Use of State Coincident Indexes

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* The views expressed today are my own and not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

Plan for today

• Provide a brief overview of our state coincident index methodology

• Preview an article that identifies state business cycles using the historical coincident index estimates

• Consider the U.S. and state business cycles using real-time estimates of the coincident indexes; most important for forecasting

• Weave a discussion of challenges and caveats throughout

• End with a mention of our research agenda
An overview of our state coincident index methodology (and U.S.)

- A dynamic single-factor model, à la Stock & Watson, is used with a Kalman filter/smooher to handle mixed frequency data.

- Seasonally adjusted estimates of four monthly and quarterly data series are standardized to have a mean of zero and a standard deviation of one.

- Key References:

Our model extracts a signal from noisy data and produces a single measure representing the state’s overall economy.
The coincident index is designed to represent the comovement of four state-level economic statistics.

- Nonfarm payroll employment (monthly)
- Unemployment rate (monthly)
- Average hours worked in manufacturing by production workers (monthly)
- Wage and salary disbursements deflated by the U.S. city average consumer price index (quarterly)

Philadelphia Fed Coincident Indexes
Index: July 1992 = 100, SA

Note: Components include the unemployment rate, payroll employment, average hours worked in manufacturing, and real wages and salaries.
Historical identification of state business cycles: A preview

- Article is forthcoming in the Q4 edition of *Economic Insights* from the Federal Reserve Bank of Philadelphia.

- Analysis is based on June 2016 vintage of coincident indexes, but considers data only through December 2015 due to the typical extent of annual data revisions.

- National recessions identified with the coincident index align well with NBER designations; state recessions fit intuition.

- Fewer energy states are recently (currently?) in recession compared to the number of energy/farm states in recession in the mid-1980s.

Our national index aligns well with NBER recessions

Pennsylvania’s as well, but state indexes are inherently more volatile

Determining state peaks and troughs

Five examples drawn from the double-dip recessions are representative.

**Criteria:**

1. A state business cycle peak is determined as the last month in which the index has a positive monthly change prior to a period of at least four months in which the sum of the monthly changes is negative and its absolute value equals or exceeds the simple variance in that state’s coincident index.

2. A state business cycle trough is determined as the last month of a qualifying recession (and one with a negative monthly change) prior to a period of at least four months in which the sum of the monthly changes is positive and its absolute value equals or exceeds the simple variance.

3. A period with offsetting monthly changes (a net change of zero for two or more months) at the start of a qualifying recession is treated as part of the prior expansion. Likewise, a period of two or more months of no net change at the end of a qualifying recession is treated as part of the subsequent expansion.

**Examples:**

- Pennsylvania followed the nation into and out of both recessions — one of 36 states to do so.
- Florida avoided both recessions. Although its growth rate was well below its norm, the state economy continued to expand.
- Connecticut also avoided both recessions. It did experience a seven-month decline (shaded yellow) during the second U.S. recession that was too shallow to qualify as a recession.
- Illinois experienced one long recession. While the U.S. enjoyed a brief intervening expansion, Illinois was one of two states that declined throughout. Three other states escaped that fate by virtue of a bare minimum four-month expansion.
- New Hampshire avoided the first recession because of an insufficient duration, although it had a sufficiently deep decline (shaded yellow). Eight other states avoided the first recession with little or no decline, but not the second, while Alaska experienced the first and avoided the second.

**Sources:** Federal Reserve Bank of Philadelphia and National Bureau of Economic Research
2015 energy state recessions are fewer than in the mid-1980s
Instances of state recession (by recession period)

No state avoided the Great Recession of 2007 to 2009
Length of each state’s recession (in months)

Source: Federal Reserve Bank of Philadelphia
Note: The duration of a recession is the number of months from the peak to the trough. The Great Recession was 18 months long for the nation as a whole.
Real-time analysis and other problems:
In brief

- Identifying state business cycles in hind-sight is easier than in real-time, or examining the coincident index “tail”

- A heavy reliance on employment data misses signals from sectors, like finance, that are important to some states

- The impacts of rerending (and not revariancing) affect the interpretation of the indexes – DO NOT RANK states

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**Philadelphia Fed Coincident Indexes**

3-Month Diffusion Index

Source: Federal Reserve Bank of Philadelphia

* Index represents percentage of respondents reporting more than a 0.5% increase minus percentage reporting less than a 0.5% decrease.
### Data revisions can be significant at turning points

One-month diffusion index viewed in real-time across multiple vintages

<table>
<thead>
<tr>
<th>Date</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov</td>
<td>35</td>
<td>56</td>
<td>72</td>
<td>58</td>
</tr>
<tr>
<td>Dec</td>
<td>64</td>
<td>65</td>
<td>58</td>
<td>50</td>
</tr>
<tr>
<td>Jan</td>
<td>56</td>
<td>57</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>Feb</td>
<td>54</td>
<td>57</td>
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<td>38</td>
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<td>Mar</td>
<td>50</td>
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<td>Apr</td>
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<td>Jun</td>
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<td>Jul</td>
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<td>Aug</td>
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<td>Sep</td>
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<td>Oct</td>
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<tr>
<td>Nov</td>
<td>34</td>
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<td>22</td>
</tr>
<tr>
<td>Dec</td>
<td>34</td>
<td>28</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

**Benchmark Revision:** 34 Jan, 28 Feb, 28 Mar, 28 Apr, 28 May, 28 Jun, 28 Jul, 28 Aug, 28 Sep, 28 Oct, 28 Nov, 28 Dec

Source: Federal Reserve Bank of Philadelphia

### As the year progressed, the coincident index became negative in February 2008 for more and more states

<table>
<thead>
<tr>
<th>Vintage</th>
<th>States in recession, and stayed in (as of January 2009)</th>
<th>States in and out of recession</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008: February</td>
<td>Nevada, Pennsylvania &amp; Rhode Island</td>
<td>Alaska, Idaho, Louisiana, Mississippi, New Mexico &amp; West Virginia</td>
</tr>
<tr>
<td>2008: May</td>
<td>Arizona, Florida, Indiana, Kentucky, Maine &amp; Michigan</td>
<td>Louisiana &amp; Mississippi</td>
</tr>
<tr>
<td>2008: December</td>
<td>Connecticut, Delaware, Hawaii, Illinois, Minnesota, Montana &amp; Washington</td>
<td>Louisiana, Mississippi, New Mexico, &amp; New Jersey</td>
</tr>
<tr>
<td>2009: January</td>
<td>Alabama, Arkansas, Georgia, Maryland, New Hampshire, Ohio, Oregon, South Carolina, Tennessee, Utah, Vermont &amp; Wisconsin</td>
<td>Idaho</td>
</tr>
</tbody>
</table>

Source: Federal Reserve Bank of Philadelphia
Example of three states with large finance sectors
(average share of nominal GDP – 1997 through 2015)

<table>
<thead>
<tr>
<th>State</th>
<th>Finance</th>
<th>Manuf.</th>
<th>Prof.</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>20%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td>29%</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>41%</td>
<td></td>
<td>11%</td>
</tr>
<tr>
<td>NY</td>
<td>30%</td>
<td></td>
<td>12%</td>
</tr>
</tbody>
</table>

Source: Bureau of Economic Analysis

GDP in these states turned negative earlier than the nation
(annual change in nominal GDP – 1997 through 2015)

Source: Bureau of Economic Analysis
Profits are twice payrolls in New York’s financial sector (annual change in nominal GDP for finance and its components – 1997 through 2015)

![Chart showing the share of components in finance compensation and gross operating surplus over time.]

Source: Bureau of Economic Analysis

Profits more than five times payrolls in Delaware finance (annual change in nominal GDP for finance and its components – 1997 through 2015)

![Chart showing the share of components in finance compensation and gross operating surplus over time.]

Source: Bureau of Economic Analysis
Coincident index results for Pennsylvania before and after retrending to match the state’s long-run GDP growth rate

![Coincident index results](image)

Source: Federal Reserve Bank of Philadelphia

Average growth rates of real GDP have fallen in successive business cycle expansions for these Mid-Atlantic states

![Average growth rates](image)

Source: Bureau of Economic Analysis
Our research agenda:

- Complete a rewrite of C++ code to EVViews for greater accessibility and greater ease for testing alternatives
- Add variables to better capture economic trends driven from farm, energy, and finance sectors
- Improve our process of retrending the indexes and incorporate a method of revariancing them to improve comparability of indexes
- Shorten the “tail” in which estimates are subject to the greatest potential for data revisions by using early benchmarks of employment data and by identifying other fresh data

Final remarks

- Our state coincident indexes have value for identifying historical state business cycles, as an immediate indicator of state GDP, and as a signal of a U.S. recession in near real-time
- However, the immediate, real-time indexes for states can be improved by:
  - capturing more state-specific factors,
  - better retrending and re-variancing, and
  - shortening the “tail” in which large data revisions are anticipated
- We are working on these improvements; however, a magic bullet for estimating economic growth within the “tail” remains elusive
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For online access to our latest data and research, go to http://www.philadelphiafed.org/research-and-data/