Revisions in State Establishment-based Employment Estimates Effective January 2010

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With the release of the estimates for January 2010, nonfarm payroll employment, hours, and earnings data for States and areas were revised to reflect the incorporation of March 2009 benchmarks and the re-computation of seasonal adjustment factors for State estimates. The revisions affect all not seasonally adjusted data from April 2008 forward, all seasonally adjusted data from January 2005 forward, and selected series subject to historical revisions. Additionally, this year BLS implemented a common start year of 1990 for all seasonally adjusted series where possible. This change mainly affects statewide sector series and MSAs, as the seasonally adjusted statewide supersectors are already published with a start year of 1990. This article offers background information on benchmarking methods and details the effects of the March 2009 benchmark revisions on State and area employment estimates.

Changes to procedures for producing Current Employment Statistics (CES) State estimates

CES monthly employment data are widely recognized by policymakers, business analysts, and the media as a critical and sensitive gauge of the health of the U.S. and State labor markets.

CES National and State estimates, while using the same underlying survey reports and statistical methodology, are developed independently by BLS and the individual State Labor Market Information offices, respectively. The independent development of estimates can lead to discrepancies between the employment trend shown by the National CES estimate and those obtained by summing the State CES estimates. In the past, the discrepancy was generally greatest at labor market turning points, and resulted in the sum of the States' estimates recording less employment change than was picked up by the National estimates. This relationship held in business cycle expansions and contractions.

Since 2006, BLS and its State partners have been developing and testing alternative approaches for substantially eliminating the potential for discrepancy between the National and sum of States estimates.

Initial changes

Beginning with the process for developing November 2008 final and December 2008 preliminary State CES estimates, BLS implemented an intensified review of the State estimation process, and began requiring States to provide fact-based justifications for any proposed estimates that diverged significantly from the estimates derived solely from standard BLS methods. An example of an acceptable fact-based justification that a State might provide is documented information about a large strike or layoff that is not captured in a CES sample report. The changes that BLS implemented to the State estimates review process more closely align it with the National estimate review process, and strengthen the consistency and transparency of the CES State estimation process. Further, the changes improve the collective accuracy of the CES State estimates, bringing them into closer alignment with the National estimates.

Further refinement

Beginning with the 2009 post-benchmark and January 2010 preliminary State CES estimates (released by BLS on March 10, 2010), BLS implemented a further refinement to the State estimation process; the selection of outliers, or atypical reports, has been automated through implementation of a standard statistical method for the statewide industry supersector estimates. Businesses identified with atypical over-the-month

employment changes account only for themselves in the estimation process and are not used to represent other firms in the population. Hence the designation of a sample unit as an outlier reduces its influence in the published series and helps to control statistical error in the estimates. The new atypical designation procedure ensures that this process is consistent across states and industry supersector estimates. This change further improves the collective transparency of the CES State industry estimates.

The review changes implemented by BLS do not create a series break in the monthly CES employment series.

BLS plans to continue the intensified State review process indefinitely to achieve and maintain consistency between employment changes seen in CES National and the sum of CES State 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 Current Employment Statistics (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 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.

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. In the March 2009 benchmark, 49 States and the District of Columbia replaced April 2008 through third-quarter 2009 (that is, through September 2009) with UI data in their benchmarking, and one State replaced with UI data through second-quarter 2009 (through June 2009).

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. 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 2 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.[1]

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

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[1] 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.

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 and (2) the inclusion of updated net birth/death estimates.

Benchmark revisions
Statewide

The percentage differences between March 2009 sample-based estimates and the revised March 2009 benchmark levels are commonly used to report the magnitude of the revisions. The average absolute percentage revision for State total nonfarm estimates is 0.9 percent for March 2009. The average absolute revision from 2004 to 2009 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -3.8 to 1.1 percent in March 2009. (See Table 1.)

Six States revised total nonfarm payroll employment upward, while 44 States and the District of Columbia had downward revisions. (See Table 2.)

Table 1. Differences between State employment estimates and benchmarks by industry, March 2004-March 2009 and December 2009

Industry	2004	2005	2006	2007	2008	Mar 2009	Dec 2009
	Average absolute percentage differences						
Total nonfarm......................................	0.4	0.5	0.5	0.4	0.4	0.9	1.0
Mining and Logging...............................	5.8	6.5	3.4	3.8	4.3	6.0	9.2
Construction...	2.4	2.8	2.7	2.2	2.6	4.0	5.4
Manufacturing..	1.2	1.3	1.7	1.2	1.3	2.2	2.8
Trade, Transportation, and Utilities........	0.8	0.7	0.5	0.7	0.6	1.6	1.4
Information……………..........................	2.5	2.2	1.9	2.2	2.0	3.3	4.4
Financial Activities…………….............	1.0	1.2	0.9	1.1	1.0	1.6	2.0
Professional and Business Services…......	1.9	1.7	2.1	1.5	1.3	2.2	2.4
Education and Health Services……..……	1.1	0.6	0.9	0.7	0.8	0.8	1.1
Leisure and Hospitality………………….	1.4	1.4	1.2	1.1	0.9	1.7	2.1
Other Services..	2.0	1.9	1.7	1.5	1.3	1.9	2.5
Government..	0.7	0.6	0.7	0.5	0.6	0.6	0.7
Total nonfarm:							
Range...	-0.9 : 1.8	-1.2 : 1.2	-0.8 : 4.2	-1.5 : 1.2	-1.4 : 1.0	-3.8: 1.1	-2.6: 1.3
Mean..	0.2	0.1	0.3	0.0	-0.1	-0.8	-1.0
Standard deviation..................................	0.5	0.6	0.7	0.5	0.5	0.8	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 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 low, relative to March 2006 (0.7). This is an indication that there is higher variation among State total nonfarm revisions in March 2006 (i.e., the mean is less representative of the group) than in March 2004 (i.e., the mean is more representative of the group). 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 2004-March 2009 and December 2009

State	2004	2005	2006	2007	2008	Mar 2009	Dec 2009
Alabama.................................	0.5	0.1	0.2	0.0	- 0.6	-1.1	-1.7
Alaska....................................	-0.3	0.2	0.6	-0.2	0.4	-0.5	0.2
Arizona..................................	0.8	0.9	0.7	-1.5	- 0.4	-0.1	-0.9
Arkansas................................	0.7	0.5	1.0	0.0	0.0	-0.3	-1.5
California...............................	(1)	(1)	0.3	-0.4	-0.3	-1.3	-2.2
Colorado................................	0.8	-0.1	0.3	0.4	-0.2	-0.3	-1.1
Connecticut............................	0.3	-0.7	0.3	-0.3	0.5	-0.5	-0.3
Delaware................................	1.8	-0.8	(1)	-0.8	0.0	0.7	0.3
District of Columbia...............	0.1	0.7	-0.5	-0.1	-0.1	-0.6	-1.4
Florida………………………	0.6	0.5	-0.1	-0.2	-1.4	-1.4	-2.6
Georgia..................................	0.1	1.2	0.4	0.4	-0.7	-0.9	-0.6
Hawaii....................................	0.2	0.4	-0.3	0.0	-0.3	-1.2	0.1
Idaho.....................................	0.2	0.9	-0.2	-0.1	0.0	-1.2	-1.3
Illinois...................................	-0.1	-0.1	0.4	0.0	-0.3	-0.3	-0.8
Indiana...................................	0.1	-0.8	0.1	0.2	-0.6	-1.3	-1.3
Iowa......................................	0.1	0.8	-0.1	-0.4	0.1	-0.3	-0.5
Kansas...................................	-0.3	-0.3	0.5	0.0	0.5	-0.8	-0.2
Kentucky................................	-0.1	-0.2	0.4	0.2	-1.2	-1.3	0.0
Louisiana...............................	0.7	(1)	4.2	0.4	-0.5	-1.4	-1.1
Maine………………………….	0.4	-1.2	0.4	0.1	0.3	-0.7	-0.4
Maryland................................	0.1	-0.7	0.4	0.0	-0.8	-0.6	-1.1
Massachusetts.........................	0.3	-0.6	0.8	-0.2	0.2	0.1	-0.8
Michigan................................	0.2	0.3	-0.3	-0.6	-0.1	-0.5	0.3
Minnesota...............................	-0.2	-0.5	0.7	-0.4	-0.3	-0.1	-0.7
Mississippi.............................	0.3	0.1	0.1	-0.5	0.0	-1.2	-1.3
Missouri.................................	-0.6	0.2	0.6	-0.1	0.1	-1.1	-1.5
Montana.................................	0.9	0.8	0.9	0.6	-0.4	-2.4	-2.1
Nebraska................................	1.5	-0.2	-0.6	-0.5	-0.8	0.1	-0.2
Nevada...................................	0.4	-0.2	0.2	-1.2	-0.9	-3.8	-2.5
New Hampshire	0.5	-0.6	-0.2	0.3	-1.2	-1.5	-0.6
New Jersey..............................	-0.9	-0.6	0.1	-0.6	0.4	-1.2	-1.3
New Mexico............................	0.1	(1)	0.7	0.1	0.0	-1.6	-1.4
New York................................	(1)	-0.1	0.1	0.4	0.3	-0.4	-0.9
North Carolina........................	-0.5	0.9	0.6	1.2	-0.3	-0.1	-0.9
North Dakota...........................	0.1	0.2	0.3	-0.3	1.0	-0.9	-0.2
Ohio.......................................	0.3	-0.3	(1)	-0.3	-0.7	-0.5	-1.6
Oklahoma...............................	0.8	0.5	0.5	0.0	0.7	-1.2	-2.3
Oregon...................................	(1)	0.4	-0.8	0.6	-0.4	-1.3	-1.3
Pennsylvania...........................	0.4	-0.2	(1)	-0.2	0.1	-0.4	-0.7
Rhode Island…………………	-0.4	-0.8	-0.5	-0.5	0.2	-0.3	-0.5
South Carolina........................	-0.3	1.0	(1)	0.8	-0.3	-1.4	-1.9
South Dakota...........................	-0.1	0.1	-0.1	-0.4	0.1	-0.4	-0.1
Tennessee...............................	0.4	0.4	0.4	-0.3	0.2	-1.3	-1.7
Texas.....................................	0.3	0.8	0.6	0.9	0.4	-0.7	-1.1
Utah.......................................	0.9	0.2	0.6	0.2	-0.9	-1.9	-1.6
Vermont.................................	(1)	-0.7	0.1	-0.3	-0.1	1.1	1.3
Virginia..................................	-0.3	0.2	0.1	-0.3	-0.1	-0.4	-1.3
Washington…………………..	-0.2	0.4	-0.2	0.6	0.3	-0.6	-2.0
West Virginia..........................	1.4	-0.1	0.7	-0.1	0.1	0.8	-0.4
Wisconsin...............................	-0.6	0.2	-0.2	0.6	0.5	0.4	-0.4
Wyoming................................	0.7	0.8	1.6	0.9	0.7	-1.5	-0.4

[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 -12.1 to 4.1 percent, with an average absolute percentage revision of 1.8 percent across all MSAs[2] (See Table 3a.). Comparatively at the State level, the range was -3.8 to 1.1 percent, with an average absolute percentage revision of 0.9 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 2009 had an average absolute revision of 0.9 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 2.1 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 2009. 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 2010 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 1.0 percent for December 2009. The average absolute revision from 2004 to 2009 is 0.5 percent. The range of the percentage revision for the States at the total nonfarm level was from -2.6 to 1.3 percent in December 2009. (See Table 1.)

For metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from -9.3 to 6.1 percent in December 2009, with an average absolute percentage revision of 2.0 percent across all MSAs. (See Table 3b.) Comparatively at the State level, the range was -2.6 to 1.3 percent, with an average absolute percentage revision of 1.0 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 2009 had an average absolute revision of 1.8 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 2.3 percent. (See Table 3b.)

Table 3a. Benchmark revisions for total nonfarm employment in metropolitan areas, March 2009

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	More than 1 million
Number of MSAs…………..	378	183	138	31	26
Average absolute percentage revision…………………	1.8	2.1	1.6	1.4	0.9
Range............................…	-12.1 : 4.1	-12.1 : 4.1	-5.3 : 2.2	-3.9 : 1.1	-2.9 : 0.1
Mean............................…	-1.4	-1.5	-1.4	-1.2	-0.9
Standard deviation..........	1.9	2.3	1.5	1.0	0.7

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[2] The CES program published employment series for 378 MSAs in 2009. This number excludes metropolitan divisions, Puerto Rico, and the 3 new MSAs (Manhattan, KS, Mankato-North Mankato, MN, and Cape Girardeau-Jackson, MO-IL). The list of BLS standard MSAs is available at http://www.bls.gov/sae/.

Table 3b. Benchmark revisions for total nonfarm employment in metropolitan areas, December 2009

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	More than 1 million
Number of MSAs…………..	378	186	137	30	25
Average absolute percentage revision…………………	2.0	2.3	1.9	1.6	1.8
Range...........................…	-9.3 : 6.1	-9.3 : 6.1	-8.0 : 3.3	-4.0 : 0.7	-4.4 :- 0.2
Mean...........................…	-1.4	-1.3	-1.6	-1.5	-1.8
Standard deviation..........	2.2	2.7	1.9	1.1	1.0

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[3]. Data for the most recent 13 months are regularly shown in Table B-7**[4].**

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