

# Technical Note

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## Using a leading employment index to forecast unemployment in 1983

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Year-to-year changes in the unemployment rate may be forecast with moderate accuracy using the leading employment index constructed by the Center for International Business Cycle Research at Rutgers University. The index consists of five components that typically lead, or move in advance of, changes in employment and unemployment. The components are the average workweek and overtime hours in manufacturing industries; the number of initial claims for unemployment insurance; the layoff rate for all workers; and the ratio of the numbers of voluntary to involuntary part-time employees. Because each of these factors reflects employment decisions that are usually made early in the process that results in a larger or smaller number of unemployed, the index is relevant to the future movements in unemployment.

Table 1 demonstrates the ability of the index to forecast changes in unemployment for the year ahead. For this purpose, the growth rate in the index was calculated by taking the ratio of the current month's index to the average index over the preceding 12 months and expressing this as an annual rate. This growth rate is called the "6-month smoothed rate" because the interval covered is approximately the previous 6 months. It is less subject to erratic movements than the ordinary 6-month change because the 12-month average used as the base is more stable than the single-month figure 6 months earlier.

Column 3 in the table shows the 6-month smoothed growth rate for each October from 1969 through 1983. These rates are available as of the first Friday in November, when the October index is computed. Columns 4 and 5 give the rates for November and December.

These figures provide the basis for forecasts that can be made early in November, December, or January for the year ahead.

The information from 1969 to 1982 was used to estimate the average relationship between the leading index growth rates and the percentage-point change in the unemployment rate for the year ahead. The relationship is, of course, inverse: when the leading index rises rapidly, unemployment can be expected to decline. Roughly speaking, the change in unemployment is about one-fourth to one-fifth as large as the leading index growth rate.

Columns 6 through 8 of table 1 give the estimated changes in unemployment based upon regression analysis; columns 9 through 11 measure the errors in these forecasts. For forecasts made using the October index, the average error was 0.5 percentage point. With November indexes, the average error was 0.4 of a percentage point, and likewise with December indexes. Chart 1 compares the November forecast changes with the actual changes.

For 1982, the average annual unemployment rate was 9.7 percent, 2.1 points higher than the 1981 average. This compares with a forecast increase of 1.7 points based on the October 1981 leading index growth rate. The November forecast came a bit closer, 1.9 points, and the December forecast actually hit the target, 2.1 points.

For 1983, the December 1982 leading index yields a forecast increase in the unemployment rate of 0.6 percentage point. This would put the average unemployment rate for 1983 at 10.3 percent, slightly below the December 1982 level, 10.8 percent. Because all forecasts are subject to error, it would be advisable to place this within a range based upon the average error,  $\pm 0.4$  points. On this basis, the 1983 figure is likely to lie within the range 9.9 percent to 10.7 percent.

Can the leading index forecast the year-to-year change in unemployment any better than can the unemployment rate itself? To test this, the 6-month smoothed change in the unemployment rate as of October, November, or December can be used to forecast the next year's annual change. Regressions were constructed along these lines for the period 1969-81, and the results

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**Table 1. Forecast changes in the unemployment rate, using changes in the leading employment index, 1969-83**

Year	Unemployment rate		Leading employment index, 6 month smoothed percent change, as of preceding -			Forecast year-to-year change in unemployment rate, <sup>1</sup> as of -			Error in forecast, as of -		
	Level (1)	Change from preceding year (2)	Oct. (3)	Nov. (4)	Dec. (5)	Oct. (6)	Nov. (7)	Dec. (8)	Oct. (9)	Nov. (10)	Dec. (11)
1969	3.5	-	-	-	-	-	-	-	-	-	-
1970	4.9	1.4	-2.3	-1.8	-2.5	0.8	0.6	0.7	-0.6	-0.8	-0.7
1971	5.9	1.0	-8.5	-7.4	-5.8	2.4	1.8	1.4	1.4	0.8	0.4
1972	5.6	-0.3	1.2	1.2	2.9	-0.1	-0.1	-0.4	0.2	0.2	-0.1
1973	4.9	-0.7	4.2	4.6	4.0	-0.9	-0.8	-0.6	-0.2	-0.1	0.1
1974	5.6	0.7	0.9	-0.7	-3.1	0.0	0.4	0.8	-0.8	-0.3	0.1
1975	8.5	2.9	-6.7	-11.1	-11.9	1.9	2.7	2.6	-1.0	-0.2	-0.3
1976	7.7	-0.8	3.1	5.9	7.8	-0.6	-1.1	-1.4	0.2	-0.3	-0.6
1977	7.1	-0.6	0.0	0.2	0.2	0.2	0.2	0.2	0.8	0.8	0.8
1978	6.1	-1.0	2.5	3.1	2.3	-0.5	-0.5	-0.3	0.5	0.5	0.7
1979	5.8	-0.3	1.5	0.8	0.2	-0.2	0.0	0.2	0.1	0.3	0.5
1980	7.1	1.3	-2.7	-3.8	-3.8	0.9	1.0	1.0	-0.4	-0.2	-0.3
1981	7.6	0.5	-2.2	0.8	1.6	0.8	0.0	-0.1	0.2	-0.5	-0.6
1982	9.7	2.1	-5.8	-7.7	-9.3	1.7	1.9	2.1	-0.4	-0.2	0.0
1983	-	-	-5.5	-3.8	-2.1	1.6	1.0	0.6	-	-	-

<sup>1</sup> As derived from regression equations based on 13 observations, 1970-82, as follows:  
 Change in unemployment rate = 0.2 - (0.26) (Leading index growth rate, October);  
 Change in unemployment rate = 0.2 - (0.22) (Leading index growth rate, November);  
 Change in unemployment rate = 0.2 - (0.20) (Leading index growth rate, December).

NOTE: The leading index used in this table is the index without the target trend adjustment.  
 SOURCE: Center for International Business Cycle Research, Rutgers University, Newark, N.J., Jan. 10, 1983.

were compared with corresponding estimates based on the leading employment index:

Reference month	Leading employment index base		Unemployment rate base	
	r <sup>2</sup>	Mean absolute error	r <sup>2</sup>	Mean absolute error
October . . . .	0.71	0.5	0.39	0.8
November . . .	.84	.4	.51	.7
December . . .	.84	.4	.68	.5

The r<sup>2</sup>'s based on the unemployment rate are smaller than those based on the leading index, and the mean errors are larger. The growth rate in unemployment for December 1982 was 2.4 percentage points, and this yields a forecast increase of 1.9 percentage points for 1982-83, or an unemployment rate averaging 11.6 percent for 1983 as a whole. This is considerably higher than the 10.3-percent forecast for 1983 based on the leading index for December. It remains to be seen which will be closer to the mark, but if experience is any guide, the leading index forecast will be more accurate because it takes into account changes in the employment situation that are reflected in the unemployment rate only with a lag.

Another standard of comparison against which to assess the accuracy of the leading index forecasts is the record of other forecasters. The comparison cannot be precise, for several reasons. One is that the errors obtained by fitting an equation to historical data are likely to be smaller than those that would have been obtained on an *ex ante* basis, which is what the forecasters' records show. Another is that the available records generally show quarterly rather than annual

forecasts. Still another point is that the average error of a group of forecasts is generally smaller than those of most of the individuals in the group, or those based on a single method of forecasting. Nevertheless, the comparison is of some interest, and one such set of records is shown in table 2.

The errors in forecasts of unemployment for one quarter ahead are generally smaller, averaging about two-tenths of a percentage point, than those for two, three, or four quarters ahead, which average about four-tenths of a point. In view of the problems of comparability mentioned above, about all one can say is that the errors in the leading index forecasts are of the same order of magnitude as those made by forecasters using other methods.

**Table 2. Average absolute error in selected forecasts of the unemployment rate, 1976-80**

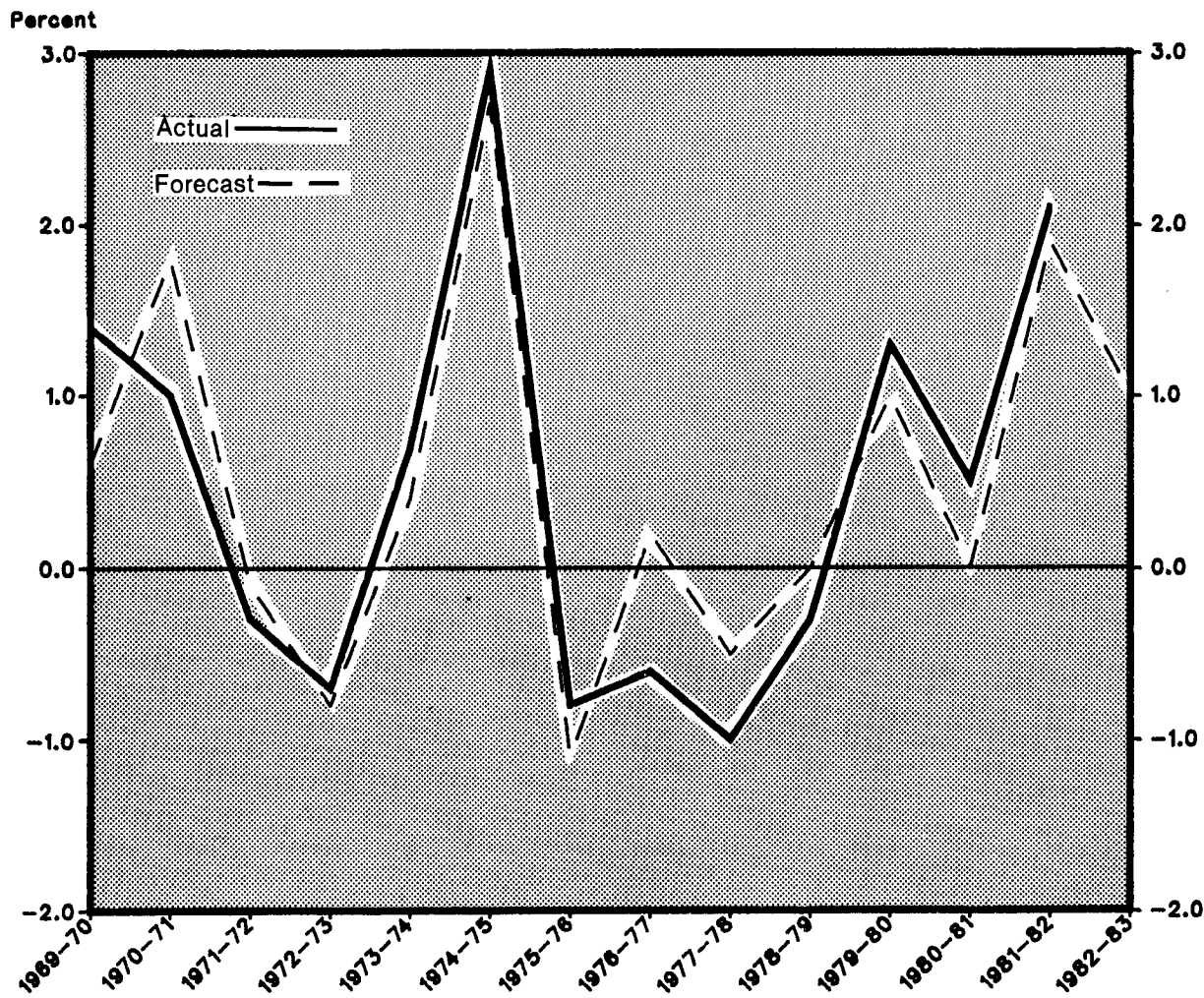
[In percentage points]

Time of forecast and group represented	Forecast horizon (number of quarters)			
	1	2	3	4
Early quarter:				
ASA-NBER . . . . .	0.2	0.4	0.4	0.4
Six forecasters . . . . .	.2	.4	.4	.4
Mid-quarter:				
Five forecasters . . . . .	.2	.4	.5	.5
Late quarter:				
Three forecasters . . . . .	.1	.3	.4	.4

NOTE: The early quarter forecasts are those based on preliminary estimates of the last quarter's GNP; mid-quarter forecasts are based on the first GNP revision, and late-quarter forecasts are those made near the end of the quarter. Entries for the American Statistical Association-National Bureau of Economic Research (ASA-NBER) are errors in the median forecasts of about 40 forecasters, while the other entries are median errors.

SOURCE: Stephen K. McNees, "The Recent Record of Thirteen Forecasters," *New England Economic Review*, September-October 1981, pp. 5-21.

**Chart 1. Year-to-year percentage-point change in the unemployment rate, actual and as forecast using the leading employment index, 1969-83**



NOTE: Forecasts are based on the 6-month smoothed growth rate in the leading employment index for November of the preceding year.

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

— FOOTNOTE —

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<sup>1</sup> The index used for the purpose of forecasting unemployment is a variant of the one regularly published by the Center for International Business Cycle Research. The published index includes a target trend adjustment to make its long-run growth trend consistent with that of

the U.S. Department of Commerce leading index, namely 3.3 percent per year. The index used here has virtually no long-run trend. It leads the unemployment rate on average by 4 months at unemployment peaks and by 6 months at unemployment troughs for the years 1948 to 1982. For a discussion of both indexes and their uses, see Geoffrey H. Moore, "A new leading index of employment," *Monthly Labor Review*, June 1981, pp. 44-47. Since that report was written, an additional component—the layoff rate for all workers—has been included in both indexes.