Revisions in State Establishment–based Employment Estimates Effective January 2012

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With the release of the estimates for January 2012, nonfarm payroll employment, hours, and earnings data for States and areas were revised to reflect the incorporation of March 2011 benchmarks and the recomputation of seasonal adjustment factors for State estimates. The revisions affect all not seasonally adjusted data from April 2010 forward, all seasonally adjusted data from January 2007 forward, and select series subject to historical revisions. This year the Bureau of Labor Statistics (BLS) used special model adjustments to control for survey interval variations for all seasonally adjusted data. These special adjustments are designed to correct for variations in the number of weeks between reference periods in any given pair of months. 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 2011 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 141,000 businesses and government agencies, representing approximately 486,000 individual worksites, in order to provide detailed industry data on employment, hours, and earnings of employees on nonfarm payrolls for all 50 state, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and about 400 metropolitan areas and divisions.[1]

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. The UI tax reports are collected, reviewed, and edited by the BLS Quarterly Census of Employment and Wages.[2] With the March 2011 benchmark, all 50 states and the District of Columbia replaced April 2010 through June 2011 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 July 2011 through December 2011. 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. Regular updating of the CES sample frame with information from the UI universe files helps to keep the CES survey current with respect to

[1] For more information on the sample size for each State, see http://www/bls.gov/sae/sample.htm
[2] For more information on the Quarterly Census of Employment and Wages, see http://www.bls.gov/cew/.

employment from business births and business deaths. The timeliest UI universe files available, however, always will be a minimum of 9 months out of date. The CES survey thus cannot rely on regular frame maintenance alone to provide estimates for business birth and death employment contributions. BLS has researched both sample–based and model–based approaches to measuring birth units that have not yet appeared on the UI universe frame. Since the research demonstrated that sampling for births was not feasible in the very short CES production timeframes, the Bureau is using a model–based approach for this component.

Earlier research indicated that while both the business birth and death portions of total employment are generally significant, the net contribution is relatively small and stable. 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 missing employment gains associated with business births.[3]

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 July through December 2011 differ from original over–the–month changes because they (1) are affected by the application of the existing sample link to a new level determined by the updated UI figures and (2) include updated net birth/death estimates that incorporate information from the most recent year of universe employment counts.

Benchmark revisions

Statewide

The percentage differences between March 2011 sample–based estimates and the revised March 2011 benchmark levels are commonly used to report the magnitude of the revisions. The average absolute percentage revision for state total nonfarm estimates is 0.5 percent for March 2011. The average of the average absolute percentage revisions from 2006 to 2010 is 0.5 percent. The range of the percentage revision for the states at the total nonfarm level was from –1.8 to 1.4 percent in March 2011 (See table 1a.)

The level differences between March 2011 sample–based estimates and the revised March 2011 benchmark levels further illustrate the revisions made. A relatively large percentage revision can correspond to a relatively small level revision based on the amount of employment in an industry. The average absolute percentage revisions for mining and logging and construction are both 3.2 percent; however, the absolute level revision for mining and logging is 500 while the absolute level revision for construction is 3,300. (See table 1b.)

As the CES program replaces estimates with population data through the second quarter, the revision to the original estimates for that time period can be identified by examining the revisions to the estimates through December 2011. Because CES has replaced the estimates with benchmark data for months after March, the

[3] 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.

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 estimates.

The average absolute percentage revision for state total nonfarm estimates is 0.7 percent for December 2011. The range of the percentage revision for the states at the total nonfarm level was from –2.0 to 2.3 percent in December 2011. (See table 1a.)

Thirty states and the District of Columbia revised total nonfarm payroll employment upward, while 21 states had downward revisions. (See table 2. or chart 1.) In March 2011, 34 states had revisions greater than –0.5 percent and less than 0.5 percent; six states had absolute percentage revisions of greater than 1.0 percent. (See table 2. or chart 1.)

In December 2011, 25 states had revisions greater than –0.5 percent and less than 0.5 percent; twelve states had revisions less than –1.0 percent or greater than 1 percent in December 2011. (See table 2. or chart 2.)

Table 1a. Percentage differences between state employment estimates and benchmarks by industry, March 2006–March 2011 and December 2011

Industry	Mar 2006	Mar 2007	Mar 2008	Mar 2009	Mar 2010	Mar 2011	Dec 2011
	Average absolute percent differences						
Total nonfarm	0.5	0.4	0.4	0.9	0.4	0.5	0.7
Mining and logging	3.4	3.8	4.3	6.0	7.5	3.2	4.0
Construction	2.7	2.2	2.6	4.0	3.6	3.2	2.8
Manufacturing	1.7	1.2	1.3	2.2	1.8	1.4	1.6
Trade, transportation, and utilities	0.5	0.7	0.6	1.6	1.2	0.9	1.2
Information	1.9	2.2	2.0	3.3	2.3	2.4	3.7
Financial activities	0.9	1.1	1.0	1.6	1.8	1.9	2.1
Professional and business services	2.1	1.5	1.3	2.2	2.2	1.8	2.1
Education and health services	0.9	0.7	0.8	0.8	1.0	0.9	1.1
Leisure and hospitality	1.2	1.1	0.9	1.7	1.8	1.9	2.3
Other services	1.7	1.5	1.3	1.9	1.9	2.4	2.4
Government	0.7	0.5	0.6	0.6	0.8	0.7	1.2
Total nonfarm:							
Range	–0.8 : 4.2	–1.5 : 1.2	–1.4 : 1.0	–3.8 : 1.1	–1.3 : 1.4	–1.8 : 1.4	–2 : 2.3
Mean	0.3	0.0	–0.1	–0.8	–0.1	0.2	0.0
Standard deviation	0.7	0.5	0.5	0.8	0.5	0.6	0.9

Table 1b. Level differences between state employment estimates and benchmarks by industry, March 2006–March 2011 and December 2011

Industry	Mar 2006	Mar 2007	Mar 2008	Mar 2009	Mar 2010	Mar 2011	Dec 2011
	Average absolute level differences						
Total nonfarm	10,500	11,200	11,500	20,700	7,600	10,200	14,500
Mining and logging	500	300	600	700	600	500	650
Construction	4,700	3,600	3,300	3,700	2,900	3,300	3,200
Manufacturing	2,900	2,700	2,500	3,200	2,000	2,100	2,700
Trade, transportation, and utilities	2,900	3,900	2,800	7,800	4,500	2,800	4,400
Information	1,000	900	1,000	1,300	1,200	1,300	1,700
Financial activities	1,300	1,900	1,800	2,300	2,300	2,600	2,800
Professional and business services	9,100	6,100	6,200	6,500	4,600	4,700	4,800
Education and health services	3,800	3,100	3,100	2,800	2,800	3,000	3,400
Leisure and hospitality	2,800	3,100	2,600	3,500	3,500	3,100	3,700
Other services	2,000	1,400	1,200	1,900	1,600	1,900	1,800
Government	2,800	2,000	2,800	2,200	3,800	3,700	4,900
Total nonfarm:							
Range	–14,000 : 73,400	–59,800 : 96,200	–112,300 : 44,000	–190,500 : 10,900	–38,700 : 28,900	–15,300 : 57,500	–40,900 : 88,500
Mean	7,400	400	–5,100	–19,600	–1,700	6,100	4,600
Standard deviation	16,700	20,800	21,000	31,500	11,300	15,300	22,400

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, in table 1a, 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 2006–March 2011 and December 2011

State	Mar 2006	Mar 2007	Mar 2008	Mar 2009	Mar 2010	Mar 2011	Dec 2011
Alabama	0.2	(1)	–0.6	–1.1	0.3	–0.1	–0.3
Alaska	0.6	–0.2	0.4	–0.5	–1.3	–0.2	(1)
Arizona	0.7	–1.5	–0.4	–0.1	–0.3	0.6	0.1
Arkansas	1.0	(1)	(1)	–0.3	–0.3	–1.1	–1.3
California	0.3	–0.4	–0.3	–1.3	–0.1	(1)	–0.3
Colorado	0.3	0.4	–0.2	–0.3	0.5	0.7	0.8
Connecticut	0.3	–0.3	0.5	–0.5	–1.3	(1)	–0.1
Delaware	(1)	–0.8	(1)	0.7	–0.4	0.7	1.4
District of Columbia	–0.5	–0.1	–0.1	–0.6	–0.4	1.4	2.1
Florida	–0.1	–0.2	–1.4	–1.4	–0.2	0.5	0.5
Georgia	0.4	0.4	–0.7	–0.9	0.2	1.4	2.3
Hawaii	–0.3	(1)	–0.3	–1.2	–0.5	(1)	–0.2
Idaho	–0.2	–0.1	–0.1	–1.2	–0.2	–0.4	–0.3
Illinois	0.4	(1)	–0.3	–0.3	0.1	(1)	–0.2
Indiana	0.1	0.2	–0.6	–1.3	–0.2	0.7	1.5
Iowa	–0.1	–0.4	0.1	–0.3	–0.5	–0.2	–0.4
Kansas	0.5	(1)	0.5	–0.8	–0.3	1.2	0.7
Kentucky	0.4	0.2	–1.2	–1.3	–0.4	–0.3	–0.3
Louisiana	4.2	0.4	–0.5	–1.4	–0.6	0.9	0.1
Maine	0.4	0.1	0.3	–0.7	0.3	–0.4	–0.4
Maryland	0.4	(1)	–0.8	–0.6	–0.1	1.1	1.2
Massachusetts	0.8	–0.2	0.2	0.1	0.9	0.3	–0.9
Michigan	–0.3	–0.6	–0.1	–0.5	0.2	0.2	0.3
Minnesota	0.7	–0.4	–0.3	–0.1	–0.4	0.8	0.5
Mississippi	0.1	–0.5	(1)	–1.2	–0.1	–0.4	–0.8
Missouri	0.6	–0.1	0.1	–1.1	–0.5	–0.4	–0.2
Montana	0.9	0.6	–0.4	–2.4	0.2	–0.7	–2
Nebraska	–0.6	–0.5	–0.8	0.1	–0.2	–0.6	–1.1
Nevada	0.2	–1.2	–0.9	–3.8	–0.6	–0.1	1.2
New Hampshire	–0.2	0.3	–1.2	–1.5	–0.7	(1)	–1.1
New Jersey	0.1	–0.6	0.4	–1.2	–0.1	–0.2	–0.1
New Mexico	0.7	0.1	(1)	–1.6	–0.1	(1)	–0.2
New York	0.1	0.4	0.3	–0.4	0.3	0.7	0.7
North Carolina	0.6	1.2	–0.3	–0.1	(1)	0.8	1.3
North Dakota	0.3	–0.3	1.0	–0.9	0.8	0.3	0.6
Ohio	(1)	–0.3	–0.7	–0.5	(1)	–0.3	–0.5
Oklahoma	0.5	(1)	0.7	–1.2	0.1	(1)	–0.5
Oregon	–0.8	0.6	–0.4	–1.3	0.1	–0.3	–0.4
Pennsylvania	(1)	–0.2	0.1	–0.4	0.3	0.3	0.1
Rhode Island	–0.5	–0.5	0.2	–0.3	1.4	(1)	–0.6
South Carolina	(1)	0.8	–0.3	–1.4	–1.2	0.3	0.4
South Dakota	–0.1	–0.4	0.1	–0.4	–0.1	0.5	–0.6
Tennessee	0.4	–0.3	0.2	–1.3	(1)	0.7	0.8
Texas	0.6	0.9	0.4	–0.7	(1)	–0.1	–0.1
Utah	0.6	0.2	–0.9	–1.9	–0.5	0.2	–0.1
Vermont	0.1	–0.3	–0.1	1.1	0.1	–1.8	–0.9
Virginia	0.1	–0.3	–0.1	–0.4	(1)	0.5	0.9
Washington	–0.2	0.6	0.3	–0.6	–0.7	0.1	0.3
West Virginia	0.7	–0.1	0.1	0.8	0.8	0.4	0.5
Wisconsin	–0.2	0.6	0.5	0.4	0.7	0.1	–0.9
Wyoming	1.6	0.9	0.6	–1.5	–0.1	0.1	–1.5

[1] Less than +/– 0.05 percent.

Chart 1. Percent differences between nonfarm payroll employment benchmarks and estimates by State, March 2011

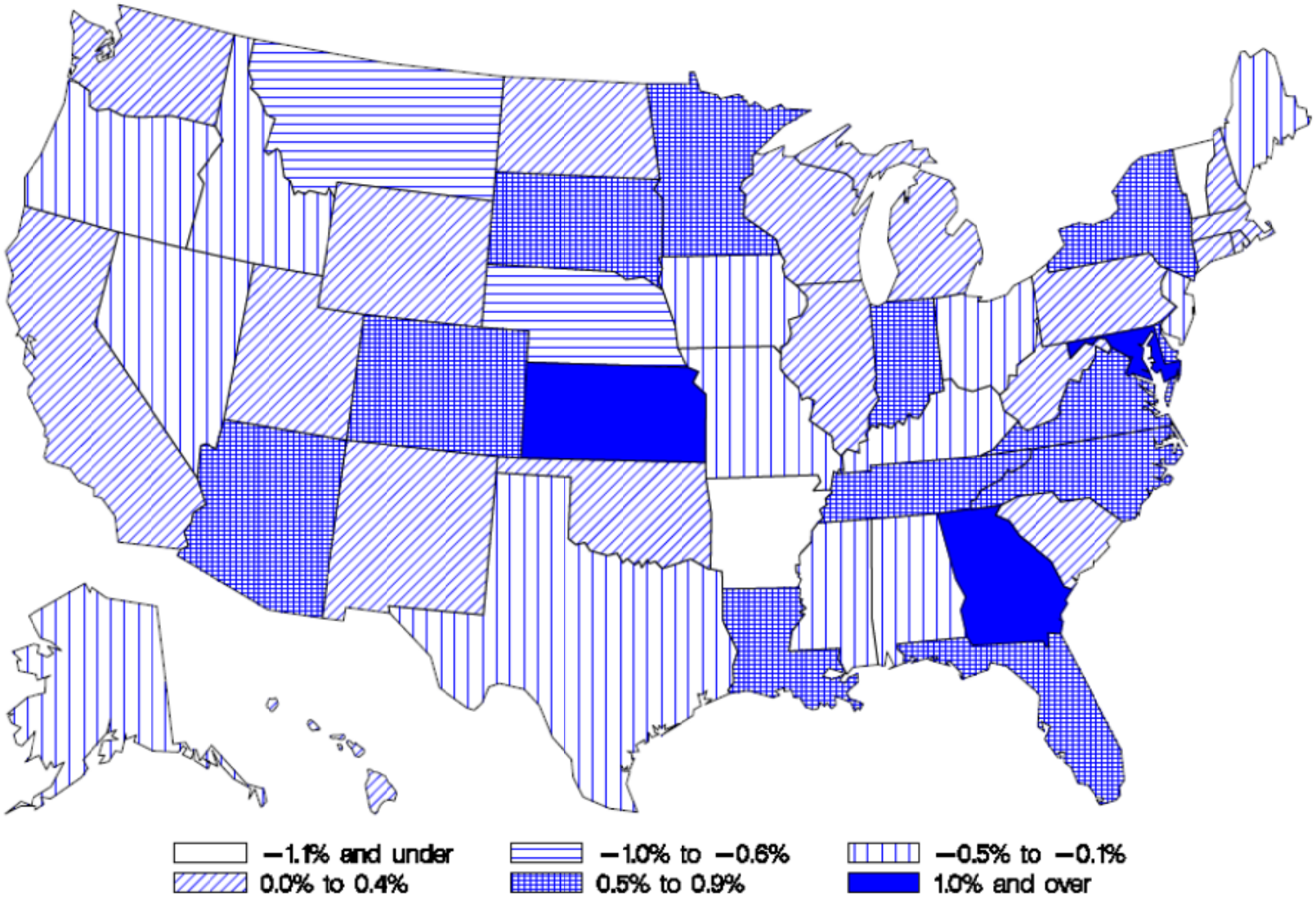
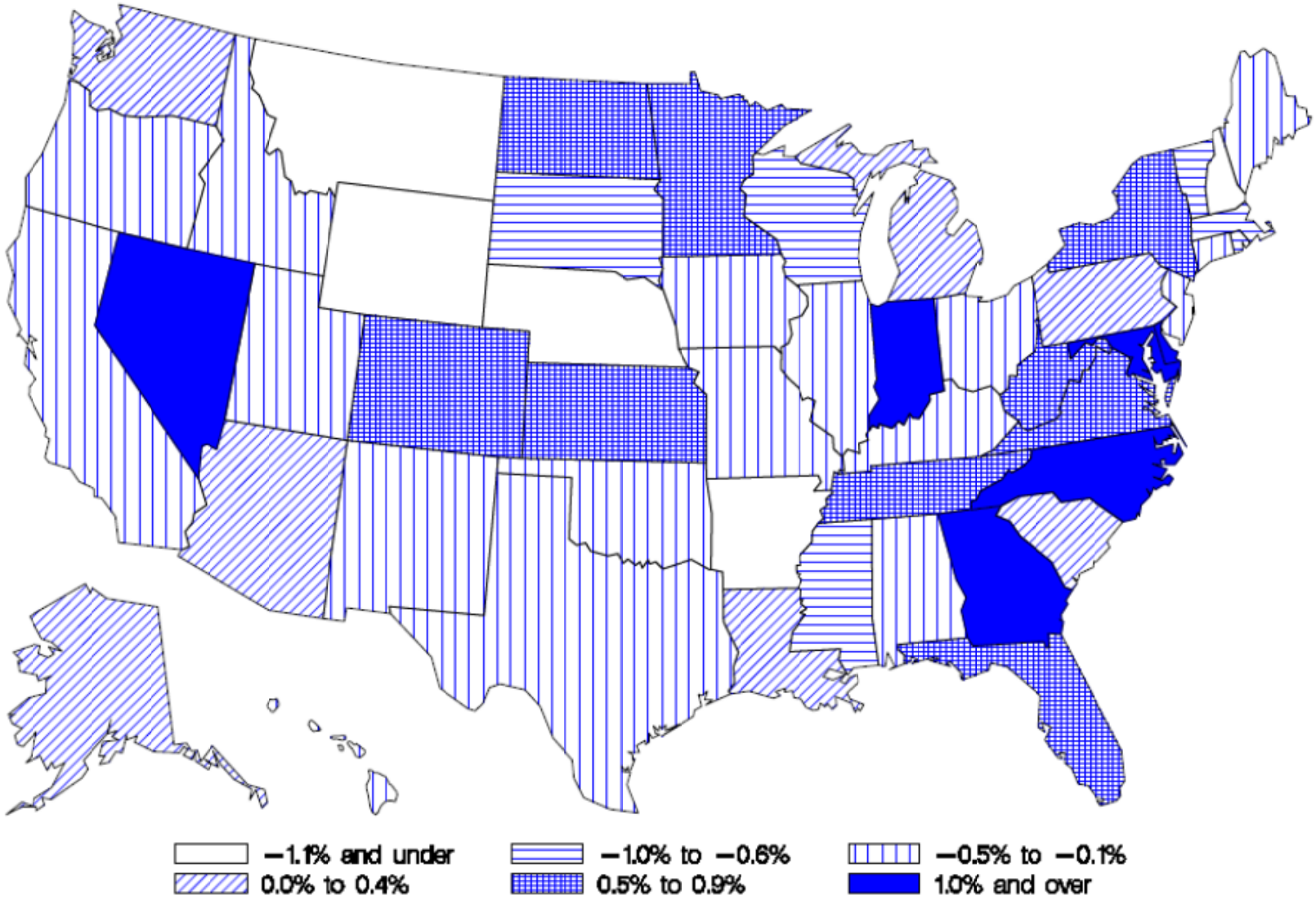


Chart 2. Percent differences between nonfarm payroll employment benchmarks and estimates by State, December 2011



Metropolitan statistical areas (MSAs)

For metropolitan statistical areas (MSAs) published by the CES program, the percentage revisions ranged from –5.6 to 5.0 percent, with an average absolute percentage revision of 1.1 percent across all MSAs.[4] (See table 3a.) Comparatively at the state level, the range was –1.8 to 1.4 percent, with an average absolute percentage revision of 0.5 percent. (See table 1a.) Generally, as MSA size decreases, both the range of percent revisions and the average absolute percent revision increases. Metropolitan areas with an annual average of 1 million or more employees in 2011 had an average absolute revision of 0.7 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 –7.8 to 7.2 percent in December 2011, with an average absolute percentage revision of 1.5 percent across all MSAs. (See table 3b.) Comparatively at the state level, the range was –2.0 to 2.3 percent, with an average absolute percentage revision of 0.7 percent. (See table 1a.) 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 2011 had an average absolute revision of 0.9 percent, while metropolitan areas with fewer than 100,000 employees had an average absolute revision of 1.8 percent. (See table 3b.)

Table 3a. Benchmark revisions for total nonfarm employment in metropolitan areas, March 2011

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	187	138	31	25
Average absolute percent revision……	1.1	1.4	0.9	0.8	0.7
Range…….	–5.6 : 5	–5.2 : 5	–5.6 : 3.7	–1.4 : 2.5	–0.8 : 2.3
Mean.....	0.1	–0.1	0.2	0.5	0.6
Standard deviation…….....	1.5	1.8	1.2	0.8	0.7

Table 3b. Benchmark revisions for total nonfarm employment in metropolitan areas, December 2011

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	186	139	31	25
Average absolute percent revision……	1.5	1.8	1.2	1.0	0.9
Range…….	–7.8 : 7.2	–7.8 : 7.2	–4.5 : 5.6	–1.3 : 3.1	–1.3 : 3.2
Mean.....	0.3	0.2	0.2	0.7	0.6
Standard deviation…….....	2.0	2.4	1.6	1.1	0.9

Seasonal adjustment

[4] The CES program published employment series for 381 MSAs in 2011. 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.

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 different 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 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 BLS website.[5] Data for the most recent 13 months are regularly shown in table D–1.[6]

Special model adjustments. BLS uses special model adjustments to control for survey interval variations sometimes referred to as the 4 vs. 5 week effect for all state non–farm seasonally adjusted series. Although the CES survey is referenced to a consistent concept the pay period including the 12th of each month inconsistencies arise because there are sometimes four and sometimes five weeks between the week including the 12th in a given pair of months. In highly seasonal industries, these variations can be an important determinant of the magnitude of seasonal hires or layoffs that have occurred at the time the survey is taken, thereby complicating seasonal adjustment. [7]

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.

[5] Seasonally adjusted and unadjusted data may be accessed from the BLS website at http://data.bls.gov/cgi–bin/dsrv?sm.
[6] Table D–1 can be viewed at www.bls.gov/sae/tables.htm.
[7] For more information on the presence and treatment of calendar effects in CES data, see www.bls.gov/ore/pdf/st960190.pdf.