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OF LEADING ECONOMIC INDICATORS

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*The views expressed in this article are solely those of the author, and should not be attributed to either the Federal Reserve Bank of Dallas or to the Federal Reserve System.

One of the most often sighted economic statistics used by the media today is the composite index of leading economic indicators published monthly by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA)¹. One reason for this could be its familiarity. The index, which has its origin in a study conducted by Wesley Mitchell and Arthur Burns (1938), has long been used as a guide to the future direction of national economic activity.

The idea behind the creation of a leading index is that changes in many economic series tend to lead changes in overall economic activity. Some of these series reflect commitments to future economic activity such as new orders for machinery or housing permits. By analyzing which series turn down prior to business cycle peaks and turn up prior to troughs it is possible to classify indicators as leading. By combining the changes in the best leading indicators into a single index, much of the random movements in the individual series are eliminated and the composite index is able to give a clearer signal of upcoming directional changes in aggregate economic activity.

Although the use of the national leading index to predict business cycle turning points has lasted fifty years, it has not been until recent years that much work has been done in the development of regional leading indexes. During the latter part of the 1970s and throughout this decade the construction and use of leading indexes by businesses, state and municipal governments and other organizations has become increasingly popular (for example see Rufolo(1979), Phillips(1988), and Kozlowski(1987)). In this paper I will address some recent evaluations of the BEA's leading index and several regional indexes. I will then summarize the findings and apply these to a suggested framework for the

¹ The leading index is published in Business Conditions Digest and is also available in a monthly release prepared by the BEA.

construction of regional indexes.

The Performance of Composite Indexes of Leading Economic Indicators

Before addressing the performance of the BEA's leading index it is important to first understand the leading indicator approach. The primary purpose of the leading index is to signal upcoming directional changes in the business cycle. In the selection and weighting of the leading index components, the BEA analyzes the variables in terms of how well they anticipate business cycle peaks and troughs as designated by the National Bureau of Economic Research (NBER).² No effort is put forth to analyze each of the component's leading relationship with economic activity over the whole business cycle. Many analysts, however, use the leading index as a predictor of levels of economic activity. Thus although it was developed to lead directional changes in the business cycle, it has recently been evaluated by how well it predicts changes in the levels of different economic variables over the whole business cycle. This is known as the whole-cycle approach.

One problem associated with the whole-cycle approach is that the analyst must first define the business cycle at all points. Since a business cycle is generally defined by the points in time where many economic variables change direction, it is not clear that movements in any one economic variable can appropriately measure the business cycle. Instead of trying to combine the

²The NBER, a private, nonprofit economic research organization, determines business cycle turning points sometime after they have occurred by studying the movements in many economic variables. Although the process is somewhat subjective, most of the selection is essentially done by computer program. For further information on this process see Klein and Moore (1985) and Bry and Boschan (1971).

movements in many economic series into a single measure, most of the recent studies have tested the predictive power of the leading index against variables such as employment, unemployment and industrial production. Although these series are generally coincident to the business cycle, they are not a comprehensive measure of it and using one versus the other can lead to differing results.

It is not the intent of this paper to empirically analyze the performance of the Commerce Department's leading index. Much work has recently been done on this and it useful to draw on this research. In a much-sighted paper Auerbach (1982) applied the causality test of Granger (1969) to determine if the leading index was significant, in a statistical sense, in forecasting cyclical behavior. To measure cyclical behavior, Auerbach uses changes in the U.S. unemployment rate and U.S. industrial production index over the period 1949 to 1977. His results show that the leading index was strongly significant in the prediction of both the industrial production index and the unemployment rate. Auerbach also uses regression results for the selection of weights and finds that these regression-based weights improve the in-sample fit of the index in predicting changes in the unemployment rate. He finds, though, that the weights are not stable over time and that the BEA index outperforms, in out-of-sample prediction, an index derived with the statistically-estimated weights.

Auerbach also addresses a result due to Neftci (1979). Neftci found that only six of the 11 component series which he tested were useful in explaining changes in both the U.S. industrial production index and the U.S. unemployment rate. However, Auebach found that a simple unweighted index composed solely of these six indicators could not outperform the leading index in out-of-sample

forecasts of the unemployment rate and the industrial production index.

In another study, Koch and Rasche (1988), use the transfer function approach and find that although, over the whole cycle, much of the relationship between the leading index and industrial production is of a coincident nature, the index does have some significant leading impacts³. Results using this method also confirm the Aubach results that the leading index provides useful information in forecasting industrial production over the whole cycle.

While the results of the whole-cycle approach are informative, other researchers have recognized that the original intent of the index was solely the prediction of turning points and have evaluated the index on this criteria. In doing so, though, it must first be clear if turning points are defined by the classical business cycle or by growth cycles. In their presentation of a new set of leading indicators Zarnowitz and Boschan (1975) commented:

In the post-World War II era, economic fluctuations in the United States, and particularly in Western Europe and Japan, have generally become much milder than they were in earlier decades. Frequently they have taken the form of alternating high and low rates of economic growth, rather than expansion and contractions, in major economic variables. Turning points in the leading indicators have sometimes predicted reversals in cyclical activity (recessions and recoveries) and other times merely the transition from the vigorous to the sluggish phase of the growth cycle or visa versa. It would be most useful to develop a system of indicators which could distinguish, on a current basis, the signals of business cycle turns from those of growth cycle turns; but, as yet, we have not developed such a system, and it is indeed questionable whether such a distinction will be possible in practice. The treatment of growth cycles will be taken up in a subsequent report; in this paper we deal with business cycles. Accordingly, our interest here is in leading indicators as predictors of business cycle peaks and troughs rather than of growth cycle turning points.

³Koch and Rasche do not directly use the BEA's leading index, but instead build a proxy for it. The proxy contains nine of the twelve indicators used by the BEA but, in the proxy, the series are not seasonally adjusted. The reason for this is that they claim that the transfer function approach cannot be used with seasonally-adjusted data. The transfer function approach is explained in more detail in Vandaele (1983).

Since this report though, Klein and Moore (1985) of the NBER, recognizing the increasing importance of growth cycles, developed a growth cycle chronology for the United States as well nine other countries. They then evaluated the performance of the leading index to the growth cycle turning points. In doing so they have set a precedence for the use of the leading index to predict not only classical business cycle turning points but also growth cycle turning points.

The results of the Klein and Moore study show that the BEA's index of leading economic indicators changed direction in advance of all but two of the growth cycle turning points from 1948 to 1975. Another study which uses the turning point approach within the framework of growth cycles was done by Ratti (1985). Although he finds similar results, he emphasizes that highly variable lead times and large initial revisions in the leading index can seriously reduce the usefulness of the index.

In judging the usefulness of the leading index, Ratti uses both a two-month and a three-month rule to define turning points. The three-month rule, which is the most commonly used in the literature, states that, if the leading index has been increasing, three months of consecutive declines signals an upcoming (growth) recession and, if the index has been decreasing, three months of consecutive increases signals an upcoming (growth) recovery.

Although this three-month rule appears to work rather well in predicting turning points, Neftci (1982) suggests a more optimal method of using the leading index to predict turning points other than this zero-one probability rule. Neftci applies a sequential probability formula to changes in the leading index so that at any given time one can observe the probability of an upcoming recession given the recent movements in the leading index. He finds

that this optimal prediction rule performs well in predicting the recessions of 1974 and 1980. He also finds that, unlike the three-month rule, the sequential probability method does not give a false signal in August 1977.

Recent work by Diebold and Rudebusch (1987) provides a rigorous evaluation of the usefulness of the leading index in predicting cyclical turning points. In particular they applied formal probability assessment scoring rules to turning point probabilities generated from the leading index through the use of Neftci's sequential probability formula. While the performance of the leading index using this approach was generally weak, the results contained several caveats. In particular, the scoring rules were only applied to turning points in the classical business cycle and not to growth cycle turning points. Also, further refinements to the sequential probability method were suggested.

It should also be mentioned that a leading index has several positive attributes that are not brought out by statistical evaluation. For example, the index is easy to construct and to use. This can be of importance to a researcher who has a limited amount of time to spend on current analysis of a region or several regions but who wants to be able to determine if the general cyclical patterns of the region are likely to change in the short term. Also, as discussed by Gorton (1982), construction of the index does not rely of the type of a priori theory imbedded in the construction of structural models. Such theories include assumptions about the way in which people behave or the relationship between two economic variables. Some of these assumptions and their resulting restrictions can be mistaken and thus lead to incorrect results.

The use of the leading indicator approach is more in line with the 'measurement without theory' approach of time series methods of forecasting.

In fact, as shown earlier in this paper, the whole-cycle approach utilizes time series techniques in analyzing the predictive ability of the leading index. Several studies have shown that the time series approach to forecasting, although simpler to construct, shows better forecasting performance than many of the large structural models.⁴

It is important to realize, though, that there may be a basic fundamental difference between the use of time-series models and the use of the leading index approach. The main difference is in the objective of the two approaches. Because the main objective of the leading index approach is to predict turning points in aggregate economic activity and not to predict levels of economic activity, it gives up much of the information content of the econometric model approach. Because it is not striving for the precision of an econometric model the BEA uses a scoring technique that produces, in essence, equal weights for the components. By doing so, the BEA keeps the movements in any one series from dominating changes in the index. In this way, the signal that directional changes in one series is giving must be confirmed by similar directional changes in the other series.⁵ This directly relates to the notion that business cycles are caused by the movements in many economic series.

But in giving up the precision of a statistical model, the leading indicator approach may be gaining greater stability over time. As discussed earlier, Auerbach finds that the BEA's leading index is more stable in out-of-

⁴For example see Cooper(1972) and Fair(1979).

⁵Although it is possible for the movements in one or two series to dominate movements in the index, it is highly unlikely. In a strict sense directional changes in one series must be confirmed by the other series so long as that directional change is not severely larger than normal.

sample forecasts than a leading index derived by a regression-based weighting procedure. He notes that the relationship between the components of the leading index and that of the business cycle might be of a more fundamental nature than many of the variables in statistical models and less subject to instability due to policy changes. This is commonly known as the Lucas critique.

The stability of the leading index approach was recently brought out in a study by Klein and Moore (1985). In the study they use the leading indicators established in 1950, from data prior to 1939, to compute a leading index for the period 1948 to 1975. This index was then compared to growth cycle turning points and found to be a good predictor in this large out-of-sample period. Klein and Moore also use international counterparts to components of the U.S. leading index to develop similar leading indexes for nine other countries. The results show that, although the index was specifically designed for the U.S. economy, its international counterparts perform well in leading their respective growth cycle turning points. This stability over long periods of time and across many nations would certainly be a tough challenge for an any econometric model.

The performance of the U.S. leading index has prompted the construction of indexes not only for other countries but also for regions within the United States. Recently there has also been some research done on the performance of several regional leading indexes. A study done by Kozlowski(1987) analyzes the performances of indexes computed for three states: Nebraska, South Carolina, and Texas; and four metropolitan areas: Detroit, Fort Wayne, Memphis and Toledo. Kozlowski finds that all of the indexes provide useful information when analyzed by how well turns in the indexes lead turning points in the

regional business cycle. In terms of prediction over the whole cycle, however, the Granger test showed that three of the seven indexes did not contain any predictive power in explaining changes in regional employment.

In summary, much work has recently been done which evaluates the performance of the BEA's leading index as well as some of the available regional indexes. Two basic approaches have been taken in the evaluations: the whole cycle approach and the turning point approach. Although the whole cycle approach is informative, and generally the results from this method show the leading index to be useful, the turning point approach is more directly related to the objective of the BEA's index. Traditional evaluations using the turning point approach simply record if the leading index signalled (usually using the three-month rule) the turning points in the business cycle. These results have generally been favorable, although it has been realized that variable lead times and revisions in the index hamper its performance. Instead of the three-month rule, Neftci (1982) estimates a sequential probability formula which uses the changes in the index to compute the probability of recession. Diebold and Rudebusch (1987) show that this sequential probability method is better than the three month rule but overall the ability of the leading index to predict turning points using this method was not proven strong.

On a more fundamental basis, the leading index is easy to construct and use. Also the index does not rely on any a priori theory and is constructed so that no one or two series dominate the movements in the index. Because of this, the leading indicator approach is not likely to suffer from the Lucas critique. It has, in fact, been shown to be quite stable over time and across countries.

Finally, it should also be mentioned that the leading indicator approach was intended to give added information to the economic forecaster and not as a replacement for econometric models. As Julius Shiskin(1961) stated:

The indicator series and summary measures provide a sensitive and revealing picture of the ebb and flow of economic tides, which a skillful analyst of the economic, political, and international scene can use to improve his chances of making a good forecast of short-run economic trends. In summary, if one is aware of their limitations and alert to events in the world around him, the indicators do provide useful guideposts for taking stock of the economy and its needs.

Method for Calculating Regional Indexes

Before one decides what methods are best for the construction of a regional index, the researcher's goals for the index must first be known. One goal might be to predict levels of economic activity while another may simply be to predict when cyclical turning points may occur. If the goal of the researcher is to predict levels of some measure of economic activity, the construction of the index should be based solely on statistical tests of the predictive power over the whole sample of data. Much of the recent literature on leading indexes have found that time series results show that the selection of variables and the weighting scheme used by the BEA method is not optimal in a forecasting sense (for example see Neftci (1979)).

If the leading index is to be used within a forecasting model of economic activity (rather than by itself to forecast turning points) then the type of model used should provide for statistical tests of the significance of each of the indicators and the weight they have in explaining the dependent variable. The appropriate test of this type of index would then seem to be not of the Granger type, but if the index provides a better result than some other type of

forecast.⁶

The use of a leading index to forecast economic activity over the whole cycle brings up another question in dealing with the construction of a leading index. This is the question of the use of seasonally adjusted data. It has been determined by Neftci (1969) and others that the components of the BEA's leading index are better predictors when they are not seasonally adjusted. However, in the construction of the leading index the BEA chooses to use seasonally-adjusted data. The BEA does so because the seasonal adjustment reduces noise in the data that could lead to false signals of turning points. Econometric models, however, are often aided by this noise in the prediction over the whole cycle. Thus, although seasonally unadjusted data seems appropriate for the goal of forecasting levels of economic activity, for other goals, such as the prediction of turning points, it may not be advantageous.

The goal of forecasting business cycle turning points, which is more in line with the original purpose of the BEA's leading index, is the goal which I set out to attain in constructing the Texas index of leading economic indicators (see Phillips 1988). In the remainder of this paper I shall address the construction of regional leading indexes which try to accomplish this goal. One might think that this goal is merely a bi-product of the prediction over the whole cycle and thus a separate method to accomplish this goal may be unnecessary. This is not the case, however, since costs associated with achieving prediction over the whole cycle can be quite higher and, as mentioned previously, the increased precision associated with it may come at the cost of

⁶Sargent and Sims (1977) points out that using a leading index in a forecasting model can be seen as the imposition of a specific set of restrictions on a vector autoregression. In this context, it would seem that the appropriate test is if the restrictions are valid and not if the leading index is significant.

increased instability.⁷

Also, as brought out by Neftci (1981) and later by Diebold and Rudebusch (1987), the business cycle turning point may represent, in a statistical sense, a special point in time. It has been hypothesized that an economy behaves quite differently in the downturn phase of the business cycle than in the upturn phase and that the empirical relationships between economic variables and the business cycle differ in the two phases. This theory of business cycles motivates the separate prediction of business cycle turning points to incorporate into a time series or structural model forecast.

In trying achieve the more general goal of forecasting cyclical turning points, I suggest that the regional leading index components be selected and weighted by the general framework established by the BEA. In applying this general framework to the region, though, several problems arise which I shall address. Also, I suggest that incorporating some time series results into this general framework could be of use to the researcher.

One of the first problems faced by a researcher in building a leading index is deciding on what it is that the index is leading. If the objective is to lead business cycle turning points he must first get a measure of the business cycle in his region. For the national leading index, the BEA utilizes business cycle turning points (and more recently growth cycle turning points) as designated by the NBER. Unfortunately there are no such officially designated turning points available for most regions. Because of this, many researchers have used one or more regionally-available coincident indicators to define turning points. One useful method in defining regional business cycles

⁷The costs to the researcher generally involve increased time associated with defining the appropriate model and continually testing it to make sure that the parameters remain stable over time.

is to use series which, at the national level, are defined as coincident and to combine these regional series into a coincident index in the same manner as the BEA uses to compute its national coincident index.

Before constructing the Texas index of leading economic indicators, I first created a Texas coincident index by combining changes in total nonagricultural employment and industrial production. Since series representing regional output are often not available, though, total nonagricultural employment may often best approximate the regional business cycle. Although it may be useful to establish growth cycles for the region, this represents a more complicated technique. In classifying turning points in the Texas economy I utilized the classical business cycle and made note that declines in the leading index at times can forecast slowdowns in growth rather than recessions.

Once a regional business cycle is defined and the peaks and troughs are specified, the analyst must decide on what variables are best suited for inclusion in the leading index. Although almost any economic variable can be a candidate for inclusion, the obvious candidates are regional counterparts to indicators classified by the BEA as leading in the national economy.⁸ Also, since most regional business cycles are influenced by the national cycle, candidates include national variables such as the U.S. leading index. Once the candidate variables are selected they then can be evaluated through the use of a detailed scoring system designed by the BEA. The scoring system, which uses the six criteria of economic significance, statistical adequacy, cyclical timing, conformity, smoothness, and timeliness and revisions, is explained in

⁸The variables are listed according to their classification in Business Conditions Digest.

much detail in Zarnowitz and Boschan(1975). This scoring system places particular weight on cyclical timing. Although the scoring system is primarily qualitative, the BEA has systematized the procedure to reduce ad hoc judgments. In other words, the explicit scoring system has helped ensure the evaluation of all of the important aspects of the economic series in a consistent and essentially replicable manner.

Although to achieve the goal of turning point prediction it may not be appropriate to pick and weight the components solely by time series methods, it may be helpful to utilize time series results within the general framework of the BEA's scoring system. In constructing a leading index for the Texas economy, I utilized the transfer function approach to analyze the conformity of the candidate series to the Texas business cycle (as measured by the calculated coincident index).⁹ Adjusting for the average lead time, a series conforms to the business cycle if it rises throughout expansions and falls throughout contractions. The use of the transfer function approach in the analysis of leading indicators has two main weaknesses. A main weakness of the transfer function, as discussed in Koch and Rasche (1988), is that it places particular emphasis on very short-term shocks in the data. Also, the transfer function approach evaluates the relationship over the whole cycle and not just at turning points.

Even with these weaknesses, however, the transfer function approach does provide useful information to the researcher. One reason for this is that many regional series are not available for long periods of time and thus cannot be

⁹ The primary result of this procedure is estimates of the conformity of the candidate series to the coincident index. These estimates are tested for statistical significance. However, the procedure also has implications for the degree to which the candidate series leads the coincident index. This result of the transfer function is also used.

evaluated over many business cycles. Thus evaluating the series only at peaks and troughs can leave the researcher with only a few observations. The transfer function approach, however, utilizes all the available information to evaluate the relationship between the two variables. This information is then used along with the information derived solely by the use of peaks and troughs.

Before looking more closely at the scoring procedure it is important to note that the BEA did not necessarily choose the indicators with the highest overall scores. It took care to select indicators which represented widely different economic processes. In doing so it has chosen variables from six different types of economic processes: employment and unemployment; consumption and distribution; fixed capital investment; inventory investment; prices, costs and profits; and money and credit. Although in analyzing regional economies, much less data sources are available, care should be taken to include as wide a range of economic processes as possible.

Also it has often been noted that the scoring system used by the BEA resulted in weights that are essentially equal to each other. This has led some to conclude that the scoring system is of little use since the index would have moved the same had the BEA just arbitrarily assigned equal weights to each of the two components (for example see Auerbach (1982)). The contention that the scoring technique is of little use is refuted in two ways. One is that the scoring technique determines not only the weights but also which indicators to include in the index. The second reason is that the scoring technique provides a basis for the equal weighting and this weighting can thus be justified rather than just assigning the equal weights in an arbitrary manner.

Although the general scoring procedure which I used in the Texas index of leading economic indicators is generally contained in Zarnowitz and

Boschan (1975), I differed somewhat from this technique and so I shall summarize the basic scoring procedure which I used. Scores are applied to indicators by how well they perform relative to other candidate variables in terms of the six criteria mentioned earlier. A score of 100 indicates that the variable, in general, outperforms the other candidate variables in terms of the criteria being judged.

Economic Significance. This criteria evaluates the candidate series on its perceived overall importance to the regional business cycle. In this way, variables that cover many sectors of the economy would be given higher scores than more narrowly defined indicators. An example of this would be the scoring of oil prices versus initial claims for state unemployment compensation. Although the oil industry is very important to the Texas economy initial claims represent a broader coverage of the economy and thus deserves a greater score.

Cyclical Timing This criteria evaluates if the indicator turns down prior to peaks in the business cycle and turns up prior to troughs. To measure this, Zarnowitz and Boschan first calculate the probability that an indicator could consistently lead a turning point just by chance. They then report how many turning points the series actually leads. If there is low probability that this series would, just by chance, show that many leads then the indicator is classified as leading. For example, if the probability of showing a leading relationship at two of five peaks is high due simply to chance, than in order to receive a high score the indicator must show a leading relationship at more than two peaks. The BEA utilizes 188 time series to analyze the probabilities corresponding to the observed lead relationship of the indicators at peaks, troughs and at all turns.

Although this scoring technique is useful at the national level, in general there are not enough series available at the regional level (and these series are generally not available over enough business cycles) to determine the associated probabilities. Instead I used a much simpler process where as I recorded the timing of each series at each peak and trough in the Texas business cycle as defined by turning points in the Texas coincident index. I then recorded the average and variance of the lead at both peaks and troughs. Indicators that showed longer and less variable leads were given higher scores than those that showed shorter and more variable leads. In order to be classified as a leading index the average lead over all turning points had to have been at least three months.

Conformity As mentioned earlier, the measure of conformity I used was different than that used by the BEA. Specifically, I use the cross correlation matrix of each of the candidate series and the Texas coincident index. To eliminate any spurious correlation due to the coincident index following the same time series pattern as the candidate series, the candidate series was first prewhitened by the use of an ARIMA model and this ARIMA model was used to prewhiten the coincident index. This process is part of the identification stage of a transfer function model. Although this process provided quantitative results of the association between the variables, the results were used in a qualitative manner. Indicators that showed stronger relationships and longer leads were given higher scores than those that showed weaker results. If an indicator showed no statistically significant relationship to the coincident index or if the relationship was only at lag zero (coincidental) than the indicator was not chosen as a leading indicator.

Smoothness This criteria tries to establish if the series will often give

false signals of turning points. In other words how promptly can a cyclical turn in the series be distinguished from a temporary change. This is measured by the months for cyclical dominance measure (MCD). This statistic shows how many months, on average, that it takes for the cyclical movements in a series to dominate the irregular movements.¹⁰ The lower the MCD the higher the score given to a component.

Timeliness and Revisions This criteria simply measures how soon the data is available for the indicator and how much it is usually revised. For example, since data for Texas retail sales are not generally available until a month after the other indicators, it was assigned the lowest score in the timeliness category. To estimate the effect of revisions, prior data of the releases of the candidate series were utilized to see how much, on average, the data series were revised. Series such as the oil price that never need revision were given the highest scores, while series such as retail sales that are sometimes revised significantly were given lower scores.

Statistical Adequacy This attempts to judge how well the indicator measures the economic variable or process in question. The BEA breaks this criteria down into eight different aspects and looks into great detail on such things as the quality of the reporting system. Although it would be useful to go through this process (not only for the leading indicators but for other empirical work as well) I did not address this criteria directly. Instead I used only indicators of which I was familiar and/or I had confidence in the organization producing it. For other regions such as cities, limited data sources may require increased emphasis on this criteria.

¹⁰The computation of this statistic is available on many software packages. For example, SAS computes the MCD as a part of its output from its X11 procedure.

In the construction of the Texas index of leading economic indicators the combined score for cyclical timing and conformity was given a weight of fifty percent. This is due to the fact that the lead relationship and overall conformity of the indicators to the business cycle is the most important aspect of the indicators. The scores for the three criteria of economic significance, smoothness, and timeliness and revisions, were then each weighted by one sixth. These measures, although important, are less crucial than the other two criteria. Once the selection and weighting procedure was accomplished it was a straightforward task to combine the series into an index. This procedure is explained in great detail in both algebraic and narrative form in the Handbook of Cyclical Indicators, U.S. Department of Commerce, 1984, pages 67-70.

It is worth noting that the Texas index of leading economic indicators, which was generated by the previous procedure, has performed well in leading turning points in the Texas economy. In its limited history it has led peaks by an average of five months and led troughs by an average of seven and a half months. Using the three-month rule the index has never falsely predicted a turning point. (Although it is still too early to tell, it appears that a decline in the index at the end of 1987, though, may have signalled only a sharp slowing of growth instead of a recession.) Although the Neftci (1982) sequential probability method has not yet been applied to the Texas leading index this is an area for future research.

Summary Conclusion

The use of the BEA's composite index of leading economic indicators has survived the test of time. Recently, though, it has come under increased

scrutiny in the literature. Although results of the recent evaluations show several problems with the use of the leading indicators, none have totally refuted the use of the index and some have found it to be very informative.

Although the BEA's index has been used for many years it has been in only recent years that much attention has been paid to the use of regional leading indexes. In this paper I describe the scoring technique which I used to derive a leading index for Texas. In using this procedure I have set out to accomplish the goal of forecasting short term directional changes in the Texas business cycle. The procedure outlined here utilizes the general framework of the BEA's scoring procedure used for the construction of the national leading index. My procedure differs, however, in that it utilizes a time series approach within this general framework.

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