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Economic Letter

Is Rising Unemployment an Early Warning of State-Level Recession?

by Alan Armen and Tyler Atkinson

ABSTRACT: Based on experience with national unemployment, analysts have viewed sharply higher state joblessness as signaling possible further deterioration. However, analyses indicate increasing state-level unemployment by itself does not indicate a recession, and that applying rule-of-thumb properties regarding recession to state economies is misguided.

Unemployment rates increased sharply in several states during 2014–15. Analysts and policymakers wondered if these increases signaled imminent state-level recessions—or in other words, contracting economies—despite the national unemployment rate trending downward.

Motivating the concern is that an increase in the U.S. unemployment rate's three-month moving average of more than 0.33 percentage points above recent lows has signaled every postwar recession, with only a few false signals.[1] If a state's unemployment rate rises 0.4 percentage points, does this imply imminent state-level recession?

The answer, it appears, is "not necessarily." Moreover, it is unclear whether the concept of recession at the state level is a useful way to think about local economy slowdowns. State-specific downturns are typically smaller and of shorter duration and do not exhibit a snowball effect—where small increases in unemployment are inevitably followed by larger ones. Instead, they tend to be symmetric variations around the national trend, where the downturns are no more pronounced than the upswings.

Business-Cycles Statistics

Two measures provide the means to preliminarily compare business cycles at the state and national levels—in recessions, how big is the increase in unemployment from peak to trough, or amplitude, and how long do recessions last, on average?

Computing these relies on defining the start and end dates of recession, which are not available for individual states.

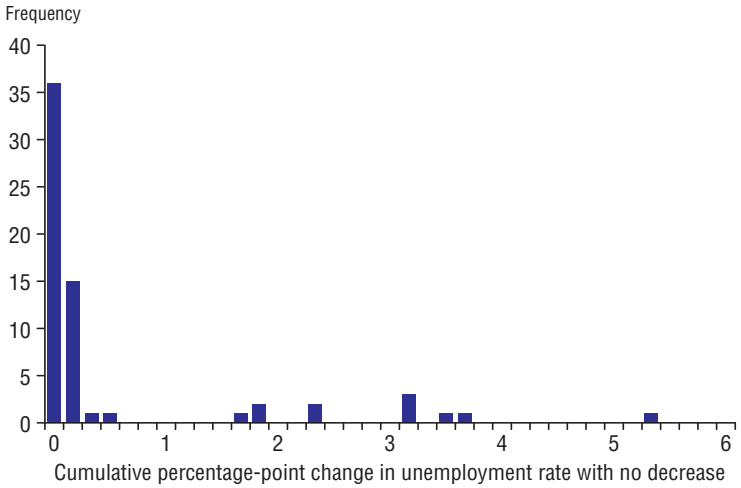
A standard business-cycle dating algorithm called BBQ defines the business-cycle turning points for a given series and calculates the average amplitude and duration of the cycles.[2] It can be applied to the U.S. and each state's unemployment rate to define recessions.

When calculating the statistics, only state recessions that don't overlap with a national one are used. Thus, only state downturns not driven by national economic conditions are included. There are only a few such events for a given state, so amplitude and duration statistics among all states are averaged.

Beginning in 1979, the average amplitude of the U.S. unemployment rate during a BBQ-defined recession is 3.2 percentage points, and the average duration is about 28 months. Meanwhile, when states are in recessions that don't overlap with U.S. recessions, the amplitude is 0.7 percentage points and the duration around 13 months.

State recessions are, thus, typically less severe and don't last as long as U.S. downturns, at least according to the unemployment rate. Can state recessions be viewed as just smaller versions of a national reces-

Chart 1 Unemployment Increases for the U.S. Are Small or Large with Little in Between

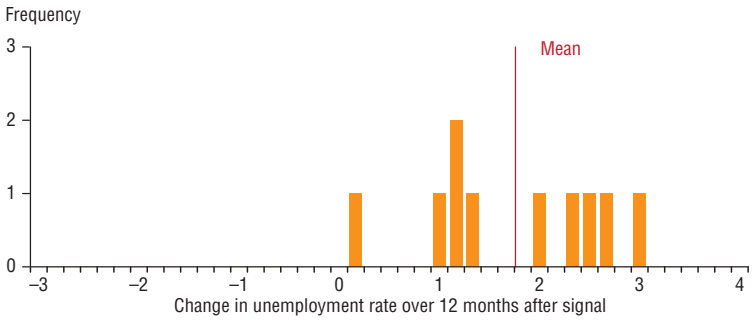


NOTES: Histogram of the cumulative increases in the three-month moving average of the U.S. unemployment rate, January 1948–March 2016. Consecutive months of increase or no change are summed until the rate decreases.

SOURCES: Bureau of Labor Statistics; authors' calculations.

Chart 2 U.S. Unemployment Rate Increase of 0.33 Percentage Points Signals Higher Rate in 12 Months

A. Threshold of 0.33 Percentage Points Breached



B. Expansion Signaled; Unemployment 0.33 Percentage Points Below Recent Maximum

NOTES: Histogram of the 12-month change in three-month moving average of the U.S. unemployment rate, January 1948–March 2016. Chart 2A shows 12 months after rising more than 0.33 percentage points above the cyclical minimum—only one observation per episode. Chart 2B shows every 12-month change where the starting point is more than 0.33 percentage points below the cyclical maximum and not more than 0.33 above the cyclical minimum.

SOURCES: Bureau of Labor Statistics; authors' calculations.

sion, or do they differ in some other fundamental way?

Business-Cycle Asymmetries

One of the defining characteristics of a business cycle is asymmetry—recessions are typically brief, infrequent and rapid, while expansions are sustained and mild. This behavior is observed in many macroeconomic indicators, such as gross domestic product (GDP), industrial production and the unemployment rate.

This could reflect many things, such as credit constraints that bind during recessions but not in expansions; greater uncertainty when output is low, causing output to fall further; or firms contracting amid the "creative destruction" felt most during downturns.[3]

One way to analyze unemployment rate asymmetry is to consider the historical distribution of cumulative increases. Specifically, each observation corresponds to one or more nondecreasing movements in the U.S. unemployment rate, with the value equal to the cumulative percentage-point change.[4] Each observation can span several months as long as the unemployment rate doesn't fall in any month. For example, the observation from the Great Recession stretches from June 2007 to December 2009 when the unemployment rate rose from 4.4 percent to 9.9 percent.

It's clear that only small and large increases exist with nothing in between (*Chart 1*). Whenever a 0.4 percentage-point increase occurs, much bigger increases follow nearly every time.[5] This is an example of a threshold asymmetry and justification for the rule-of-thumb recession signal of a 0.33 percentage-point unemployment rate increase.

The rule of thumb is put to the test in Chart 2A, which features a histogram of the change 12 months following a breach of the 0.33 threshold over 1948–2015. The signal isn't a 0.33 percentage-point increase in a given month, but from a recent minimum, which allows for decreases in the interim, unlike Chart 1. The rule of thumb is a reliable indicator of recession, as there is only one observation between 0 and 1, and nine above 1.

A similar distribution of the 12-month change following every month *not* above the threshold of 0.33 reveals that expansions are milder than recessions (*Chart 2B*). Most of these unemployment rate changes are between 0 and –1 percentage points, in contrast with only one observation below 1 after a threshold breach.

Asymmetry Among States

Because states' economies are highly sensitive to national activity, their unemployment rates display similar asymmetry. The more interesting question is whether the component of a state's unemployment

rate not driven by the rest of the nation is also asymmetrical. If so, then an increase in a state's unemployment rate absent an increase in the national one can be seen as a warning sign of sharper deterioration for the state.

The asymmetry analysis is repeated for all state unemployment rates but excludes any episode that overlaps a national recession.

Runs of state unemployment increases outside of recession do not show a clear threshold as the national one does (*Chart 3*). There are plenty of cumulative increases that stop between 0.4 and 1.5 percentage points, meaning that an increase in a state's unemployment rate of 0.4 or more isn't necessarily followed by more increases.

Further, state unemployment doesn't seem bound by the 0.33 national threshold. If a state's unemployment rate rises more than 0.33 percentage points above its recent minimum, it is just as likely to fall 1 percentage point over the coming year as rise 1 percentage point, assuming there is no U.S. recession (*Chart 4A*).

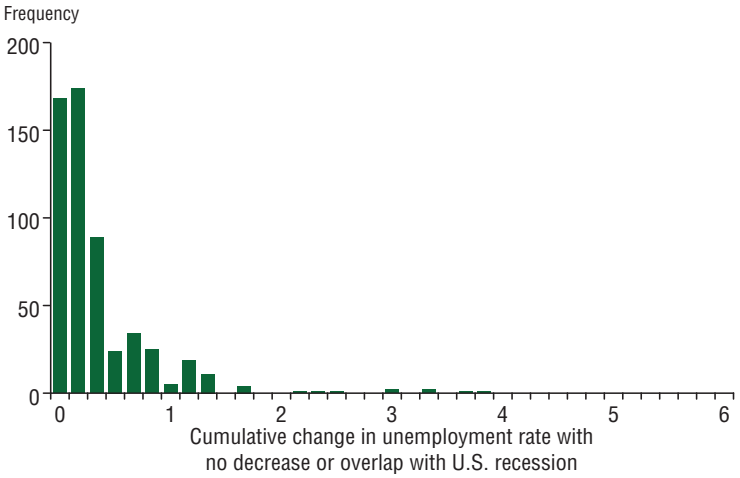
If the threshold has not been breached for a given state, the subsequent unemployment change is not all that different than if it had been (*Chart 4B*). Consequently, the national rule of thumb does not effectively signal state recessions. It could be that the threshold value for the states is different than the national one. To test this, the exercise was repeated with 0.3, 0.4, 0.5, 0.6 and 0.7 as the threshold and all provided similar results.

It may seem odd to exclude U.S. recessions from the analysis of state cycles, as those periods contain much of the data variation. Another potential criticism is that only certain states behave like the U.S., or they may each have a different threshold. For example, a 0.2 percentage point increase in California could signal a state recession, while a 0.6 increase is required for Rhode Island. Such a situation is possible, and the following more general analysis allows for it and does not exclude U.S. recessionary periods.

Testing for Threshold Effects

A Self-Exciting Threshold Autoregressive (SETAR) model provides another method to look for asymmetry in time series data. With this method, the dynamics of the unemployment rate can change depending on whether the most recent change is above or below an estimated threshold.

Chart 3 States Experience Many Medium-Length Runs of Unemployment

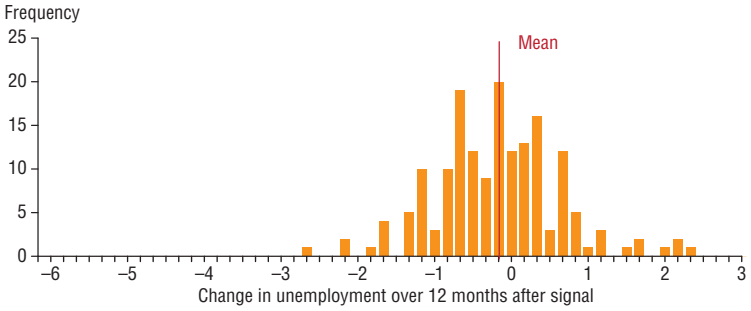


NOTES: Combined histogram of cumulative increases of 50 U.S. states' unemployment rates, January 1978–February 2016. Consecutive months of increase or no change are summed until the rate decreases. If the span of increases overlaps a U.S. recession, the span is excluded.

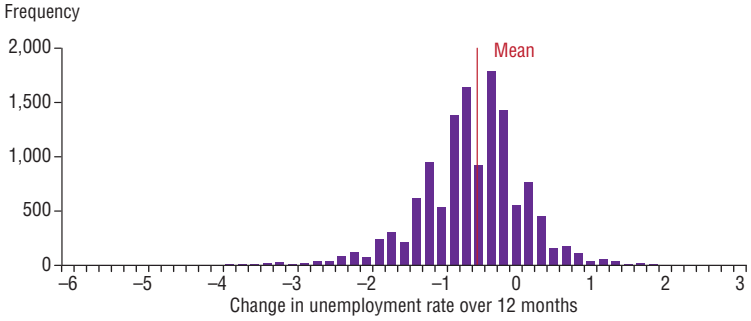
SOURCES: Bureau of Labor Statistics; authors' calculations.

Chart 4 Unemployment Rate Rule of Thumb Doesn't Signal State Recession

A. Threshold of 0.33 Percentage Points Breached



B. Expansion Signaled; Unemployment 0.33 Percentage Points Below Recent Maximum



NOTES: Combined histogram of the 12-month change in the 50 U.S. states' unemployment rate, January 1978–February 2016. Any 12-month period overlapping a U.S. recession is excluded. Chart 4A shows the 12 months after a rise of more than 0.33 percentage points above the cyclical minimum—one observation per episode. Chart 4B depicts every 12-month change where the starting point is more than 0.33 percentage points below the cyclical maximum and not more than 0.33 above the cyclical minimum.

SOURCES: Bureau of Labor Statistics; authors' calculations.

For example, when this method is applied to one-month changes in the U.S. unemployment rate, the estimated threshold is 0.2. After it has increased more than that, the behavior switches

from no change on average to increasing on average and exhibiting greater persistence, as is typical in a recession. This is consistent with the rule-of-thumb signal.

A formal statistical test confirms that the change in the U.S. unemployment rate is better described by a SETAR model.[6] However, the test can't be directly applied to the individual states, because they are strongly influenced by what's occurring nationally. To account for this, the level of each state's unemployment rate is regressed on the current and lagged values of the national rate.[7] The regression residuals represent the state-specific components and can be tested for a threshold effect in their changes.

Forty-one states display no threshold effect while nine show evidence of a threshold—Alaska, Montana, North Dakota, Nebraska, Oklahoma, Tennessee, Texas, Utah and Wisconsin.[8] Other than Tennessee and Wisconsin, all had relatively large and rapid increases during the 1985–86 oil bust despite the national unemployment rate falling, which may have driven the results.[9]

The larger point is that more than four-fifths of the states did not show a threshold in their state-specific component. The national business cycle's expansions and recessions are markedly different. These tests show that it is more appropriate to think of a state as varying above and below the national trend in a roughly symmetric fashion.

Regional Analysis Implications

These methodologies suggest that, as tempting as it is, we should not interpret an individual state's unemployment rate as we would the national rate. Unless driven by national economic conditions, states typically do not exhibit the same boom-and-bust dynamics.

If the national unemployment rate is holding steady or falling, a moderate uptick in most states' unemployment rate does not necessarily signal a state recession. Energy-intensive states could be an exception, which was the case in the 1980s. But those economies, including Texas, may be less sensitive to oil price declines now than three decades ago, as evidenced by their resilience during the recent oil price plummet.

This result could reflect several features of the U.S. economy. One is the tendency for migration between states to keep unemployment rates from drifting too far from their long-term average—unemployed workers can move to states where jobs are more plentiful.[10] Another is automatic stabilizers inherent in federal spending: If income in a state falls, the federal taxes paid by its citizens will fall and demand for government services such as Medicaid will rise, increasing the net flow of federal transfers to the state.

Finally, the result sheds light on the source of asymmetry in the business cycle that collectively involves all states—such as a tightening credit market—and not state-specific factors such as labor market tightness.

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Notes

[1] "Gauging the Odds of a Double-Dip Recession amid Signals and Slowdowns," by Harvey Rosenblum and Tyler Atkinson, Federal Reserve Bank of Dallas *Economic Letter*, vol. 5, no. 12, 2010.

[2] "Dissecting the Cycle: a Methodological Investigation," by Don Harding and Adrian Pagan, *Journal of Monetary Economics*, vol. 49, no. 2, pp. 365–81. BBQ can be found at www.ncer.edu.au/data/documents/bbq_000.zip.

[3] "The Brevity and Violence of Contractions and Expansions," by Alisdair McKay and Ricardo Reis, *Journal of Monetary Economics*, vol. 55, no. 4, 2008, pp. 738–51.

[4] In the remainder of the article, a three month-moving average is applied to the U.S. unemployment rate but not to states' unemployment rates. This is because state data are smoothed from the Bureau of Labor Statistics model used to produce them.

[5] The two exceptions are a 1959 steel workers' strike and a 0.033 percentage-point fall in the 1974 recession that broke up what would have been large cumulative increases into two small ones.

[6] Using the method developed by Bruce Hansen, "Inference When a Nuisance Parameter Is Not Identified Under the Null Hypothesis," *Econometrica*, vol. 64, no. 2, 1996, pp. 413–30.

[7] The maximum number of lags is selected by minimizing the Akaike information criterion; up to 12 are allowed. The sample is 1977–2016, except Louisiana and Mississippi, which ends in July 2005 due to the effects of Hurricane Katrina. For the threshold test of the residuals, the sample is the same, but 12 lags are used.

[8] Shown at the 5 percent statistical significance level.

[9] Using a threshold variable that excludes increases in the residual that occur without a corresponding increase in the state unemployment rate gives similar results.

[10] "Regional Evolutions," by Olivier Jean Blanchard and Lawrence F. Katz, *Brookings Papers on Economic Activity*, vol. 23, no. 1, 1992, pp. 1–75.

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