Revising the Texas Index of Leading Indicators

By Keith R. Phillips and José Joaquín López

We suggest changes to the Texas Leading Index that generally reflect the growing importance of services and globalization.

The Texas Leading Index (TLI), produced monthly by the Federal Reserve Bank of Dallas, combines eight measures that tend to anticipate changes in the Texas business cycle by about three to nine months.

The TLI was first published in the Dallas Fed's *Economic Review* in July 1988. The index's approaching 20th anniversary provides an apt occasion to review its real-time performance and look at ways it might be improved to keep up with the changing structure of the Texas economy and the availability of new data sources.

We find that the TLI performed well in the one recession since 1990 and, used in a model forecasting Texas employment, has done well in real time when compared with other forecasts. Although the current version of the TLI works reasonably well, we suggest changes to the TLI that generally reflect the growing importance of services and globalization and the reduced importance of energy production in Texas business cycles.

Measuring Performance

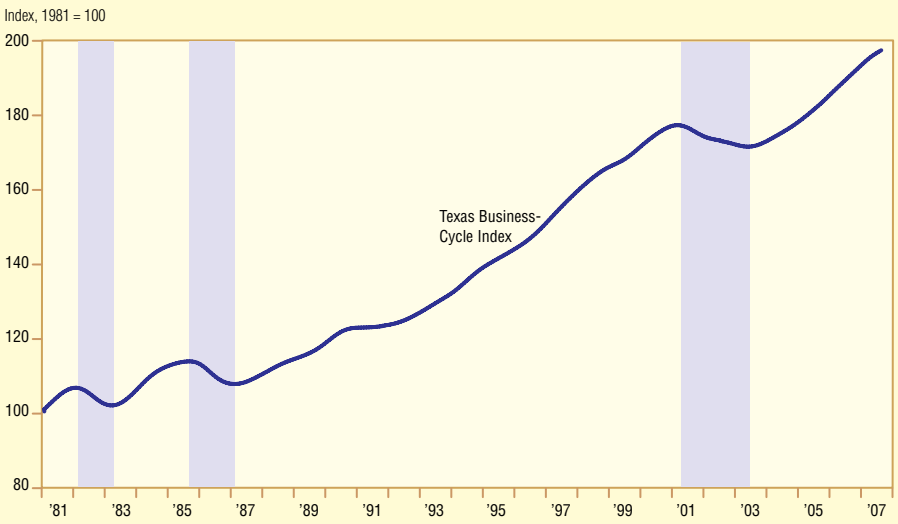
The current TLI's components are average weekly hours in manufacturing, an index of state help-wanted advertising, an index of real stock prices of Texas-based companies, initial claims for unemployment insurance, permits to drill oil and gas wells, the real price of West Texas Intermediate crude oil, a weighted exchange rate based on Texas exports and the U.S. leading index.

How did these indicators perform? A simple chart of the TLI plotted with turning points in the economy would seem to provide a good indication of how well the index did in foreshadowing changes in the business cycles. This analysis, however, encounters two complications. First, there's no state-level counterpart to the committee that determines business cycles for the nation, so we must first define the state economy's peaks and troughs. Second, revisions to the index can distort its real-time performance—what you see now may not be what you saw when it mattered most.

We rely on the Dallas Fed's Texas Business-Cycle Index to determine turning points for the state economy.[1] It shows three distinct periods of recession since 1981 (*Chart 1*). The 1982–83 slump followed a national downturn. The 1986–87 episode reflected the oil bust and real estate problems that followed. The 2001–03 recession started with troubles in the tech sector.

To map the national business cycle, the National Bureau of Economic Research (NBER) Dating Committee looks at a host of broad indicators but places particular emphasis on real GDP. Because the peaks and troughs are tied to particular months and real gross domestic product is quarterly, the NBER also focuses on monthly data, placing particular emphasis on two measures—real personal income less transfer payments, and nonfarm employment.[2]

Chart 1
Texas Experiences Three Recessions Since 1981



NOTE: Shaded bars indicate recession.
SOURCE: Federal Reserve Bank of Dallas.

As far as possible, the Texas Business-Cycle Index incorporates data on the state level that's similar to what the NBER uses at the national level.

The index combines the movements of three broad measures of the Texas economy—real state GDP, nonfarm employment and the unemployment rate. Personal income less transfer payments isn't available monthly at the state level, although the quarterly values are used in calculating Texas' quarterly real GDP.[3]

With a gauge of Texas' business cycles, we compare the TLI and the state's nonfarm employment with shaded areas that indicate recessions (*Chart 2*). Looking at the period since 1990, the TLI turned down 13 months prior to the recession that began in April 2001 and turned up eight months prior to the expansion that began in July 2003.

The TLI provides a partial real-time representation because revisions are allowed for only the previous seven months. For example, the data currently go through September 2007, including revisions from February. With the October TLI, revisions will extend from March.

This system incorporates recent data updates but doesn't allow routine annual revisions to impact the historical data. As a result, the index retains key information over time. Regarding the recession signal, for example, real-time TLI data through November 2000 were very close to the current version and clearly showed a decline in the index beginning in April 2000 (*Chart 3*).[4]

While the TLI foreshadowed the 2001 recession, the index was quite volatile. It had brief periods of downturn that were followed by slower job growth but not actual recessions. For example, the TLI's decline from May to November 1998 wasn't followed by recession, but job growth did slow sharply from an annual rate of 3.6 percent in the second half of 1998 to 1.1 percent in the first half of 1999. The index also turned down for several months in 1987–88, 1993 and 1994–95.

A recession rule is one way to deal with these events. One version might require the leading index to decline for at least four months, with a cumulative decrease of at least 3.7 percent, to warrant a recession signal. Following this rule would have meant no false signals in the past and still given us a lead time of four months for the recession that began in 2001 and at least five months for the downturn that began in 1981. However, the signal would have lagged behind the recession that began in late 1986 by four months.

Infrequent recessions limit the number of observations to judge leading indexes' performance. While an index or component must perform well at turning points, more information can be gathered about its relationship to the economy by examining how the series tracks some economic measure on a month-to-month basis.

With so few recession observations, we prefer to use a regression model to analyze all past TLI movements and forecast whether a recession is likely to occur.

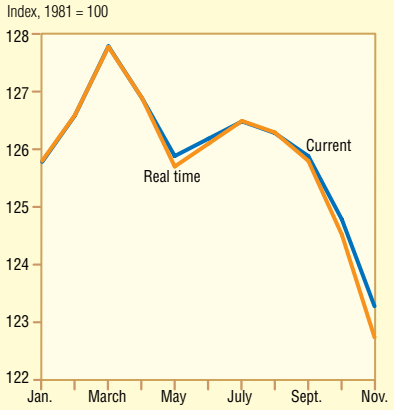
Nonfarm employment gives a timely, broad reading on the Texas economy. The Dallas Fed uses changes in employment and the TLI to forecast job growth. Looking at the forecast's real-time performance provides an idea of the leading index's ability to anticipate movements in the Texas economy.

Since 1994, the Dallas Fed job growth projections have been included in the Arizona State University business school's Western Blue Chip Economic Forecast. Each year, the publication looks back to determine which annual job-growth forecast turned out to be closest to the actual. Among an average of eight Texas forecasters, the Dallas Fed model was most accurate in seven of the past 12 years. The next most accurate forecaster was closest in three of those years.

Revising the Index

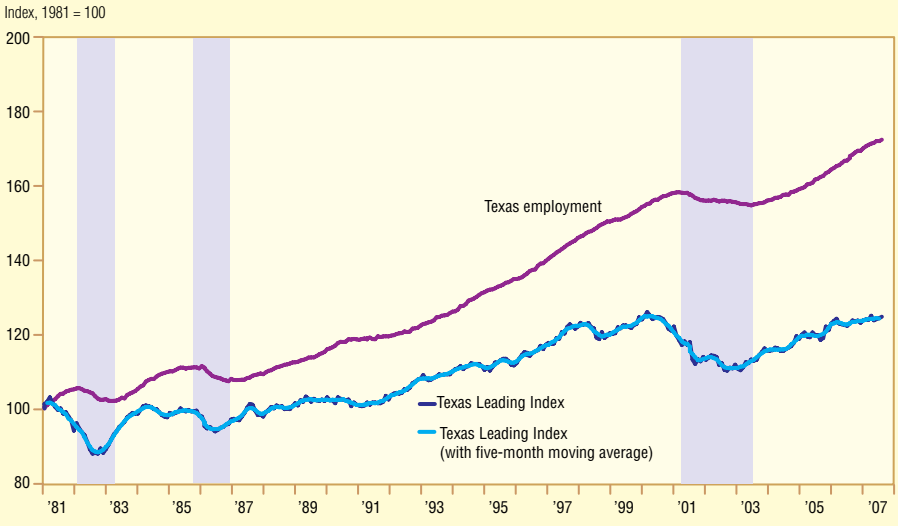
Traditionally, leading indexes have been weighted toward measures of the manufacturing industry, a more cyclically sensitive part of the economy. In recent years, however, Texas has joined the nation in a shift away from goods production and toward the service sector.

Chart 3
Texas Leading Index Turns Down in Real Time, 2000



SOURCE: Federal Reserve Bank of Dallas.

Chart 2
Texas Leading Index Signals Recent Recession



NOTE: Shaded bars indicate recession.
SOURCE: Federal Reserve Bank of Dallas.

Dallas Fed economist D'Ann Petersen noted an important implication of this development: "Shifting the employment base from goods to services changes the way economies perform when hard times hit. Employment usually holds up better in services than in goods when economies slip into recession."[5]

Have changes in Texas' economic structure given rise to new leading indicators? Have some original indicators lost their predictive power? To account for structural changes in the Texas economy, we test the predictive ability of new variables and retest the forecasting properties of the original components. To do this, we adapted the scoring procedure used by the Conference Board for the U.S. leading index, which assesses data on consistent timing, economic significance, statistical adequacy, smoothness, timeliness and conformity.[6]

We considered seven potential variables for inclusion in a revised TLI. Four of them had turning points that led changes in the Texas business cycle and did well on our statistical evaluations. They are:

• **Consumer confidence.** Available since 1981, the Conference Board's Consumer Confidence Index for the West South Central region measures public sentiment about the economy in Texas, Arkansas, Louisiana and Oklahoma. It peaked six months before the recessions of 1982 and 2001 and 10 months prior to the 1985 recession (*Chart 4A*).

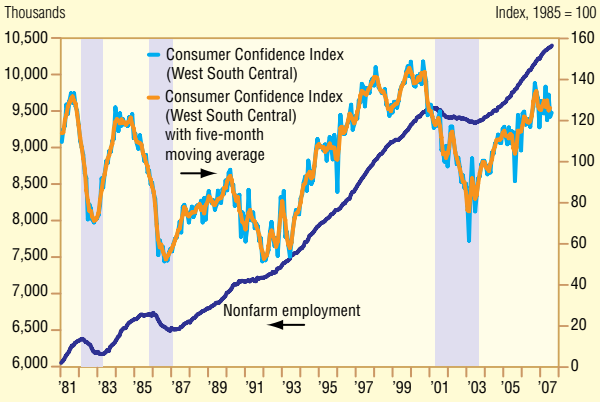
• **Real retail sales.** While real retail sales were included in the 1990 revision, the Department of Commerce stopped producing monthly data by state in the mid-1990s. The Texas Comptroller of Public Accounts releases quarterly retail sales estimates, which the Dallas Fed converts to monthly data through sales tax rebates and retail employment.[7] Real retail sales in the state peaked in March of 2000, one year before the most recent recession (*Chart 4B*).

• **Real exports.** Available from the Census Bureau since 1994, Texas real exports started declining seven months prior to the last state recession (*Chart 4C*).

• **Jobs in employment services.** Businesses will often let go of temporary workers first when demand weakens and hire them first when conditions improve (see "Spotlight," page 10). Jobs in employment services, which includes temporary employment agencies and job placement

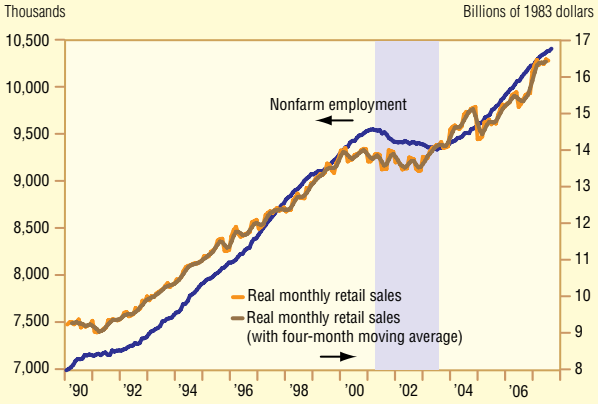
Chart 4
Top Four Indicators for Revised Texas Leading Index

A. Consumer Confidence Leads Changes in Texas Business Cycle



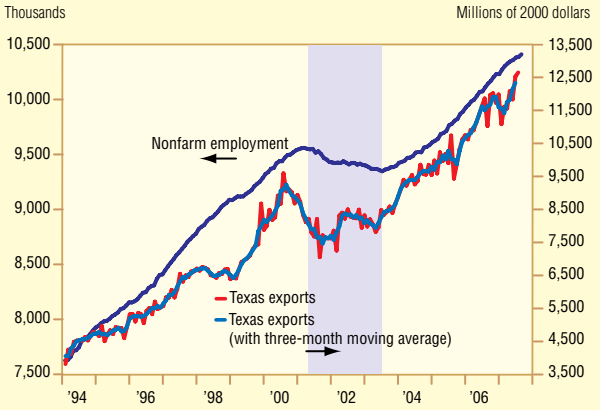
SOURCES: Federal Reserve Bank of Dallas; Conference Board.

B. Retail Sales Show Leading Ability



SOURCES: Federal Reserve Bank of Dallas; authors' calculations with data from the Texas Comptroller and Dallas Fed.

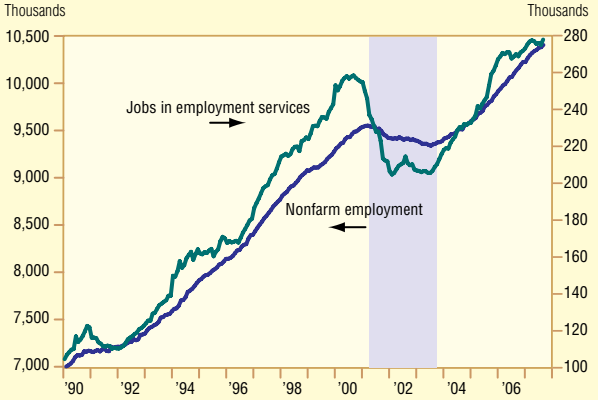
C. Texas Exports Move Ahead of Overall Economy



SOURCES: Federal Reserve Bank of Dallas; Census Bureau.

NOTE: Shaded bars indicate recession.

D. Jobs in Employment Services Lead Overall Job Growth



SOURCE: Federal Reserve Bank of Dallas.

services, started to decline six months prior to the most recent recession (*Chart 4D*).

We tested three other potential leading indicators—the real value of nonresidential construction, a new measure of help-wanted advertising that takes into account the shift to the Internet, and jobs in business and professional services. They didn't show a statistically significant leading ability or weren't as significant as a similar variable already included.

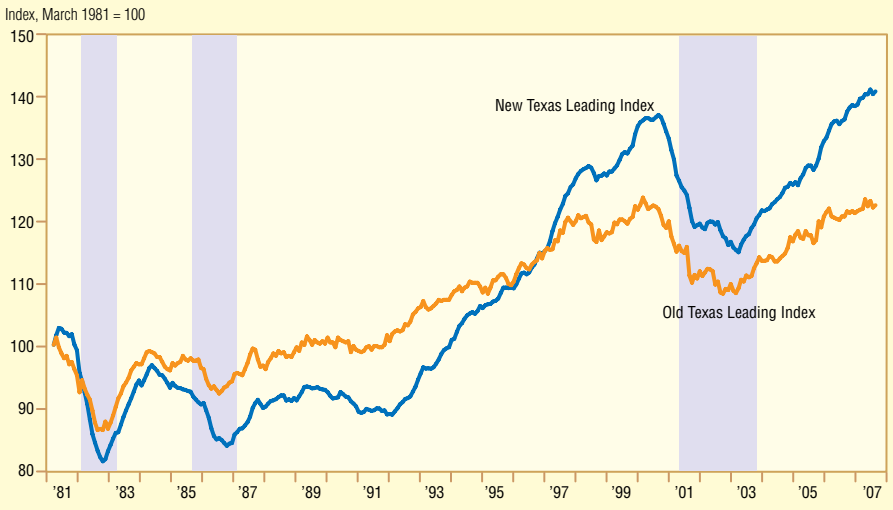
Real nonresidential construction contract values, which can reflect fixed business investment, had cycles consistent with the Texas business cycle but failed statistical tests on its leading capacity. A help-wanted index adjusted to account for the migration of advertising to the Internet wasn't as significant as the standard measure using percent changes.[8] Jobs in employment services showed better performance than jobs in the broader category of business and professional services.

What about the existing indicators? Four of them failed our scoring procedure, suggesting they should be dropped from the index. Somewhat surprisingly, the U.S. leading index wasn't significant. Two other indicators, real oil prices and well permits, didn't show a statistical leading relationship with Texas employment, most likely a reflection of the energy industry's declining importance in the Texas economy.

We will monitor the new Texas Leading Index over the next 12 months to study its real-time performance.

Chart 5

New Texas Leading Index Smoother Than Current Index



NOTE: Shaded bars indicate recession.

SOURCE: Federal Reserve Bank of Dallas.

Results for the Texas Trade Weighted Value of the Dollar Index were mixed. Our tests showed some statistical significance over the entire period, but it seems to vanish after 1990. The addition of real exports provides a more direct measure of globalization's impact on the Texas business cycle.

Evaluating the New Index

What emerges is a new Texas Leading Index—still experimental—that retains average weekly hours in manufacturing, help-wanted advertising in the state, real stock prices of Texas-based companies and initial claims for unemployment insurance. To these holdovers, we add regional consumer confidence, real retail sales, real exports and jobs in employment services.[9]

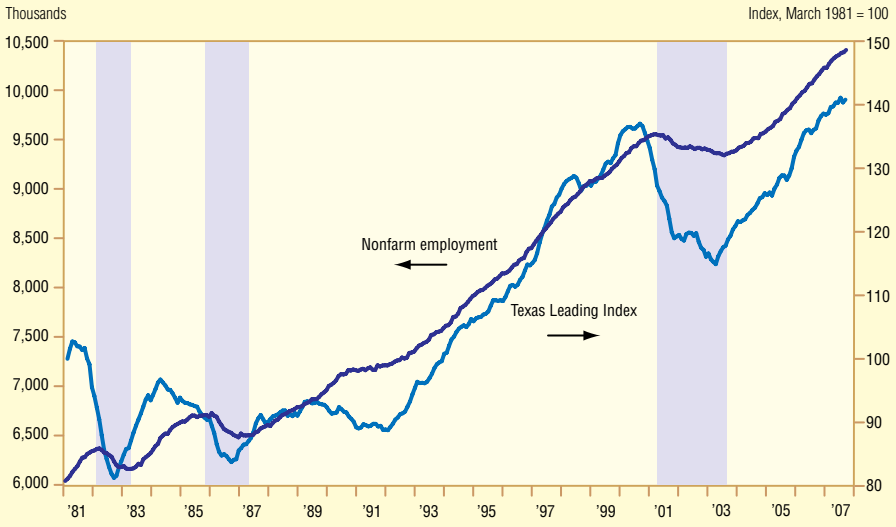
The new TLI is smoother, yet still leads the Texas economy's turning points (*Chart 5*). It declines somewhat more steeply than the old one prior to the slowdown in 1991. While this might be regarded as a false signal, this period was very close to a recession. From October 1990 to March 1992, jobs grew at an annual pace of only 0.7 percent, and real state GDP declined slightly in fourth quarter 1990 and first quarter 1991. The Texas Business-Cycle Index was barely positive, which means that the economy just missed a recession.

The new TLI has a close relationship with Texas employment (*Chart 6*). In the forecasting model of Texas employment, successfully used in the Western Blue Chip survey, substituting the new TLI for the old TLI results in a slightly lower standard error of the estimate. While this gives some support to the new TLI, we won't immediately replace the existing index but will monitor the new TLI over the next 12 months to study its real-time performance. A comparison over at least a year will be needed to accurately gauge the performance of the new index.

What signals are we getting from the revised TLI? The latest reading—for the three months ending in October 2007—ebbed slightly (*Chart 7*). A sharp drop in average weekly hours in manufacturing led the decline, followed by less dramatic reductions in consumer confidence, help-wanted advertising and Texas stock prices. Texas exports and retail sales sent positive signals.

Overall, movements in the index suggest that job growth in Texas will likely slow over the next three to nine months

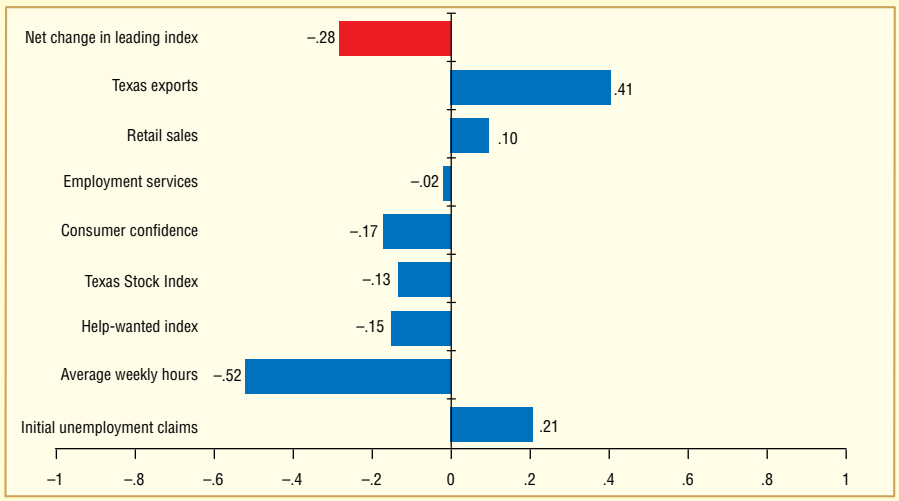
Chart 6
New TLI Leads Texas Job Growth



SOURCE: Federal Reserve Bank of Dallas.

Chart 7
New TLI Declines in Recent Months

(Net contribution to index, August–October 2007)



SOURCES: Federal Reserve Bank of Dallas; Conference Board; Census Bureau; authors' calculations with data from the Texas Comptroller and Dallas Fed.

but a recession remains unlikely. The Texas forecasting model based on changes in the index predicts job growth will be 2.1 percent in 2008, down from 3.3 percent in 2007.

Phillips is a senior economist and policy advisor and López is an economic analyst at the San Antonio Branch of the Federal Reserve Bank of Dallas.

Notes

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[1] For a description of the Texas Business-Cycle Index, see "A New Monthly Index of the Texas Business Cycle," by Keith R. Phillips, *Journal of Economic and Social Measurement*, vol. 30, no. 4, 2005.

[2] See www.nber.org/cycles/recessions.html.

[3] For a description of quarterly Texas real GDP, see "A New Quarterly Output Measure for Texas," by Franklin D. Berger and Keith R. Phillips, Federal Reserve Bank of Dallas *Economic Review*, Third Quarter 1995.

[4] Data were published in "Regional Update," Federal Reserve Bank of Dallas *Southwest Economy*, January/February 2001. See dallasfed.org/research/swe/2001/swe0101e.pdf.

[5] "Texas Transitions to Service Economy," by D'Ann Petersen, Federal Reserve Bank of Dallas *Southwest Economy*, May/June 2007.

[6] The Conference Board's scoring process is described in more detail in its *Business Cycle Indicators Handbook*, available at www.conferenceboard.org/publications/describebook.cfm?id=852. Our measure of conformity differs from the one used by the Conference Board. We statistically test the relationship between movements in a candidate series and movements in Texas employment at least three months later. The series scores high on conformity if its changes are followed by changes in employment three, four, six or more months later.

[7] Monthly retail sales were estimated using quarterly retail sales and monthly sales tax rebates from the Texas Comptroller of Public Accounts and retail trade employment.

[8] An article in the Federal Reserve Bank of San Francisco's *Economic Letter*, Jan. 26, 2005, recommends using a Hodrick-Prescott (HP) filter to separate out trend movements and to then use cyclical movements as the leading indicator. We use the HP filter to separate out the trend in the Texas help-wanted index, although the current index construction and evaluation use percent changes in the components, which is another way to eliminate the trend in the data.

[9] Several of the new components are filtered with a three-month moving average before inclusion in the index. This is necessary because of a high degree of noise in the data, which would have resulted in very low weights. Tests for the months for cyclical dominance in each of these variables reveal that at least a three-month moving average is needed for the trend-cycle movements to overcome the noise in the series. The Months for Cyclical Dominance measure is produced with the X-11 seasonal adjustment process.