Working papers economics - Approach to Estimating Confidence Intervals for a Business Cycle

Download Keep in mind
The series Working Papers on Economics is published by the Office for Economic Studies at the *Banco de la República* (Central Bank of *Colombia*). It contributes to the dissemination and promotion of the work by researchers from the institution. This series is indexed at Research Papers in Economics (RePEc).

On multiple occasions, these works have been the result of collaborative work with individuals from other national or international institutions. The works published are provisional, and their authors are fully responsible for the opinions expressed in them, as well as for possible mistakes. The opinions expressed herein are those of the authors and do not necessarily reflect the views of Banco de la República or its Board of Directors.

AUTHORS AND/OR EDITORS Martinez-Rivera, Wilmer Osvaldo Hernández-Bejarano, Manuel Darío
Through two empirical applications using economic data from the United States and Colombia, we illustrate the effectiveness of our methodology, providing not only accurate point estimates for the dating of turning points, but also enabling us to construct confidence intervals around these estimates.

Publication Date: Thursday, 19 of March 2026 **Approach**
We develop a methodology to estimate the business cycle by producing both point estimates and confidence intervals for the dating of turning points. The methodology applies the Bry and Boschan (1971) dating algorithm to identify turning points across a set of economic indicators. Once these points are identified, we employ a novel procedure—the coincident matrix—which generalizes the Coincident Profile method proposed by Martinez-Rivera et al. (2016) and allows us to measure the degree of concordance among a group of economic indicators.

After identifying the turning points, we define peak and trough zones over time, following recommendations in the literature to avoid overlaps and ensure alternation between these phases. Once these peak and trough zones (groups of turning points) are identified, we compute the average value within each zone to obtain a summary measure, which serves as the point estimate. To construct confidence intervals around the point estimate, we rely on a Bootstrapping technique. We assess the performance of the proposed methodology through a simulation exercise and two empirical applications using data for the United States and Colombia.

Contribution
This proposal is part of the literature on estimating business cycle turning points and adds the simultaneous estimation of confidence intervals around these estimated turning points. The study expands the literature on constructing confidence intervals for turning points using a nonparametric approach. We highlight several advantages of the proposed methodology.

First, no specific reference cycle is required to define the business cycle, as demonstrated by the simulation exercises. However, the estimates can be improved using an adjustment parameter calibrated from a given reference cycle, as done in the two empirical applications.

Second, because this is a nonparametric approach, it does not rely on distributional assumptions about the sets of peaks and troughs, allowing the data to speak for themselves. This feature is also seen in the Bry and Boschan

(1971) algorithm, which does not require parametrization.

Results

Through two empirical applications—using economic data from the United States and Colombia—we show the effectiveness of our proposed methodology. It provides not only accurate point estimates for the timing of turning points, closely aligned with the reference cycle in each case, but also enables us to construct confidence intervals around these estimates. The simulation studies corroborate these findings.

In our analysis of U.S. economic data, we conduct a pseudooutofsample exercise showing that our method can anticipate peaks by 2 to 5 months and troughs—which require more time—by 12 to 25 months, preceding NBER announcements.

In the Colombian case, although it is difficult to clearly identify peak and trough zones due to overlapping—particularly at the beginning of the sample—once the adjustment parameter is defined, the overlap is reduced while preserving the most relevant or coincident relationships. Additionally, applying the methodology to a broad set of variables is complex; an alternative approach would be to use a dimensionreduction technique, similar to the procedure used for the United States. Nonetheless, the results are consistent with those reported by Arango et al. (2025).