Revisions in State Establishment-based Employment Estimates Effective January 2009

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W ith the release of the estimates for January 2009, nonfarm payroll employment, hours, and earnings data for States and areas were revised to reflect the incorporation of March 2008 benchmarks and the recomputation of seasonal adjustment factors for State estimates. The revisions affect all not-seasonally adjusted data from April 2007 forward, all seasonally adjusted data from January 2004 forward, and selected series subject to historical revisions. This article offers background information on benchmarking methods and details the effects of the March 2008 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. As with data from other sample surveys, CES estimates are subject to both sampling and non-sampling 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. Non-sampling error, by contrast, generally refers to errors in reporting and processing.

To help control both sampling and non-sampling 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. Benchmark levels replace the original sample-based estimates from April of the previous year to March of the benchmark year for each month. For the current 2008 benchmark, estimates from April 2007 to March 2008 were replaced with UI-based universe counts.

Improvements in the receipt of UI data and in the standardization of State operations have enabled all States to replace estimates with UI data beyond March of the benchmark year. In the March 2008 benchmark, 46 States and the District of Columbia replaced with UI data through third-quarter 2008 (that is, through September 2008) in their benchmarking, and 4 States replaced with UI data through second-quarter 2008 (through June 2008).

Recalculated sample links and business birth/death factors were then applied to these new levels to derive revised estimates for the months following the replacement quarter. 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.

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.

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 over-the-month changes used during the benchmark process may differ slightly from those used to derive the original estimates because they include (1) data from respondents that reported too late for inclusion in the previously published estimates, (2) the use of new sample weights, and (3) the inclusion of updated net birth/death estimates.

Benchmark revisions

The percentage differences between March 2008 sample-based estimates and the revised March 2008 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 2008, equal to the revision in March 2007. The average absolute revision from 2003 to 2008 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -1.4 to 1.0 percent in March 2008. (See Table 1.)

Table 1. Differences between State employment estimates and benchmarks by industry, March 2003-March 2008 and December 2008

Industry	2003	2004	2005	2006	2007	Mar 2008	Dec 2008
	Average absolute percentage differences						
Total nonfarm..	0.6	0.4	0.5	0.5	0.4	0.4	0.7
Natural Resources and Mining................	3.8	5.8	6.5	3.4	3.8	4.3	4.9
Construction...	2.6	2.4	2.8	2.7	2.2	2.6	3.7
Manufacturing..	1.4	1.2	1.3	1.7	1.2	1.3	2.5
Trade, Transportation, and Utilities........	1.0	0.8	0.7	0.5	0.7	0.6	1.3
Information...	2.5	2.5	2.2	1.9	2.2	2.0	2.8
Financial Activities................................	1.7	1.0	1.2	0.9	1.1	1.0	1.4
Professional and Business Services........	2.1	1.9	1.7	2.1	1.5	1.3	1.8
Education and Health Services..............	1.0	1.1	0.6	0.9	0.7	0.8	1.0
Leisure and Hospitality...........................	1.3	1.4	1.4	1.2	1.1	0.9	1.4
Other Services.......................................	2.1	2.0	1.9	1.7	1.5	1.3	1.6
Government..	0.8	0.7	0.6	0.7	0.5	0.6	1.0
Total nonfarm:							
Range...	-1.9:1.4	-0.9:1.8	-1.2:1.2	-0.8:4.2	-1.5:1.2	-1.4:1.0	-2.8:1.5
Mean...	-0.2	0.2	0.1	0.3	0.0	-0.1	-0.4
Standard deviation.................................	0.7	0.5	0.6	0.7	0.5	0.5	0.9

 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 widely used 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 2004 standard deviation (0.5) is lower than that of March 2003 (0.7). This is an indication that there is higher variation among State total nonfarm revisions in March 2003 than in March 2004. The standard deviation is found 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 2003-March 2008 and December 2008

State	2003	2004	2005	2006	2007	Mar 2008	Dec 2008
Alabama.................................	(1)	0.5	0.1	0.2	0.0	-0.6	-1.1
Alaska....................................	0.6	-0.3	0.2	0.6	-0.2	0.4	0.9
Arizona..................................	0.2	0.8	0.9	0.7	-1.5	-0.4	-0.6
Arkansas................................	-0.6	0.7	0.5	1.0	0.0	0.0	0.3
California...............................	-0.5	(1)	(1)	0.3	-0.4	-0.3	-1.4
Colorado................................	-0.9	0.8	-0.1	0.3	0.4	-0.2	-0.6
Connecticut............................	-0.6	0.3	-0.7	0.3	-0.3	0.5	-0.3
Delaware................................	0.1	1.8	-0.8	(1)	-0.8	0.0	-2.5
District of Columbia...............	0.2	0.1	0.7	-0.5	-0.1	-0.1	0.3
Florida...................................	(1)	0.6	0.5	-0.1	-0.2	-1.4	-2.8
Georgia..................................	-1.3	0.1	1.2	0.4	0.4	-0.7	-0.8
Hawaii...................................	0.2	0.2	0.4	-0.3	0.0	-0.3	-0.7
Idaho.....................................	0.7	0.2	0.9	-0.2	-0.1	0.0	0.3
Illinois...................................	-0.9	-0.1	-0.1	0.4	0.0	-0.3	-0.8
Indiana...................................	0.6	0.1	-0.8	0.1	0.2	-0.6	0.4
Iowa......................................	-0.4	0.1	0.8	-0.1	-0.4	0.1	-0.4
Kansas...................................	-1.8	-0.3	-0.3	0.5	0.0	0.5	0.2
Kentucky................................	-0.2	-0.1	-0.2	0.4	0.2	-1.2	-1.1
Louisiana...............................	0.4	0.7	(1)	4.2	0.4	-0.5	(1)
Maine.....................................	-0.2	0.4	-1.2	0.4	0.1	0.3	-0.4
Maryland................................	-0.3	0.1	-0.7	0.4	0.0	-0.8	-1.7
Massachusetts.........................	-0.9	0.3	-0.6	0.8	-0.2	0.2	-0.6
Michigan................................	-0.4	0.2	0.3	-0.3	-0.6	-0.1	-0.8
Minnesota………………….	-0.1	-0.2	-0.5	0.7	-0.4	-0.3	-0.2
Mississippi.............................	-1.1	0.3	0.1	0.1	-0.5	0.0	-0.3
Missouri.................................	1.4	-0.6	0.2	0.6	-0.1	0.1	-0.1
Montana.................................	1.0	0.9	0.8	0.9	0.6	-0.4	0.1
Nebraska................................	-0.2	1.5	-0.2	-0.6	-0.5	-0.8	-0.7
Nevada...................................	1.4	0.4	-0.2	0.2	-1.2	-0.9	-2.2
New Hampshire......................	-0.6	0.5	-0.6	-0.2	0.3	-1.2	-1.5
New Jersey.............................	-1.0	-0.9	-0.6	0.1	-0.6	0.4	-0.5
New Mexico...........................	-0.4	0.1	(1)	0.7	0.1	0.0	0.2
New York...............................	0.2	(1)	-0.1	0.1	0.4	0.3	0.4
North Carolina........................	-1.3	-0.5	0.9	0.6	1.2	-0.3	-0.5
North Dakota..........................	0.2	0.1	0.2	0.3	-0.3	1.0	1.5
Ohio.......................................	-0.1	0.3	-0.3	(1)	-0.3	-0.7	-1.3
Oklahoma...............................	-0.9	0.8	0.5	0.5	0.0	0.7	0.3
Oregon...................................	-0.2	(1)	0.4	-0.8	0.6	-0.4	-0.5
Pennsylvania..........................	-0.5	0.4	-0.2	(1)	-0.2	0.1	0.2
Rhode Island..........................	0.3	-0.4	-0.8	-0.5	-0.5	0.2	0.5
South Carolina........................	0.9	-0.3	1.0	(1)	0.8	-0.3	-1.1
South Dakota..........................	-0.5	-0.1	0.1	-0.1	-0.4	0.1	-0.2
Tennessee...............................	-0.4	0.4	0.4	0.4	-0.3	0.2	-0.7
Texas.....................................	-0.6	0.3	0.8	0.6	0.9	0.4	-0.1
Utah.......................................	-0.2	0.9	0.2	0.6	0.2	-0.9	0.6
Vermont.................................	-1.9	(1)	-0.7	0.1	-0.3	-0.1	-1.6
Virginia..................................	-0.1	-0.3	0.2	0.1	-0.3	-0.1	-0.9
Washington.............................	-0.4	-0.2	0.4	-0.2	0.6	0.3	0.0
West Virginia.........................	-0.8	1.4	-0.1	0.7	-0.1	0.1	0.1
Wisconsin...............................	-0.5	-0.6	0.2	-0.2	0.6	0.5	0.4
Wyoming................................	-0.3	0.7	0.8	1.6	0.9	0.7	1.4

[1] Less than ± 0.05 percent.

Twenty States revised total nonfarm payroll employment upward, while 25 States and the District of Columbia had downward revisions; 5 States were unchanged. (See Table 2.)

For metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from -5.7 to 3.6 percent, with an average absolute percentage revision of 1.0 percent across all MSAs[1] (See Table 3a.). Comparatively at the State level, the range was -1.4 to 1.0 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 one (1) million or more employees in 2008 had an average absolute revision of 0.5 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.3 percent. (See Table 3a.)

As States replace with population data through either the second or third quarter, the revision to their original estimates for that time period can be identified by examining the revisions to the estimates through December 2008. Since 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 2009 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 0.7 percent for December 2008. The average absolute revision from 2003 to 2008 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -2.8 to 1.5 percent in December 2008. (See Table 1.)

For metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from -8.6 to 4.9 percent in December 2008, with an average absolute percentage revision of 1.4 percent across all MSAs. (See Table 3b.) Comparatively at the State level, the range was -2.8 to 1.5 percent, with an average absolute percentage revision of 0.7 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 one (1) million or more employees in 2008 had an average absolute revision of 1.2 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.6 percent. (See Table 3b.)

Table 3a. Benchmark revisions for total nonfarm employment in metropolitan areas, March 2008

Measure	All MSAs	MSA's grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	More than 1 million
Number of MSA's……..	319	118	144	28	29
Average absolute percentage revision………………	1.0	1.3	0.9	0.6	0.5
Range……………………	-5.7:3.6	-5.7:3.6	-4.1:3.2	-1.6:0.8	-4.2:0.7
Mean…………………..	-0.3	-0.4	-0.3	-0.3	-0.3
Standard Deviation……	1.3	1.7	1.1	0.7	0.8

Table 3b. Benchmark revisions for total nonfarm employment in metropolitan areas, December 2008

Measure	All MSAs	MSA's grouped by level of total nonfarm employment			
		Less than 100,000	100,000 to 499,999	500,000 to 999,999	More than 1 million
Number of MSA's……..	319	118	144	28	29
Average absolute percentage revision………………	1.4	1.6	1.4	1.0	1.2
Range............................…	-8.6:4.9	-8.3:4.9	-8.6:2.6	-3.1:1.3	-4.7:0.6
Mean…………………..	-0.7	-0.5	-0.8	-0.7	-1.1
Standard Deviation……	1.8	2.1	1.8	1.1	1.1

Seasonal adjustment

BLS 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 http://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 BLS web site[2]. Data for the most recent 13 months are regularly shown in Table B-7 of this publication.

Additional information

Historical State and area employment, hours, and earnings data are available at **http://www.bls.gov/sae/** on the BLS Internet site. Users may access the data via various retrieval tools at this address. Any questions on how to access the data through the Internet should be directed to *webmaster@bls.gov*. Inquiries for additional information on the methods or estimates derived from the CES survey should be sent to: U.S. Bureau of Labor Statistics, Room 4860, 2 Massachusetts Avenue, NE, Washington, DC 20212-0001. The telephone number is (202) 691-6559; fax (202) 691-6644. The e-mail address is *sminfo@bls.gov.*

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[2] Seasonally adjusted and unadjusted data may be accessed from the BLS web site at **http://data.bls.gov/cgi-bin/dsrv?sm**.