has been pointed to by critics as demonstrating the fallibility of the entire approach. There is no questioning the fact that the sensitivity of the leading series to a leveling-off period in the economy places a burden on the user of the

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indicators of distinguishing between modest adjustment periods and major cyclical movements. But this should not render the approach unworkable. Some guidance in making this distinction may be given by the performance of the coinciding and lagging series, a point that Geoffrey Moore has stressed.<sup>2</sup> In addition, the analyst must also use his knowledge of the general economic environment.

I find it difficult to believe that any economist using these indicators would have forecast a full-blown recession in 1951–52. It is reasonable to assume that he would have known about the Korean War, that he would have known about the tremendous planned expansion in military expenditures, and that he would have known about the government's program to stimulate defense-related business investment. In view of the presence of these powerful expansionary factors, it would seem unlikely that he would have forecast more than a modest easing in the pace of economic activity.

A modest easing in economic activity is, in fact, what resulted—a reaction to the panic buying of both businesses and consumers which occurred during the months immediately following the outbreak of the Korean War. There was, as Chart 4.2 shows, a gentle downward trend in industrial production during 1951 and the first half of 1952, and there were movements of cyclical proportions in inventories, wholesale prices, retail sales and other aspects of economic activity. But the swift expansion in federal government expenditures offset their effects. Employment showed a slight upward trend throughout the period, the impact on the labor force being restricted to the number of hours worked.

The 1951–52 period remains fresh in my memory, because during that period I was an economist in the Office of Price Stabilization. After the imposition of the general price freeze at the beginning of 1951, which was followed by a frenzied period of organization, we found, somewhat to our chagrin, that during the second half of 1951, apart from items directly related to the defense effort, there was very little inflation to control and, furthermore, that an astonishing percentage of basic commodities and consumer goods were selling substantially below their ceiling prices.

I think that the indicators would have been useful to us at OPS. They showed that self-correcting forces were already at work at the time of the imposition of the general price freeze. In retrospect, and somewhat reluctantly, I would say that for the most part our efforts at OPS only had the effect of formalizing, in a monumental mass of regulations, the inflation that had already occurred.

Nevertheless, the fact that a sustained downward movement of the leading series index will not always indicate a full-blown recession is,

<sup>2</sup> See Chapters 3 and 7.

obviously, a disadvantage; but it need not be a fatal one to the user who is aware of this fact.

To sum up my impressions of the predictive value of the indicators during the postwar years: I think that a competent analyst, using the indicators, might have made some mistakes in attempting to forecast the precise timing of cyclical turning points in the economy and he might have made mistakes in judging, very far in advance, the amplitude of swings in the economy. He should not, however, have made mistakes with regard to the direction of movement of the economy; and, in general, I think that his record in forecasting the recessions and revivals of 1948-49 and 1953-54 should have been reasonably good.

### *The Duration-Rate Index*

At this point, I would like to digress and discuss the measures used in obtaining a consensus of the movements of the groups of indicators. The most commonly used measure is the "percentage expanding" index, which simply records, in an unweighted fashion, the direction of movement of the indicators. A second measure, less commonly used, is the "average duration of run" index, which weights the direction of movement of the indicators by the number of consecutive months that the movement has occurred. This is the type of index used in Charts 4.1 and 4.2. The advantage of the average duration of run is that it smoothes some of the erratic movements found in the percentage expanding index and brings out the cyclical trend more clearly. Its disadvantages are that it occasionally will lag behind the percentage expanding index at cyclical turning points and that it is more difficult to explain.

These measures reflect the direction of change in the indicators, but they do not reflect the *rate* of change. I thought it might be worth-while to experiment with an index which gave some weight to the rate of change in the indicators. The results of the experiment demonstrate that this type of index has some considerable advantages over those now in use.

One such index, which I call the "duration-rate" index, gives equal weight to the duration of run and the rate of change in the indicators. During the 1947-57 period, this index showed considerably less erratic movement than either the percentage expanding or the average duration of run. At the same time, it was as sensitive to cyclical turning points as the percentage expanding index (and occasionally more sensitive).

The ability of the duration-rate index to bring out cyclical trends more clearly without loss of sensitivity is based on the fact that a change in the direction of movement of an indicator is often preceded by a slackening in the rate of change of the indicator. The properties of the duration-rate index and its construction are illustrated in Table 4.1, which shows



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TABLE 4.1  
New Orders for Durable Goods  
(seasonally adjusted)

Period	3-Month Moving Average	Duration of Run	% Change in Moving Average	% Change ÷ Median % Change	Duration Rate
1948					
May	7,063	+1	+3.1	1.8	+1.8
June	7,254	+2	+2.7	1.6	+3.2
July	7,677	+3	+5.8	3.4	+6.0
Aug.	7,705	+4	+0.4	0.2	+0.8
Sept.	7,750	+5	+0.6	0.4	+2.0
Oct.	7,651	-1	-1.3	0.8	-0.8
Nov.	7,468	-2	-2.4	1.4	-2.8
Dec.	6,998	-3	-6.3	3.7	-6.0
1949					
Jan.	6,707	-4	-4.2	2.5	-8.0
Feb.	6,445	-5	-3.9	2.3	-10.0
Mar.	6,418	-6	-0.4	0.2	-1.2
Apr.	6,315	-6	-1.6	0.9	-5.4
May	6,229	-6	-1.4	0.8	-4.8
June	6,192	-6	-0.6	0.4	-2.4
July	6,195	+1	+0.1	0.1	+0.1
Aug.	6,548	+2	+5.7	3.4	+4.0
Sept.	6,860	+3	+4.8	2.8	+6.0
Oct.	7,120	+4	+3.8	2.2	+8.0

the movements of the series on new orders for durable goods during 1948-49.

Since there are substantial differences in the cyclical amplitudes of the indicators, some means had to be found to make the rates of change in the various indicators reasonably comparable. To attain this comparability, the measure of the rate of change used in constructing the index is the rate of change divided by the median rate of change for the particular statistical series during the 1947-56 period. (For the new orders for durable goods series in our example, the median rate of change in the three-month moving average of the series was 1.7 per cent.)

This rate of change measure is then multiplied by the duration of run to obtain the duration rate, with the exception that, if the rate of change is more than twice the median, it is considered to be only twice the median in making the calculation. Thus, with the range of possible values of the duration of run index limited to  $\pm 6$ , the range of possible values for the duration-rate index is  $\pm 12$ .

Table 4.1 shows that the duration-rate figure for new orders for durable goods reached a peak in July 1948, even though the direction of change remained upward through September. Similarly, the duration-rate

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 CHART 4.3  
 Leading Series, 1954-57

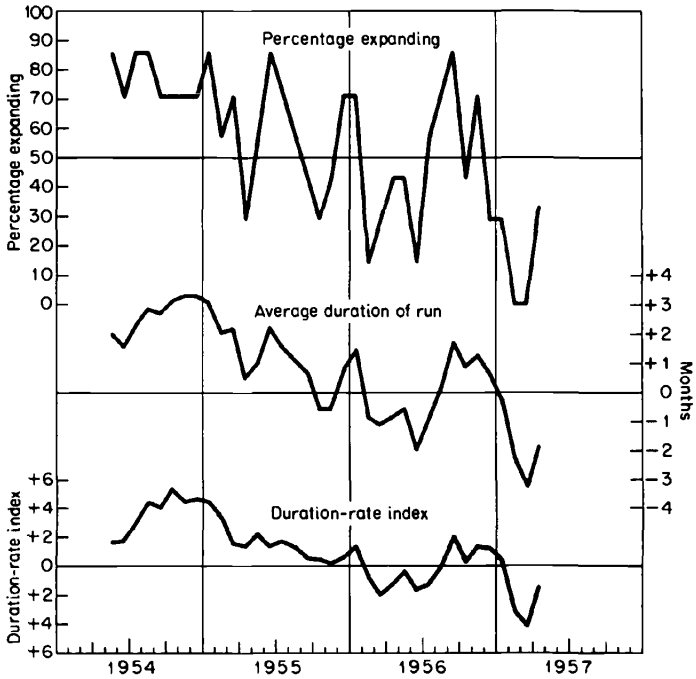


figure reached a low point in February 1949, although the direction of change remained downward through June.

To the extent that a slackening in the rate of change precedes a reversal in the direction of movement of the indicators, which often (but not always) occurs, the duration-rate index can be expected to lead the duration of run index. If the user does not want to give weight to the duration of run, a similar type index can be constructed which gives equal weight to the direction of movement and the rate of change. This index, which I call the "direction-rate" index, tends to coincide with (and, occasionally, to lead) the percentage expanding index at important turning points and, at the same time, shows considerably less erratic movement.

The smoothing quality imparted by weighting the indexes by the rate of change in the indicators is demonstrated in Chart 4.3. Chart 4.3 shows the percentage expanding, the average duration of run and the duration-rate indexes from mid-1954 to the present. All three indexes are drawn to the same scale. During this period, the movements of the percentage expanding index covered 86 per cent of its possible range of values. The

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comparable figures for the duration of run and duration-rate indexes are 55 per cent and 38 per cent, respectively.<sup>3</sup>

### *Conclusions*

In conclusion, the National Bureau's statistical indicators, like most other tools of economic analysis, probably have considerably more merit than their most uninformed critics see and probably more limitations than some of their most ardent advocates like to recognize.

The difficulties in applying the indicators to forecasting on a current basis, which I have noted, should demonstrate that these indicators do not provide a certain and easy method of forecasting. They have not brought automation to forecasting; and they do not threaten the professional judgment of economists with technological unemployment. However, I believe that the postwar experience does show that, properly used, the indicators can be a very valuable tool for the forecaster.

There is, however, much room for the further development of this approach. The recent work of Julius Shiskin in breaking down the average monthly fluctuations in the indicators into their irregular, cycle-trend, and seasonal components provides a useful aid in analyzing the significance of month-to-month changes in the data.<sup>4</sup> There is need for a broadening of the coverage of the leading indicators. In particular, I believe that the leading series underweight the governmental sector of the economy. This is the reason I have included government construction contract awards in the nonresidential construction component of the leading series. This is not to say that government construction itself tends to lead the cycle, but that trends in government construction may dampen the impact of a change in private construction; and, in fact, this has happened this year.

There is need for research toward establishing what Sidney Schoeffler has called "validity conditions" for the indexes.<sup>5</sup> And there is also need for research toward establishing some linkages, capable of quantification, between movements of the indicators and movements of the aggregates to be forecast. With the infinite complexity of economic life, I am not hopeful that such research will succeed in turning up a set of "rules of thumb" having universal validity, but the attempt might provide an improved basis for interpreting the movements of the indicators.

In summary, I am inclined to accept the judgment of Arthur F. Burns when he said of the National Bureau indicators that they "should prove extremely helpful to the many economists who can master statistical devices without being mastered by them."<sup>6</sup>

<sup>3</sup> For other experiments in which the indicators are adjusted according to their average rate of change, see Chapters 18 and 19.

<sup>4</sup> See Chapter 17.

<sup>5</sup> Sidney Schoeffler, *The Failures of Economics: A Diagnostic Study*, Cambridge, Mass., 1955, pp. 56-64.

<sup>6</sup> See p. 36.