Current Employment Statistics Survey

Concurrent Seasonal Adjustment for Industry Employment Statistics

Bureau of Labor Statistics
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The Current Employment Statistics (CES) Survey, conducted monthly by the Bureau of Labor Statistics, obtains payroll employment, hours, and earnings from business establishments and produces industry-based estimates. Accurate seasonal adjustment is an important component in the usefulness of these monthly data. The CES program will convert to the North American Industry Coding System (NAICS) with the publication of May 2003 first preliminary estimates, published in June 2003. Simultaneous with this conversion CES will replace the current projected-factor seasonal adjustment methodology with concurrent seasonal adjustment. This paper compares the two seasonal adjustment methodologies, examines results from recent research evaluating the two methods, and discusses the implications of a conversion to concurrent seasonal adjustment.

Introduction: The CES is a monthly survey of over 300,000 business establishments. The national CES estimates of employment, hours, and earnings are some of the most timely and sensitive economic indicators published by the federal government. They are widely viewed as a key measure of the health of the economy and are closely tracked by both public and private policy makers alike.

Most CES data users are interested in the seasonally adjusted over-the-month employment changes as a primary measure of overall national economic trends. While seasonally adjusted series go through several monthly revisions and an annual benchmark revision before they are finalized, the first published estimates are the most widely anticipated and analyzed. Thus it is important to use the most efficient and reliable methods for seasonal adjustment of current months' data. Currently, CES uses seasonal adjustment methodology that applies forecasted seasonal factors to the employment estimate. Twice a year seasonal factors are forecasted for six months into the future and applied to the not seasonally adjusted estimates during the subsequent six months. Beginning in 2003, CES will convert to concurrent seasonal adjustment in which new seasonal factors are calculated each month using all relevant data, up to and including the current month.

Background on CES Estimates: One of the benefits of CES is the timeliness of the estimates. CES estimates are published each month after only 2 ½ weeks of data collection. The primary deadline for data receipts, referred to as "first closing", is the last Friday of the reference month, and preliminary estimates are published on the first Friday following the reference month. In order to incorporate additional sample received after the primary deadline, each estimate undergoes two monthly revisions before being finalized. The secondary cut-off, or "second closing", is usually three weeks after the primary deadline, and the third deadline, or "third closing" is three weeks after the second. Therefore, for any given reference month, second closing estimates are published the following month, and third closing estimates are published two months subsequent.

CES estimates also undergo annual revisions called "benchmarks". Each year, the sample-based estimates for the previous year are adjusted to universe employment counts derived from State unemployment insurance tax records. This constitutes the final estimate for all reference months in the benchmark period.

To seasonally adjust the estimates, CES uses X-12 ARIMA software developed by the US Census Bureau. Seasonal adjustment factors are recalculated semi-annually, in April and November, and projected factors are published in advance for the next 6 months. Currently, new seasonal factors are published in June and December of each year. The June CES publication incorporates annual benchmark revisions that include recalculation of seasonally adjusted data for the most recent 5 years. After 5 years of seasonal adjustment revisions, figures are frozen. For example, the March 2001 benchmark revision, published in June 2002, provided revised seasonally adjusted data for 1997 through the first quarter of 2002.

Research approach: During the past several years, BLS has been researching the impact that a change in seasonal adjustment methodology would have on both the CES data itself and on users. Each month, parallel to the monthly production of CES seasonally adjusted data using projected-factor methodology, CES runs concurrent seasonal adjustment for research purposes. The parallel tests are structured in a way to measure only the effect of incorporating additional months of data into the seasonal adjustment process.

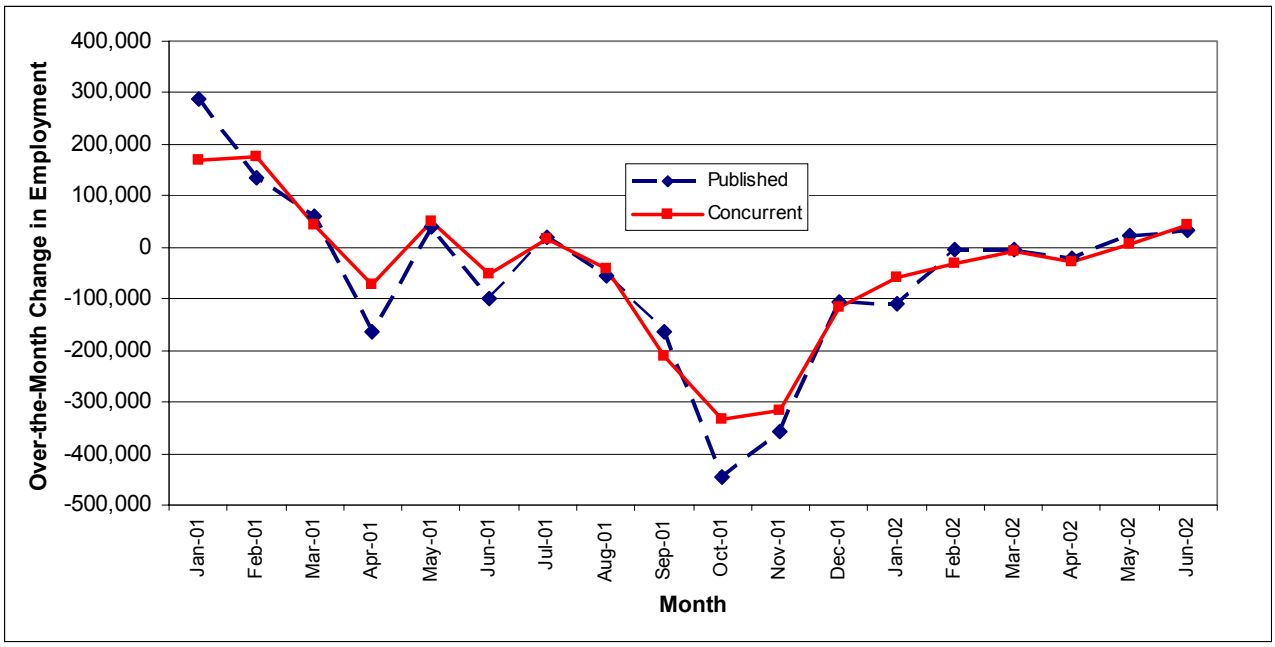
Current CES standard practice requires ten years of historical data to be used as input to the X-12 ARIMA model. The same historical data set was used for the experimental concurrent run. Therefore, any prior adjustments originally made to the data during production, such as to account for strikes or editing and screening, are included in the concurrent simulations as well. The only difference in inputs between the two runs is that concurrent adjustment also incorporates up to 5 months of additional estimates when calculating the seasonally adjusted data.

In the parallel series, incorporation of revised seasonal factors is handled within the normal CES monthly revisions procedures. With the calculation of first closing estimates for a current month, the second closing and third closing estimates for the prior two months are revised on an unadjusted basis to incorporate further sample receipts. Likewise, the concurrent seasonally adjusted data are recalculated using revised second closing and third closing estimates, mirroring the current production process. Finally, all published data types are seasonally adjusted under both methods; however, because the all employee series is the most closely watched series published by CES, it is the focus of this paper.

Results: The two methods are compared in terms of (1) mean absolute revisions to the over-the-month changes evident from first preliminary estimate to the benchmarked series, (2) the variation between monthly revisions, and (3) the smoothness of the seasonally adjusted series. Looking first at the smoothness of the series, Figure 1 compares the third closing over-the-month changes of the seasonally adjusted employment figures for Total Nonfarm from January 2001 to June 2002 for the two methodologies. The dashed line shows the published over-the-month changes for third closing, while the solid line shows the third closing over-the-month change for the experimental series (i.e., what the over-the-month change would have been if CES had been using concurrent seasonal adjustment). As the graph illustrates, concurrent adjustment produces a slightly smoother seasonally adjusted series with less variability in the over-the-month changes.

Table 1 underscores the smoothness of the concurrent seasonally adjusted series for Total Nonfarm plus all nine industry divisions. The smoothness ratio shown in column B of Table 1 is a comparison

Figure 1. Third Closing Over-the-Month Change, Total Nonfarm, January 2001 through June 2002



measure of variability in the third closing over-the-month change of the seasonally adjusted estimate. The calculation compares the sum of the squared over-the month changes in the concurrently adjusted series to the sum of the squared over-the-month changes in the projected-factor adjusted series. A smoothness ratio below 1 indicates that concurrent seasonal adjustment has less variability in the over-the-month changes than does a series adjusted using projected seasonal factors. As Table 1 illustrates, concurrent adjustment produces a smoother seasonally adjusted series for Total Nonfarm plus all nine industry divisions. Taken with the results from Figure 1, this indicates that CES will benefit from a switch to concurrent seasonal adjustment by producing employment series with less variability in the over-the-month changes.

Table 1. Smoothness Ratio, January 2001 through June 2002

(A) Group	(B) Smoothness Ratio (Third Closing)
Total Nonfarm	.67
Mining	.77
Construction	.47
Manufacturing	.87
TPU	.78
Wholesale Trade	.88
Retail Trade	.56
FIRE	.68
Services	.58
Government	.67

Results to this point focused solely on estimates of seasonally adjusted over-the-month changes in employment. Also of interest is the revision to the estimate of the seasonally adjusted over-the-month change, both from first closing to the final benchmarked series, and between monthly closings. Table 2 illustrates the size of the mean absolute revision to the over-the-month change from first preliminary to the final benchmarked series for all nine major industry divisions and their topside aggregate, total nonfarm. Column B shows the mean absolute revision in the over-the-month change for the 6-month projected method for March 1998 through March 2001, while column C shows the same for the concurrent adjustment method. Column D shows the difference between the two methodologies (concurrent minus 6-month projected). As the table illustrates, CES employment estimates seasonally adjusted under the concurrent method have a smaller revision from first closing estimates to final benchmarked series in eight of nine industry divisions plus total nonfarm. In Wholesale Trade, the revision statistic was larger for concurrent adjustment, but only by 0.2%.

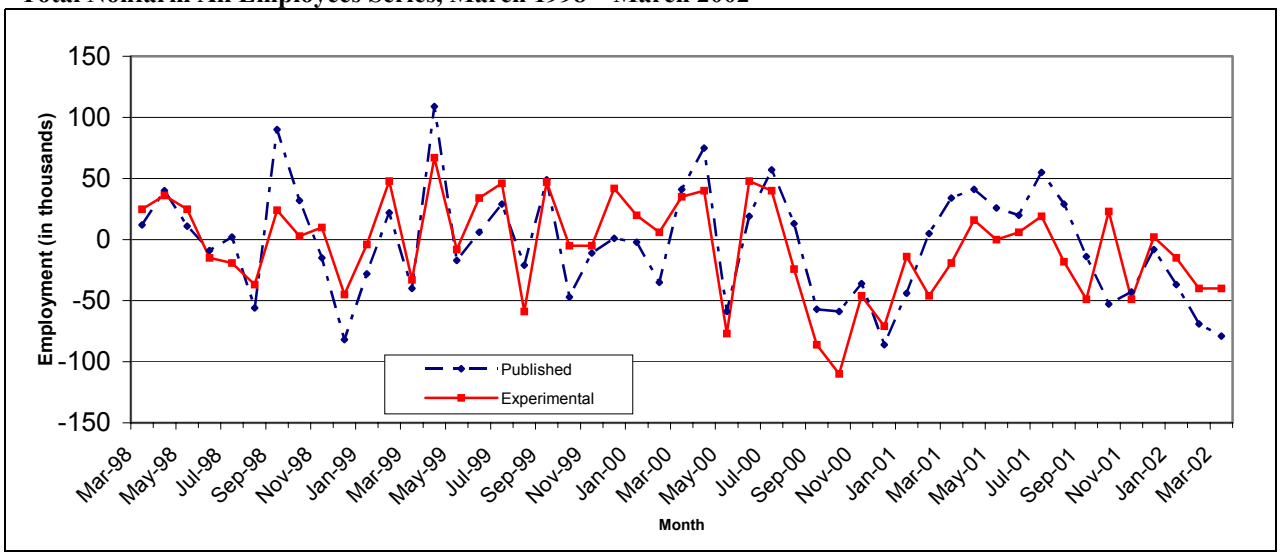
Table 2. Mean Absolute Revision in Over-the-Month Changes, March 1998 through March 2001

(A) Group	(B) CES Published Series (6-month projected)	(C) Experimental Series (Concurrent)	(D) Difference
Total Nonfarm	77,973	64,973	-13,000
Mining	1,892	1,865	-27
Construction	22,892	17,838	-5,054
Manufacturing	13,757	12,487	-1,270
TPU	7,892	6,568	-1324
Wholesale Trade	11,135	11,162	27
Retail Trade	32,162	21,946	-10,216
FIRE	6,919	5,703	-1216
Services	38,784	29,703	-9,081
Government	23,135	17,432	-5,703

In addition to a smaller revision between first closing and the final benchmarked series, revisions in the over-the-month changes between closings are of concern as well. In particular, there is the potential for these monthly revisions between closings to increase under concurrent adjustment because the seasonal factors can change with each iteration of the monthly adjustment process. However, results indicate that, in addition to a smaller revision between first closing and the final benchmarked series, concurrent seasonal adjustment leads to equal or even less variability in the over-the-month changes between closings.

Figure 2 shows the revision to the over-the-month change between seasonally adjusted first closing and second closing total nonfarm estimates under both methods. The graph illustrates that, in general, the concurrently adjusted series shows slightly less variability in the seasonally adjusted over-the-month changes between revisions. Results were very similar for revisions between first closing and third closing.

Figure 2. Over-the-month changes between Revisions, 1st Closing to 2nd Closing Seasonally Adjusted Total Nonfarm All Employees Series, March 1998 – March 2002



Likewise, Table 3 illustrates a comparison of revisions between closings for the currently published CES series and the same series adjusted concurrently. As the table shows, the mean revision and mean absolute revision in the over-the-month change does not differ between first closing and second closing across the two methods. However, from first closing to third closing, both the mean revision and mean absolute revision are lower in the concurrently adjusted series. These results, when combined with results shown in Figure 2, suggest that concurrent seasonal adjustment will not increase revisions between closings.

Table 3. Mean and Mean Absolute Revisions in Over-the-Month Changes, Total Nonfarm All Employees Series, March 1998 through March 2002

Type	CES Published Series (6-month projected)	Experimental Series (Concurrent)	Difference
First closing to second closing			
Mean Revision	-4	-7	3
Mean Absolute Revision	37	34	-3
First closing to third closing			
Mean Revision	19	4	-15
Mean Absolute Revision	48	36	-12

Summary of Advantages and Disadvantages of Concurrent Seasonal Adjustment

Advantages

More accurate seasonal factors – Concurrent seasonal adjustment is technically superior to the 6-month forecasted factors because it takes into account the timeliest information available. Empirical results from this analysis illustrate that seasonally adjusted CES data are closer to the final benchmarked series under concurrent adjustment, leading to smaller revisions between first primary estimates and the final benchmark series. Furthermore, monthly revisions between first closing and third closing are slightly lower for concurrent adjustment.

Conversion to NAICS – Using concurrent seasonal adjustment will be especially advantageous during the first few years following the CES conversion to NAICS because most of the NAICS historical data will be reconstructed from the SIC-based sample. Only two years of NAICS history from a NAICS-based sample will be available. Therefore, under the projected-factor method, in the first year of the NAICS conversion, there would be only two historical NAICS-based estimates per month used to calculate projected seasonal factors, while with concurrent adjustment three actual NAICS-based estimates would be used (the previous two years of NAICS-based estimates plus the current one). The additional observations will be valuable because X-12 weights the most recent years more heavily than the past when calculating seasonal factors.

Familiarity with revisions – As discussed earlier, CES already revises two prior months of estimates with each month's release. As part of the current monthly production process, not-seasonally adjusted estimates are revised for the previous two months, and projected seasonal factors are applied to the revised estimate to calculate the new seasonally adjusted figures. No additional revisions would occur under concurrent seasonal adjustment. Under concurrent adjustment, the non-seasonally adjusted estimate for the previous two months would still be revised as before, and the seasonally adjusted data for these months will be based on these revisions.

Potential Disadvantage

Factors will not be available ahead of time – As discussed earlier, CES traditionally calculates seasonal factors twice a year and projected factors are published in advance for the next six months. Under concurrent seasonal adjustment, CES will not publish factors in advance because the new seasonal factors are calculated each month. However, it is possible to make available beforehand the ARIMA model specifications used by BLS so that the seasonal adjustment run can be replicated if desired.

Summary and Implementation Plans: The research done with the National CES employment series indicates that the CES will benefit from conversion to concurrent adjustment through smaller revisions to the over-the-month changes from the first closing estimates to the final benchmarked estimate. Furthermore, it shows that concurrent adjustment would not increase revisions between closings, and would actually reduce revisions from first closing to third closing. Based on these results, simultaneous with the program's conversion to NAICS industry coding in June, 2003, CES will switch to concurrent seasonal adjustment methodology. At that time, the practice of publishing forecasted seasonal factors will be discontinued.