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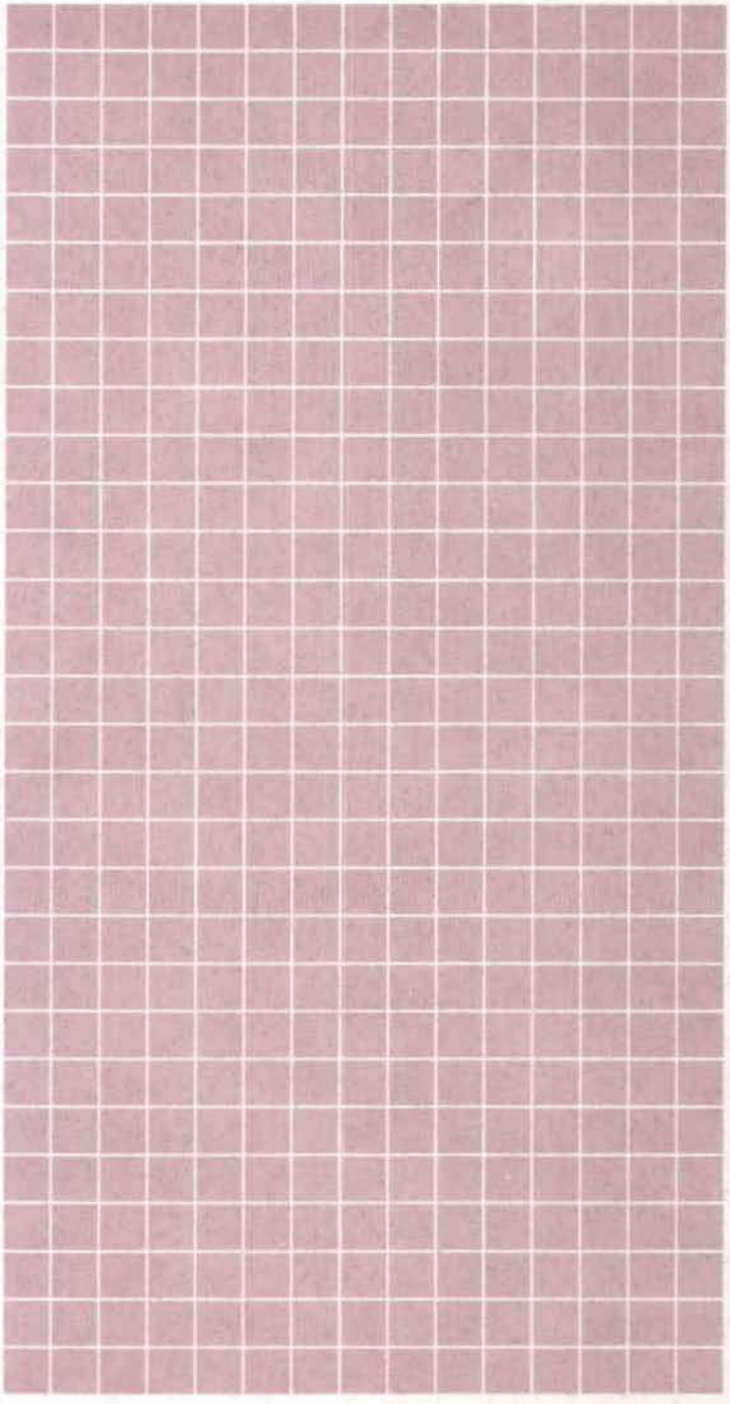
Economic Review

Misleading Indicators? Using the Composite Leading Indicators to Predict Cyclical Turning Points

Evan F. Koenig and Kenneth M. Emery

A Return to Profitability: The Performance of Eleventh District Commercial Banks

Kevin J. Yeats



Economic Review

Federal Reserve Bank of Dallas

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Misleading Indicators? Using the Composite Leading Indicators to Predict Cyclical Turning Points

Receiving timely notice of shifts in the economy's direction is important to a wide variety of economic decisionmakers. Households may wish to defer the purchase of such big-ticket items as automobiles and houses if they believe that the jobs of household members are insecure. Firms, similarly, are unlikely to want to invest in new plant and equipment if sales are about to decline. A prospective decline in sales might also inhibit the introduction of new products or efforts to break into new markets. For the policymaker, lack of timely information can transform what was meant to be a countercyclical policy into a policy that reinforces fluctuations in unemployment and inflation.

As the United States slipped into a recession in the summer of 1990, the U.S. Department of Commerce composite index of leading indicators—the U.S. government's principal tool for predicting business-cycle turning points—continued to register all-time highs. Not until late September, with the release of its August value, did the composite leading index begin to slide. Not until late November did the composite index register the three consecutive monthly declines that are often taken to signal a future slowing of real economic activity. Rather than providing advance warning of recession, then, the composite index of leading indicators failed to predict a recession until well after the downturn in economic activity was under way.[1]

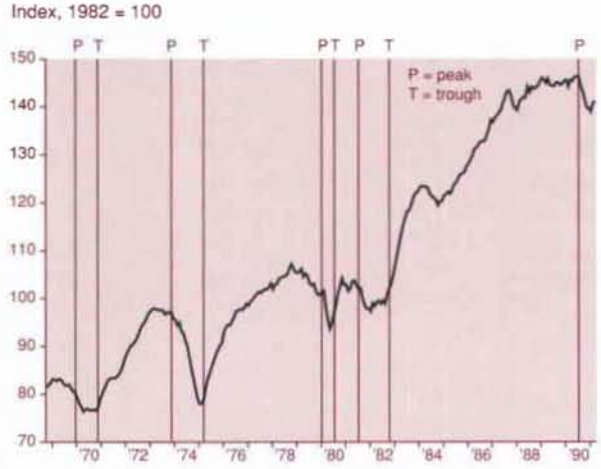
Economists, to varying degrees, attach some of the blame for the current recession to the sudden, unexpected Iraqi invasion of Kuwait in August, with its disruptive impact on world oil markets and depressing effect on consumer confidence. Thus, exceptional circumstances may have been responsible for the poor performance of the composite leading index in 1990. Certainly, a casual inspection of the plot of the leading index contained in any recent issue of the *Survey of Current Business* would lead one to believe that the index typically changes direction well in advance of peaks and troughs in the overall economy. (See Figure 1. The lead time for pre-1990 cyclical peaks ranges from two months to twenty months and averages 9.7 months. At cyclical troughs, the lead time ranges between one month and ten months and averages 4.6 months.)

For a number of reasons, however, such plots are misleading. First, the value of the leading index for, say, February is not announced until the end of March. A one-month advance warning is, therefore,

We wish to thank Stephen P.A. Brown, Michael P. Niemira, Keith R. Phillips, and Paula K. Tucker for helpful comments and discussions. We would also like to thank Francis X. Diebold and Glenn D. Rudebusch for giving us access to their data set. Matthew I. Turner and James L. Hedges provided excellent research assistance.

[1] *Of the four most frequently cited coincident indicators of real economic activity, one (nonagricultural employment) peaked in June, one (constant-dollar personal income less transfer payments) peaked in July, one (constant-dollar manufacturing and trade sales) peaked in August, and one (the industrial production index) peaked in September. According to the National Bureau of Economic Research, a private research organization whose rulings on such dates are widely accepted, the economy as a whole peaked in July.*

Figure 1
U.S. Commerce Department Composite Index of Leading Indicators



SOURCE: *Survey of Current Business*, April 1991

really no advance warning at all. Second, cyclical turning points in the leading index are often difficult to recognize until well after the fact: the leading index frequently begins to turn up in the middle of a recession—or turn down in the middle of an expansion—only to reverse course a few months later. Finally, contributing to the difficulty in recognizing cyclical turning points, each value of the leading index is subject to substantial revision after its initial release.

In this article, we review the construction of the composite index of leading indicators and evaluate its historical performance as a forecaster of business-cycle turning points. Several simple methods for forecasting recessions and expansions are considered. We also evaluate the forecasting methodology developed by Neftci (1982). Our analysis differs from that of others chiefly in that, for each method, we construct forecasts using only "real-time" data; that is, we use only information that was available at the time the forecast would have been made.[2] Our August 1990 forecast, for example, is based on historical data for the composite index of leading indicators taken from the August 1990 *Survey of Current Business*. By constructing our forecasts using only information that would have been available at the time, we hope to obtain a realistic assessment of the likely future performance of the composite leading index.

We find that the behavior of the composite index of leading indicators during the months immediately preceding the 1990 recession was not at all atypical. In general, then, the composite index has not changed direction early enough to provide reliable advance warning of the onset of recessions and recoveries.[3] A reliable signal of recession cannot typically be extracted from the composite index until one month or more *after* the recession has already begun. Reliable signals of expansions have been available with somewhat shorter lags. In predicting recessions, simple rules of thumb have often performed every bit as well as the more sophisticated Neftci methodology. In predicting expansions, however, the Neftci methodology has had a clear edge.

Description of the composite leading index

All the methods for forecasting expansions and recessions examined in this article are based on movements in the Commerce Department's composite index of leading indicators (CLI). While other composite leading indexes are available, the CLI is the only composite leading index constructed and published by an agency of the federal government.[4] As such, it is the index that is most familiar and most accessible to the public. Also, the Commerce Department's index, first published in November 1968, predates other available composite indexes. The extended publication record of the CLI gives us a long interval over which we can evaluate the index's real-time forecasting performance.

[2] *See, however, Diebold and Rudebusch (1991) and Hymans (1973).*

[3] *Of course, the composite index of leading indicators may, nevertheless, provide the first available clear confirmation of a cyclical turning point.*

[4] *Composite leading indicator series are also maintained by Columbia University's Center for International Business Cycle Research and, on an experimental basis, by the National Bureau of Economic Research (NBER).*

As its name suggests, the composite index of leading indicators is an amalgam of several underlying economic time series, each of which tends to lead broad movements in the business cycle.[5] The idea underlying a composite index is that it will give a more reliable signal of business-cycle turning points than would any individual indicator.

The components of the CLI are chosen on the basis of a detailed scoring system that puts particular emphasis on cyclical timing. Other criteria incorporated into the scoring system are economic significance, degree of conformity to the stages of the business cycle, prompt availability of the series, and the size of revisions in the series. In early versions of the composite index, the greatest weights were given to series with high scores on the basis of the above criteria. In the current version of the composite index, however, equal weights are given to all the index's component series.[6] Table 1 shows the series currently in the leading index.

Revisions to the composite leading index

Three factors hinder attempts to use the composite index of leading indicators to forecast business-cycle turning points: (1) the CLI is published with a lag, (2) cyclical turning points in the CLI are often difficult to recognize until well after the fact, and (3) the CLI is subject to substantial revision after its initial release. In this section, we focus on the third factor, discussing the source and magnitude of revisions to the CLI.

At the end of each month, the U.S. Bureau of Economic Analysis (BEA)—an arm of the Commerce Department—releases a value for the previous month's CLI based on incomplete and preliminary information.[7] At the same time, the BEA may also revise the CLI values for any or all of the preceding five months. These revisions occur as new information becomes available on the component series. A similar, but more comprehensive, revision of the CLI is undertaken once each year.

In addition, however, there are occasional changes in the composition of the CLI, as well as revisions, *ex post*, to the weights attached to its component series.[8] For example, in 1989, an index of consumer expectations and a measure of manufacturers' orders for durable goods were added to the CLI, replacing measures of the change in business and consumer credit and the change in business inventories.

The revisions to the CLI are substantial, both across periods in which definitional changes have occurred and within periods with no definitional changes. For instance, over the entire sample period from December 1968 to February 1991, the average absolute size of revisions to the estimated month-to-month percentage change in the CLI is 0.32. For comparison, the average absolute size of the initial estimate of the month-to-month percentage change in the CLI over this period is 0.43.[9] As would be expected, for periods in which there have been no definitional changes to the CLI, the size of the revisions is smaller. Between January 1983 and January 1987, a period when there were no definitional changes, the average

[5] *Business cycles have typically been defined as sequences of expansion and contraction (recession) in various coincident indicators of aggregate economic activity. (See note 1.) Because the NBER's dating of business cycles is considered the most reliable, its business-cycle dates are used in constructing the Commerce Department's leading indicators index.*

[6] *For a detailed description of the current version of the Commerce Department's leading indicators index, see the January 1989* Business Conditions Digest.

[7] *Between November 1968 and February 1990, the CLI was published in the Commerce Department's* Business Conditions Digest. *Since March 1990, the CLI has been published in the* Survey of Current Business.

[8] *Important definitional changes were made in 1969, 1975, 1979, 1982, 1983, 1987, and 1989. Detailed descriptions of these changes can be found in the September 1969, May 1975, March 1979, February 1983, March 1987, and January 1989 issues of* Business Conditions Digest.

[9] *Over the entire sample period, the standard deviation of the revision from the initial estimate of the CLI percentage change to the final estimate (as given in February 1991) is 0.45. Assuming normality, the implication is that if the initial estimate is, say, a 0.43-percent increase in the CLI (an increase equal to the average absolute change in the CLI over the sample period), 90 percent of the time the final value of the CLI will lie between -0.31 percent and 1.17 percent.*

Table 1
Components of the Composite Index of Leading Indicators

Average weekly hours of production or nonsupervisory workers, manufacturing
Average weekly initial claims for unemployment insurance, state programs
Manufacturers' new orders in 1982 dollars, consumer goods and materials industries
Vendor performance, slower deliveries diffusion index
Contracts and orders for plant and equipment in 1982 dollars
Index of new private housing units authorized by local building permits
Change in manufacturers' unfilled orders in 1982 dollars, durable goods industries, smoothed
Change in sensitive materials prices, smoothed
Index of stock prices, 500 common stocks
Money supply M2 in 1982 dollars
Index of consumer expectations (University of Michigan survey)

SOURCE: *Survey of Current Business.*

absolute size of the revisions to the month-to-month percentage change in the CLI is 0.18.[10] For the same period, the average absolute size of the initial estimate of the percentage change in the CLI is 0.32.[11] (*See the box titled "Statistical Properties of the Initial CLI Estimates."*)

Rules of thumb for predicting recessions and expansions: how well do they perform?

We turn now to an examination of how well several rules of thumb predict turning points in the business cycle, using real-time data on the CLI. The advantage of these rules is their simplicity. They can generally be implemented by using data in a single issue of the *Survey of Current Business* and require only straightforward mathematical calculations.

The rationale for using real-time data is that the CLI is designed to forecast business-cycle turning points. Therefore, an evaluation of the CLI's performance should be made from the perspective of a forecaster who has only the limited information set available at the time the forecast is made.

[10] *The January 1987* Business Conditions Digest *was used to examine the January 1983-February 1986 sample. The February 1986 date was chosen so that the initial estimates of the CLI would be compared with estimates that might have undergone as many as eleven routine monthly revisions.*

[11] *For this period, the standard deviation of the revisions is 0.22. Assuming normality, the implication is that if the initial estimate is, say, a 0.32-percent increase in the CLI (an increase equal to the average absolute change in the index over the sample period), 90 percent of the time the final value of the CLI will lie between -0.05 percent and 0.69 percent.*

Statistical Properties of the Initial CLI Estimates

Following Phillips (1990), we evaluated whether the initial release of the composite index of leading indicators has been an unbiased estimate of its final value. That is, we evaluated whether the initial release of the CLI has, on average, been correct. The following ordinary least squares regression was run:

$$Final_t = A + B \cdot Prelim_t + e_t,$$

where $Final_t$ is the final estimate of the percentage change in the CLI from period $t-1$ to period t, A is an intercept parameter, B is the slope parameter, $Prelim_t$ is the initial estimate of the percentage change in the CLI from period $t-1$ to period t, and e_t is the error term.

If the initial estimate of the change in the CLI is an unbiased estimate of the final value, then A will equal zero and B will equal 1. The above regression was run for the entire sample period (December 1968–February 1991), as well as for the period from January 1983 to January 1987. For the entire sample period, the joint hypothesis that $A = 0$ and $B = 1$ could be rejected.[1] This result is not very surprising, given the many definitional changes in the CLI since 1968. For the more recent sample period, in which there were no definitional changes to the CLI, the regression results indicated that the joint hypothesis of $A = 0$ and $B = 1$ could not be rejected at the 95-percent confidence level.

These results suggest that, for periods when there are no structural changes to the CLI, the initial release provides an unbiased estimate of the final value of the month-to-month percentage change in the index. However, whether the initial release of the CLI is or is not an *efficient* (best available) forecast of the final value is a more complicated matter. For more on this issue, see Diebold and Rudebusch (1991) or Mankiw and Shapiro (1986).

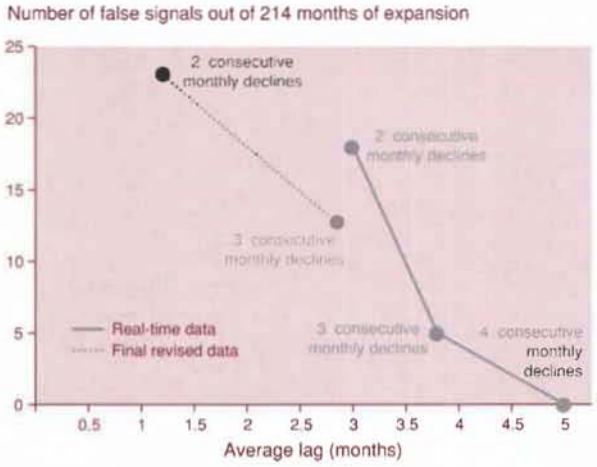
[1] Serial correlation was detected in the error terms. Because an F test is not valid if the errors are serially correlated, the joint hypothesis test of $A = 0$ and $B = 1$ was carried out after the autocorrelation in the error terms was eliminated by means of the Cochrane–Orcutt method.

While subsequent revisions to data and definitional changes may enhance the performance of the CLI *ex post*, those revisions and changes are of no use in forecasting turning points *ex ante*.

We find that, in signaling recessions, rules that attach as much weight to the size of declines in the CLI as to the number of declines generally do better than rules that focus on the number of declines alone. Even from the best-performing rules of thumb, however, a reliable signal of recession is unlikely to be available until one month or more after the recession has already begun. In signaling expansions, no one rule or class of rules has a clear advantage over others. Here again, realistically, the CLI cannot be expected to provide reliable advance warning of the end of a recession.

Rules of thumb for signaling recession. Using recent movements in the CLI, we consider three specific measures that can be translated into rules of thumb for signaling recessions. The first—and simplest—measure is the number of consecutive monthly declines in the CLI. The second measure is the percentage difference between the current value of the CLI and its maximum value over the preceding twelve months. One might expect rules based on this measure to perform better than those based on the number of consecutive declines in the CLI because weight is placed on the *size* of declines, not just their number. The final measure is the percentage gap between the current value of the CLI and a twelve-month moving average of past values. Following Moore and Zarnowitz (1982),

Figure 2
Predicting Recessions: Performance of Consecutive-Decrease Rules



we converted this gap to an annualized percentage rate of growth.[12]

Each of these three measures can be combined with a critical value to yield a rule of thumb for predicting the onset of recessions. For example, using the consecutive-decrease measure, one might interpret two consecutive declines as a signal of recession. Alternatively, one might require three—or four—consecutive declines as a signal of recession. In general, the more stringent the critical value, the less advance warning of recession a given measure will provide. At the same time, the more stringent the critical value, the fewer false signals of recession the measure is likely to give.

Figure 2 presents the post-1968 performance of rules based on the number of consecutive declines in the CLI. The vertical axis shows the number of months during which each rule gave a false signal.[13] The horizontal axis shows the average lag (again, measured in months) with which each rule signaled the five recessions in the sample period.[14] The performance of the consecutive-decline measure is shown both for the real-time data (data that would have been available to a forecaster) and for the final revised data.

For instance, with real-time data, if two consecutive decreases in the index of leading indicators had been taken as a signal that a recession was under way, a valid signal would have come, on average, three months *after* the recession had actually begun. In eighteen months (out of a total of 214 months the economy was expanding), the rule would have issued a false signal of recession. If three, rather than two, consecutive decreases in the index had been taken as a signal of recession, a valid signal would have arrived 3.8 months late, on average, and false signals would have been given on five occasions. If four consecutive increases had been required, the signal would have been five months late and never false. As would be expected, the trade-off between false signals and lag time appears to be more favorable when final revised data on the CLI are used rather than the data available at the time the forecast was relevant.[15]

We next examined signaling rules based on the percentage difference between the current value of the CLI and the maximum value of the CLI over the preceding twelve months. For such rules, we found that there would sometimes have been an advantage to ignoring the most recently released value of the CLI. That is, there was sometimes so much noise in the initial CLI data that it would have been better to wait one month, for the data to go through a revision, rather than

[12] *Specifically, we divided the gap by 6.5 to convert it to a monthly growth rate (the average of the preceding twelve months is located 6.5 months before the current month) and then multiplied by 12.*

[13] *A signal was interpreted as false if it was reversed before the onset of a recession. For example, using two consecutive declines in the CLI as a signal of recession, we counted a signal as false if two consecutive declines were followed by an increase before a recession developed. Once the economy entered a recession, as defined by the NBER, there were no false signals.*

[14] *Because, for instance, the August CLI value is not released until the end of September, a signal of recession that is based on the August CLI would lag one month for a recession beginning in August.*

[15] *For the final data, we have not plotted a point for four consecutive monthly declines in Figure 2 because four consecutive declines did not occur before or during the 1980 recession. The average lead time is, therefore, infinite in this case.*

Figure 3
Predicting Recessions: Performance of Decrease-Relative-to-Maximum Rules

Number of false signals out of 214 months of expansion

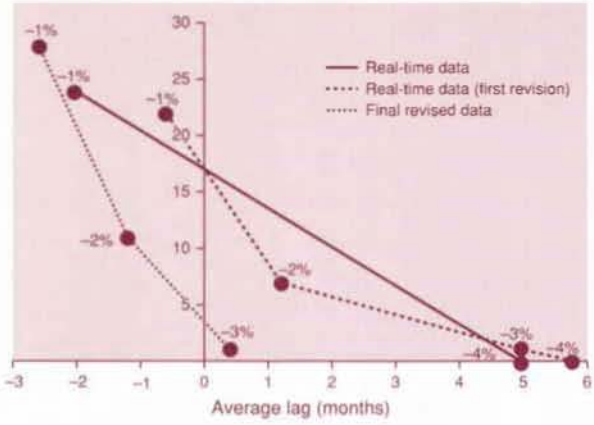
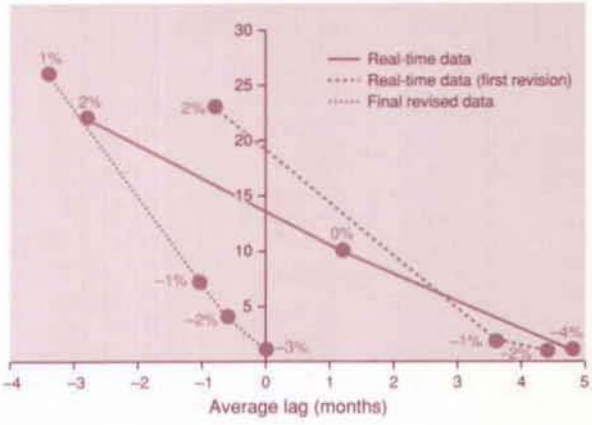


Figure 4
Predicting Recessions: Performance of Decrease-Relative-to-Moving-Average Rules

Number of false signals out of 214 months of expansion



apply the signaling rule to the data initially released.[16] Critical values of –1 percent through –4 percent were considered. Figure 3 plots the resultant performance points.

According to the figure, if one had used a rule based on the first revision of the CLI and a critical value of –1 percent, false recession signals would have been obtained in twenty-two months, and a valid signal would have come, on average, 0.6 month before a recession actually began. With a critical value of –2 percent, there would have been seven false signals, and a valid signal typically would not have been obtained until 1.2 months *after* a recession had actually begun. If one had waited for the first CLI revision to decline 4 percent relative to the CLI maximum over the preceding twelve months, one would have observed no false signals but would not have found out about a recession until 5.8 months, on average, after it had begun.[17] Again, the final revised data paint a misleadingly favorable picture of the trade-off between false signals and lag time.

Figure 4 illustrates the performance of rules based on the gap between the current value of the CLI and a twelve-month moving average of past values. As with the previous two figures, each point in the diagram represents the performance of a signaling rule that corresponds to a different critical value. For real-time data, the number of false signals ranges from twenty-two (with a 2.8-month average lead time) to ten (with a 1.2-month average lag) to one (with a 4.8-month average lag).[18] At very low numbers of false signals, somewhat better warning times could have been achieved by waiting to see the first revision of the CLI data.

[16] *The diagram takes into account the additional one-month lag involved in waiting for the first revision of the CLI.*

For other signaling rules considered in this article, waiting for revisions to the CLI was generally not worthwhile. (That is, the loss of one month of lead time more than offset any reduction in the number of false signals.)

[17] *For the final values of the CLI, the average lead time is infinity for the critical value of –4 percent.*

For the real-time data, performance points corresponding to the critical values of –2 percent and –3 percent are not shown because they lie above a linear combination of the points corresponding to the critical values of –1 percent and –4 percent. A forecaster could have done better by choosing this linear combination than by choosing either –2 percent or –3 percent as the critical value for his signaling rule. In effect, the lines indicate the best trade-off this measure could have yielded in predicting the past five recessions.

[18] *Again, points corresponding to some of the critical values are not plotted because these points lie above a linear combination of other feasible points and, so, are dominated.*

Figure 5
Predicting Recessions: Real-Time Data

Number of false signals out of 214 months of expansion

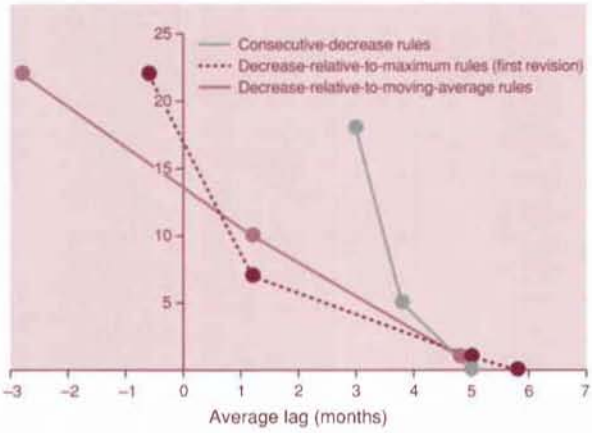


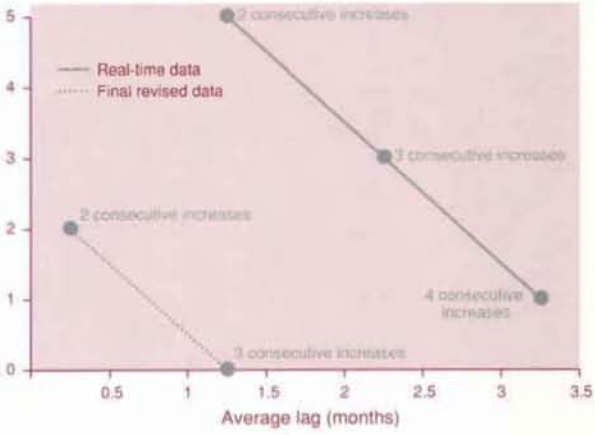
Figure 5 shows the comparative performance of the three different classes of rules of thumb using real-time data from the past five recessions. The rules most often mentioned in the popular press—those based on the number of consecutive declines in the index of leading indicators—are not typically the top performers. Unless one is willing to tolerate a five-month lag between the time a recession begins and the time at which it is signaled, Figure 5 suggests that one could generally do better by using a rule based on the difference between the CLI and its twelve-month maximum or by using a rule based on the gap between the CLI and its twelve-month moving average. These two classes of rules have the advantage of paying as much attention to the *size* of declines in the leading index as to the *number* of declines. Even for these classes, however, one cannot expect to receive any advance warning of recessions unless one is willing to tolerate a substantial number of false signals. While this sounds like a poor performance, such rules may, nevertheless, provide the earliest available confirmation that a recession is under way.

Rules of thumb for signaling expansion. Rules of thumb analogous to those used to forecast recessions can be used to signal recoveries. For instance, one can use consecutive increases in the CLI to signal the beginning of an expansion. Alternatively, one can look at the difference between the current value of the CLI and its minimum value over some recent interval or the gap between the current value of the CLI and a moving average of past values to obtain a signal of an upcoming expansion.[19]

Figures 6 through 9 show the performance

Figure 6
Predicting Expansions: Performance of Consecutive-Increase Rules

Number of false signals out of 55 months of contraction



of the three types of rules of thumb for various critical values over the four recoveries since 1968. As was the case in predicting recessions, using final revised data gives a very misleading picture of the performance of the rules in real time.[20] Rules based on the number of consecutive increases in the CLI or on the increase in the CLI relative to a recent minimum have a slight performance edge over rules based on the gap between the current value of the CLI and its moving

[19] *In predicting expansions, the minimum and moving-average rules performed better when the current CLI value was compared with six past values than when the current CLI value was compared with twelve past values. A possible explanation is that the average length of the past four recessions is only 12.2 months.*

[20] *In forecasting recoveries, unlike forecasting recessions, waiting a month for the CLI to undergo its first revision does not enhance the performance of any of the rules.*

Figure 7
Predicting Expansions: Performance of Increase-Relative-to-Minimum Rules

Number of false signals out of 55 months of contraction

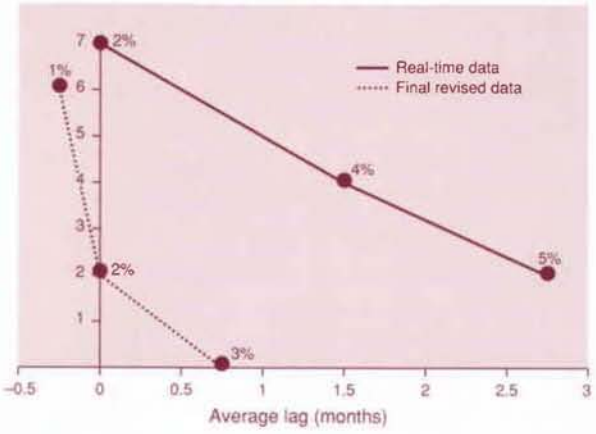
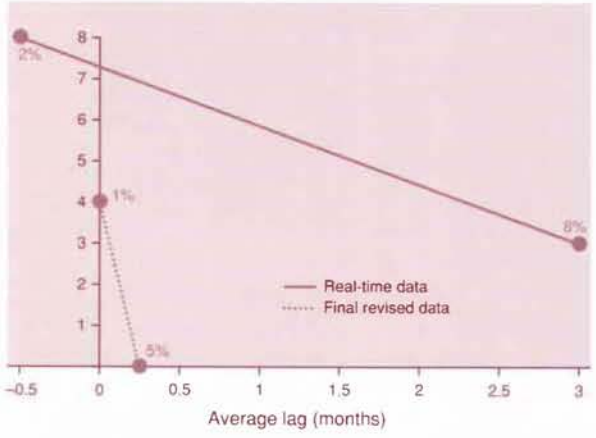


Figure 8
Predicting Expansions: Performance of Increase-Relative-to-Moving-Average Rules

Number of false signals out of 55 months of contraction



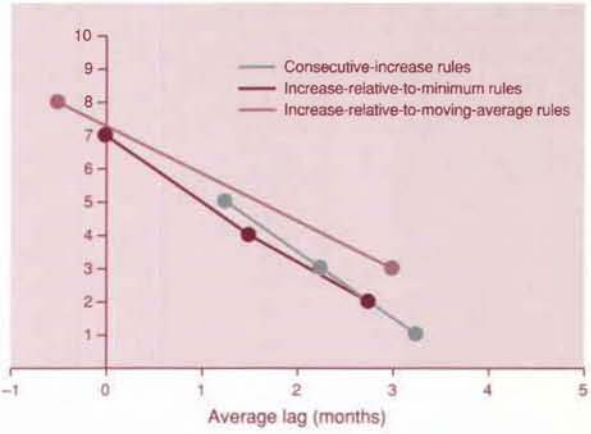
average. Still, none of the rules can be relied on to provide advance warning of expansions.

Are sophisticated signaling rules any better? The Neftci methodology

Neftci (1982) has developed a method for forecasting business-cycle turning points that is not as easy to implement as our rules of thumb

Figure 9
Predicting Expansions: Real-Time Data

Number of false signals out of 55 months of contraction



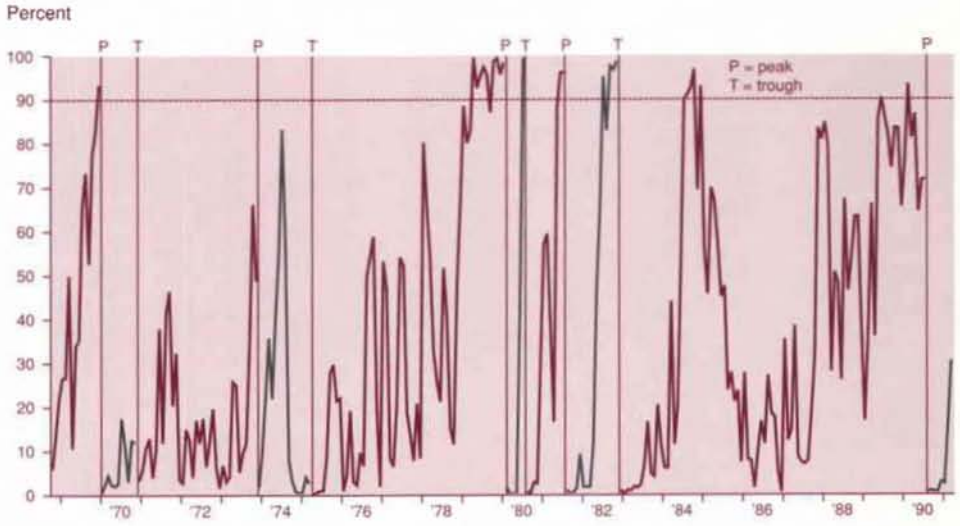
but, in principle, makes better use of the information available to the analyst.[21] As a practical matter, we find that while the Neftci methodology is clearly superior to our rules of thumb in predicting expansions, there is nothing to be gained by using the Neftci approach in predicting recessions.

The Neftci methodology assumes that the history of the CLI can be divided into expansion and contraction phases, with the behavior of the index during its expansion phase being fundamentally different from the behavior of the index during its contraction phase. The methodology further assumes that turning points in the CLI will precede turning points in the overall economy. The hope is that, using a formula developed by Neftci, the analyst will be able to recognize that the CLI has entered its contraction (expansion) phase before the economy as a whole begins to decline (expand).

If the National Bureau of Economic Research (NBER) declares that a recession ended as of a certain month, the Neftci methodology sets the probability of recession equal to zero in that month. In subsequent months, the Neftci formula is used to evaluate evidence on whether the CLI is in its contraction phase. The evidence-gathering

[21] *For an international application of the Neftci methodology, see Niemira (1991).*

Figure 10
Predicting Recessions and Expansions: Neftci Probabilities



process is cumulative: the probability that the CLI is in its contraction phase in the current month (and, hence, that the economy is about to enter a recession) is an increasing function of the probability that the CLI was in its contraction phase during the previous month. The probability that the CLI is in its contraction phase in the current month is also a function of this month's change in the index: the larger the decrease (smaller the increase) in the CLI, the greater is the probability that the index is in its contraction phase. Finally, the probability that the CLI is in its contraction phase in the current month is an increasing function of the number of past contraction phases relative to the cumulative length of past expansion phases: if transitions from expansion to contraction have been rare in the past, the Neftci formula assumes that they probably will also be rare in the future. (*For details, see the box titled "The Neftci Formula."*)

Once the NBER has declared that the economy peaked in a certain month, a procedure analogous to that outlined above can be used to calculate the probability that the CLI is in its expansion phase (and, hence, that the economy is about to recover).

Figure 10 plots the probability of imminent recession (during periods when the economy was expanding) and the probability of imminent expansion (during periods when the economy was contracting) obtained by applying the Neftci formula to real-time data. The figure shows that the probability of imminent recession was at or above 90 percent—the critical value advocated by Neftci—at the start of only three of the past five recessions. Further, in twelve months, the probability of recession reached at least 90 percent, only to fall below 90 percent without a recession. That is, the Neftci formula gave twelve false signals of recession.

Similarly, still using a 90-percent critical value, the Neftci formula gave advance or coincident warning of only two of the past four recoveries. In one month, the formula signaled a recovery but reversed itself before the recovery began.

Figure 11 shows the average lead time and number of false recession signals given by the Neftci formula, using two alternative critical values—70 percent and 90 percent. Trade-offs between lead time and false signals are plotted, using both real-time and final data. Again, our contention is that the trade-off obtained by using final data is misleading. The trade-off we are most likely to face in predicting future recessions is that obtained from real-time data.

Figure 12, which combines Figure 11 with Figure 5, shows that using the Neftci methodology

Figure 11
Predicting Recessions: Neftci Formula

Number of false signals out of 214 months of expansion

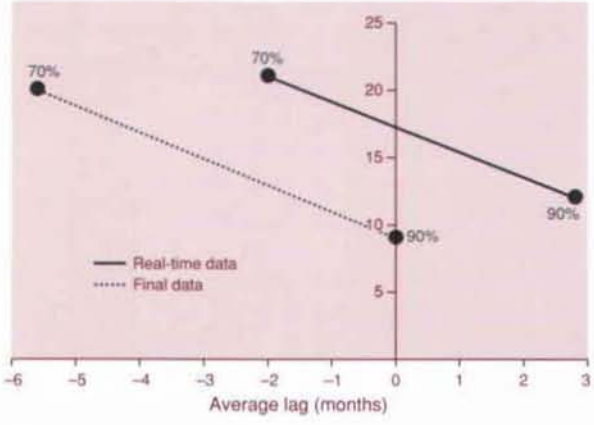


Figure 12
Predicting Recessions: Neftci Formula and the Rules of Thumb

Number of false signals out of 214 months of expansion

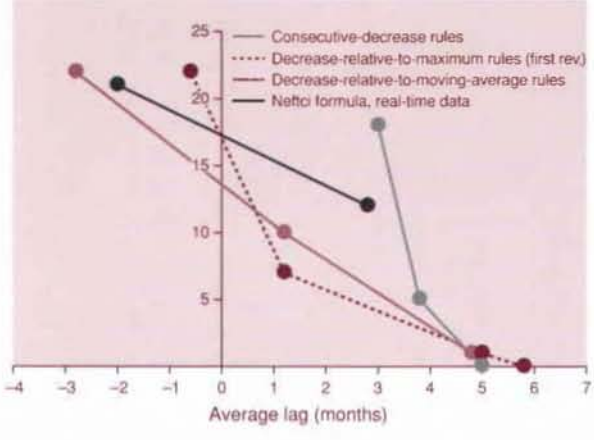


Figure 13
Predicting Expansions: Neftci Formula

Number of false signals out of 55 months of contraction

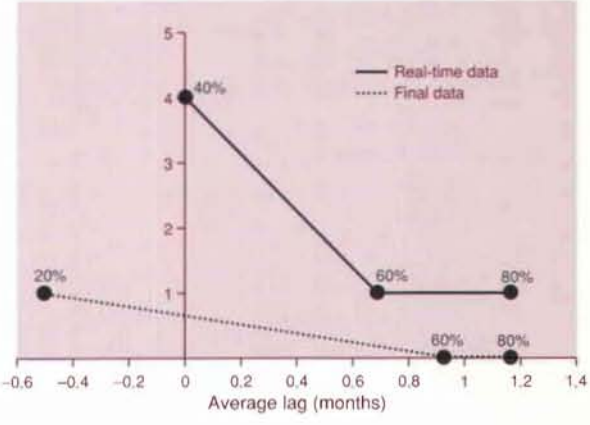
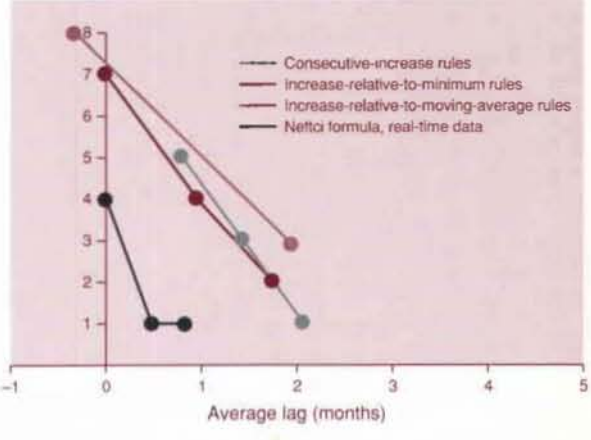


Figure 14
Predicting Expansions: Neftci Formula and the Rules of Thumb

Number of false signals out of 55 months of contraction



to predict recessions yields no gain in performance relative to using simple rules of thumb.

The performance of the Neftci methodology in forecasting expansions is shown in Figure 13. Again, the ability of the methodology to forecast business-cycle turning points is exaggerated when final revised data are used. Using real-time data, the Neftci methodology can be better described as a coincident indicator of expansions than as a leading indicator of expansions.

From Figure 14, which combines Figure 13 with Figure 9, we can see that in predicting expansions, the Neftci formula outperforms any of the rules of thumb considered above.

Summary and conclusion

Standard plots of the composite index of leading indicators give a misleading picture of the amount of help the CLI can provide the economic

The Neftci Formula

The Neftci formula for the probability of recession is

$$P_t = [P_{t-1} + P_L (1 - P_{t-1})] F_t^d$$
$$/\{[P_{t-1} + P_L (1 - P_{t-1})] F_t^d$$
$$+ (1 - P_{t-1})(1 - P_L) F_t^u\},$$

where P_t is the estimated probability that the composite index of leading indicators is in its contraction phase at time t, so a recession is imminent; P_L is the *a priori* probability that the CLI has entered its contraction phase, given that a month earlier the CLI was in its expansion phase; and F_t^d and F_t^u are the likelihoods that the latest observation of change in the CLI came from the contraction phase of the index and the expansion phase of the index, respectively.

Following Diebold and Rudebusch (1989), we made three adjustments to the original Neftci paper. First, we simplified the Neftci formula by using the Diebold and Rudebusch (1990) result that the *a priori* transition probability (P_L) apparently is not, in the real world, a function of the current length of the expansion. (In practice, then, P_L is set equal to the number of months in the past in which the economy made the transition from expansion to recession, divided by the total number of months in which the economy was expanding.) Second, we assumed that changes in the CLI during its expansion and contraction phases are normally distributed, instead of deriving the distribution of changes in the CLI directly from historical data. Finally, in calculating the probability that the current CLI observation is signaling a recession, if the Neftci formula said that the probability of a recession *last* month was greater than 95 percent, we set *last* month's probability equal to 95 percent. This modification is meant to prevent the probability of a recession becoming stuck at unity.

Once it has been determined that the economy is in recession, the Neftci formula can be used to yield the probability that an expansion is imminent. This is done by switching F_t^d and F_t^u in the formula and replacing P_L with the *a priori* probability that the CLI has entered its expansion phase, given that a month earlier the CLI was in its contraction phase.

analyst trying to forecast recessions and expansions. Because of a one-month publication delay, numerous revisions, and the difficulty—in real time—of knowing whether the index has or has not reached a cyclical turning point, the CLI can, at best, provide a coincident signal of recessions and expansions. Even then, there are likely to be many months in which the CLI signals that a recession or expansion is developing when, in fact, one does not materialize.

Rules of thumb that do the best job in predicting recessions appear to be those that place as much emphasis on the *size* of declines in the CLI as on the *number* of declines. Thus, one apparently does better by looking at the difference between the current value of the CLI and a recent maximum, or by looking at the gap between the current value of the CLI and a moving average of recent values, than by looking for a given number of consecutive declines in the index. There does not appear to be any advantage, in predicting recessions, to moving from simple rules of thumb to more sophisticated signaling methodologies.

In predicting expansions, in contrast, all types of rules of thumb perform about equally well, but the more sophisticated Neftci methodology has a clear advantage.

Several cautions are in order. First, the analysis in this article is based on a very limited sample. We have experienced only five recessions since the composite index of leading indicators

Is an End to the Current Recession in Sight?

The Neftci probabilities of recession and expansion plotted in Figure 10 incorporate values of the composite leading indicators through March 1991. The figure shows the probability that an economic recovery is about to begin rose from 2.4 percent in January this year to 15.3 percent in February and to 30.3 percent in March.

The April value of the composite leading indicators has now been released (along with revisions of CLI values for November 1990 through March 1991). Applying the Neftci formula to this new observation gives us a 56.2-percent probability that the CLI has entered its expansion phase. On the basis of the historical record over the past four recessions, as summarized in Figure 13, this probability suggests that an economic recovery may already have begun. However, the probability that the CLI has entered its expansion phase is still low enough that little confidence can be placed in this prediction.

was first developed and (at the time this article was written) only four recoveries. The advantage that one rule of thumb apparently has over another may disappear or may be reversed as additional observations accumulate. Second, there have been numerous definitional changes to the composite index through the years, so that the index's historical performance is not necessarily a good guide to the future behavior of the index *as currently defined*. A useful exercise—beyond the scope of this article—would be to use real-time data on the individual components of today's CLI to determine how today's CLI would have behaved, through time, as data on the individual components were initially released. Finally, we repeat that no matter how little warning of business-cycle turning points the Commerce Department's leading indicators series may give, it may still provide the earliest warning available.

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A Return to Profitability: The Performance of Eleventh District Commercial Banks

In the Eleventh Federal Reserve District, 1990 was a turnaround year for the commercial banking industry. (The Eleventh District encompasses Texas, northern Louisiana, and southern New Mexico.) Banks in the District collectively earned a profit for the first time since 1985, and the share of profitable banks rose from 56 percent in 1987 to 79 percent. One factor contributing to the improved performance was a significant reduction of nonperforming loans at commercial banks made possible by a steady recovery in the regional economy since 1987 and the resolution of the most troubled banks by the Federal Deposit Insurance Corporation (FDIC).[1]

In this article, I examine the condition and performance of commercial banks in the Eleventh Federal Reserve District in 1990. I explore the reasons behind the banks' improved performance. I also examine the role the region's economic recovery played in bank performance independent of the effect of the FDIC's resolution of insolvent banks. My analysis indicates that both the region's economic improvement and the FDIC assistance helped reduce nonperforming loans at commercial banks, thus contributing to net profits.

To determine how broadly based the recovery has been, I divide banks into three size categories and look at the performance of each group. I also compare Eleventh District banks with banks in the rest of the country. I find that large banks in the Southwest have nearly caught up to the performance levels found elsewhere in the country, but small and mid-size banks have room for improvement.

Assessing the performance and condition of Eleventh District banks

The 1,305 commercial banks in the Eleventh District earned a collective $783 million in 1990. The banks' performance translated into a return on average assets (ROA) of 0.43 percent, slightly less than the 0.50 percent reported by banks outside the District.[2] Return on average equity also showed gains and, in fact, was greater for Eleventh District banks than for banks elsewhere, reflecting the lower capital ratios reported by Eleventh District banks. (*See the box titled "Definitions of Banking Terms."*)

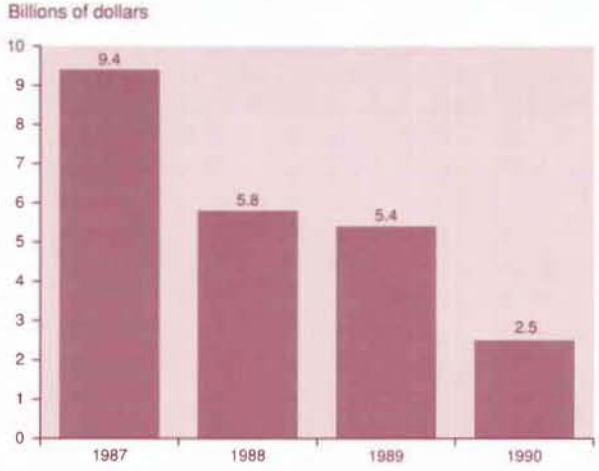
Profits also increased as credit quality improved. With better credit quality, more loans paid interest and interest income rose. The risk premium also fell, decreasing the interest cost of deposits.[3] On the banks' income statements, lower premiums caused total interest expense to decline

[1] Nonperforming loans, or delinquencies, are defined as loans that are 90 or more days past due and still accruing interest, plus loans in nonaccrual status.

[2] These ROA figures for 1990 are down slightly from the historical average of 0.56 percent recorded over the 1985–89 period for all banks nationwide. This figure is biased downward by the poor performance of banks in the Southwest. The figure also includes 1987, a year in which many large banks reported substantial losses related to loans to developing nations.

[3] Depositors with balances exceeding the $100,000 deposit insurance limit want a higher interest rate to compensate for the risk of loss if the bank fails. The greater the chance of failure, the greater the risk premium depositors demand (Short and Gunther). The risk premium had increased as depositors demanded a higher interest rate on uninsured deposits, such as large certificates of deposit. The risk premium paid by Eleventh District banks has declined over the past several years relative to the rates paid by banks in the rest of the country.

Figure 1
Total Nonperforming Loans, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

and net income to rise. Other effects of better credit quality also improved profitability. As credit quality improved, loans required less monitoring and banks paid fewer recovery costs, thus noninterest expenses declined. Having more performing loans and a lower cost of funds also contributed to the increase in the banks' net interest margin.

Lower market interest rates helped improve banks' profits. The net interest margin generally improves as interest rates decline, which they have done since early 1989. The boost from lower interest rates usually occurs when deposit rates fall faster than lending rates.

Eleventh District bank profits rose in 1990 because of both increased revenues and lower expenses. Interest income grew by $141 million in 1990 over 1989, even as total loans declined. Banks no longer had to make large additions to loan loss reserves because nonperforming loans had decreased. Additions to the reserve account fell from $2.4 billion during 1989 to $0.9 billion in 1990. This $1.5-billion decline in expenses led the way for an increase in net income of $1.3 billion. The amount of loan charge-offs declined by $750 million between 1989 and 1990. Table 1 provides more detail about the current and historical condition and performance of Eleventh District banks.

Factors contributing to the demise and recovery of Eleventh District banks

Eleventh District banks' return to profitability in 1990 stemmed from three factors. First, the burden of nonperforming loans subsided as banks realized their losses and removed bad loans from their books. Second, through the resolution of failed banks, the FDIC took over many of the nonperforming loans. Third, with the recovery of the regional economy, some borrowers who were delinquent in their loan payments were able to become current or to restructure their loans and meet new payment schedules. Total nonperforming loans at year-end 1990 were less than one-third the level reached at the end of 1987 (*Figure 1*).[4]

Fewer nonperforming loan losses. Losses from delinquent loans plagued Eleventh District banks in the 1980s, and, in too many cases, resulted in bank failures. (*See the box titled "How Banks Cope with Nonperforming Loans."*) Nonperforming loans, although a normal, expected part of banking, jeopardize a bank's well-being when they are greater than anticipated, which was the case in the Eleventh District in the mid- to late 1980s. By underestimating nonperforming loans, many Eleventh District banks suffered losses that diminished or depleted their loan loss reserve and equity capital accounts. By the end of 1990, however, most Eleventh District commercial banks had been relieved of the burden of nonperforming loans.

FDIC resolution. The FDIC's methods of resolving failed banks, in effect, reduce the amount of nonperforming loans reported by operating commercial banks. When a bank's chartering authority declares the bank insolvent, the FDIC usually becomes the bank's receiver, and all the bank's assets and liabilities are transferred to the FDIC for disposition. The FDIC has two basic resolution methods at its disposal: purchase and assumption transactions and liquidations. With

[4] *Nonperforming loans reached a peak of $10.5 billion in the third quarter of 1988.*

Table 1
Measures of Financial Condition and Performance

	All Eleventh District Banks				Other Districts' Banks
Year	1987	1988	1989	1990	1990
Number of Banks	1,903	1,624	1,437	1,305	11,007
(In billions of dollars)					
Total Assets	201.2	180.4	183.4	180.8	3,186.4
Total Loans	110.1	90.8	84.2	80.6	1,960.7
Total Nonperforming Loans	9.4	5.8	5.4	2.5	75.0
Total Equity Capital	11.0	8.7	8.7	11.1	206.4
Total Reserves	3.9	3.2	2.8	2.2	52.6
Total Net Charge-offs	2.4	2.6	2.0	1.2	27.8
Total Provisions for Loan Losses	3.4	2.8	2.4	.9	30.7
Total Net Income	–2.1	–2.1	–.5	.8	15.7
(Percent)					
Nonperforming Loan Ratio	8.57	6.35	6.45	3.14	3.83
Troubled Asset Ratio	6.47	5.05	5.05	2.57	2.96
Net Charge-off Ratio	2.08	2.61	2.24	1.45	1.43
Loan Loss Provisions to Total Loans	2.91	2.79	2.78	1.12	1.59
Primary Capital Ratio	7.29	6.49	6.14	7.27	8.00
Return on Average Assets	–1.02	–1.08	–.30	.43	.50
Return on Average Equity	–17.57	–20.94	–6.25	7.94	7.84
Net Interest Margin	2.76	2.62	2.66	3.01	3.61
Percentage of Profitable Banks	56	61	69	79	88
Number of Failed Banks	67	121	144	105	64
(Percent)					
Failure Rate	3	6	9	7	

either method, the FDIC removes the effect of nonperforming loans and other troubled assets from the bank.

In a *purchase and assumption transaction*, which is used in most bank failure cases, a pre-arranged buyer takes possession of the good assets from the failed bank. The FDIC retains the failed bank's troubled assets, including the nonperforming loans. The buyer acquires a broad base of revenue-generating assets, thus improving the buyer's own prospects for profitability.[3] In a *liquidation*, the FDIC retains all the failed bank's assets, both good and bad, and disposes of them through its Division of Liquidation. No bank

[3] *Under a whole bank purchase and assumption, the acquiring bank takes all the assets of the failed bank, including any nonperforming loans and foreclosed real estate. The FDIC compensates the acquiring bank by providing it with enough cash to charge off the nonperforming loans.*

Definitions of Banking Terms

Banks Failures include banks receiving FDIC assistance to prevent failure.

Failure Rate is the number of banks that fail during a year divided by the number of banks at the beginning of the year.

Loan Loss Provisions to Total Loans are the total additions to loan loss reserves from current-period net income to average loans.

Net Charge-off Ratio is the ratio of charge-offs on loans net of recoveries to average loans.

Net Interest Margin is the difference between interest income and interest expense, adjusted for interest income exempt from federal taxes, divided by total assets.

Nonperforming Loan Ratio is the ratio of total loans 90 days or more past due and still accruing, plus nonaccrual loans to total loans.

Primary Capital Ratio is ratio of the sum of equity capital plus loan loss reserves to the sum of total assets plus loan loss reserves.

Return on Average Assets is the ratio of total net income earned to average assets.

Return on Average Equity is the ratio of total net income to average equity.

Total Loans are calculated as loans net of loan loss reserves and allocated transfer risk.

Troubled Asset Ratio is the fraction of total assets that are recorded as nonperforming loans or other real estate owned. Foreclosed real estate assets are recorded on the bank's balance sheet as other real estate owned.

directly acquires the failed bank's nonperforming loans in a liquidation.

From 1987 through 1990, 437 commercial banks failed in the Eleventh District. These failed banks held total assets of $82.6 billion, or 38 percent of the total assets in District banks at the end of 1986. Of these 437 failures, 404 were resolved by the FDIC by selling the banking operations to other banks. Only 16 were liquidated, with the insured depositors receiving payments from the FDIC. The remaining 17 were given Open Bank Assistance, meaning that the bank was not formally closed, but the FDIC and outside investors provided more capital while the bank continued its operations.

Commercial banks have also benefited from less competition for deposits since the Resolution Trust Corporation (RTC) took control of or sold many of the insolvent thrifts that were operating across the United States, particularly in the Southwest. These insolvent thrifts paid excessively high interest rates to attract and retain deposits (Short and Gunther). Since the demise of the insolvent thrifts, thrifts and commercial banks alike have benefited from not having to match high deposit rates. In effect, the RTC's conservatorship and resolution activity has stopped much of the "bidding up" of deposit interest rates by troubled thrifts. Through the end of 1990, 140 thrifts in the Eleventh Federal Reserve District had been seized by the RTC. Of these seizures, 81 thrifts were sold to new investors, typically other financial institutions, who acquired the thrift's performing assets.

Regional economic recovery. In the Eleventh District, 1990 was a year of economic expansion. The upswing enabled some delinquent borrowers to become current in their loan payments to banks, and it allowed commercial banks, in turn, to reduce their nonperforming loans.

Employment data provide evidence that in the Eleventh District began to recover from its regional

recession of the late 1980s. Payroll employment has more than recovered from the job losses experienced in the downturn of 1986 and early 1987. Employment has shown steady growth, with annual increases of more than 150,000 jobs from 1987 through 1989.[6] In 1990, however, growth slowed to a 73,000-job increase. The annual average unemployment rate is down considerably from that experienced through the mid-1980s in three of the District's major metropolitan areas: Dallas, Fort Worth–Arlington, and Houston.

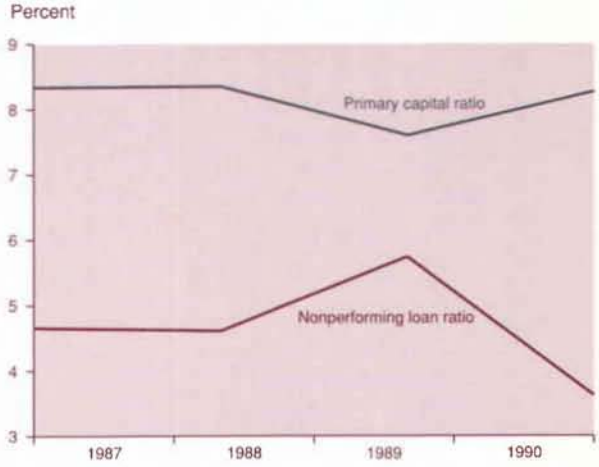
The banking sector's delayed response to the region's recovery

The Eleventh District banking sector's recovery followed the general economic recovery with an apparent lag of three to four years. The lag may have been especially long because of the depth of the recession that hit the Southwest. As regional economic downturns threaten other areas of the country, bankers may benefit from understanding what some of the Southwestern banks did that enabled them to survive. One of the most important lessons to be learned from these banks is to not underestimate loan loss reserve requirements.

The recovery of unassisted banks. To learn how fast the Southwest's improved economy translated into improved commercial bank performance, I examined the condition of a group of banks that were influenced only by the recovering economy and received no FDIC assistance. These unassisted banks neither acquired a failed bank nor failed themselves in a subsequent year; they managed their nonperforming loans without help from the FDIC. Consequently, any improvement in their condition reflected primarily the improved economy.

My examination revealed that the economy influences bank performance with a delay of as long as three years. The Eleventh District economy showed signs of recovery as early as 1987. Nevertheless, the nonperforming loan ratio at these unassisted banks climbed to nearly 6 percent in 1989. By the end of 1990, however, this ratio had fallen to less than 4 percent. Capital ratios in 1990 also improved from 1989. While return on assets cannot be described as robust, banks managed to keep losses during this period at moderate levels. A healthy net interest margin each year helped limit net losses (*Figure 2*).

Figure 2
The Recovery of Unassisted Banks, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

This group of banks still has room for improvement. Three years elapsed between the first signs of economic recovery and the banks' return to profitability. The capital ratios of these banks will take even more time to fully recover from the economic downturn. As the economy in the Eleventh District continues to improve and as these banks generate profit, they also will be able to increase capital and charge off more of their nonperforming loans. Table 2 provides more information about this group of banks.

A lesson for other banks. The Southwest banks' course to recovery reveals an important lesson for financial institutions suffering through regional economic downturns. All Eleventh District banks operated in the same economic environment, but not all of them were affected to the same degree. Some banks were able to continue operations without outside assistance. What the successful banks did for their own survival was to accurately forecast the depth of the recession and prepare

[6] *Employment figures are from seasonally adjusted employment data.*

Table 2
Measures of Financial Condition and Performance
Unassisted Eleventh District Banks

	Unassisted Banks			
Year	1987	1988	1989	1990
Number of Banks	1,443	1,279	1,181	1,120
(*In billions of dollars*)				
Total Assets	97.4	81.6	79.4	74.9
Total Loans	48.5	38.2	35.7	31.5
Total Nonperforming Loans	2.3	1.8	2.0	1.1
Total Equity Capital	7.0	5.9	4.9	5.4
Total Reserves	1.2	.9	1.2	.9
Total Net Charge-offs	1.0	.7	.7	.5
Total Provisions for Loan Losses	1.3	.8	.8	.4
Total Net Income	–.3	.1	–.2	.3
(*Percent*)				
Nonperforming Loan Ratio	4.66	4.61	5.74	3.62
Troubled Asset Ratio	3.59	3.66	4.78	3.29
Net Charge-off Ratio	1.24	1.57	1.83	1.38
Loan Loss Provisions to Total Loans	1.54	1.81	2.20	1.10
Primary Capital Ratio	8.33	8.34	7.59	8.26
Return on Average Assets	–.18	.10	–.22	.41
Return on Average Equity	–2.72	1.32	–3.30	6.15
Net Interest Margin	2.23	3.18	3.42	3.40
Percentage of Profitable Banks	66	70	73	78

for its impact, to develop and maintain a more diversified portfolio with limited exposure to the weaker sectors of the declining Southwest economy, and to make sound lending decisions.

Assessing performance by bank-size classifications: has the recovery been even?

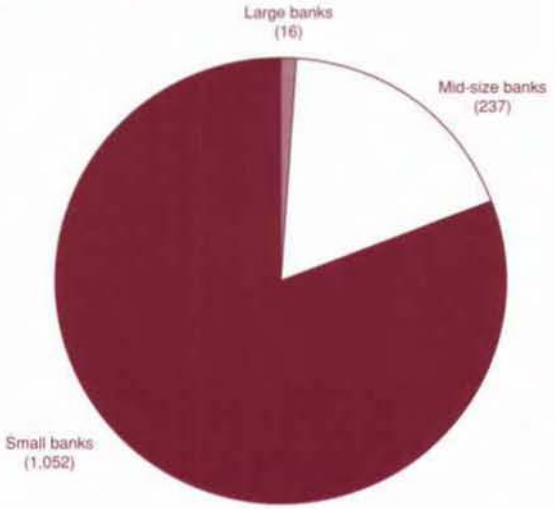
To determine if the banking recovery has been broadly based, I separated the sample of banks into three groups based on size. Dividing the banks by size facilitated comparisons with previous studies. The distinction between sizes is also important because a few large banks hold almost half the total commercial bank assets, and results of the large banks may mask those of the smaller banks.

Large banks are those with total assets exceeding $1 billion; mid-size banks have assets between $100 million and $1 billion, and the small-bank category consists of banks with assets under $100 million. Figures 3 and 4 show the proportion of banks and assets in each size class, and Figure 5 depicts the sharp reduction in nonperforming loans for each size category of bank. Tables 3, 4, and 5 provide detailed information about the condition and performance of Eleventh District banks by size.

Small banks. The banks with less than $100 million in assets, as a whole, have been recovering since early 1989. They finally returned to profits in 1990. Their small loss of $3 million in 1989 became a profit of $173 million in 1990. In fact, more than three-quarters of the small banks earned a profit

Figure 3
Eleventh District Banking Structure
by Size Class, 1990

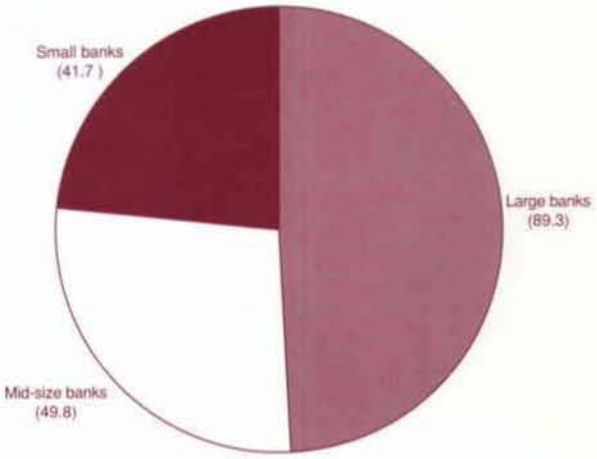
(Number of banks)



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

Figure 4
Eleventh District Banking Structure
by Size Class, 1990

(Assets in billions of dollars)



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

for 1990. Profits resulted, in part, from a healthier economy, but also from lower nonperforming assets and an improved spread between the interest earned on assets and the cost of deposits. Small banks' 1990 performance, as measured by an ROA of 0.40, is up from the slightly negative ROA of −0.01 percent reported in 1989.

Throughout the 1980s, this group of small banks remained relatively stronger than the other two groups, but the poor economy did not leave small banks unscathed. Still, they maintained healthy capital ratios and healthy interest margins that allowed for a quick recovery of return on assets. The strong capital base that small banks reported enabled most of them to endure the economic downturn.

Mid-size banks. The recovery of the mid-size banks was similar to the recovery of small banks. Of the 237 mid-size banks operating at the end of 1990, 205 banks, or 87 percent, earned a profit for the year, up from 70 percent in 1989. These 237 banks produced a composite net profit of $172 million in 1990. As with the small banks, this improvement can be attributed to an improved economy, a decrease in nonperforming loans, and a more favorable interest spread. This group of banks reported an ROA of 0.35 percent for 1990, an improvement from –0.35 percent reported in 1989.

The equity capital ratios for these banks also improved, rising to 6.43 percent in 1990 from 5.78 percent in 1989, as equity capital increased by $300 million. About half this amount is as a result of new capital stock issuance and holding company transactions; another one-sixth stemmed from consolidations of branch banks or other business enterprises.

Large banks. This category of banks with more than $1 billion in assets comprises 16 regional banking giants. These banks also returned to profitability in 1990, after losing $3 billion from 1987 through 1989. The FDIC and, to a lesser extent, the banks themselves, addressed loans that were reported as problems, and this attention led to considerable declines in total nonperforming loans. The resulting improved credit quality led to lower expenses, particularly in loan loss reserves. These factors, coupled with the capital injections associated with the takeover of several large failed

Table 3
Measures of Financial Condition and Performance
Banks with Assets Less than $100 Million

	Small Eleventh District Banks				Other Districts' Banks
Year	1987	1988	1989	1990	1990
Number of Banks	1,577	1,364	1,196	1,052	8,186
(In billions of dollars)					
Total Assets	58.4	50.7	45.6	41.7	317.3
Total Loans	29.6	24.1	20.5	17.6	168.1
Total Nonperforming Loans	1.4	1.2	.9	.6	3.3
Total Equity Capital	4.3	3.6	3.3	3.2	29.1
Total Reserves	.7	.6	.5	.4	2.9
Total Net Charge-offs	.7	.6	.4	.2	1.0
Total Provisions for Loan Losses	.8	.6	.5	.2	1.3
Total Net Income	–.3	–.2	0	.2	2.4
(Percent)					
Nonperforming Loan Ratio	4.67	5.02	4.25	3.22	1.94
Troubled Asset Ratio	4.00	4.28	3.88	3.02	1.53
Net Charge-off Ratio	2.24	2.06	1.93	1.20	.60
Loan Loss Provisions to Total Loans	2.60	2.38	2.09	1.18	.78
Primary Capital Ratio	8.53	8.27	8.37	8.52	9.97
Return on Average Assets	–.48	–.33	–.01	.40	.76
Return on Average Equity	–6.35	–4.51	–.09	5.32	8.25
Net Interest Margin	3.62	3.56	3.77	3.69	4.07
Percentage of Profitable Banks	56	62	69	77	88
Number of Failed Banks	60	87	107	93	45
(Percent)					
Failure Rate	3	6	8	8	

banks, increased the large banks' capital ratios. If these banks can maintain their profitability, their capital ratios should continue to climb to the level of large banks elsewhere in the country that did not endure regional recessions.

While banks in all three categories showed profits in 1990, the large banks' recovery was the most pronounced, as is demonstrated in Figure 6. This group increased ROA from –0.44 percent in 1989 to 0.49 percent in 1990. The percentage of profitable large banks rose from 31 percent in 1988 to 81 percent in 1990, the biggest improvement among the three groups (*Figure 7*). During the recession, the large banks' earnings had fallen the furthest, leaving room for large swings in ROA.

A more thorough examination of the large banks in the Eleventh District indicates that the dramatic decrease in nonperforming assets resulted primarily from the FDIC's resolution of the large troubled banks. Total nonperforming

Table 4
Measures of Financial Condition and Performance
Banks with Assets Between $100 Million and $1 Billion

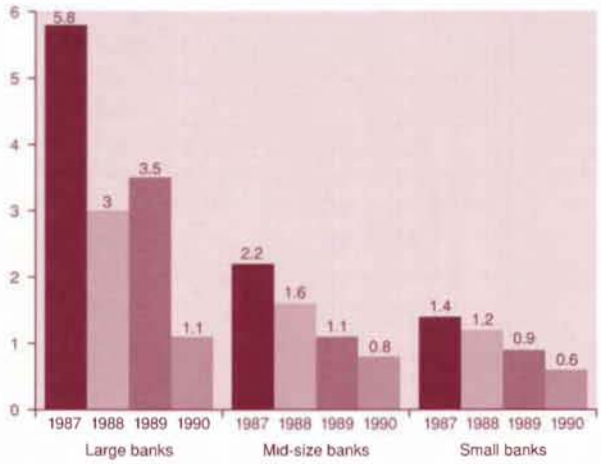
	Mid-Size Eleventh District Banks				Other Districts' Banks
Year	1987	1988	1989	1990	1990
Number of Banks	307	244	227	237	2,467
(*In billions of dollars*)					
Total Assets	69.4	53.3	49.6	49.8	601.0
Total Loans	34.5	25.7	21.8	21.2	367.8
Total Nonperforming Loans	2.2	1.6	1.1	.8	7.9
Total Equity Capital	4.0	2.6	2.9	3.2	46.9
Total Reserves	1.1	.9	.7	.7	6.1
Total Net Charge-offs	.8	.8	.5	.3	2.9
Total Provisions for Loan Losses	1.1	.9	.5	.3	3.8
Total Net Income	–.5	–.6	–.2	.2	4.8
(*Percent*)					
Nonperforming Loan Ratio	6.50	6.04	4.94	3.91	2.14
Troubled Asset Ratio	4.97	5.12	4.13	3.45	1.86
Net Charge-off Ratio	2.20	2.53	1.90	1.45	.79
Loan Loss Provisions to Total Loans	2.76	2.85	2.23	1.29	1.06
Primary Capital Ratio	7.26	6.54	7.14	7.65	8.72
Return on Average Assets	–.73	–.95	–.35	.35	.82
Return on Average Equity	–12.38	–17.44	–6.53	5.68	10.59
Net Interest Margin	2.79	2.69	3.25	3.31	4.24
Percentage of Profitable Banks	59	62	70	87	92
Number of Failed Banks	7	29	34	11	17
(*Percent*)					
Failure Rate	2	9	14	5	

loans were reduced by more than half from the end of 1989 to the end of 1990.[7] Two banks in particular, Bank One–Texas and TEAM Bank, account for a large share of this improvement. Both banks emerged after the failure of other large banks that the FDIC resolved through the purchase and assumption method.[8] These two failed bank resolutions were finalized in 1990. Another transaction completed in 1990 that further reduced Eleventh District banks' nonperforming

[7] *Total nonperforming loans declined to $1.1 billion from $3.5 billion. Nonperforming real estate and nonperforming commercial loans also showed pronounced improvements over 1990, as both fell by more than 50 percent. Real estate owned, predominately foreclosed real estate, also fell noticeably.*

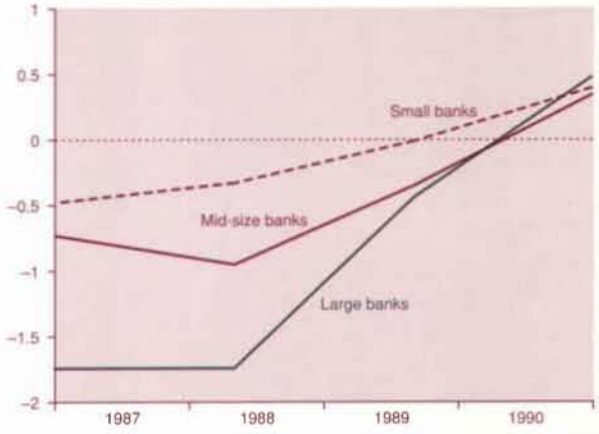
[8] *Bank-One Texas was formed from the MBanks that failed. TEAM Bank was formed from the failed Texas American Banks.*

Figure 5
Total Nonperforming Loans by Size of Bank, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

Figure 6
Return on Assets by Size of Bank, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

assets was NCNB–Texas' acquisition of a failed subsidiary of the National Bankshares Corporation of Texas that held more than $1 billion in assets.[9]

With retained earnings from 1990 profits and fresh capital injections, large banks were able to increase their capital ratios. Equity capital to assets increased from 2.8 percent at the end of 1989 to 5.27 percent for 1990. The amount of equity also increased by more than $2.2 billion; of this amount, $1.3 billion came from new capital stock issued and transactions with parent holding companies. A substantial portion of this increased capital came from the equity injection made when Bank One–Texas and TEAM Bank finalized their respective takeovers. First Interstate Bancorp also made a capital injection to its subsidiary banks in Texas during 1990.

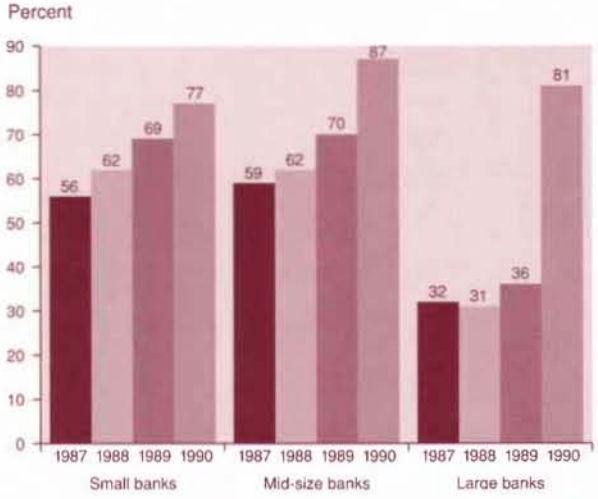
Room for improvement: a comparison of District and non-District performance

Eleventh District banks' positive net income for 1990 indicates that they are recovering. But this recovery cannot be declared complete until capital ratios meet regulatory standards and bank failures subside. All Eleventh District banks have been operating in a recovering economic environment for the past three years, but banks may need another full year before their capital ratios are considered sound. The few banks that received FDIC assistance during their acquisition of failed banks have generally healthy returns and capital ratios. The unassisted banks, as noted earlier, have become profitable but with weak returns. Given time in a growing economy, however, they should gain financial strength.

While Eleventh District banks of all sizes showed improvement in 1990, the two groups with assets less than $1 billion must improve further to compare favorably with banks outside the region. The 1990 performance of both small and mid-size groups fell below that for banks of similar size outside the Eleventh District. Also, a higher percentage of similar-sized, out-of-District banks were profitable in 1990. These other banks reported higher primary capital ratios: small out-of-District banks reported 9.97 percent versus 8.52 percent for small Eleventh District banks, and mid-size out-of-District banks reported 8.72 percent versus 7.65 percent for mid-size Eleventh

[9] *Nine banks belonging to this holding company were declared insolvent and sold to NCNB–Texas on June 1, 1990.*

Figure 7
Percentage of Profitable Banks by Size, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

District banks. However, signs of regional economic weakness in the other parts of the country surfaced when delinquent credits at banks in other Federal Reserve Districts increased during 1990.

Only the performance of the District's largest banks compared favorably with that of banks in other Districts. Both return on assets and return on equity were higher in the Eleventh District than elsewhere; still, both measures were below historical standards for large banks. Capital ratios of large Eleventh District banks were still below national norms. Large banks elsewhere started to show weakness as their nonperforming loan ratio and troubled assets ratio increased, becoming greater than that for large Eleventh District banks. Foreclosed real estate at these out-of-District banks more than doubled during 1990, passing the $14 billion mark. Total nonperforming loans for these banks jumped by $17.2 billion, a 37-percent increase.

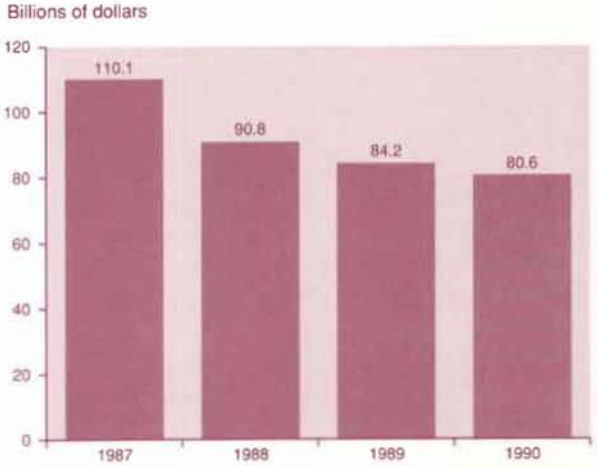
Lending in the Eleventh District

Despite their return to profitability, Eleventh District banks have not collectively increased lending. Banks, in responding to past loan losses and new regulatory requirements, have shifted their investments from loans into securities. Total loans diminished by nearly $30 billion since 1987, while securities have increased by nearly $14 billion (*Figure 8*).

Several explanations for this portfolio shift are possible. Loan demand by qualified borrowers may be weak. On the other hand, banks may have tightened their credit standards in response to the loan losses that occurred under the too-liberal standards of previous years. Bank regulators, in response to the costs of the numerous bank failures of the past several years, may be cautious in the examination of the loans on each bank's books and, in turn, may be requiring banks to be overly prudent in their supply of credit.

Banks also may be adjusting to the new risk-based capital guidelines by moving into assets, such as government securities, that require less capital. Economic theory suggests that a bank will choose among competing investments based on their competitive yields. Yields are adjusted for costs of funds, provisions for loan losses, and overhead expenses. Under the simple 6-percent capital rule, the risk-adjusted yields for loans and securities were approximately equal. With the implementation of risk-based capital requirements that call for more equity capital for riskier assets,

Figure 8
Total Loans at Eleventh District Banks, 1987–90



SOURCE OF PRIMARY DATA: Consolidated Reports of Condition and Income (Board of Governors, Federal Reserve System).

Table 5
Measures of Financial Condition and Performance
Banks with Assets Greater than $1 Billion

	Large Eleventh District Banks				Other Districts' Banks
Year	1987	1988	1989	1990	1990
Number of Banks	19	16	14	16	354
(In billions of dollars)					
Total Assets	73.4	76.4	88.2	89.3	2,268.0
Total Loans	46.1	41.0	41.9	41.8	1,424.8
Total Nonperforming Loans	5.8	3.0	3.5	1.1	63.9
Total Equity Capital	2.7	2.5	2.5	4.7	130.4
Total Reserves	2.1	1.7	1.5	1.2	43.8
Total Net Charge-offs	.9	1.3	1.1	.7	23.9
Total Provisions for Loan Losses	1.5	1.3	1.4	.4	25.5
Total Net Income	–1.3	–1.3	–.4	.4	8.5
(Percent)					
Nonperforming Loan Ratio	12.62	7.33	8.30	2.71	4.48
Troubled Asset Ratio	9.85	5.50	6.16	1.86	3.45
Net Charge-off Ratio	1.87	3.00	2.60	1.56	1.70
Loan Loss Provisions to Total Loans	3.24	3.00	3.48	1.00	1.82
Primary Capital Ratio	6.34	5.29	4.44	6.48	7.54
Return on Average Assets	–1.74	–1.74	–.44	.49	.38
Return on Average Equity	–41.65	–50.90	–14.57	12.23	6.75
Net Interest Margin	2.02	1.88	1.65	2.52	3.37
Percentage of Profitable Banks	32	31	36	81	79
Number of Failed Banks	0	5	3	1	2
(Percent)					
Failure Rate	0	26	19	7	

the yield after expenses is greater for securities than for loans. Therefore, banks are appropriately responding to this incentive to hold more securities and fewer loans.

Other research suggests that a lack of equity capital is a constraining factor in a bank's ability to increase its loan volume. Clair and Yeats (1991) show that, among banks in poor financial health, the equity-to-assets ratio is a significant factor in limiting the bank's ability to make loans. Bank regulators urge banks with capital at or below required minimums to improve their equity-capital-to-assets ratio. Many banks do so by slowing or even reversing loan growth. Among financially sound Texas banks, however, Clair and Yeats found the equity-to-assets ratio is not a significant factor in explaining loan growth, suggesting that as banks become less capital-constrained, they will be in a better position to extend credit to worthy borrowers.

If the changing structure of the banking industry in the Eleventh District constrains the region's loan supply, commercial enterprises will have to deal with the consequences. Businesses must adapt to the new credit climate by tapping other sources of funds, such as banks in other regions, commercial paper, or even suppliers willing to provide trade credit. Each of these alternatives presents drawbacks. Borrowing from the local loan production offices of out-of-state or foreign banks headquartered in other regions is usually available only to large corporations with loan demand in excess of $10 million. Similarly, the commercial paper market is available to only the largest corporations. The use of trade credit is usually more expensive than bank financing. In fact, the costs associated with each type of alternate financing can be greater than those associated with loans from local commercial banks.

Tightened credit conditions are not isolated to the Eleventh District. The national economy has been in a shallow recession since late 1990, and banks nationwide have responded with a reduced, but still positive growth in loan volume.[10] In the Northeast, however, the economic slowdown has been more pronounced, similar to the Southwest's downturn in the 1980s. Banks in the First Federal Reserve Bank District have recorded declining loan volume for the past two years.

The Eleventh District's outlook, however, appears a bit brighter. Given the District's general economic performance, new, profitable lending opportunities should arise for the commercial banks. Because these banks have been recovering for at least a full year, they should be able to fund new loans, and lending activity should increase.

Conclusion

In 1986, the Southwest's economic downturn resulted in drastically increased nonperforming loans at some Eleventh District banks. Some bank managers were unable to forecast accurately the severity of the downturn or to hedge adequately against its effects. Many such institutions required federal intervention when their chartering authority declared them insolvent.

Other institutions, however, were able to continue operations throughout the turbulent years, thanks to the quality of their management, plentiful capital levels, and sufficient diversification. With ample reserves to address their nonperforming loans, these banks maintained profitability, or at least minimized their losses.

After four years and numerous bank failures, the Eleventh District's banking sector returned to profitability. While FDIC assistance supported the recovery, the improved economic climate made the turnaround possible. Even so, two years elapsed before Eleventh District banks felt the effects of the region's recovery. And three years passed before banks returned to profitability. Perhaps four or more years are needed before banks return to full financial health.

Still, the banking industry's return to profitability in 1990 sends positive signals that Eleventh District banks are returning to financial health as well. Many banks still need to increase their capital levels before the recovery can be declared complete. Should delinquencies continue to decline and net income remain positive, the Eleventh District's banks can proceed down the road to full recovery from the turmoil of the 1980s.

[10] *Total loans at out-of-District banks actually declined over the fourth quarter of 1990.*

How Banks Cope with Nonperforming Loans

At every bank, the management expects and prepares for nonperforming loans. In any economic climate, some businesses and individuals to whom a bank lends will be unable to repay their debt in full. Bank management attempts to minimize loan losses through its underwriting standards and periodic loan review.

Bank management can take several actions once a loan becomes delinquent. The bank could attempt loan collection, incurring such costs as legal expenses associated with foreclosure. If this effort is unsuccessful, management could write down the value of the loan on its book to a level that more accurately reflects the loan's collectible value. Management prepares for the eventual loan loss by establishing a general loan loss reserve account to absorb future losses on loans. The size of this account depends on management's expectations of future loan losses.

The general loan loss reserve account, called *allowance for loan and lease losses*, is built up over time by retaining income. Additions to the loan loss reserve account, referred to as *provisions for loan and lease losses*, are noninterest expenses that reduce current-period net income.

All loans are priced to cover all the anticipated costs of making the loans. These anticipated expenses consist of interest costs of funding the loan and a share of overhead, which includes loan collection costs and provisions for loan losses. As long as the amount of nonperforming loans remain at or below expected levels, bank management can handle the delinquencies internally without a threat to the bank's capital position.

If nonperforming loans are greater than anticipated, the bank must make higher-than-expected provisions for loan losses that cut into net income. Because these loans are not generating revenue, making the necessary additions to the loan loss reserve account becomes difficult. These loans also generate other expenses, such as monitoring costs, not needed with performing loans.

Continued losses from nonperforming loans will jeopardize the solvency and viability of the bank. The reserve account that was counted toward the bank's primary capital requirement becomes depleted.[1] Because banks must maintain minimum capital-to-assets ratios in accordance with regulatory guidelines, banks that are at or below these minimums typically respond to a drop in primary capital by raising more equity capital, making additions to loan loss reserves from current-period net income, or reducing assets to the extent that the bank is able. When these efforts to recapitalize fall short, the bank is insolvent and faces resolution by the FDIC.

[1] Before December 31, 1990, regulators counted loan loss reserves as an element in primary capital. As of that date, commercial banks are required to meet capital requirements that are based on the risk level of their assets. Reserves count toward supplemental capital under the new rules (Alfriend).

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