Revisions in State Establishment-based Employment Estimates Effective January 2011

Erin Buss and Parth Tikiwala

With the release of the estimates for January 2011, nonfarm payroll employment, hours, and earnings data for States and areas were revised to reflect the incorporation of March 2010 benchmarks and the recomputation of seasonal adjustment factors for State estimates. The revisions affect all not seasonally adjusted data from April 2009 forward, all seasonally adjusted data from January 2006 forward, and select series subject to historical revisions. Additionally, this year BLS began utilizing calendar effect treatments designed to correct for variations in the number of weeks between reference periods in any given pair of months.[1] This resulted in revisions to many seasonally adjusted series affecting data from 1990 forward. This article provides background information on benchmarking methods and details the effects of the March 2010 benchmark revisions on State and area employment estimates.

Benchmark methods

The Current Employment Statistics (CES) program, also known as the payroll survey, is a Federal/State cooperative program that provides employment, hours, and earnings estimates for States and areas on a timely basis by estimating the number of jobs in the population from a sample of that population. Each month the CES program surveys about 140,000 businesses and government agencies, representing approximately 410,000 individual worksites, in order to provide detailed industry data on employment, hours, and earnings of workers on nonfarm payrolls for all 50 States, the District of Columbia, Puerto Rico, the Virgin Islands, and about 400 metropolitan areas and divisions.

As with data from other sample surveys, CES estimates are subject to both sampling and nonsampling error. Sampling error is an unavoidable byproduct of forming an inference about a population based on a sample. The larger the sample is, relative to the population, the smaller the sampling error. The sample-to-population ratio varies across States and industries. Nonsampling error, by contrast, generally refers to errors in reporting and processing.

To help control both sampling and nonsampling error, estimates are benchmarked annually to universe employment counts. These counts are derived primarily from employment data reported on unemployment insurance (UI) tax reports that nearly all employers are required to file with State Workforce Agencies.

Historically, benchmark levels replace the original sample-based estimates from April of the previous year to March of the benchmark year for each month. Improvements in the receipt of UI-based universe counts and in the standardization of State operations have enabled all States to replace estimates with UI data beyond March of the benchmark year. With the March 2010 benchmark, all 50 States and the District of Columbia replaced April 2009 through September 2010 with UI figures.

Existing sample information and updated business birth/death factors were then applied to these new levels to derive revised estimates for the months following the replacement quarter, which is October 2010 through December 2010. The sample links capture the over-the-month change of the sample estimates. A sample link for a given month is calculated by dividing weighted employment reported by survey respondents for that month by weighted employment reported by those same respondents for the previous month.

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[1] For more information on the presence and treatment of calendar effects in CES data, see www.bls.gov/ore/pdf/st960190.pdf.

In a dynamic economy, firms are continually opening and closing. These two occurrences offset each other to some extent. That is, firms that are born replace firms that die. CES uses this fact to account for a large proportion of the employment associated with business births. This is accomplished by excluding business death units from the matched sample definition. Effectively, business deaths are not included in the sample-based link portion of the estimate, and the implicit imputation of their previous month's employment is assumed to offset a portion of the employment associated with births.[2]

Employment associated with business births will not exactly equal that associated with business deaths. The amount by which it differs varies by month and by industry. As a result, the residual component of the birth/death offset must be accounted for by using a model-based approach.

During the net birth/death modeling process, simulated monthly probability estimates over a 5-year period are created and compared with population employment levels. Moving from a simulated benchmark, the differences between the series across time represent a cumulative birth/death component. Those residuals are converted to month-to-month differences and used as input series to the modeling process. Models are fit using X-12 ARIMA (Auto-Regressive Integrated Moving Average).

The revised over-the-month changes for October through December 2010 differ from original over-the-month changes because they include (1) data from respondents that reported too late for inclusion in the previously published estimates and (2) the inclusion of updated net birth/death estimates.

Benchmark revisions

Statewide

The percentage differences between March 2010 sample-based estimates and the revised March 2010 benchmark levels are commonly used to report the magnitude of the revisions. The average absolute percentage revision for State total nonfarm estimates is 0.4 percent for March 2010. The average absolute percentage revision from 2005 to 2010 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -1.3 to 1.4 percent in March 2010. (See Table 1.)

Nineteen States revised total nonfarm payroll employment upward, while 31 States and the District of Columbia had downward revisions. (See Table 2.)

As States replace with population data through the third quarter, the revision to their original estimates for that time period can be identified by examining the revisions to the estimates through December 2010. Because the States have replaced their estimates with benchmark data for months after March, the revision to a State's original sample-based estimates for those months will not contribute to the March 2011 benchmark revision. Therefore, including an analysis of the December revision is an important piece in analyzing the overall quality of the State estimates.

The average absolute percentage revision for State total nonfarm estimates is 0.6 percent for December 2010. The average absolute percentage revision for March from 2005 to 2010 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -2.0 to 2.6 percent in December 2010. (See Table 1.)

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[2] Technical information on the estimation methods used to account for employment in business births and deaths is available at www.bls.gov/ces/cesbdtech.htm.

Table 1. Differences between State employment estimates and benchmarks by industry, March 2005–March 2010 and December 2010

Industry	Mar 2005	Mar 2006	Mar 2007	Mar 2008	Mar 2009	Mar 2010	Dec 2010
	Average absolute percentage differences						
Total nonfarm	0.5	0.5	0.4	0.4	0.9	0.4	0.6
Mining and logging	6.5	3.4	3.8	4.3	6.0	7.5	7.7
Construction	2.8	2.7	2.2	2.6	4.0	3.6	3.9
Manufacturing	1.3	1.7	1.2	1.3	2.2	1.8	2.1
Trade, transportation, and utilities	0.7	0.5	0.7	0.6	1.6	1.2	1.3
Information	2.2	1.9	2.2	2.0	3.3	2.3	4.0
Financial activities	1.2	0.9	1.1	1.0	1.6	1.8	1.9
Professional and business services	1.7	2.1	1.5	1.3	2.2	2.2	2.2
Education and health services	0.6	0.9	0.7	0.8	0.8	1.0	1.2
Leisure and hospitality	1.4	1.2	1.1	0.9	1.7	1.8	1.7
Other services	1.9	1.7	1.5	1.3	1.9	1.9	2.4
Government	0.6	0.7	0.5	0.6	0.6	0.8	1.0
Total nonfarm:							
Range	-1.2 : 1.2	-0.8 : 4.2	-1.5 : 1.2	-1.4 : 1.0	-3.8 : 1.1	-1.3 : 1.4	-2.0 : 2.6
Mean	0.1	0.3	0.0	-0.1	-0.8	-0.1	0.0
Standard deviation	0.6	0.7	0.5	0.5	0.8	0.5	0.8

NOTE: The range indicates the lowest and highest percentage revision at the total nonfarm level. The mean is the sum of all the items in a series divided by the number of items. The standard deviation is a measure of dispersion. It measures the extent to which the individual items in a series are scattered about the mean of the series and indicates the reliability of the mean. For example, the March 2007 standard deviation (0.5) is low, relative to March 2009 (0.8). This is an indication that there is higher variation among State total nonfarm revisions in March 2009 (i.e., the mean is less representative of the group) than in March 2007 (i.e., the mean is more representative of the group). The standard deviation is computed by taking the difference of each item in a series from the mean of the series, squaring each difference, summing the squared differences, dividing the result by the number of items, and obtaining the square root of that figure.

Table 2. Percent differences between nonfarm payroll employment benchmarks and estimates by State, March 2005–March 2010 and December 2010

State	Mar 2005	Mar 2006	Mar 2007	Mar 2008	Mar 2009	Mar 2010	Dec 2010
Alabama	0.1	0.2	(1)	- 0.6	-1.1	0.3	0.1
Alaska	0.2	0.6	-0.2	0.4	-0.5	-1.3	1.7
Arizona	0.9	0.7	-1.5	- 0.4	-0.1	-0.3	-1.7
Arkansas	0.5	1.0	(1)	(1)	-0.3	-0.3	0.1
California	(1)	0.3	-0.4	-0.3	-1.3	-0.1	0.3
Colorado	-0.1	0.3	0.4	-0.2	-0.3	0.5	0.6
Connecticut	-0.7	0.3	-0.3	0.5	-0.5	-1.3	0.1
Delaware	-0.8	(1)	-0.8	(1)	0.7	-0.4	0.5
District of Columbia	0.7	-0.5	-0.1	-0.1	-0.6	-0.4	-1.8
Florida	0.5	-0.1	-0.2	-1.4	-1.4	-0.2	-0.5
Georgia	1.2	0.4	0.4	-0.7	-0.9	0.2	0.4
Hawaii	0.4	-0.3	(1)	-0.3	-1.2	-0.5	0.1
Idaho	0.9	-0.2	-0.1	(1)	-1.2	-0.2	-0.5
Illinois	-0.1	0.4	(1)	-0.3	-0.3	0.1	0.3
Indiana	-0.8	0.1	0.2	-0.6	-1.3	-0.2	(1)
Iowa	0.8	-0.1	-0.4	0.1	-0.3	-0.5	-0.4
Kansas	-0.3	0.5	(1)	0.5	-0.8	-0.3	-0.9
Kentucky	-0.2	0.4	0.2	-1.2	-1.3	-0.4	0.1
Louisiana	(1)	4.2	0.4	-0.5	-1.4	-0.6	-0.9
Maine	-1.2	0.4	0.1	0.3	-0.7	0.3	0.3
Maryland	-0.7	0.4	(1)	-0.8	-0.6	-0.1	-0.4
Massachusetts	-0.6	0.8	-0.2	0.2	0.1	0.9	0.2
Michigan	0.3	-0.3	-0.6	-0.1	-0.5	0.2	1.1
Minnesota	-0.5	0.7	-0.4	-0.3	-0.1	-0.4	-0.5
Mississippi	0.1	0.1	-0.5	(1)	-1.2	-0.1	0.4
Missouri	0.2	0.6	-0.1	0.1	-1.1	-0.5	-0.3
Montana	0.8	0.9	0.6	-0.4	-2.4	0.2	0.7
Nebraska	-0.2	-0.6	-0.5	-0.8	0.1	-0.2	-0.2
Nevada	-0.2	0.2	-1.2	-0.9	-3.8	-0.6	0.4
New Hampshire	-0.6	-0.2	0.3	-1.2	-1.5	-0.7	-2.0
New Jersey	-0.6	0.1	-0.6	0.4	-1.2	-0.1	0.4
New Mexico	(1)	0.7	0.1	(1)	-1.6	-0.1	-0.5
New York	-0.1	0.1	0.4	0.3	-0.4	0.3	0.6
North Carolina	0.9	0.6	1.2	-0.3	-0.1	-1.0	-0.9
North Dakota	0.2	0.3	-0.3	1.0	-0.9	0.8	2.6
Ohio	-0.3	(1)	-0.3	-0.7	-0.5	(1)	0.6
Oklahoma	0.5	0.5	(1)	0.7	-1.2	0.1	-0.8
Oregon	0.4	-0.8	0.6	-0.4	-1.3	0.1	0.2
Pennsylvania	-0.2	(1)	-0.2	0.1	-0.4	0.3	0.2
Rhode Island	-0.8	-0.5	-0.5	0.2	-0.3	1.4	1.8
South Carolina	1.0	(1)	0.8	-0.3	-1.4	-1.2	-0.7
South Dakota	0.1	-0.1	-0.4	0.1	-0.4	-0.1	(1)
Tennessee	0.4	0.4	-0.3	0.2	-1.3	(1)	0.3
Texas	0.8	0.6	0.9	0.4	-0.7	(1)	-0.2
Utah	0.2	0.6	0.2	-0.9	-1.9	-0.5	-0.5
Vermont	-0.7	0.1	-0.3	-0.1	1.1	0.1	1.4
Virginia	0.2	0.1	-0.3	-0.1	-0.4	(1)	-0.5
Washington	0.4	-0.2	0.6	0.3	-0.6	-0.7	-1.1
West Virginia	-0.1	0.7	-0.1	0.1	0.8	0.8	0.4
Wisconsin	0.2	-0.2	0.6	0.5	0.4	0.7	0.1
Wyoming	0.8	1.6	0.9	0.7	-1.5	-0.1	-0.1

[1] Less than +/- 0.05 percent.

Metropolitan statistical areas (MSAs)

For metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from -7.1 to 6.0 percent, with an average absolute percentage revision of 1.1 percent across all MSAs.[3] (See Table 3a.) Comparatively at the State level, the range was -1.3 to 1.4 percent, with an average absolute percentage revision of 0.4 percent. (See Table 1.) Generally, as MSA size decreases, both the range of percentage revisions and the average absolute percentage revision increases. Metropolitan areas with an annual average of 1 million or more employees in 2010 had an average absolute revision of 0.5 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.4 percent. (See Table 3a.)

For MSAs published by the CES program, the percentage revisions ranged from -10.1 to 6.2 percent in December 2010, with an average absolute percentage revision of 1.3 percent across all MSAs. (See Table 3b.) Comparatively at the State level, the range was -2.0 to 2.6 percent, with an average absolute percentage revision of 0.6 percent. (See Table 1.) Again, as MSA size decreases, both the range of percentage revisions and the average absolute percentage revision generally increase. Metropolitan areas with an annual average of 1 million or more employees in 2010 had an average absolute revision of 0.8 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.5 percent. (See Table 3b.)

Table 3a. Benchmark revisions for total nonfarm employment in metropolitan areas, March 2010

Measure	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs……..	381	188	139	30	24
Average absolute percentage revision……	1.1	1.4	0.9	0.7	0.5
Range……	-7.1 : 6.0	-7.1 : 6.0	-2.6 : 3.7	-0.8 : 2.0	-0.8 : 1.7
Mean.....	0.0	-0.2	0.1	0.3	0.3
Standard deviation……...	1.5	1.9	1.1	0.8	0.6

Table 3b. Benchmark revisions for total nonfarm employment in metropolitan areas, December 2010

Measure	All MSAs	MSAs grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	1 million or more
Number of MSAs……..	381	188	137	31	25
Average absolute percentage revision……	1.3	1.5	1.1	1.0	0.8
Range.....…	-10.1 : 6.2	-10.1 : 5.7	-3.3 : 6.2	-1.2 : 3.4	-1.6 : 3.0
Mean.....…	0.4	0.2	0.5	0.8	0.4
Standard deviation.....	1.8	2.1	1.5	1.0	1.0

[3] The CES program published employment series for 381 MSAs in 2010. This number excludes metropolitan divisions and Puerto Rico. The list of Bureau of Labor Statistics (BLS) standard MSAs is available at www.bls.gov/sae.

Seasonal adjustment

CES uses a two-step seasonal adjustment process for adjusting State nonfarm payroll employment estimates. This process uses UI seasonal trends to adjust the benchmarked historical data but incorporates sample-based seasonal trends to adjust the current sample-based estimates in the post benchmark months. By accounting for the differing seasonal patterns of the benchmark data and the sample-based estimates, this technique yields improved seasonally adjusted series for analyzing over-the-month employment change. For more information about seasonal adjustment and a list of all seasonally adjusted CES State and area employment series please visit www.bls.gov/sae/saeseries.htm. The latest seasonally adjusted nonfarm payroll employment data for all States and the District of Columbia are available on the Bureau of Labor Statistics (BLS) Web site.[4] Data for the most recent 13 months are regularly shown in Table B-7.[5]

Additional information

Historical State and area employment, hours, and earnings data are available at www.bls.gov/sae on the BLS Internet. Users may access the data via various retrieval tools at this address. Inquiries for additional information on the methods or estimates derived from the CES survey should be sent to ***sminfo@bls.gov***. The telephone number is (202) 691-6559.

[4] Seasonally adjusted and unadjusted data may be accessed from the BLS Web site at http://data.bls.gov/cgi-bin/dsrv?sm.
[5] Table B-7 can be viewed at www.bls.gov/sae/tables.htm.