

Methodology Notes: South Carolina Index of Leading Economic Indicators

In an effort to monitor and forecast the South Carolina economy, the South Carolina Index of Leading Economic Indicators (SC Leading Index) was constructed. Typically, leading indices provide an indication of the behavior of the economy for the upcoming three to six months. This document outlines the specific methodology employed in the development of both the SC Index of Leading Economic Indicators as well as the SC Index of Coincident Economic Indicators (SC Coincident Index), which was built concurrently.

Introduction

Many states and localities adopt the Conference Board's Methodology to build their own leading index. The SC Leading Index is also modeled after this methodology with an additional adjustment to account for the current economic situation of the state—an adjustment procedure in which the SC Leading Index incorporates the variation of the monthly percentage change of the SC Coincident Index. This adjustment is achieved by incorporating the standard deviation of the percent change of the state's Coincident Index.

Methodology

The SC Leading Index is based on the Conference Board's Leading Index Methodology with additional adjustments aimed at incorporating the state's current economic situation. The SC Coincident Index is based on the same methodology. All indicators of monetary values are inflation-adjusted based on the January 2000 US dollar value.

The specifics for the methodology are described as follows:

Step 1: Calculate the Month-to-Month Percent Changes (x_t) for Each Index Component (X)

Situation 1: If the variable is not already in a percent change form, use equation (1) which is a symmetric alternative to the conventional percent change formula. Symmetrical treatment of positive and negative changes means that when a certain percent increase is followed by an equal percent decrease, the variable has returned to its original value.

$$x_t = 200 * \frac{X_t - X_{t-1}}{X_t + X_{t-1}} \quad (1)$$

Situation 2: If the variable is already in a percent change form or is an interest rate or the variable contains zero or negative values, use simple arithmetic differences.

In either situation 1 or 2, the Month-to-Month Percent Changes need to be re-directed to show an improvement as a positive change and a worsening as a negative change. This is done by multiplying by negative one (-1) those Month-to-Month Percent Changes of components whose values are negatively correlated with "good" outcomes. The unemployment rate is an example of such a component.

Step 2: Adjust Monthly Component Changes to Remove Volatility

Weight the Month-to-Month Percent Change for each index component so that the more variation or volatility a component has the less proportion it contributes to the final index.

Step 2.1: Take the inverse of each component's standard deviation $\left[\frac{1}{stddev(x_t)} \right]$.

Step 2.2: Sum the inverted standard deviations $\sum \left[\frac{1}{stddev(x_t)} \right]$.

Step 2.3: Develop volatility weights by dividing the inverted standard deviations by the sum of all inverted standard deviations. The volatility adjustment weights all sum to one.

$$v_x = \left(\frac{1}{\sum \left(\frac{1}{stddev(x_t)} \right)} \right) * \left(\frac{1}{stddev(x_t)} \right) \quad (2)$$

where v_x is the volatility adjustment weight of the x^{th} index component.

Step 2.4: Applying the result of equation (2), a new variable is created for each index component by multiplying each of the symmetrical Month-to-Month Percent Changes (X_t) calculated in Step 1 by v_x . By its meaning, this variable can be thought of as the Month-to-Month Adjusted Change.

Step 3: Sum Individual Components into a Total Index

By summing up the Month-to-Month Adjusted Changes for each component using equation (3), a single variable (i_t) that represents all the components is obtained.

$$i_t = \sum(v_x * X_t) \quad (3)$$

Step 4: Obtain Coincident-Volatility Adjusted Month-to-Month Adjusted Changes for the Leading Index

For the SC Coincident Index, there is no need for further adjustment, so Step 4 may be omitted.

Step 4.1: For the SC Leading Index, calculate the index standardization factor which is expressed as the ratio of the standard deviation of the Sum of the Month-to-Month Adjusted Changes for the SC Coincident Index to the standard deviation of the Sum of the Month-to-Month Adjusted Changes of the SC Leading Index.

Step 4.2: Multiply each of the values of the Sum of the Month-to-Month Adjusted Changes (i_t) obtained from Step 3 by the index standardization factor calculated in Step 4.1. The resulting variable is the Coincident-Volatility Adjusted Month-to-Month Adjusted Changes (S_t) as shown in Equation (4).

$$S_t = i_t * \frac{stdev_{coin}}{stdev_{lead}} \quad (4)$$

where $stdev_{coin}$ is the standard deviation of the Sum of the Month-to-Month Adjusted Changes for the SC Coincident Index, and $stdev_{lead}$ is the standard deviation of the Sum of the Month-to-Month Adjusted Changes of the SC Leading Index. $[\frac{stdev_{coin}}{stdev_{lead}}]$ is the index standardization factor.

Step 4 incorporates the volatility of the coincident index into the leading index so that the more monthly changes are observed in the coincident index as compared to those in the leading index the more weight the coincident index will have on the leading index. Since the leading index signals

the future economic situations, the future is effectively influenced by the present which is indicated by the coincident index.

Step 5: Compute the Index (I_t) Using Symmetric Change

First, set the initial month's (January 2000) index value, I_t , equal to 100. For the SC Leading Index, use the symmetric change equation (5) for the subsequent months.

$$I_t = I_{t-1} * \frac{200+S_t}{200-S_t} \quad (5)$$

where S_t is the t^{th} month's value of the Coincident-Volatility Adjusted Month-to-Month Adjusted Changes obtained from Step 4.

For the SC Coincident Index, use the following symmetric change equation (6) for the subsequent months.

$$I_t = I_{t-1} * \frac{200+i_t}{200-i_t} \quad (6)$$

where i_t is the t^{th} month's value of the Month-to-Month Adjusted Changes obtained from Step 3.

Step 6: Re-base the Index to Equal 100 in the Year 2000

Take the average of the index, \bar{I} , for the 12 months of the base year (January to December, 2000). Divide each value of the index, I_b , by this average and then multiply the result by 100. This re-based index is the final SC Leading Index (or SC Coincident Index).

Leading Index Components

The SC Leading Index contains five components of which four cover monthly South Carolina data from January 2000 to the present and the fifth component is a national stock index which covers the same period of time. The components were chosen based on both their theoretical and practical capabilities to predict how the economy will do in the next three to six months as well as their availability, timeliness, and likelihood of not being subject to large revisions. The five leading indicators are as follows:

Initial Claims for Unemployment Insurance: The South Carolina weekly initial claims for unemployment insurance are averaged on a monthly basis to obtain unbiased values for both four-week and five-week months. The data comes from the US Department of Labor.

South Carolina Residential Building Permits: These are state level monthly building permit units. The data is obtained from the US Census Bureau.

South Carolina Residential Building Permit Valuation: These are state level monthly building permit valuations. The values are inflation-adjusted based on January 2000 US dollar values. The data is also obtained from the US Census Bureau.

South Carolina Manufacturing Average Weekly Hours: These are state level average weekly hours for manufacturing workers. The data source is the US Department of Labor.

Dow Jones Composite Average: This is a stock index representing the monthly closing values of the Dow Jones Industrial Composite Index from January 2000 to the present. The data is obtained from economagic.com.

Coincident Index Components

The SC Coincident Index consists of three components which cover monthly South Carolina data from January 2000 to the present.

South Carolina Unemployment Rate: These are seasonally adjusted state level monthly unemployment rates. The data source is the US Department of Labor.

South Carolina Retail Sales: These are the state level monthly retail sales. All values are inflation adjusted based on the US dollar value as of January 2000. The data is obtained from the South Carolina Department of Revenue.

Total Nonfarm Employment: These are seasonally adjusted monthly state level total employment figures for the nonfarm sector. The data source is the US Department of Labor.

Future Revisions

In order to improve the performance and capabilities of the South Carolina Index of Leading Indicators, a number of modifications to it are currently under consideration. These include: seasonally adjusting remaining index components where necessary; constructing a South Carolina stock index; and adding additional components to both the leading and coincident indexes which cover consumer expectations,

available job postings, business dynamics, and accommodations.

Data availability and timeliness are issues which cannot be overlooked in constructing an index. While both seasonally adjusted and unadjusted data on the national level are readily available, little adjusted data on the state level is available. Seasonal adjustment is required for several remaining index components, including initial claims for unemployment insurance, monthly building permit units and valuations, manufacturing average weekly hour, and retail sales. Preparations are under way to utilize the X-12 ARIMA process developed and serviced by the US Census Bureau to conduct these seasonal adjustments.

Another change being planned currently is the replacement of the Dow Jones Composite Average by a stock index that is composed of publicly traded South Carolina companies. This localized stock index will be able to enhance the SC Leading Index's capability to signal the local economic directions and trends.

Finally, additional components will be added to both the leading and coincident indexes. Indicators such as the Conference Board's Help Wanted Online data series for South Carolina, accommodations data, new business incorporations data, and consumer expectations data will be identified, evaluated, and added into the indexes based on their quality and timely availability.