What a New Set of Indexes Tells Us About State and National Business Cycles

BY THEODORE M. CRONE

Many people are interested in comparing the pattern of economic growth in their state with growth in other states or in the nation. Although the National Bureau of Economic Research sets dates for peaks and troughs of national business cycles, we lack official dates for turning points in state economies. Some states have suffered recessions when the nation did not, and some avoided recessions during some national downturns. In this article, Ted Crone presents information on a recently constructed set of coincident indexes for the 50 states. These indexes can be used to define business cycles at the state level and can tell us how business cycles and the overall patterns of growth have differed among the states.

Workers, business owners, and policymakers are typically interested in how the pattern of economic growth in their state compares with growth in other states or in the nation. Often their job prospects, their profits, or their tax revenues are sensitive to the local business cycle. They may want to know if recessions are more frequent in their state than in other states or if their recessions are more severe or last longer. They may also be interested in how well the information they have about the local economy reflects national conditions.

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At the national level, we have a commonly accepted definition of business cycles. A committee of the National Bureau of Economic Research (NBER) sets dates for peaks at the end of expansions and troughs at the end of recessions.[1] The economies of the individual states, however, do not march in lock-step with the national economy, and there are no official dates for turning points in state economies. A casual glimpse at state economic data reveals that some states have suffered recessions when the nation did not and some states have avoided recessions when the nation was in a downturn. Using a recently constructed set of coincident indexes for the 50 states, we can more clearly define business cycles at the state level.[2] We can also learn about the course of the national economy from what is happening in the states. For example, by following the states whose indexes are declining we can trace the spread of national recessions across the country. Finally, by calculating an index based on the number of states in decline versus the number expanding we can get an early signal of national recessions.

WHAT IS A BUSINESS CYCLE ANYWAY?

The popular notion of a business cycle and the one used by the NBER dating committee goes back to the work of Arthur Burns and Wesley Mitchell. They identified four phases

[1] An explanation of the committee's procedure for determining the dates of business-cycle turning points can be found at www.nber.org/cycles.html.

[2] See the article I wrote with Alan Clayton-Matthews. The historical series for these indexes can be found at www.philadelphiafed.org/econ/stateindexes. This article is based on the indexes from 1979 to 2004. A complete set of state indexes is available only from 1979 because some data series needed to construct the indexes are not available before then. For consistency, each state's index is constructed from the same set of variables. Using a different set of variables for different states could affect the timing and magnitude of changes in the index so comparisons across the states would not be valid.

of the business cycle: an expansion followed by recession and contraction and then a revival of economic activity leading to the next expansion phase. These four phases are commonly collapsed into two periods: a period of growth (revival and expansion) and a period of widespread and significant decline in economic activity (recession and contraction).

The NBER dating committee looks at a number of indicators, such as personal income, employment, wholesale and retail sales, and industrial production, when it sets the dates for peaks in the expansion and troughs in the recession. These data are not all available at the state level. But the new state indexes combine several monthly and quarterly data series that are available for all 50 states — nonfarm employment, average hours worked in manufacturing, the unemployment rate, and wages and salaries adjusted for inflation. The indexes represent a composite measure of the underlying "state of the economy" in each of the 50 states, and we use changes in the indexes to define state business cycles.

To compare business cycles at the state level with national business cycles, we need a common measure of the underlying "state of the economy." For this purpose we have constructed a national index of economic activity based on the same economic series as the state indexes. (See *A National Index of Economic Activity,* pages 22-23.) Over the past 25 years, all of the monthly declines in the national index have occurred in unbroken time intervals that we can identify as national recessions. The four periods of decline in this index correspond closely to the four official recessions defined by the NBER. When we refer to national recessions in the remainder of this article, we will be referring to these periods of decline in the national index of economic activity.

BUSINESS CYCLES DIFFER WIDELY AMONG THE STATES

The state indexes do not trace out recessions and expansions as clearly as the national index. During state expansions, the indexes sometimes register a month or two of decline that is neither sharp enough nor long enough to indicate a separate state recession. During state recessions, the indexes sometimes register a month or two of increases that do not indicate the beginning of a recovery. The data at the state level are more volatile than the national data, and single events, such as hurricanes, plant shutdowns, or temporary spikes or declines in demand for a particular product, can affect the state economies more strongly than the national economy.

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We use the following criteria to define recessions at the state level. The cumulative decline in the state's coincident index must be at least 0.5 percent, which is the smallest decline in the national index for any recession in the last quarter century. The period from the state index's peak to its trough must be at least three months.[3] Based on these criteria, at least 36 states and as many as 44 states have been in recession during each of the four national recessions since 1979.[4]

The Number and Timing of Recessions Varies Among the 50 States. Only about half the states (24) have been in recession *every time* the nation has, and 28 states have not had a recession independently of a national recession. Fifteen states belong to both groups. They have had recessions that correspond to all four national downturns since 1979 and have had no other recessions (Table 1, Column 1).[5] Missouri and Pennsylvania are good examples of states whose business cycles follow the national pattern (Figure 1). Recessions in both states have occurred at the same time as in the nation. But the state recessions in Missouri and Pennsylvania have been deeper and lasted longer than the national recessions. In part because of the longer and deeper recessions, the average monthly growth in the indexes for these two states has only been about three-quarters as great as the average for the nation (Table 2). Among the 50 states, the average monthly increases in the state indexes have ranged from 1.8 times the U.S. average (Nevada) to slightly more than one-third the U.S. average (Louisiana). Not surprisingly, the states with the highest average economic growth as measured by the change in their indexes also had some of the greatest increases in population (Nevada, Arizona, Georgia, Florida, and Utah), and states with the weakest economic growth had some of the slowest population growth over the past 26 years (Louisiana, West Virginia, Michigan, North Dakota, Ohio, and Iowa).

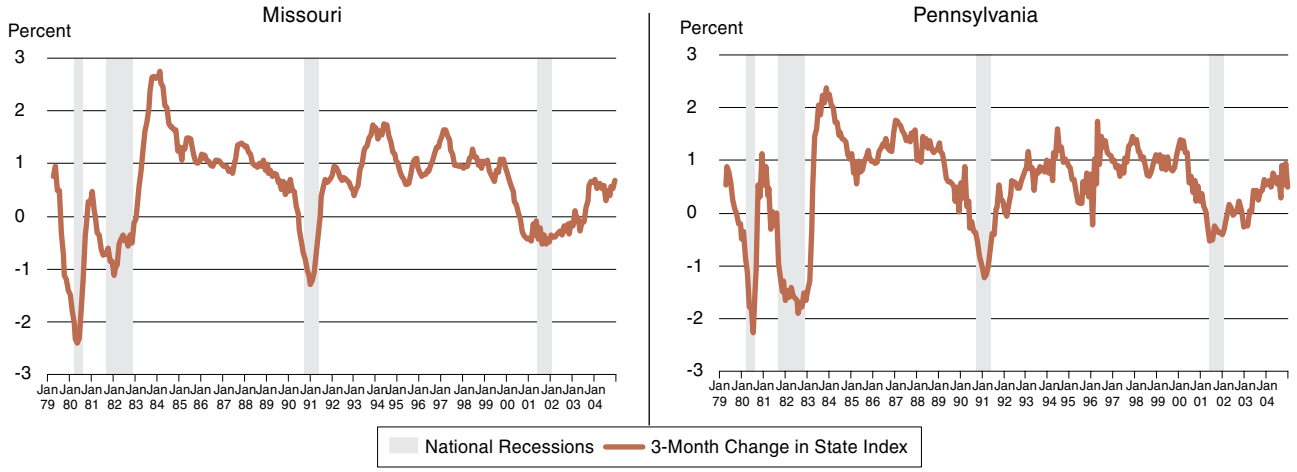
[3] These criteria were chosen to meet Burns and Mitchell's conditions for a recession: The decline in the economy must be diffuse, last a sufficient length of time, and be sufficiently large.

[4] Thirty-six states were in recession during the brief national recession in 1980, and 44 states were in recession at some point in the long national recession in 1981-82.

[5] Two states in recession during all four national recessions (Delaware and Illinois) had no recovery between the two national recessions in the early 1980s. Seven states were in recession during three of the four national recessions and had no other recessions (Table 1, Column 2).

FIGURE 1

Three-Month Change in State Index



Shaded areas represent periods of decline in the national index described in *A National Index of Economic Activity.*

TABLE 1

States in Recession During Most National Recessions Since 1979 and Experiencing No Other State Recessions

States in Recession During All Four National Recessions Since 1979	States in Recession During Three of the Four National Recessions Since 1979
Alabama	Georgia
California	Iowa
Delaware*	Maine
Illinois*	Maryland
Indiana	Rhode Island
Kansas	Utah
Kentucky	Virginia
Massachusetts	
Minnesota	
Missouri	
Nevada	
Pennsylvania	
South Carolina	
Tennessee	
Wisconsin	

*These states had no recovery between the 1980 and 1981-82 recessions.

While state recessions generally occur around the same time as national recessions, 22 states have had at least one recession that did not correspond to a national recession. Texas is a good example. Figure 2 shows the three-month change in the coincident index for Texas, with periods of decline in the national index shaded in gray. Texas has had three recessions since 1979, but only two of them occurred during national downturns. The third recession in Texas occurred in the mid-1980s when all the major energy-producing states suffered an economic downturn. This was a period of general decline in oil prices.[6] At some time between 1984 and 1986, 13 states were in recession, including all nine states with the highest proportion of output (gross state product) in mining and natural resources. These nine states are Wyoming, Alaska, Louisiana, New Mexico, West Virginia, Oklahoma, Texas, North Dakota, and Montana.[7]

[6] There was a 50 percent decline in the refiners' acquisition costs of crude oil between the fourth quarter of 1985 and the fourth quarter of 1986.

[7] The four other states that suffered a recession in the mid-1980s were Colorado, Idaho, Nebraska, and South Dakota.

Industrial Structure Explains Some of the Differences in the Pattern of Growth Among the States. In general, changes in the indexes for states with a relatively high dependence on natural resources are not highly correlated with changes in the U. S. index, and changes in these states tend to lag changes in the national economy. That is, over the business cycle, the U.S. economy tends to accelerate or decelerate before the economy in these states. To illustrate this point, we calculated the correlations of the change in the national index with the change in the state index for the same month and for each of the six months preceding and following the change in the national index.[8]

Table 3 shows the highest correlation for each state in this 13-month span and the month in which the highest correlation occurs.[9] For the states in the column marked "t," the highest correlation was between changes for the state and the nation in the same month. Almost half the states (23) had their highest correlation with the contemporaneous change in the national index. The columns to the left of "t" show states with the highest correlations between the national changes and *previous* months' changes in the states. Thus, for Arkansas the highest correlation (0.73) was between the change in the national index and the change in the state index two months earlier. In other words, Arkansas' growth leads that of the nation. The columns to the right of "t" show states with the highest correlations between the changes at the national level and *future* months' changes for the states. For example, the highest correlation with the change in the Illinois state index (0.84) was one month after the change in the national index.

We used the proportion of state output, or gross state product, for nine different sectors to estimate the effect of industrial structure on the timing of changes in each state's economy. Other things equal, economic growth in states with higher percentages of output in agriculture and construction tends to lead growth in the nation. The opposite is true for states with

TABLE 2

Average Monthly Increase in State Indexes 1979 to 2004

(Average Increases in U.S. Index = 0.24)

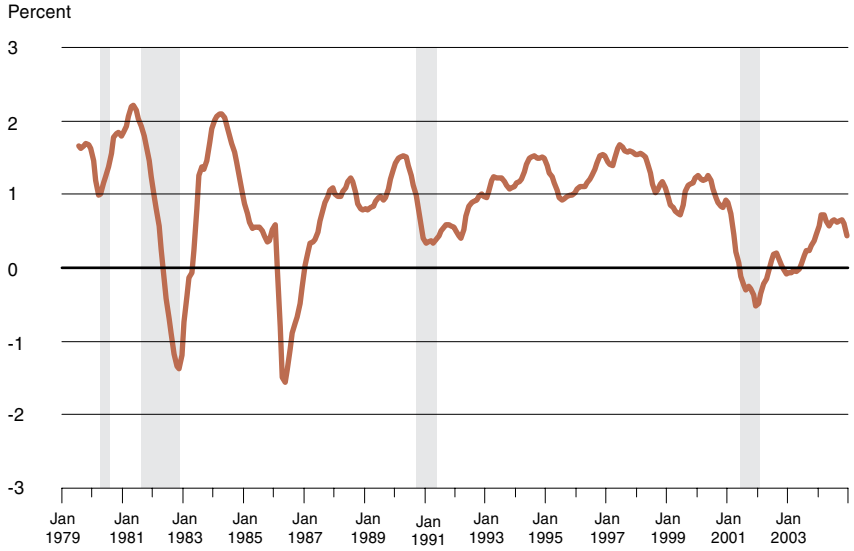
State	Average Monthly Growth in State Index	State	Average Monthly Growth in State Index
Nevada	0.44	Maine	0.23
New Hampshire	0.40	South Dakota	0.23
Arizona	0.40	Arkansas	0.23
Georgia	0.35	Wisconsin	0.23
Florida	0.34	Kentucky	0.21
Idaho	0.34	Nebraska	0.21
Oregon	0.32	Alabama	0.21
Utah	0.32	Indiana	0.20
North Carolina	0.31	Mississippi	0.20
Colorado	0.30	New York	0.19
California	0.30	Missouri	0.19
Massachussetts	0.30	Pennsylvania	0.18
New Mexico	0.29	Kansas	0.18
Washington	0.29	Illinois	0.18
Delaware	0.29	Hawaii	0.17
South Carolina	0.29	Iowa	0.17
Vermont	0.29	Wyoming	0.17
Virginia	0.28	Ohio	0.17
Texas	0.28	North Dakota	0.14
New Jersey	0.28	Michigan	0.14
Minnesota	0.27	Oklahoma	0.14
Tennessee	0.27	Montana	0.13
Connecticut	0.27	West Virginia	0.12
Maryland	0.25	Alaska	0.11
Rhode Island	0.24	Louisiana	0.09

[8] The correlation of the change in the indexes measures the degree of co-movement between changes in the state index and the national index. The correlations will not be affected by differences in trend growth.

[9] The correlations at neighboring leads and lags are often very similar, but the correlations continually decline as one moves farther away from the lead or lag with the highest correlation. The correlations for Alaska were negative for all the leads and lags in the 13-month span we considered. For Alaska, we report the correlation closest to zero during that time span. Alaska's business cycles have not been in sync with the national cycles; in terms of timing the closest positive correlation is between the change in the national index and the change in the state index 26 months prior.

FIGURE 2

Three-Month Change in Texas State Index



Shaded areas represent periods of decline in the national index described in *A National Index of Economic Activity.*

higher percentages of output in mining and natural resources and in wholesale trade.[10] Thus, differences in industrial structure help explain differences in the timing of growth among the states.

INFORMATION FROM THE STATES ADDS TO OUR UNDERSTANDING OF THE NATIONAL ECONOMY

The 50 state indexes in this article were designed to track economic conditions at the state level, and we use them to define state business cycles. But they are also useful in describing the geographic scope of national expansions and contractions, and they provide information about the near-term outlook for the national economy.

Changes in the State Indexes Track the Geographic Progression of National Recessions and Recoveries. The maps in Figure 3 show the progression of the most recent recession and recovery. The shading indicates which states experienced an increase, a decrease, or no change in their economic activity indexes at three-month intervals between March 2001 and June 2002—a period that spans the recession and early recovery. In March 2001 declines were concentrated in a limited number of states, mostly in the Midwest and South. By September, the recession had spread to almost every state in the nation, and most remained in recession through the end of 2001. By March 2002, however, most of the states in the West, Rocky Mountains, and Southeast were in recovery. By June 2002 almost all the states were in recovery.[11]

The other three national recessions since 1979 developed in a similar manner. Declines began in a relatively small group of states, most of them in one or two geographic areas. The initial group of states has not always been the same, but 12 states have consistently gone into recession before the nation, even if they have not been in the initial group.[12] Eventually, the economic decline spreads to almost all of the states and practically every section of the country.[13] Once the national recession is over, the number of states in decline drops quickly to just a few, and most states enter their recovery phase.

A Diffusion Index Summarizes the Pattern of Growth and Decline Among the States. The geographic

[10] We used a statistical technique known as an ordered probit to estimate the extent to which the industrial structure of the states influenced the timing of changes in their economic activity relative to the nation. States were given values between -2 and +6 based on the timing of the highest correlation of the change in their indexes with the change at the national level reported in Table 3. The other sectors included in the ordered probit analysis were manufacturing, transportation and utilities, financial services, other services, and retail trade. None of these had a significant effect on the timing of changes in the states' economies. The government sector was omitted.

[11] Researchers at the St. Louis Fed have also used the 50 state indexes with a slightly different definition of state recessions to illustrate the geographic spread of the four national recessions since 1979. See the article by Michael Owyang, Jeremy Piger, and Howard Wall. The authors use the state indexes in what is known as a regime-switching model to estimate whether a state is in the recession or expansion phase of the business cycle in every quarter from 1979 to 2002. In my 2005 article I used similarities among the cyclical components of these state indexes to redefine economic regions in the U.S.

[12] The 12 states are California, Indiana, Massachusetts, Michigan, Missouri, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Washington. The lead times have varied, however, for each state and each recession. This pattern is not likely to be the result of mere chance. If, for every national recession, each state had a 50 percent chance of going into recession before the nation, the probability of a state going into recession *early all four times* since 1979 would be $0.0625 = (0.5)^4$. This would imply that only about three states, not 12, would have entered every recession since 1979 before the nation as a whole.

[13] The 1990-91 recession was somewhat different. Even though most states went into recession, many in the Southwest and Rocky Mountain regions did not.

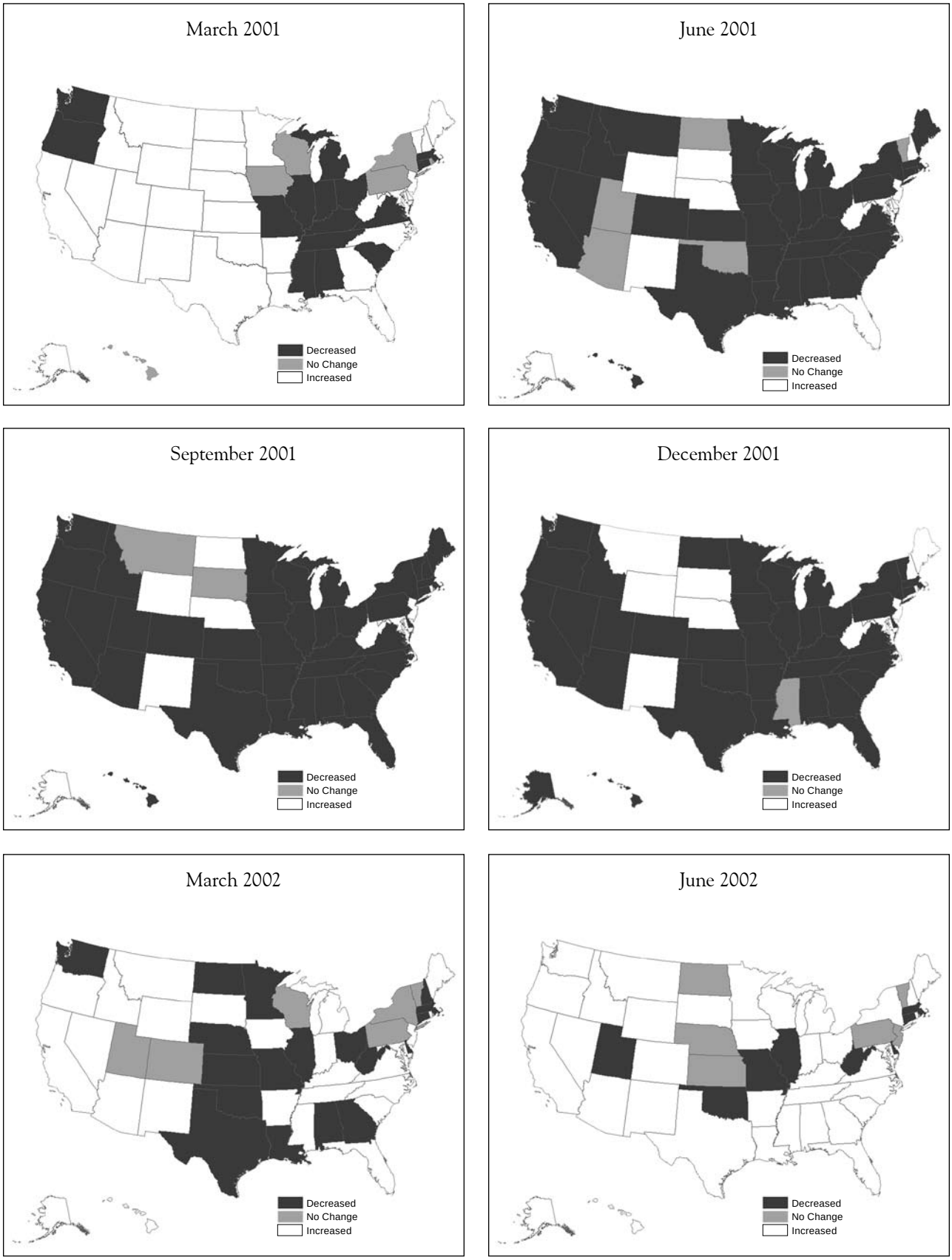
TABLE 3

Highest Correlation of Change in the State Index With Change in the National Index*

Period Relative to U.S. (= t)	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6
Number of States	7	13	23	2	1	1	1	1	1
	AR (0.73)	GA (0.83)	AL (0.73)	IL (0.84)	WV (0.63)	TX (0.55)	LA (0.31)	OK (0.31)	WY (0.23)
	DE (0.72)	IN (0.74)	AZ (0.81)	UT (0.71)					
	ID (0.54)	MD (0.77)	CA (0.65)						
	MT (0.34)	ME (0.71)	CO (0.56)						
	OR (0.68)	MI (0.72)	CT (0.75)						
	SD (0.52)	MO (0.83)	FL (0.77)						
	WA (0.74)	MS (0.77)	HI (0.21)						
		NE (0.67)	IA (0.72)						
		NH (0.71)	KS (0.71)						
		NV (0.69)	KY (0.78)						
		OH (0.77)	MA (0.70)						
		RI (0.67)	MN (0.79)						
		SC (0.84)	NC (0.84)						
			ND (0.35)						
			NJ (0.76)						
			NM (0.64)						
			NY (0.80)						
			PA (0.82)						
			TN (0.84)						
			VA (0.80)						
			VT (0.72)						
			WI (0.78)						
			AK (-0.15)						

* The correlation indicates the degree to which the change in the state's index moves with the change in the national index. For example, if the highest correlation occurs at t-1, this means that economic growth or decline in the state precedes growth or decline at the national level.

FIGURE 3


March 2001
Decreased
No Change
Increased
June 2001
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September 2001
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No Change
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December 2001
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No Change
Increased
March 2002
Decreased
No Change
Increased
June 2002
Decreased
No Change
Increased

dispersion of national recessions and expansions like that shown in Figure 3 can be summarized by a diffusion index of the 50 states. This index is simply the percentage of states in which the economy is expanding minus the percentage in which it is declining.[14] Diffusion indexes can be calculated using changes over any interval of time, although one-, three-, and six-month changes in the indexes are the most common.

Figure 4 presents the one-month and three-month diffusion indexes for the 50 states from 1979 to 2004. The one-month diffusion index represents the percentage of states whose indexes have increased in the last month minus the percentage whose indexes have declined. The three-month diffusion index represents the percentage of states whose indexes have increased over the most recent three-month period minus the percentage of states whose indexes have declined over that period. These indexes do not measure the magnitude of the change but only the scope of change across the states. The *degree* of increase or decrease in a state's index does not affect the diffusion index.

Diffusion indexes are commonly used to measure the breadth of a downturn or of an expansion in the overall economy or in a particular sector.[15] For example, the Bureau of Labor Statistics (BLS) produces a diffusion index for payroll employment, and the Federal Reserve Board produces one for industrial production by subtracting the percentage of subsectors that is declining from the percentage that is increasing.[16]

These types of indexes received considerable attention in the 1950s when Geoffrey Moore argued that they could be used as leading indicators because they tend to decline before the aggregate series in economic downturns and rise before the aggregate series in recoveries.[17] But this is not true for all diffusion indexes. Patricia Getz and Mark Ulmer compared turning points or peaks and troughs in the diffusion indexes for total private employment and for manufacturing employment to turning points in the two overall series from 1977 to 1989. They found *some* evidence that turning points in the diffusion index for manufacturing employment signaled turning points in overall manufacturing employment, but they found no such evidence for total employment.[18] James Kennedy at the Federal Reserve Board examined break-even or reference points in the diffusion index for industrial production, that is, points at

[14] Reported percentage changes in these indexes, like changes in most statistical series, are rounded to the first decimal place. Thus, any change less than 0.05 percent in either direction is recorded as no change.

[15] Diffusion indexes are also a standard way to summarize the responses to qualitative surveys in which respondents are asked whether some aspect of their business has increased, decreased, or remained unchanged. See the article by Michael Trebing and the OECD handbook.

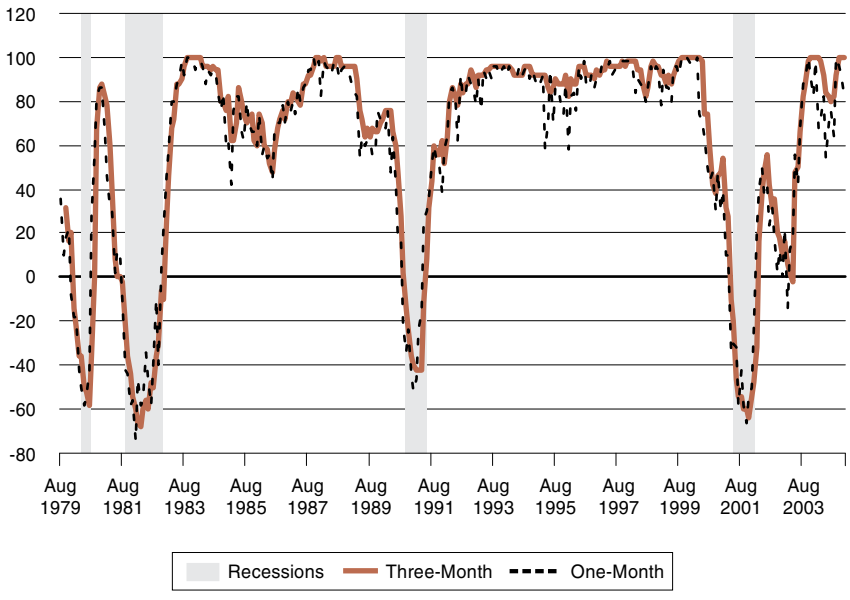
[16] The diffusion index of the 50 state economies differs in a significant way from these two. The state indexes are not components of the national index. The national index is estimated separately; it is not the sum or a weighted average of the 50 states, as in the case of employment and industrial production.

[17] See the two articles by Moore. The suggestion that diffusion indexes decline before the peak in the aggregate series and rise before the trough is only a historical observation, not a statement about the mathematical properties of diffusion indexes. See the article by Stefan Valavanis.

[18] The authors examined the relationship between the diffusion indexes and the levels of employment. But the logical comparison is with *growth rates*. See the article by Arthur Broida and the one by H.O. Stekler.

FIGURE 4

One-Month and Three-Month Diffusion Indexes for the 50 States



Shaded areas represent periods of decline in the national index described in *A National Index of Economic Activity*.

which the number of components that were increasing equaled the number decreasing. These break-even points rarely preceded turning points in industrial production, and more often than not, they lagged the turning points in the overall index.

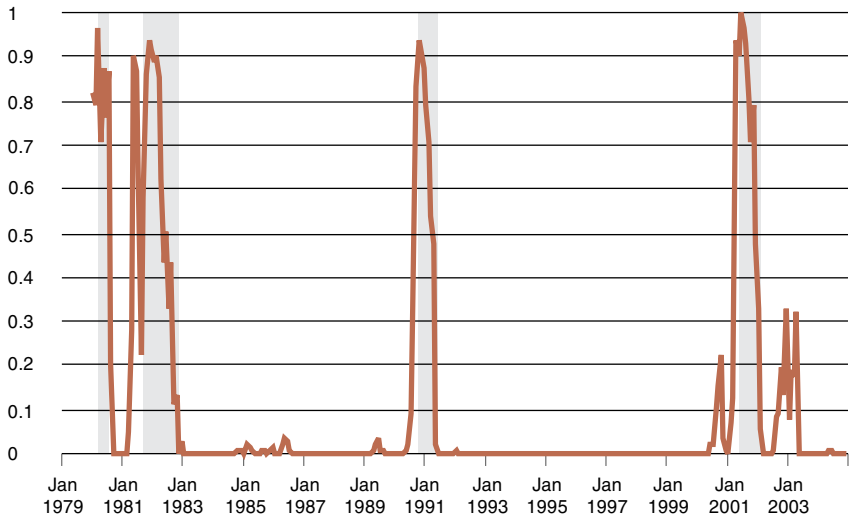
Our Diffusion Indexes of Economic Activity in the 50 States Do Better as Predictors of National Recessions. The one-month diffusion index has turned negative before the decline in the national index in all four recessions since 1979, with lead times of one to four months (Figure 4). The three-month diffusion index has not provided as much lead time as the one-month index. In three of the four recessions it turned negative between one and three months before the national index. In the other recession, it turned negative in the same month as the decline in the national index.[19]

The ability of a diffusion index to predict a coming recession can be formalized with a statistical model that uses the index to predict the probability of being in recession in the near future. It is obvious from Figure 4 that recessions are preceded by low readings of the diffusion index and by sharp declines in the index. We used the three-month diffusion index and the three-month change in that index to predict the probability of being in a national downturn three months in the future (Figure 5).[20] We would expect that when the probability climbs above 50 percent, the nation would be in a recession sometime in the near future. Indeed, the probability climbs above 50 percent before every national recession, with a lead time of one to four months. Moreover, there has been no occasion since 1979 when the probability climbed above 50 percent and the nation did not go into recession. At the end of recessions, the model's record of predicting recoveries is good but not perfect. Before the end of every recession except the one in 1980, the probability of being in recession in the near future drops below 50 percent. After the 1980 recession, the probability dropped below 50 percent in the first month of the recovery.

Diffusion Indexes Also Contain Information on the Course of the National Economy Beyond Turning Points. In his study of industrial production, James Kennedy found that the diffusion index provided valuable information for forecasting near-term growth in industrial production. We repeated Kennedy's exercise with the one-month and three-month diffusion indexes for the states and the monthly change in the national index. We got results similar to Kennedy's. (See *Information in the Diffusion Indexes about Changes in the National Index,* page 24.) Past changes in the national economic activity index provide information about the current month's change. If we add past values of the diffusion index for the 50 states, we get a better estimate of the current month's change in the national index. Thus, the diffusion index of the 50 states not only confirms the information in the national index, but it also provides independent information about the future course of the national economy.

FIGURE 5

Probability of Being in a National Recession in Three Months Based on the Three-Month Diffusion Index for the 50 States*



Shaded areas represent periods of decline in the national index described in *A National Index of Economic Activity.*

* The probability is based on the three-month diffusion index for the 50 states and the three-month change in that index.

[19] Both the one-month and the three-month diffusion indexes had a one-month negative reading in early 2003 that was not followed by a recession. This negative reading may have been associated with the uncertainty surrounding the buildup to and the beginning of the war in Iraq.

[20] We estimated the probability with a standard probit model. See the article by Andrew Filardo for the use of probit and other types of models to predict recessions. The one-month diffusion index and its three-month change send signals of recession using the probit model, but the signals are somewhat weaker. The one-month change also produces a false signal in February 2003 when the recession probability was slightly above 50 percent.

THE VIEW FROM THE STATES: A FULLER PICTURE OF REGIONAL AND NATIONAL BUSINESS CYCLES

The new indexes for the 50 states were developed as summary measures of state economic conditions. They provide valuable information not only about the economies of the individual states but also about the national economy. The indexes help us identify state business cycles. We can compare the state cycles with national cycles in terms of their timing and severity, and we can compare business cycles across states.

The state indexes also allow us to track the geographic development of national recessions and recoveries. Furthermore, diffusion indexes for the 50 states can signal the near-term onset of a national recession. This ability to forecast recessions is formalized in a model that predicts recession probabilities rather accurately. Furthermore, the diffusion indexes contain information about the course of the national economy beyond these turning points; they provide independent information about the next month's increase in the national index.

More than a half century ago, Arthur Burns and Wesley Mitchell argued that we should look at a large number of indicators when judging the condition of the U. S. economy. The NBER dating committee looks at a number of national series to set the dates for recessions and expansions, but they do not determine these dates until recessions or expansions are well underway. The new state indexes add another set of indicators for researchers and economic forecasters to look at. The individual state indexes and the diffusion indexes for the 50 states are available within a month of the time the data are collected. The indexes can confirm the information in the national data that are available at the time; they can illustrate the breadth of expansions and recessions; and they can provide valuable information about the near-term course of the national economy.

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A National Index of Economic Activity

In the late 1980s James Stock and Mark Watson developed a coincident index for the U.S. economy by identifying a common unobserved factor underlying the observed measures of economic activity for the nation.[a] The U.S. index in this paper is estimated by a Stock/Watson type model using national data that are also available at the state level.[b] Thus, the model produces a national index comparable to the state indexes. The Stock/Watson type model is commonly referred to as a single dynamic factor model and is based on the following set of equations.

For each of the observed variables:

$$\Delta x_t = a + b\,\Delta c_t + u_t$$

For the unobserved state of the economy:

$$\Delta c_t = d + f\,\Delta c_{t-1} + g\,\Delta c_{t-2} + e_t$$

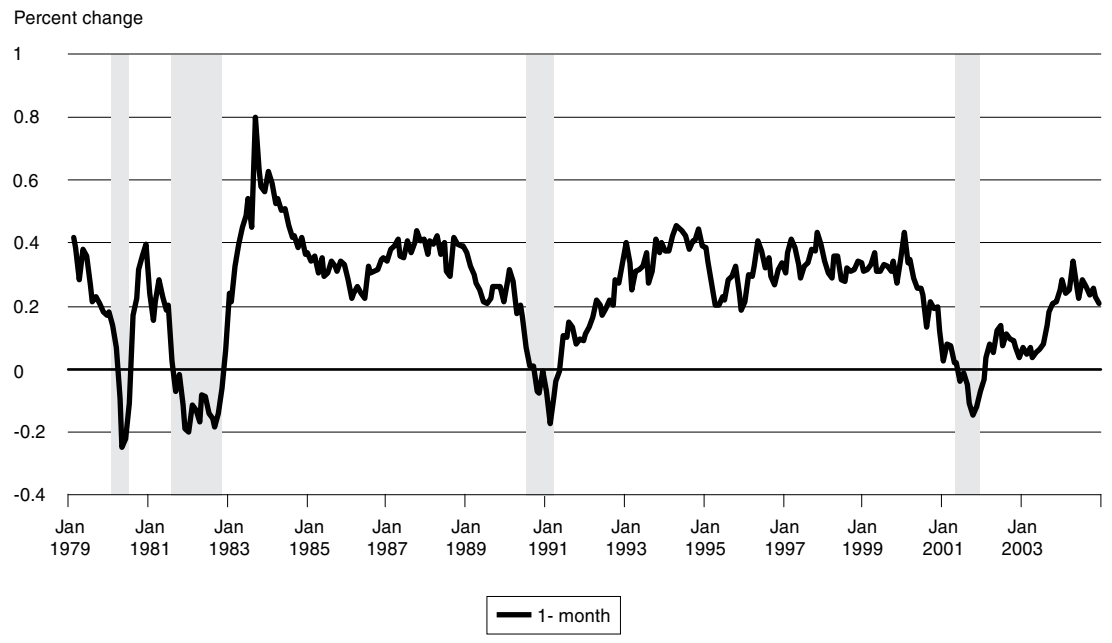
In the model developed for this article, Δx_t is the change in the log of employment, the change in the log of average hours worked, the change in the unemployment rate, and the change in real wages and salaries. Δc_t is the change in the log of the unobserved state of the economy or the coincident index that is to be estimated. The trend in the index is set to equal the trend in total gross state product for the 50 states.

The figure below shows the monthly percentage change in the national coincident index estimated from this model. There have been four periods since 1979 when changes in the national index were negative for several consecutive months; these four periods correspond closely to the four official recessions since 1979. Except for these four periods there has never been a monthly decline in the index. Thus, we can use the index to designate a set of business-cycle peaks and troughs for the national economy. The cumulative declines in the index from peak and trough have ranged from 0.5 percent (1990-91) to 1.8 percent (1981-82).

FIGURE

One-Month Change in National Index

(Shaded Areas Represent Recessions Based on NBER Dates)



[a] See the article by Stock and Watson. The Stock and Watson coincident index was developed as an alternative to the coincident index currently published by the Conference Board. The NBER no longer publishes the alternative Stock and Watson index; it was discontinued at the end of 2003.

[b] This is the same model referred to in my 2003 *Business Review* article.

A National Index of Economic Activity (continued)

The table below compares the peaks and troughs based on this national index to the peaks and troughs designated by the NBER dating committee. The peaks in the business cycle based on the index are one to two months later than the official dates set by the NBER dating committee. The troughs of the recession are either simultaneous with the NBER dates or two months later. This difference in timing between the index and the NBER dates may be due to the fact that the timing of the index is primarily based on the timing of nonfarm employment, which slightly lags the overall economy.[c]

Despite the differences in timing, the index contains valuable information about national recessions and expansions. The NBER typically announces the end of an expansion or recession five months or more after the end has occurred because it wants to make sure that a new phase of the business cycle has begun and that the original data do not simply represent the normal variation in the series. Therefore, any information before the announcement can be helpful in evaluating the state of the national economy.[d]

TABLE

Business-Cycle Peaks and Troughs
1979-2004

	Coincident Index of U.S. Economic Activity	NBER Business Cycle Dates	NBER Announcement Dates
Peak	March 1980	January 1980	June 1980
Trough	July 1980	July 1980	July 1981
% change in the index	**-0.7%**		
Peak	August 1981	July 1981	January 1982
Trough	November 1982	November 1982	July 1983
% change in the index	**-1.8%**		
Peak	September 1990	July 1990	April 1991
Trough	May 1991	March 1991	December 1992
% change in the index	**-0.5%**		
Peak	May 2001	March 2001	November 2001
Trough	January 2002	November 2001	July 2003
% change in the index	**-0.6%**		

[c] See Stock and Watson's article. Each of the other variables besides employment contributes significantly to the estimation of the coincident index for the nation. This is also true for most of the state indexes.

[d] See the article by Glenn Rudebusch for an illustration of the difficulty of timing recessions.

Information in the Diffusion Indexes about Changes in the National Index

In his examination of the diffusion indexes for industrial production, James Kennedy tested whether the diffusion indexes provide any independent information about future changes in overall industrial production. He estimated a regression of the one-month change in industrial production on 12 lags of changes in industrial production and 12 lags of various diffusion indexes for industrial production. He found that the lags of the diffusion indexes provided information beyond that found in past changes in industrial production itself.

We repeated Kennedy's experiment with the national economic index and the one-month and three-month diffusion indexes of the 50 states. The results of our regressions are found in the table below. A standard statistical test (an F-test) confirms that the 12 lags of the diffusion indexes add information to past changes in the national index that helps predict the current change in the national index. The statistics reported in the table are based on equations of the following form:

$$\Delta \ln(US)_t = \alpha + \sum_{i=1}^{12} \beta_i \, \Delta \ln(US)_{t-i} + \sum_{i=1}^{12} \gamma_i \, DIFF_{t-i}$$

where $(US)_t$ is the national index of economic activity described in this article and DIFF is either the one-month or three-month diffusion index for the 50 states.

TABLE

Results of Regression of One-Month Change in the National Index on 12 Lags in the Change in the National Index and 12 Lags in the Diffusion Indexes for the 50 States*

Dependent variables in the equation	Adjusted R-squared (R^2)	Probability that all the coefficients on the lags of the diffusion index equal zero (based on an F-test)
12 lags of changes in the national index	0.89	—
12 lags of changes in the national index and 12 lags of the one-month diffusion index	0.91	< 0.001
12 lags of changes in the national index and 12 lags of the three-month diffusion index	0.92	< 0.001

* The adjusted R^2 is a measure of the goodness of fit of the regression. A higher R^2 for the estimated equations with the diffusion indexes indicates a better fit with the inclusion of these variables. The probability measure from the F-test indicates that the improvement in the R^2 is statistically significant.