

## Taking Account...

### Better reconciliation of the U.S. economic accounts

Economic measures are produced with varying frequencies—monthly, quarterly, or annual, for example—and with different objectives. Monthly or quarterly statistics aim to provide a timely picture of short-term activity, for example, while annual data often provide a more accurate picture of medium- and long-term trends. The most comprehensive data are collected by the Census Bureau's economic census, which publishes data every 5 years.

Theoretically, higher frequency measurements should be consistent with lower frequency benchmarks. In practice, however, this is rarely the case. In a statistical system that uses low- and high-frequency data, such as the U.S. national economic accounting system, observed data need to be adjusted for consistency, satisfying both temporal and contemporaneous constraints.

A strong reconciliation process would also aim to preserve as much of the substance of the preliminary information as possible.

In a recent Bureau of Economic Analysis (BEA) working paper, Baoline Chen and Thomas Howells, economists at BEA; Tommaso Di Fonzo of the University of Padova, Italy; and Marco Marini of the International Monetary Fund reconciled the 2003–2007 U.S. annual input-output (I-O)

accounts, the gross domestic product (GDP)-by-industry accounts, and expenditure-based GDP accounts with the 2002 and 2007 quinquennial I-O benchmark accounts.

The U.S. national accounts system takes three approaches to measuring GDP: production, expenditures, and incomes.

For the entire system to be internally consistent, production-based GDP (measured as total output less total inputs from the I-O accounts), expenditure-based GDP (measured as total final expenditures from the national income and product accounts (NIPAs)), and gross domestic income (GDI) (as measured in the NIPAs) must all be reconciled.

Accordingly, the objective of the authors was to adjust the preliminary series such that they (1) are consistent with the quinquennial benchmarks available, (2) fulfill all the accounting relationships for any given year, and (3) show movements that are as close as possible to the preliminary information.

The working paper showed that reconciling annual preliminary series of national accounts with the I-O benchmarks was best achieved through a constrained optimization procedure based on a movement preservation principle—specifically a least squares procedure based on the proportional first difference (PFD) method pioneered by Frank Denton in 1971 and modified by P.A. Cholette in

1984.

This procedure was compared with a pure proportional (PROP) adjustment procedure.

The results showed that the authors' objectives were best achieved through the procedure based on the PFD criterion; this procedure was able to smooth the differences observed between the preliminary and the benchmark data, reducing the impact of the correction by distributing it over all the years.

However, the authors also noted that the PFD-based adjustment didn't work as well for a small subset of series that included breaks in time and changes from positive to negative values. Because these movements are difficult to preserve, they were adjusted according to the PROP criterion.

In general, the authors showed that a constrained optimization procedure, one that minimizes a combined PFD-PROP objective function, improves the overall adjustment of the system, minimizing the impact on the year-to-year changes of the preliminary series.

The paper relied on a study by Chen and others in 2013 that sought to fulfill similar objectives using older data. The release of the 2007 benchmark input-output tables by BEA in January 2014 made it possible for the authors to extend the analysis.

This [BEA working paper](#) is available at no charge on the BEA Web site.