

Supporting Statement

Job Opening and Labor Turnover Survey (JOLTS)

B. Collection of Information Employing Statistical Methods

For detailed technical materials on the sample allocation, selection, and estimation methods as well as other related statistical procedures see the BLS Handbook, internal BLS technical reports, and ASA papers listed in the references section of this document. The following is a brief summary of the primary statistical features of JOLTS.

1a. Universe

The Job Openings and Labor Turnover Survey measures the job openings, hires, total separations, quits, layoffs and discharges, and other separations for each month at the national level from a sample of about 16,500 establishments (worksites). The universe for this survey is the Quarterly Contribution Reports (QCR) filed by employers subject to State Unemployment Insurance (UI) laws. The U.S. Bureau of Labor Statistics (BLS) receives these QCR for the Quarterly Census of Employment and Wages (QCEW) program from the 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. The QCEW data, which are compiled for each calendar quarter, provide a comprehensive business name and address file with employment, wage, detailed geography (i.e., county), and industry information at the six-digit North American Industry Classification System (NAICS) level. This information is provided for over eight million business establishments of which about 8.1 million are in the scope of this survey. Similar data for Federal Government employees covered by the Unemployment Compensation for Federal Employees program (UCFE) are also included. The final data is stored in a Longitudinal Data Base (LDB), which is then used as a sample frame for sample selection. Another data source used for sampling is the universe of railroad establishments obtained from the Federal Railroad Administration.

1b. Sample

Scope—The JOLTS sample is selected from the populations stated above excluding Puerto Rico and the Virgin Islands. It also excludes from the universe records that are for private household workers (NAICS 814110) and records from Agriculture, Forestry, Fishing and Hunting (NAICS 11) other than logging (113310). Records with average employment of zero in the last twelve months are also excluded from the universe.

Stratification—The JOLTS sample has about 16,500 establishments allocated based on the stratification of four census regions, 20 two-digit industry codes, and six employment size classes, including certainty establishments which have a certain level of employment, or the number of establishments in the universe for a sampling cell is less than or equal to 24. These certainty establishments are assigned a sampling weight of 1.00 and other establishments are assigned the sampling weight of the strata population count divided by the strata sample count. The population and sample counts and their employment levels by industry are shown in Table 1.

In addition to the annual sample, BLS added about 250 establishments in each of the three remaining quarters to represent newly formed businesses. The total sample size, therefore, is about 17,000 establishments. However, with a new sample selection every 1st quarter, the sample size is reduced to about 16,500 after discarding the out of business units not on the current frame.

| Industry | IDNAICS | Popn(N) | Popn(Emp) | Sample(n) | Sample(Empl) |
|---|---------|-----------|-------------|-----------|--------------|
| Natural resources and mining | 21 | 36,676 | 758,116 | 470 | 118,257 |
| Construction | 23 | 695,300 | 8,513,793 | 686 | 189,028 |
| Nondurable goods | 31 | 121,041 | 5,134,536 | 599 | 306,870 |
| Durable goods | 33 | 205,431 | 8,369,859 | 767 | 785,818 |
| Wholesale Trade | 42 | 556,788 | 6,558,704 | 600 | 225,291 |
| Retail trade | 44 | 990,609 | 18,376,772 | 1,370 | 420,836 |
| Transportation, warehousing, and utilities | 48 | 236,100 | 6,468,521 | 665 | 753,841 |
| Information | 51 | 142,163 | 3,235,971 | 662 | 527,464 |
| Finance and Insurance | 52 | 453,098 | 6,483,136 | 517 | 320,994 |
| Real estate and rental and leasing | 53 | 354,448 | 2,504,428 | 549 | 119,839 |
| Professional and business services | 54 | 1,490,715 | 19,281,313 | 1,281 | 534,476 |
| Employment services | 56 | 83,948 | 4,554,440 | 639 | 409,769 |
| Educational services | 61 | 105,169 | 3,239,175 | 651 | 748,697 |
| Health care and social assistance | 62 | 901,659 | 20,458,694 | 1,412 | 1,755,395 |
| Arts, entertainment, and recreation | 71 | 124,352 | 3,085,493 | 622 | 443,951 |
| Accommodation and food services | 72 | 650,721 | 16,014,229 | 1,289 | 398,329 |
| Other services | 81 | 550,179 | 4,900,460 | 463 | 88,921 |
| Federal government | 91 | 29,711 | 2,291,038 | 650 | 817,011 |
| State and local government education | 92 | 72,673 | 10,728,375 | 922 | 2,555,593 |
| State and local government non-education | 93 | 159,311 | 9,738,391 | 791 | 1,396,294 |
| Total annual sample including certainty/birth units | | 7,960,092 | 160,695,444 | 15,605 | 12,916,674 |
| Quarterly sample of newly formed businesses | | | | 227 | |

2a. Sample Design

Allocation method—The JOLTS sample design is a probability-based stratified random sample. The basic sampling unit is an establishment or worksite which generally remains in the survey for 24 months for a noncertainty establishment and stays out of the survey for the next three years after completion of the 24 months. Important features of the sample design are the use of stratified random sampling, a Neyman allocation (Cochran, 1977, pp. 259-261), and ratio estimators. The characteristics used to stratify the sample are geographic area by four census regions, 2-digit industry divisions as defined in Table 1, and six establishment employment size classes.

JOLTS characteristics are highly correlated with an establishment's employment level. Thus for a fixed sample size, stratified sampling results in a greater precision than simple random

sampling. Given a fixed sample size, the Neyman allocation provides the maximum precision of an estimate. Some establishments are included in the sample with certainty.

Sample Rotation—The sample is divided into one certainty panel (panel 0) and 24 noncertainty panels. Each month, the oldest panel is rotated out and replaced by a new panel. Each panel is asked to provide data for 24 months. This maintains 24 active noncertainty panels for estimation.

In April 2009, new sampling procedures were implemented. During the annual sample, the previously sampled establishments still used in JOLTS estimation were updated, removing out-of-business establishments and updating industry and employment size class information. Also an age variable was added to all establishments in the sample. All the establishments to be used in the JOLTS estimation during the course of the sampling year were then weighted to the current sampling frame, so that they may represent the most current data. During that same sampling year, a quarterly birth sample was also implemented. The purpose of this birth sample is to enroll younger establishments into the JOLTS sample as soon as possible.

2b. Estimation Procedure

The survey utilizes a ratio estimator to improve the precision of the sample estimates. This estimator improves the precision of the sample estimates by utilizing the correlation between the employment data and the characteristics to be measured. A Horvitz-Thompson estimator (Lohr, 1999, Chapter 6.) with a ratio adjustment is used to produce estimates of surveyed characteristics at several levels of geographic and industrial detail. These estimates include the following:

- Totals
- Rates
- Estimates of monthly change

The generalized formula for totals for all survey characteristics (job openings, hires, etc.) for time period t is as follows for ready reference:

$$\hat{X}_t = \sum_{i \in \text{cell}} (W_{t,i} * NRAF_{t,cell} * BMF_{t,cell}) * X_{t,i}$$

where,

$X_{t,i}$ is the characteristic of interest for the i^{th} unit at time t .

\hat{X}_t is the estimate of a characteristic at time t .

$W_{t,i}$ is the sample weight for the i^{th} unit at time t .

$NRAF_{t,cell}$ is the cell (Region/2-digit NAICS/SZC) non-response adjustment factor defined by

$$\left(\frac{\sum_{t, \text{cell}} W_{t, \text{eligibles}}}{W_{t, \text{respondents}}} \right) \text{ at time } t.$$

Where “respondents” are the all units reporting employment at time t and “eligible” are all sampled units excluding out-of-business units at time t within a cell.

BMF is the (Current Employment Statistics) Benchmark factor at time t. It is computed for each estimation cell as:

$$\text{Benchmark factor} = \left(\frac{CES_{Emp_t}}{JOLTS_{Emp_t}} \right)$$

where, CES_{Emp_t} is the employment level at time t obtained from the monthly Current Employment Statistics (CES) Survey, also known as the monthly Payroll Survey. The CES employment serves as a population control for each estimation cell and $JOLTS_{Emp_t}$ is the sample weighted employment at time t.

The formula for the Job Openings rate is as follows:

$$JO_Rate_t = \frac{\hat{JO}_t}{CES_Emp_t + \hat{JO}_t}$$

where, \hat{JO}_t is the estimated level of job openings at time t.

The generalized formula for all other rates is as follows:

$$Rate_t = \frac{\hat{X}_t}{CES_Emp_t} \text{ where } \hat{X}_t \text{ is the estimate of the characteristic at time } t.$$

Details of JOLTS estimation are available at <http://www.bls.gov/osmr/pdf/st000140.pdf>

Birth/Death Model—As with any sample survey, the JOLTS sample can be only as current as its sampling frame. The time lag from the birth of an establishment until its appearance on the sampling frame is approximately one year. In addition, many of these new units may fail within the first year. Since these universe units cannot be reflected on the sampling frame immediately, the JOLTS sample cannot capture job openings, hires, and separations from these units during their early existence. BLS has developed a model to estimate birth/death activity using QCEW longitudinal data. The birth/death model also uses historical JOLTS data to estimate the total amount of “churn” (hires and separations) that exists in establishments of various sizes. The model then combines the estimated total churn with the QCEW employment change of younger units (less than 18 months) to estimate the number of hires and separations taking place in these units that cannot be measured through sampling.

The model-based estimate of total separations is distributed to the three components – quits; layoffs and discharges; and other separations – in proportion to their contribution to the sample-based estimate of total separations. Additionally, job openings for the modeled units are estimated by computing the ratio of openings to hires in the collected data and applying that ratio to the modeled hires. The estimates of job openings, hires, and separations produced by the birth/death model are then added to the sample-based estimates produced from the survey to arrive at the estimates for openings, hires, and separations. The derivation of the parameter's computational procedure is given in Appendix A and Appendix B.

Alignment—JOLTS hires minus separations should be comparable to the CES net employment change. The CES series is considered a highly accurate measure of net employment change owing to its very large sample size and annual benchmarking to universe counts of employment from the QCEW program. However, definitional differences as well as sampling and non-sampling errors between the two surveys historically caused JOLTS to diverge from CES over time. To limit the divergence and to improve the quality of the JOLTS hires and separations series, BLS implemented a monthly alignment method. This monthly alignment method applies the seasonally adjusted CES employment trends to the seasonally adjusted JOLTS implied employment trend (hires minus separations) forcing them to be approximately the same, while preserving the seasonality of the JOLTS data. A brief description is as follows.

First, the two series are seasonally adjusted and the difference between the JOLTS implied employment trend and the CES net employment change is calculated. Next, the JOLTS implied employment trend is adjusted to equal the CES net employment change through a proportional adjustment. This proportional adjustment procedure adjusts the two components (hires, separations) proportionally to their contribution to the total churn (hires plus separations). For example, if hires are 40 percent of the churn for a given month, they will receive 40 percent of the needed adjustment and separations will receive 60 percent of the needed adjustment. The following example illustrates the adjustment.

Example: let hires = 40; seps = 60; change in ces emp = -25

- 1) $D = (\text{hires} - \text{seps}) - \text{change of cesemp} = 40 - 60 - (-25) = 5$
- 2) $\text{PropAdj_Hires} = \text{hires} / (\text{hires} + \text{seps}) * D = 40 / (40 + 60) * 5 = 2$
- 3) $\text{PropAdj_Seps} = \text{seps} / (\text{hires} + \text{seps}) * D = 60 / (40 + 60) * 5 = 3$
- 4) $\text{Hires_sa} = \text{Hires} - \text{PropAdj_Hires} = 40 - 2 = 38$
- 5) $\text{Seps_sa} = \text{Seps} - \text{PropAdj_Seps} = 60 - 3 = 57$

Job openings are adjusted based on the adjustment made to hires. This adjustment applies the ratio of job openings to hires to the hires adjustment to arrive at the job openings adjustment. The adjusted job openings, hires, and separations are converted back to not seasonally adjusted data by reversing the application of the original seasonal factors. After the monthly alignment method is used to adjust the not seasonally adjusted level estimates, rate estimates are computed from the adjusted levels. The monthly alignment procedure assures a close match of the JOLTS implied employment trend with the CES trend for not seasonally adjusted data. The adjusted estimates are then again seasonally adjusted (see <http://www.bls.gov/osmr/pdf/st090300.pdf>).

2c. Reliability

This survey is designed to produce reliable estimates of the characteristics of interest. For the period January 2017 through December 2017, the average relative standard errors for national estimates of job openings; hires; quits; layoffs and discharges; other separations; and total separations rate, respectively, were 1.9, 1.75, 2.12, 4.56, 6.13, and 2.01 percent. (See table 2.) Table 2 details the Average Relative Standard Error of the JOLTS rates in percentages (Coefficients of Variation) for each JOLTS industry and variable. For the most part, the average JOLTS relative standard errors are below a reasonable acceptable RSE (that is, an RSE of 30 percent). The notable exception would be other separations. The mean Other Separations rate is generally near zero and this proximity of the mean to zero can substantially, on occasion, raise the RSE above a reasonable RSE.

The estimation of sample variances for the JOLTS survey is accomplished through the method of Balanced Half Samples (BHS) similar to CES. This replication technique uses half samples of the original sample and calculates estimates using those subsamples. The replicate weights in both half samples are modified using Fay's method of perturbation. The sample variance is calculated by measuring the variability of the estimates made from these subsamples. (For a detailed mathematical presentation of this method, see Handbook of Methods, BLS Chapter 2, Bureau of Labor Statistics, 2011 or <http://www.bls.gov/opub/hom/homch2.htm> under Reliability of Estimates.)

We compute the replicate estimates $\hat{Y}^{(\alpha)}$ using the whole sample rather than only half of the sample, as with the original BRR method. For each replicate, sample units are used with the modified weights $w_i^{(\alpha)}$:

$$w_i^{(\alpha)} = \left(1 + \gamma G_i h^{(\alpha)} \sqrt{1-f}\right) w_i$$

Where

$\gamma = 0.5$, a perturbation factor

$G_i = \pm 1$, the replicate indicator

$h^{(\alpha)}$ is the element of the Hadamard matrix (row α for a given column)

f is the sampling fraction

w_i is the selection weight

In the above formula, the factor $\sqrt{1-f}$ is not part of the Fay's procedure, it was added to account for sampling from the finite population.

After we obtain the replicate estimates, we compute the variance using the usual formula:

$$\text{Var}_{\text{FayBRR}}(\hat{Y}) = \frac{1}{A} \sum_{\alpha=1}^A (\hat{Y}^{(\alpha)} - \hat{Y})^2$$

where A is the number of replicates, 114 for JOLTS from a Hadamard matrix of order 116.

Before estimates of these characteristics are released to the public, they are first screened to ensure that they do not violate the Bureau of Labor Statistics' (BLS) confidentiality pledge. A promise is made by the Bureau to each respondent that BLS will not release its reported data to the public in a manner which would allow others to identify the establishment, firm, or enterprise. Estimates which fail confidentiality screening based on p-percent rule for disclosure (see Federal Committee on Statistical Methodology Working paper 22) are not published.

2d. Revisions

In order to reflect revisions in the CES (Current Employment Statistics) estimates, the CES second closing revision is reflected in the JOLTS second closing estimates, and the final CES revision is incorporated in the JOLTS estimates on a yearly basis when JOLTS rebenchmarks to CES after CES estimates are benchmarked against the QCEW population.

2e. Specialized Procedures

BLS conducted extensive research to: (1) improve sampling procedures to bring in birth units on a timely basis in order to reduce bias; (2) improve the quality of the reported data in order to reduce response error; and (3) improve data collection procedures in order to increase response rates. The BLS achieved a 64 percent overall unweighted response rate. Therefore, the current respondent annual burden is about 21,650 hours with the targeted goal of a 66 percent unweighted response rate. This calculation is derived as:

$$\text{Annual burden hours} = 16,400 \times 0.66 \times 12 \times 10 / 60 = \text{approximately } 21,650 \text{ hours.}$$

Where, 16,10 is the total number of establishments in the current annual sample and 100 establishments for each of the three remaining quarters for births; 0.66 is the target goal of response rate; 12 months; 10 minutes per schedule; and 60 minutes. NOTE: The actual burden will vary depending on how many birth establishments are sampled during the whole year.

2f. Data Collection Cycles

JOLTS data are collected every month.

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| Table 2 | | Average Relative Standard Error in Percentages (Coefficients of Variation) for Rates by Industry January 2017 - December 2017 | | | | | |
|----------------|--|--|--------------|--------------|---------------------------------------|------------------------------|------------------------------|
| ID | Industry/Rates | Job Openings | Hires | Quits | Layoffs and Discharges | Other Separations | Total Separations |
| TOT | Total | 1.90 | 1.75 | 2.12 | 4.56 | 6.13 | 2.01 |
| PRI | Total Private | 2.06 | 1.86 | 2.22 | 4.78 | 7.24 | 2.11 |
| 21 | Mining and Logging | 21.57 | 18.87 | 14.48 | 27.87 | 35.38 | 14.09 |
| 23 | Construction | 13.83 | 8.60 | 11.49 | 16.24 | 42.50 | 8.40 |
| MFG | Manufacturing | 5.96 | 5.77 | 6.13 | 13.68 | 13.80 | 6.88 |
| DUR | Durable Goods | 7.63 | 8.00 | 8.47 | 14.84 | 16.61 | 8.24 |
| NDR | Nondurable Goods | 9.09 | 7.99 | 7.08 | 24.64 | 22.80 | 11.08 |
| TTU | Trade, Transportation, and Utilities | 4.74 | 3.88 | 4.80 | 10.13 | 13.82 | 4.60 |
| 42 | Wholesale Trade | 8.76 | 9.77 | 15.11 | 20.65 | 30.70 | 10.24 |
| 44 | Retail Trade | 6.33 | 4.59 | 5.44 | 12.18 | 15.49 | 5.71 |
| 48 | Transportation, Warehousing, and Utilities | 9.36 | 8.64 | 9.21 | 20.00 | 23.27 | 9.49 |
| 51 | Information | 8.17 | 13.48 | 12.06 | 22.24 | 26.01 | 11.33 |
| FIR | Financial Activities | 7.03 | 8.68 | 9.51 | 20.16 | 26.34 | 8.96 |
| 52 | Finance and Insurance | 8.03 | 10.36 | 10.29 | 24.47 | 28.69 | 9.93 |
| 53 | Real Estate and Rental and Leasing | 14.03 | 13.08 | 15.73 | 27.41 | 41.09 | 14.74 |
| 54 | Professional and Business Services | 4.18 | 3.86 | 5.40 | 6.44 | 14.52 | 4.14 |
| 55 | Employment Services | 6.11 | 7.25 | 9.79 | 13.27 | 19.81 | 7.78 |
| EHS | Education and Health Services | 3.77 | 3.90 | 3.95 | 12.23 | 11.28 | 4.62 |
| 61 | Educational Services | 7.89 | 11.66 | 9.44 | 24.42 | 20.99 | 11.04 |
| 62 | Health Care and Social Assistance | 4.05 | 4.07 | 4.26 | 13.30 | 12.46 | 5.00 |
| L&H | Leisure and Hospitality | 4.89 | 3.68 | 4.21 | 14.07 | 20.69 | 4.60 |
| 71 | Arts, Entertainment, and Recreation | 11.77 | 10.10 | 11.38 | 24.38 | 32.67 | 12.71 |
| 72 | Accommodation and Food Services | 5.26 | 3.88 | 4.41 | 15.70 | 22.22 | 4.76 |
| 81 | Other Services | 14.43 | 11.66 | 14.08 | 32.21 | 36.07 | 14.85 |
| GOV | Government | 3.54 | 4.47 | 5.17 | 12.49 | 6.60 | 5.77 |
| 91 | Federal | 6.33 | 5.94 | 8.07 | 6.79 | 7.34 | 5.17 |
| S&L | State and Local | 4.01 | 4.96 | 5.56 | 14.30 | 7.99 | 6.51 |
| SLE | State and Local Education | 5.39 | 8.20 | 7.01 | 18.11 | 11.85 | 8.16 |
| SLN | State and Local, excluding Education | 5.30 | 5.64 | 7.39 | 16.90 | 9.91 | 8.04 |

3. Methods to Maximize Response Rates and Nonresponse Adjustment

3a. Maximize Response Rates

To maximize the response rate for this survey, interviewers initially refine addresses ensuring appropriate contact with the employer. Then, employers are mailed a folder containing a JOLTS brochure and data collection form, along with a cover letter explaining the importance of the survey and the need for voluntary cooperation, and pledging confidentiality. An interviewer calls the establishment after the package is sent and attempts to enroll them into the survey. Nonrespondents and establishments that are reluctant to participate are recontacted by an interviewer specially trained in refusal aversion and conversion. The response rates for February 2018 are shown below in Table 3.

3b. Nonresponse Adjustment

As with other surveys, JOLTS experiences a certain level of nonresponse. To adjust for the nonresponses, JOLTS has divided the nonresponse into two groups: (1) unit nonrespondents and failure to enroll; and (2) item nonresponse. Unit nonrespondents are the establishments that do not report the employment and item non-respondents are the establishments that do report employment but do not report one or more data items, for example, job openings or hires.

The unit nonresponse is treated using a Nonresponse Adjustment Factor (NRAF) as explained in the estimation procedure section of this document and item non-response is adjusted using item imputation. Within each sampling cell, NRAFs are calculated every month based on the ratio of the number of viable establishments to the number of usable respondents in that month. The details regarding the NRAF procedure are given in <http://www.bls.gov/osmr/pdf/st950130.pdf>. The method used for item imputation is Nearest Neighbor Hot Deck. Details of this procedure are available at <http://www.bls.gov/osmr/pdf/st000140.pdf>. New methods are being developed to improve on the current item non response imputation.

3c. Nonresponse Bias Assessment and Research

As mentioned earlier, JOLTS has developed a birth/death model of hires and separations based on historical QCEW-LDB data. The model allows for establishment-level estimates of hires and separations for all establishments on the QCEW-LDB. Since the QCEW-LDB serves as the sampling frame for JOLTS, it is possible to produce model hires and separations estimates for all establishments sampled by JOLTS. Consequently, it is possible to compare the model estimates for respondents to non-respondents for establishments in the JOLTS sample. The research indicates the JOLTS respondents differ from non-respondents in one important aspect: the rate of out-of-business establishments for responding sample is much lower than for nonresponding sample. That is, it appeared that establishments exiting the labor force were not likely to report JOLTS data as they exited. The JOLTS birth/death model has been added to the estimation process in an attempt to mitigate this bias.

Table 3: Unweighted and Weighted Unit Response Rates by Industry, February 2018

| Industry Division | Sampled (n) | Respondents (n) | Out of Business Respondents | Unweighted Response Rate % | Weighted Response Rate % |
|---|--------------------|------------------------|------------------------------------|-----------------------------------|---------------------------------|
| 1.0 Total | 15,767 | 9,516 | 1,049 | 65% | 79% |
| 2.0 Total Private | 13,385 | 7,851 | 980 | 63% | 78% |
| 2.1 Mining and Logging | 519 | 283 | 63 | 62% | 83% |
| 2.2 Construction | 691 | 419 | 55 | 66% | 76% |
| 2.3 Manufacturing | 1,385 | 857 | 79 | 66% | 83% |
| 2.3.1 Durable Goods | 778 | 462 | 48 | 63% | 82% |
| 2.3.2 Nondurable Goods | 607 | 395 | 31 | 69% | 84% |
| 2.4 Transportation, Warehousing, and Utilities | 2,649 | 1,531 | 240 | 64% | 81% |
| 2.4.1 Wholesale Trade | 616 | 364 | 39 | 63% | 86% |
| 2.4.2 Retail Trade | 1,372 | 757 | 161 | 63% | 78% |
| 2.4.3 Transportation, Warehousing, and Utilities | 661 | 410 | 40 | 66% | 81% |
| 2.5 Information | 668 | 310 | 58 | 51% | 74% |
| 2.6 Financial Activities | 1,084 | 611 | 63 | 60% | 78% |
| 2.6.1 Finance and Insurance | 539 | 308 | 34 | 61% | 78% |
| 2.6.2 Real Estate and Rental and Leasing | 545 | 303 | 29 | 59% | 77% |
| 2.7 Professional and Business Services | 1,313 | 739 | 93 | 61% | 76% |
| 2.8 Employment Services | 641 | 308 | 45 | 52% | 68% |
| 2.9 Educational and Health Services | 2,062 | 1,320 | 108 | 68% | 79% |
| 2.9.1 Educational Services | 647 | 417 | 25 | 67% | 80% |
| 2.9.2 Health Care and Social Assistance | 1,415 | 903 | 83 | 68% | 79% |
| 2.10 Leisure and Hospitality | 1,904 | 1,165 | 146 | 66% | 77% |
| 2.10.1 Arts, Entertainment, and Recreation | 623 | 392 | 46 | 68% | 82% |
| 2.10.2 Accommodation and Food Services | 1,281 | 773 | 100 | 65% | 76% |
| 2.11 Other Services | 469 | 308 | 30 | 70% | 83% |
| 3.0 Government | 2,382 | 1,665 | 69 | 72% | 81% |
| 3.1 Federal | 657 | 412 | 22 | 65% | 68% |
| 3.2 State and Local | 1,725 | 1,253 | 47 | 75% | 83% |
| 3.2.1 State and Local Education | 937 | 661 | 30 | 73% | 77% |
| 3.2.2 State and Local, excluding Education | 788 | 592 | 17 | 77% | 86% |

4. Tests

The initial survey's questionnaire was developed and tested using cognitive design techniques. The questionnaire has been used in production of estimates from December 2000 to the present. A Response Analysis Survey (RAS) was conducted on two major industries—Temporary Help Services and State and Local Government Education—to assess the sources of divergence between the employment change from CES and the implied employment change from JOLTS hires minus separations. In the former industry, businesses have a difficult time reporting hires and separations of temporary help workers. In the latter industry, employers have difficulty reporting hires and separations of student workers. BLS now devotes additional resources to the collection, editing, and review of data for these industries. BLS analysts more closely examine reported data that do not provide a consistent picture over time, and recontact the respondents as necessary. Analysts work with the respondents to adjust their reporting practices as possible. Units that cannot be reconciled but are clearly incorrect on a consistent basis are not used; they are replaced by imputed values using standard techniques.

Periodic tests similar to the RAS are necessary to understand the quality of the reported data and to improve the process in order to reduce sources of error or bias. In the future, BLS may make a nonsubstantive change request of approximately 400 respondent burden hours for future cognitive tests, such as a response analysis survey on the reporting of data items. The questionnaire(s) as well as relevant materials will be provided to OMB at the time of the request.

5. Statistical and Analytical Responsibility

Mr. Edwin Robison, Acting Chief, Statistical Methods Division of the Office of Employment and Unemployment Statistics, is responsible for the statistical aspects of the JOLTS program. Mr. Robison can be reached on 202-691-6363. As mentioned in the above paragraph, BLS seeks consultation with other outside experts on an as needed basis.

6. References

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Appendix A

Deriving Ω levels

The initial approach taken to estimate Ω was to utilize the hires and separations rates for stable, contracting, and expanding units. For each type of unit (stable, contracting, and expanding) the hires and separations data was available at the industry level and size level but not for a combined industry-size level. An approximation was made using industry level data and increasing or decreasing Ω levels for each size class within the industry.

Another approach has been taken. In this approach, a dataset containing JOLTS respondent data from Dec 2000 to April 2008 was created such that all reporters reported two consecutive months of data (a necessary precondition for simulation) and, additionally, all reporters reported both hires and separations. Using this data set, a crude simulation was made such that:

1. For stable units, the hires and separations rates found on page 3 were utilized. The rates were smoothed so that the hires rate equaled the separations rate and the industry-size estimate was made using the initial approach.
2. For expanding units, the hires were set equal to the increase in employment and the separations were set to zero.
3. For contracting units, the separations were set equal to the absolute decrease in employment and the hires were set to zero.

This crude simulation would measure the amount of net churn for a given industry-size cell. Comparing this estimate with the actual reported values would enable one to solve for the underlying churn (and hence Ω level) for all industry-size cells. The difference between the reported value and the net churn is equal to the underlying churn (that is, the hires and separations reported in addition to the net change in employment).

Following is an example to illustrate the technique used to derive Ω levels:

ID: 21 (Mining & Natural resources)
Size: 4 (250-999 employees)

Reported Data

| | |
|--------------|-----------|
| Employment: | 1,258,767 |
| Hires: | 30,277 |
| Separations: | 28,652 |

| | | | |
|------------------------------|--------|-----------------------|--------|
| Crude Simulated Hires: | 19,799 | Reported – Simulated: | 10,478 |
| Crude Simulated Separations: | 16,802 | Reported – Simulated: | 11,850 |

$$\Omega_h = 10,478/1,258,767 = 0.83 \%$$

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$$\Omega_s = 11,850/1,258,767 = 0.94 \%$$

Below are the calculated Ω levels for each industry size:

| ID | S | Emp | Orig_Hires | Orig_Seps | C_Impied | C_Impied | Ω_h | Ω_s |
|----|---|----------|------------|-----------|----------|----------|------------|------------|
| 2 | | | | | | | | |
| 1 | 1 | 14504 | 594 | 648 | 511 | 601 | 0.57% | 0.32% |
| 2 | | | | | | | | |
| 1 | 2 | 80094 | 3081 | 3094 | 2424 | 2252 | 0.82% | 1.05% |
| 2 | | | | | | | | |
| 1 | 3 | 314440 | 10471 | 10491 | 5884 | 5814 | 1.46% | 1.49% |
| 2 | | | | | | | | |
| 1 | 4 | 1258767 | 30277 | 28652 | 19799 | 16802 | 0.83% | 0.94% |
| 2 | | | | | | | | |
| 1 | 5 | 1492912 | 23759 | 25011 | 15333 | 15718 | 0.56% | 0.62% |
| 2 | | | | | | | | |
| 1 | 6 | 29894 | 366 | 140 | 513 | 449 | 0.00% | 0.00% |
| 2 | | | | | | | | |
| 3 | 1 | 22379 | 1004 | 1047 | 859 | 809 | 0.65% | 1.06% |
| 2 | | | | | | | | |
| 3 | 2 | 229794 | 11431 | 12046 | 8913 | 8947 | 1.10% | 1.35% |
| 2 | | | | | | | | |
| 3 | 3 | 569558 | 32932 | 32755 | 20682 | 21724 | 2.15% | 1.94% |
| 2 | | | | | | | | |
| 3 | 4 | 637288 | 40631 | 41288 | 20984 | 23587 | 3.08% | 2.78% |
| 2 | | | | | | | | |
| 3 | 5 | 1141391 | 84884 | 66046 | 28781 | 38916 | 4.92% | 2.38% |
| 2 | | | | | | | | |
| 3 | 6 | 225161 | 5200 | 6448 | 2863 | 4657 | 1.04% | 0.80% |
| 3 | | | | | | | | |
| 1 | 1 | 27293 | 493 | 706 | 402 | 604 | 0.33% | 0.37% |
| 3 | | | | | | | | |
| 1 | 2 | 98963 | 3691 | 3854 | 2629 | 2730 | 1.07% | 1.14% |
| 3 | | | | | | | | |
| 1 | 3 | 971022 | 25611 | 28187 | 16726 | 19297 | 0.92% | 0.92% |
| 3 | | | | | | | | |
| 1 | 4 | 3160271 | 67644 | 82306 | 31846 | 45164 | 1.13% | 1.18% |
| 3 | | | | | | | | |
| 1 | 5 | 4188433 | 99473 | 108788 | 40411 | 53721 | 1.41% | 1.31% |
| 3 | | | | | | | | |
| 1 | 6 | 942869 | 13428 | 13310 | 4075 | 4996 | 0.99% | 0.88% |
| 3 | | | | | | | | |
| 3 | 1 | 15587 | 513 | 576 | 457 | 465 | 0.36% | 0.71% |
| 3 | | | | | | | | |
| 3 | 2 | 176236 | 5770 | 6437 | 3925 | 4154 | 1.05% | 1.30% |
| 3 | | | | | | | | |
| 3 | 3 | 1743483 | 45242 | 50697 | 26280 | 29533 | 1.09% | 1.21% |
| 3 | | | | | | | | |
| 3 | 4 | 5784226 | 109121 | 137136 | 55017 | 75608 | 0.94% | 1.06% |
| 3 | | | | | | | | |
| 3 | 5 | 7865330 | 104141 | 124366 | 62973 | 80668 | 0.52% | 0.56% |
| 3 | | | | | | | | |
| 3 | 6 | 16593811 | 117190 | 154901 | 62815 | 102656 | 0.33% | 0.31% |
| 4 | | | | | | | | |
| 2 | 1 | 28627 | 595 | 704 | 705 | 582 | 0.00% | 0.43% |
| 4 | | | | | | | | |
| 2 | 2 | 243266 | 5724 | 5763 | 4829 | 4138 | 0.37% | 0.67% |
| 4 | | | | | | | | |
| 2 | 3 | 669718 | 17239 | 17275 | 10116 | 17998 | 1.06% | 0.00% |
| 4 | | | | | | | | |
| 2 | 4 | 928400 | 22793 | 25240 | 9943 | 13239 | 1.38% | 1.29% |
| 4 | | | | | | | | |
| 2 | 5 | 3191628 | 49358 | 58455 | 21868 | 29618 | 0.86% | 0.90% |
| 4 | 1 | 103130 | 2655 | 3048 | 2828 | 2016 | 0.00% | 1.00% |

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|----|---|----------|------------|-----------|----------|-----------|------------|------------|
| 4 | | | | | | | | |
| 4 | | | | | | | | |
| 4 | 2 | 365482 | 15386 | 15776 | 10321 | 11012 | 1.39% | 1.30% |
| 4 | | | | | | | | |
| 4 | 3 | 1787337 | 91017 | 87324 | 41122 | 44166 | 2.79% | 2.41% |
| 4 | | | | | | | | |
| 4 | 4 | 1462379 | 78863 | 76591 | 32418 | 34178 | 3.18% | 2.90% |
| 4 | | | | | | | | |
| 4 | 5 | 2319000 | 121224 | 112461 | 58725 | 33591 | 2.70% | 3.40% |
| 4 | | | | | | | | |
| 4 | 6 | 373621 | 39839 | 48516 | 20860 | 20363 | 5.08% | 7.54% |
| 4 | | | | | | | | |
| 8 | 1 | 13379 | 375 | 458 | 325 | 341 | 0.37% | 0.87% |
| 4 | | | | | | | | |
| 8 | 2 | 320310 | 4361 | 4977 | 5531 | 5423 | 0.00% | 0.00% |
| 4 | | | | | | | | |
| 8 | 3 | 1182664 | 21597 | 20777 | 17483 | 11835 | 0.35% | 0.76% |
| 4 | | | | | | | | |
| 8 | 4 | 1218587 | 39959 | 40399 | 18051 | 19338 | 1.80% | 1.73% |
| 4 | | | | | | | | |
| 8 | 5 | 6260773 | 130071 | 110621 | 51525 | 52898 | 1.25% | 0.92% |
| 4 | | | | | | | | |
| 8 | 6 | 13594810 | 202640 | 209447 | 82383 | 99945 | 0.88% | 0.81% |
| 5 | | | | | | | | |
| 1 | 1 | 8418 | 200 | 212 | 175 | 167 | 0.30% | 0.53% |
| 5 | | | | | | | | |
| 1 | 2 | 87343 | 2472 | 2624 | 1554 | 1522 | 1.05% | 1.26% |
| 5 | | | | | | | | |
| 1 | 3 | 308407 | 8081 | 8687 | 5336 | 6222 | 0.89% | 0.80% |
| 5 | | | | | | | | |
| 1 | 4 | 838610 | 14833 | 18489 | 9165 | 11061 | 0.68% | 0.89% |
| 5 | | | | | | | | |
| 1 | 5 | 1886036 | 30291 | 33930 | 12912 | 19433 | 0.92% | 0.77% |
| 5 | | | | | | | | |
| 1 | 6 | 1855299 | 44643 | 47192 | 11134 | 10573 | 1.81% | 1.97% |
| 5 | | | | | | | | |
| 2 | 1 | 17147 | 321 | 334 | 358 | 337 | 0.00% | 0.00% |
| 5 | | | | | | | | |
| 2 | 2 | 166324 | 3600 | 3698 | 2855 | 3059 | 0.45% | 0.38% |
| 5 | | | | | | | | |
| 2 | 3 | 641224 | 14313 | 14958 | 8151 | 8336 | 0.96% | 1.03% |
| 5 | | | | | | | | |
| 2 | 4 | 2358154 | 49490 | 45860 | 26845 | 19376 | 0.96% | 1.12% |
| 5 | | | | | | | | |
| 2 | 5 | 3832948 | 64972 | 73486 | 28153 | 37994 | 0.96% | 0.93% |
| 5 | | | | | | | | |
| 2 | 6 | 6305608 | 97040 | 106120 | 28060 | 21219 | 1.09% | 1.35% |
| | | | | | | | Ω_h | Ω_s |
| ID | S | Emp | Orig_Hires | Orig_Seps | C_Impied | C_Implied | | |
| 5 | | | | | | | | |
| 3 | 1 | 13050 | 428 | 432 | 315 | 336 | 0.87% | 0.74% |
| 5 | | | | | | | | |
| 3 | 2 | 62884 | 2041 | 2101 | 1411 | 1609 | 1.00% | 0.78% |
| 5 | | | | | | | | |
| 3 | 3 | 164801 | 7417 | 7419 | 4436 | 4763 | 1.81% | 1.61% |
| 5 | | | | | | | | |
| 3 | 4 | 609318 | 24652 | 23280 | 10965 | 9799 | 2.25% | 2.21% |
| 5 | | | | | | | | |
| 3 | 5 | 249919 | 13884 | 16235 | 8279 | 10141 | 2.24% | 2.44% |
| 5 | | | | | | | | |
| 4 | 1 | 46235 | 1360 | 1556 | 1108 | 1341 | 0.55% | 0.47% |
| 5 | | | | | | | | |
| 4 | 2 | 313919 | 10425 | 10683 | 8440 | 8186 | 0.63% | 0.80% |
| 5 | | | | | | | | |
| 4 | 3 | 1821071 | 75467 | 68074 | 41635 | 47733 | 1.86% | 1.12% |
| 5 | | | | | | | | |
| 4 | 4 | 3695469 | 153032 | 137626 | 67723 | 67909 | 2.31% | 1.89% |
| 5 | | | | | | | | |
| 5 | 5 | 5082319 | 122746 | 133124 | 52634 | 72164 | 1.38% | 1.20% |

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| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 4 | 6 | 10917197 | 174524 | 194316 | 97378 | 94517 | 0.71% | 0.91% |
| 5 | | | | | | | | |
| 6 | 1 | 3562 | 135 | 146 | 148 | 138 | 0.00% | 0.22% |
| 5 | | | | | | | | |
| 6 | 2 | 11907 | 883 | 760 | 547 | 1054 | 2.82% | 0.00% |
| 5 | | | | | | | | |
| 6 | 3 | 49219 | 8355 | 6761 | 2703 | 2491 | 11.48% | 8.68% |
| 5 | | | | | | | | |
| 6 | 4 | 71476 | 9800 | 8305 | 3433 | 4859 | 8.91% | 4.82% |
| 5 | | | | | | | | |
| 6 | 5 | 211376 | 19185 | 17350 | 5540 | 6550 | 6.46% | 5.11% |
| 5 | | | | | | | | |
| 6 | 6 | 1105696 | 116331 | 108415 | 12693 | 14129 | 9.37% | 8.53% |
| 6 | | | | | | | | |
| 1 | 1 | 19363 | 366 | 323 | 380 | 351 | 0.00% | 0.00% |
| 6 | | | | | | | | |
| 1 | 2 | 73520 | 2055 | 1745 | 2044 | 1812 | 0.01% | 0.00% |
| 6 | | | | | | | | |
| 1 | 3 | 298031 | 8374 | 6989 | 7330 | 6292 | 0.35% | 0.23% |
| 6 | | | | | | | | |
| 1 | 4 | 1048565 | 25114 | 21040 | 27659 | 26735 | 0.00% | 0.00% |
| 6 | | | | | | | | |
| 1 | 5 | 3790949 | 71597 | 64193 | 77364 | 67090 | 0.00% | 0.00% |
| 6 | | | | | | | | |
| 1 | 6 | 9204829 | 143095 | 103710 | 127526 | 123120 | 0.17% | 0.00% |
| 6 | | | | | | | | |
| 2 | 1 | 43209 | 1410 | 1356 | 1008 | 934 | 0.93% | 0.98% |
| 6 | | | | | | | | |
| 2 | 2 | 308251 | 9434 | 9047 | 6529 | 6021 | 0.94% | 0.98% |
| 6 | | | | | | | | |
| 2 | 3 | 2094016 | 72128 | 63981 | 31118 | 33679 | 1.96% | 1.45% |
| 6 | | | | | | | | |
| 2 | 4 | 4689700 | 125028 | 101436 | 49086 | 41601 | 1.62% | 1.28% |
| 6 | | | | | | | | |
| 2 | 5 | 23037096 | 416536 | 314362 | 149685 | 126420 | 1.16% | 0.82% |
| 6 | | | | | | | | |
| 2 | 6 | 29557101 | 458090 | 326803 | 153575 | 74406 | 1.03% | 0.85% |
| 7 | | | | | | | | |
| 1 | 1 | 8879 | 399 | 413 | 610 | 587 | 0.00% | 0.00% |
| 7 | | | | | | | | |
| 1 | 2 | 52249 | 3553 | 3290 | 2642 | 2682 | 1.74% | 1.16% |
| 7 | | | | | | | | |
| 1 | 3 | 204795 | 16241 | 14560 | 14019 | 13822 | 1.08% | 0.36% |
| 7 | | | | | | | | |
| 1 | 4 | 838029 | 61092 | 55543 | 46479 | 45513 | 1.74% | 1.20% |
| 7 | | | | | | | | |
| 1 | 5 | 3298756 | 270103 | 255808 | 166759 | 174070 | 3.13% | 2.48% |
| 7 | | | | | | | | |
| 1 | 6 | 299834 | 10546 | 8903 | 4326 | 4100 | 2.07% | 1.60% |
| 7 | | | | | | | | |
| 2 | 1 | 46600 | 1722 | 1525 | 1109 | 3739 | 1.32% | 0.00% |
| 7 | | | | | | | | |
| 2 | 2 | 393101 | 25409 | 25245 | 13450 | 13955 | 3.04% | 2.87% |
| 7 | | | | | | | | |
| 2 | 3 | 833812 | 54413 | 51148 | 25741 | 28916 | 3.44% | 2.67% |
| 7 | | | | | | | | |
| 2 | 4 | 919954 | 45839 | 43999 | 22205 | 25571 | 2.57% | 2.00% |
| 7 | | | | | | | | |
| 2 | 5 | 4091228 | 156671 | 152035 | 73334 | 77568 | 2.04% | 1.82% |
| 7 | | | | | | | | |
| 2 | 6 | 2349840 | 51009 | 45821 | 18157 | 18343 | 1.40% | 1.17% |
| 8 | | | | | | | | |
| 1 | 1 | 24837 | 591 | 708 | 501 | 562 | 0.36% | 0.59% |
| 8 | | | | | | | | |
| 1 | 2 | 124960 | 3852 | 4274 | 3084 | 3276 | 0.61% | 0.80% |
| 8 | | | | | | | | |
| 8 | 3 | 298374 | 14960 | 13703 | 8678 | 8376 | 2.11% | 1.79% |

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| 1 | | | | | | | | | |
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| 8 | | | | | | | | | |
| 1 | 4 | 684543 | 31511 | 27756 | 16681 | 18698 | 2.17% | 1.32% | |
| 8 | | | | | | | | | |
| 1 | 5 | 1256498 | 60786 | 41757 | 26287 | 24561 | 2.75% | 1.37% | |
| 9 | | | | | | | | | |
| 1 | 1 | 3194679 | 49421 | 45021 | 23179 | 11087 | 0.82% | 1.06% | |
| 9 | | | | | | | | | |
| 1 | 2 | 10318038 | 158249 | 128050 | 49293 | 37810 | 1.06% | 0.87% | |
| 9 | | | | | | | | | |
| 1 | 3 | 3055757 | 39851 | 38232 | 46782 | 17132 | 0.00% | 0.69% | |
| 9 | | | | | | | | | |
| 1 | 4 | 2656688 | 49661 | 43392 | 22031 | 12157 | 1.04% | 1.18% | |
| 9 | | | | | | | | | |
| 1 | 5 | 13969519 | 222103 | 200263 | 58426 | 63754 | 1.17% | 0.98% | |
| 9 | | | | | | | | | |
| 1 | 6 | 45700741 | 585870 | 454070 | 269931 | 166348 | 0.69% | 0.63% | |
| 9 | | | | | | | | | |
| 2 | 1 | 208970 | 2701 | 2438 | 5013 | 4114 | 0.00% | 0.00% | |
| 9 | | | | | | | | | |
| 2 | 2 | 379681 | 5221 | 4214 | 9235 | 7343 | 0.00% | 0.00% | |
| 9 | | | | | | | | | |
| 2 | 3 | 2252458 | 34030 | 26720 | 47121 | 42958 | 0.00% | 0.00% | |
| 9 | | | | | | | | | |
| 2 | 4 | 4586257 | 69058 | 48199 | 112835 | 102262 | 0.00% | 0.00% | |
| 9 | | | | | | | | | |
| ID | S | Emp | Orig_Hires | Orig_Seps | C_Impied | C_Implied | Ω_h | Resid_S% | |
| 9 | | | | | | | | | |
| 2 | 5 | 18518842 | 311435 | 207704 | 396109 | 356746 | 0.00% | 0.00% | |
| 9 | | | | | | | | | |
| 2 | 6 | 103749630 | 1880372 | 1508904 | 1480803 | 1404892 | 0.39% | 0.10% | |
| 9 | | | | | | | | | |
| 3 | 1 | 112428 | 2099 | 1485 | 1441 | 1637 | 0.59% | 0.00% | |
| 9 | | | | | | | | | |
| 3 | 2 | 494395 | 8066 | 7322 | 5725 | 5367 | 0.47% | 0.40% | |
| 9 | | | | | | | | | |
| 3 | 3 | 4712258 | 58616 | 50842 | 35485 | 35649 | 0.49% | 0.32% | |
| 9 | | | | | | | | | |
| 3 | 4 | 9238622 | 147199 | 132673 | 85143 | 90945 | 0.67% | 0.45% | |
| 9 | | | | | | | | | |
| 3 | 5 | 22185518 | 338298 | 287402 | 161892 | 144201 | 0.80% | 0.65% | |
| 9 | | | | | | | | | |
| 3 | 6 | 62082500 | 748715 | 591932 | 358277 | 298834 | 0.63% | 0.47% | |

NOTE: Negative values were set to 0.00%

NOTE: For the simulation the Ω levels were rounded to the nearest tenth of a percentage point.

A simulation was performed on the JOLTS data and a comparison was made against the actual reported data. Here are the results:

| ID | Type | N | Emp | Avg Emp | H | TS | HR | TSR | CR |
|----|------|--------|-----------|---------|---------|---------|-------|-------|--------|
| 21 | Rep | 14,153 | 3,190,611 | 225 | 68,548 | 68,036 | 2.15% | 2.13% | 4.28% |
| 21 | Sim | 14,153 | 3,190,611 | 225 | 69,588 | 66,854 | 2.18% | 2.10% | 4.28% |
| 23 | Rep | 33,114 | 2,825,571 | 85 | 176,082 | 159,630 | 6.23% | 5.65% | 11.88% |
| 23 | Sim | 33,114 | 2,825,571 | 85 | 175,866 | 160,117 | 6.22% | 5.67% | 11.89% |
| 31 | Rep | 30,963 | 9,388,851 | 303 | 210,340 | 237,151 | 2.24% | 2.53% | 4.77% |
| 31 | Sim | 30,963 | 9,388,851 | 303 | | 238,280 | 2.21% | 2.54% | 4.75% |

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|-----------|------------|----------|------------|------------|-----------|-----------|-----------|------------|-----------|
| | | | | | 207,857 | | | | |
| 33 | Rep | 52,305 | 32,178,673 | 615 | 381,977 | 474,083 | 1.19% | 1.47% | 2.66% |
| 33 | Sim | 52,305 | 32,178,673 | 615 | 383,807 | 467,009 | 1.19% | 1.45% | 2.64% |
| 42 | Rep | 28,141 | 5,061,639 | 180 | 95,709 | 107,437 | 1.89% | 2.12% | 4.01% |
| 42 | Sim | 28,141 | 5,061,639 | 180 | 96,820 | 108,890 | 1.91% | 2.15% | 4.06% |
| 44 | Rep | 62,609 | 6,410,949 | 102 | 348,984 | 343,716 | 5.44% | 5.36% | 10.80% |
| 44 | Sim | 62,609 | 6,410,949 | 102 | 349,473 | 343,704 | 5.45% | 5.36% | 10.81% |
| 48 | Rep | 21,943 | 22,590,523 | 1,030 | 399,003 | 386,679 | 1.77% | 1.71% | 3.48% |
| 48 | Sim | 21,943 | 22,590,523 | 1,030 | 405,638 | 385,305 | 1.80% | 1.71% | 3.50% |
| 51 | Rep | 12,190 | 4,984,113 | 409 | 100,520 | 111,134 | 2.02% | 2.23% | 4.25% |
| 51 | Sim | 12,190 | 4,984,113 | 409 | 100,344 | 112,266 | 2.01% | 2.25% | 4.27% |
| 52 | Rep | 22,861 | 13,321,405 | 583 | 229,736 | 244,456 | 1.72% | 1.84% | 3.56% |
| 52 | Sim | 22,861 | 13,321,405 | 583 | 228,934 | 254,784 | 1.72% | 1.91% | 3.63% |
| 53 | Rep | 12,557 | 1,099,972 | 88 | 48,422 | 49,467 | 4.40% | 4.50% | 8.90% |
| 53 | Sim | 12,557 | 1,099,972 | 88 | 47,950 | 49,355 | 4.36% | 4.49% | 8.85% |
| 54 | Rep | 57,411 | 21,876,210 | 381 | 537,554 | 545,379 | 2.46% | 2.49% | 4.95% |
| 54 | Sim | 57,411 | 21,876,210 | 381 | 537,036 | 545,247 | 2.45% | 2.49% | 4.95% |
| ID | Typ | N | Emp | Avg | H | TS | HR | TSR | CR |
| | | | | | | | 10.64% | | 20.40% |
| 56 | Rep | 2,764 | 1,453,236 | 526 | 154,689 | 141,737 | 10.66% | 9.75% | 20.42% |
| 56 | Sim | 2,764 | 1,453,236 | 526 | 154,891 | 141,882 | | 9.76% | |
| 61 | Rep | 15,046 | 14,435,257 | 959 | 250,601 | 198,000 | 1.74% | 1.37% | 3.11% |
| 61 | Sim | 15,046 | 14,435,257 | 959 | 261,740 | 226,161 | 1.81% | 1.57% | 3.38% |
| 62 | Rep | 64,890 | 59,729,373 | 920 | 1,082,626 | 816,985 | 1.81% | 1.37% | 3.18% |
| 62 | Sim | 64,890 | 59,729,373 | 920 | 1,079,522 | 830,742 | 1.81% | 1.39% | 3.20% |
| 71 | Rep | 14,377 | 4,702,542 | 327 | 361,934 | 338,517 | 7.70% | 7.20% | 14.90% |
| 71 | Sim | 14,377 | 4,702,542 | 327 | 360,231 | 340,092 | 7.66% | 7.23% | 14.89% |
| 72 | Rep | 43,329 | 8,634,535 | 199 | 335,063 | 319,773 | 3.88% | 3.70% | 7.58% |
| 72 | Sim | 43,329 | 8,634,535 | 199 | 332,903 | 327,243 | 3.86% | 3.79% | 7.65% |
| 81 | Rep | 23,447 | 2,389,212 | 102 | 111,700 | 88,198 | 4.68% | 3.69% | 8.37% |
| 81 | Sim | 23,447 | 2,389,212 | 102 | 112,234 | 88,836 | 4.70% | 3.72% | 8.42% |
| 91 | Rep | 10,739 | 78,895,422 | 7,347 | 1,105,155 | 909,028 | 1.40% | 1.15% | 2.55% |
| 91 | Sim | 10,739 | 78,895,422 | 7,347 | 1,099,79 | 926,418 | 1.39% | 1.17% | 2.57% |

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|-----|-----|---------|-------------|-------|-----------|-----------|-------|-------|-------|
| | | | | | 0 | | | | |
| 92 | Rep | 46,938 | 129,695,838 | 2,763 | 2,302,817 | 1,798,179 | 1.78% | 1.39% | 3.16% |
| 92 | Sim | 46,938 | 129,695,838 | 2,763 | 2,378,613 | 2,174,869 | 1.83% | 1.68% | 3.51% |
| 93 | Rep | 53,067 | 99,925,721 | 1,883 | 1,302,993 | 1,071,656 | 1.30% | 1.07% | 2.38% |
| 93 | Sim | 53,067 | 99,925,721 | 1,883 | 1,312,940 | 1,049,607 | 1.31% | 1.05% | 2.36% |
| ALL | Rep | 622,844 | 522,789,653 | 839 | 9,604,453 | 8,409,241 | 1.84% | 1.61% | 3.45% |
| ALL | Sim | 622,844 | 522,789,653 | 839 | 9,696,177 | 8,837,661 | 1.85% | 1.69% | 3.55% |

Appendix B

The Current JOLTS imputation vs. the Simulation

A sample of the JOLTS dataset mentioned in Appendix A was drawn. The sample consisted of approximately 14% of the dataset. The units sampled received two treatments: (1) using the simulation, hires and separations data were produced; and (2) they had hires and separations data imputed using the current JOLTS imputation algorithm.

The current JOLTS imputation algorithm is a hot-deck nearest neighbor technique. The imputation cell (region/industry) is sorted by reported monthly employment. Units in need of imputation borrow from the closest available donor within the cell with respect to employment. Ties in closeness are broken randomly.

In this treatment we can directly compare the actual reported hires and separations directly against the hires and separations for the simulated and imputed data.

Below is a summary of the analysis:

| ID | N | Emp | OHR | OSR | OCR | SHR | SSR | SCR | IHR | ISR | ICR |
|----|-------|-----------|--------|-------|--------|-------|-------|--------|-------|-------|--------|
| 21 | 2,002 | 512,189 | 1.87% | 1.84% | 3.71% | 1.84% | 1.67% | 3.51% | 1.85% | 1.74% | 3.58% |
| 23 | 4,353 | 374,430 | 5.70% | 5.56% | 11.26% | 6.21% | 5.40% | 11.61% | 5.29% | 5.00% | 10.29% |
| 31 | 3,842 | 1,209,735 | 2.41% | 2.44% | 4.85% | 2.16% | 2.30% | 4.46% | 2.09% | 2.16% | 4.25% |
| 33 | 6,898 | 4,207,648 | 1.25% | 1.30% | 2.55% | 1.12% | 1.22% | 2.34% | 1.26% | 1.37% | 2.64% |
| 42 | 3,715 | 799,824 | 1.92% | 1.96% | 3.88% | 2.11% | 1.75% | 3.86% | 1.91% | 1.80% | 3.72% |
| 44 | 8,293 | 848,729 | 5.13% | 5.00% | 10.13% | 5.03% | 4.79% | 9.82% | 4.55% | 4.50% | 9.04% |
| 48 | 2,843 | 2,812,648 | 1.88% | 1.84% | 3.72% | 1.77% | 1.72% | 3.48% | 1.86% | 1.87% | 3.73% |
| 51 | 1,595 | 709,821 | 2.13% | 2.22% | 4.35% | 2.05% | 2.07% | 4.13% | 1.87% | 2.12% | 3.99% |
| 52 | 2,960 | 1,644,613 | 1.62% | 1.65% | 3.28% | 1.74% | 1.80% | 3.54% | 1.65% | 1.57% | 3.23% |
| 53 | 1,700 | 152,889 | 4.26% | 4.35% | 8.61% | 4.19% | 4.62% | 8.80% | 4.15% | 3.82% | 7.98% |
| 54 | 7,312 | 2,353,207 | 2.34% | 2.06% | 4.40% | 2.31% | 2.46% | 4.77% | 2.23% | 2.18% | 4.41% |
| 56 | 421 | 346,873 | 10.67% | 8.66% | 19.33% | 9.75% | 9.83% | 19.58% | 6.02% | 6.61% | 12.63% |
| 61 | 2,372 | 2,495,490 | 1.46% | 1.33% | 2.79% | 1.74% | 1.74% | 3.47% | 1.61% | 1.40% | 3.01% |
| 62 | 9,064 | 9,680,562 | 1.71% | 1.30% | 3.00% | 1.68% | 1.37% | 3.05% | 1.67% | 1.28% | 2.96% |
| 71 | 2,157 | 772,826 | 8.32% | 6.55% | 14.88% | 7.81% | 6.66% | 14.47% | 5.15% | 5.40% | 10.55% |

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|-----------|---------------|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 72 | 5,763 | 1,328,931 | 3.82% | 3.40% | 7.22% | 3.82% | 3.49% | 7.31% | 3.47% | 3.13% | 6.60% |
| 81 | 3,128 | 422,095 | 4.83% | 3.52% | 8.34% | 4.65% | 3.52% | 8.16% | 3.69% | 3.12% | 6.82% |
| 91 | 1,445 | 10,690,793 | 1.38% | 1.37% | 2.75% | 1.08% | 1.22% | 2.30% | 1.47% | 1.34% | 2.82% |
| 92 | 6,722 | 21,219,082 | 1.78% | 1.47% | 3.25% | 1.78% | 1.49% | 3.27% | 1.72% | 1.31% | 3.03% |
| 93 | 7,532 | 16,074,949 | 1.23% | 1.11% | 2.34% | 1.24% | 1.06% | 2.30% | 1.28% | 0.99% | 2.27% |
| AL | | | | | | | | | | | |
| L | 84,117 | 78,657,334 | 1.81% | 1.60% | 3.41% | 1.76% | 1.60% | 3.36% | 1.74% | 1.49% | 3.23% |

Main Finding on the 1st randomly selected sample of reported JOLTS data:

The imputed values show less churn (both hires and especially separations) than do the actual and simulated values.

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Reference- attachment.
Comparing the Level of Employment Churn:
JOLTS Respondents vs. JOLTS Non-Respondents

Mark Crankshaw
April 2008

Introduction

One assumption in the JOLTS survey is that the non-respondents to the JOLTS survey do not systematically differ from respondents. This assumption has been questioned by some and it has been asserted that the non-respondents to the JOLTS survey are more volatile with respect to monthly employment than are respondents to the survey; that is, employment churning of non-respondents greatly exceeds the employment churning of respondents. This would imply that the estimated rates of JOLTS variables that measure employment churning, namely hires and separations, are systematically biased in the downward direction.

One way to test the hypothesis that JOLTS non-respondents have greater employment churning than respondents is to match the JOLTS sample to the Longitudinal Database (LDB). The LDB contains historical employment data for all JOLTS records. The absolute month-to-month employment of matched units on the LDB can serve as a proxy for employment churning. Those establishments with a higher absolute average employment change on the LDB could be assumed to have greater levels of employment churn than establishments with lower absolute average employment change.

Making the Comparison

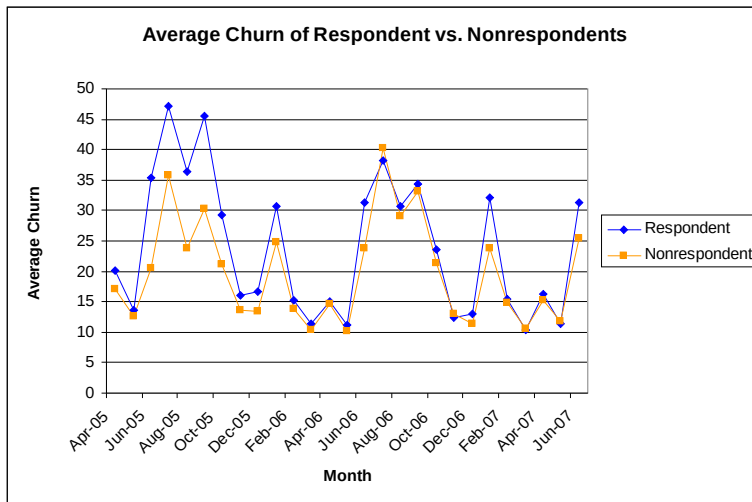
To test whether non-respondents have higher levels of average absolute employment change than respondents we can contrast the average absolute employment change on the LDB for all non-respondents to the JOLTS survey against the average absolute employment change on the LDB for all respondents to the JOLTS survey. If the average absolute employment change for non-respondents is statistically higher than the average absolute employment change for respondents, then the assumption of no difference is violated. However, if there is no statistical difference found, then the assertion that non-respondents systematically differ from the respondents is not backed up by LDB data.

All JOLTS records were matched with the LDB (over the period April, 2005 to June 2007). The absolute employment change was calculated for all matched records. The average absolute employment change for non-respondents and respondents was calculated.

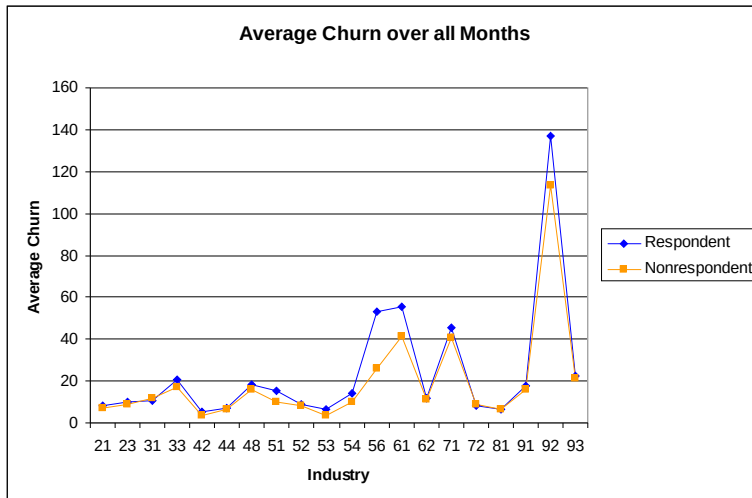
Findings

There was no evidence found to support the hypothesis that non-respondents systematically differ from respondents to the JOLTS survey. Overall, the average absolute employment change from month to month for respondents was 23.88, while for non-respondents it was 19.83. The difference between the two was not statistically significant. This finding of no difference was found across all months analyzed as well as across all industries.

The graph below charts the average absolute employment change across the months analyzed:



The graph below charts the average absolute employment change for all industries:



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The table below details the comparison by industry:

| Industry | JOLTS ID | Absolute Average Emp change Respondents | Absolute Average Emp change Non-Respondents |
|--|-----------------|--|--|
| Natural Resources | 21 | 8.35 | 7.18 |
| Construction | 23 | 10.06 | 8.89 |
| Durable MFG | 31 | 10.91 | 12.00 |
| Non-Durable MFG | 33 | 20.64 | 17.36 |
| Wholesale Trade | 42 | 5.07 | 3.82 |
| Retail Trade | 44 | 7.05 | 6.23 |
| Transportation, Warehousing, Utilities | 48 | 18.06 | 16.05 |
| Information | 51 | 15.52 | 9.97 |
| Finance & Insurance | 52 | 8.68 | 8.12 |
| Real Estate | 53 | 6.73 | 3.84 |
| Pro Bus Services | 54 | 14.13 | 10.28 |
| Employment Services | 56 | 53.12 | 25.77 |
| Ed Services | 61 | 55.68 | 41.08 |
| Health Care | 62 | 11.58 | 11.09 |
| Arts, Entertainment, Recreation | 71 | 45.49 | 40.49 |
| Accommodation, Food Services | 72 | 7.97 | 8.85 |
| Other Services | 81 | 6.32 | 6.20 |
| Fed Government | 91 | 17.61 | 15.89 |
| State & Local Ed | 92 | 136.99 | 113.54 |
| State & Local Non-Ed | 93 | 22.33 | 21.16 |

NOTE: No differences are statistically significant.

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Reference-Attachment:

Developing a Birth/Death Model

Mark Crankshaw
BLS Washington
August 21, 2008

Background

Prior research has indicated that the current JOLTS estimation may not adequately capture the level of churning (hires and separations) actually occurring in the economy. This primarily due to the inability of the JOLTS survey to capture hires data from new and young firms and to capture separations from closing firms. Additionally, the divergence between the implied employment changes yielded through JOLTS hires and separations level estimates and the actual employment changes seen in CES estimation indicates that additional churning (primarily separations) is systematically under-reported to the JOLTS respondents. This finding was further confirmed by the recently conducted Response Analysis Survey (RAS) for the two industries with the largest divergence. These industries are Employment Services (ID56) and State and Local Government (ID92). While improvements in the JOLTS sampling methodology may help mitigate these inadequacies, the bulk of the shortcomings may have to be treated with a model.

To correct for the above inadequacies, a birth/death model has been developed that will address two separate shortcomings:

- The model will attempt to estimate for a given month the level of employment for firms entering the labor force (that is, birth employment). The model will also estimate the level of hires and separations for those birth establishments.
- The model will attempt to estimate for a given month the level of separations for firms exiting the labor force (that is, establishment deaths). Note that these establishments do not contribute to the employment level since firms that have exited the labor force have no employment by definition.

To that end, the LDB simulation of JOLTS hires and separations data will be utilized. (See the paper entitled ‘Simulating JOLTS Hires and Separations Data Using the LDB’ for the details of this method.) The simulation yields estimated employment, hires and separations for those establishments who have entered the labor force for a given month as well as the employment, hires and separations of those establishments that can not be adequately sampled (i.e., establishments less than 12 months old). The simulation also yields estimated separations levels for those establishments who have exited the labor force in a given month.

Birth Employment

The first aspect to be modeled is the level of birth employment (i.e., first time reporters as well as those young firms less than 30 months old) for a given industry for a given month. The birth employment level is taken directly from the monthly simulation of JOLTS data on the LDB. Likewise, the hires and separations levels for the cohort of birth units were taken directly from the simulation.

Death Separations

The separations from the deaths on the LDB were drawn directly from the simulation. Only the first month of each quarter will contain deaths.

Forecasting

Since current LDB data is unavailable when JOLTS estimation is produced, it is not possible to simulate JOLTS birth/death employment, hires and separations. Therefore, it would be necessary to forecast JOLTS birth/death

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employment, hires and separations. One possible method that can be used to forecast this data would be to use an ARIMA prediction using historical JOLTS birth/death employment, hires and separations data. An ARIMA forecast has been conducted on this data and the forecast performed adequately. It is also possible to forecast using the ratio of CES year ago employment to current employment to adjust birth employment, hires, and separations.

Reference-Attachment:

Addressing JOLTS-CES Divergence

Beginning with the release of January 2009 data on March 10, BLS will implement improvements to the methodology used to generate estimates of hires, separations, and job openings from the Job Openings and Labor Turnover Survey (JOLTS). These changes are designed to improve the measurement of hires, separations, and openings and to more closely align the hires and separations estimates with monthly employment change as measured by the BLS establishment survey.

Research comparing the relationship between JOLTS hires and separations to the monthly employment change measured by the Bureau's Current Employment Statistics (CES) program (the establishment survey) indicate substantial discrepancies in employment trends over time. While JOLTS does not produce estimates of month-to-month change in employment, an implied employment change can be derived from JOLTS data by subtracting the separations estimate from the hires estimate for a given month. When viewed over time, this derived JOLTS measure of employment change does not track well with the CES, the Bureau's larger and better-known establishment survey. The CES is designed specifically to measure month-to-month employment change, collects data from a much larger sample, and benchmarks annually to universe employment counts, making CES the more reliable source of monthly employment change. Further, comparison of JOLTS hires and separations data to similar data produced in the Bureau's Current Population Survey (CPS or household survey) also indicates that JOLTS may be understating the levels of hires and separations.

BLS engaged in a multi-year research project to better understand these two issues, to establish their probable causes, and to develop improvements. As a result of this research, BLS plans to implement improvements in the following areas:

- 1) Revision of the JOLTS sample design to incorporate new business births more quickly, and to remove business deaths from the frame on a more timely basis;
- 2) Addition of a birth/death model for JOLTS to provide an estimate of hires, separations, and openings for births which are too new to be captured by the sample and for deaths which often do not get reported during monthly sample collection;
- 3) Modification to data collection, editing, and review procedures in specific industries where research has indicated a prevalence of particular response errors; and
- 4) Establishment of a monthly alignment procedure that takes the CES employment change estimates into consideration.

Improvements to the JOLTS Sample Design

Currently, the JOLTS sample is constructed from individual panels of sample units drawn on an annual basis. The full sample consists of one certainty panel made up of large units selected with virtual certainty based on their size, and 24 noncertainty panels. Each year a new set of panels is drawn from the Bureau's Longitudinal Database (LDB), a product of the Quarterly Census of Employment and Wages (QCEW) program. Each month a new noncertainty panel is rolled into collection, and the oldest noncertainty panel is rolled out. The collection life of a sample panel is therefore 24 months. This means that at any given time the JOLTS sample is constructed from panels from three different sampling frames, the most current being slightly over one year old and the oldest being slightly over three years old. Thus the JOLTS sample design reflects established firms that have been in business for a minimum of one year.

To better reflect the impact of younger establishments in the JOLTS sample, BLS is modifying the JOLTS sample design in the following ways. First, when a new set of panels is selected each year, the birth units in the sample (those not in existence on the previous year's frame) will be initiated for collection first, rather than waiting until their associated panel is initiated. Second, each quarter the newly updated LDB will be reviewed to identify birth

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establishments and a supplemental sample of these units will be drawn and added to the survey; at the same time, out-of-business units will be dropped from the sample on a quarterly basis. Thus, the JOLTS sample will be refreshed quarterly rather than annually. Third, the entire sample of old plus new panels will be poststratified and re-weighted annually to represent the most recent sampling frame; at present, this is not done for sample drawn from earlier frames. This procedure will make the sample more efficient than at present.

JOLTS Business Birth/Death Model

As with any sample survey, the JOLTS sample can only be as current as its sampling frame. The sampling frame for JOLTS is drawn from the LDB, which is updated quarterly from files submitted to the BLS QCEW program as part of the State Unemployment Insurance system. The built-in time lag from the birth of an establishment until its appearance on the sampling frame is approximately one year. In addition, many of these new units may fail within the first year. Since these universe units cannot be reflected on the sampling frame immediately, the JOLTS sample cannot capture job openings, hires, and separations from these units during their early existence. To develop data for these units that cannot be measured through sampling, BLS has developed a model to estimate the contribution of these units to the current month estimates. The birth/death model estimates birth/death activity for current month by examining the birth/death activity from previous years on the LDB and projecting forward using the ratio of over-the-year CES employment change. The birth/death model also uses historical JOLTS data to estimate the amount of “churn” (hires plus separations) that exists in establishments of various sizes. The model then combines the estimated churn with the projected employment change to estimate the number of hires and separations taking place in these units that cannot be measured through sampling.

The model-based estimate of total separations is distributed to the three components: quits, layoffs, and other separations, in proportion to their contribution to the sample-based estimate of total separations. Additionally, job openings for the modeled units are estimated by computing the ratio of openings to hires in the collected data and applying that ratio to the modeled hires.

The estimates of job openings, hires, and separations produced by the birth/death modeling process will then be added to the sample-based estimates produced from the survey to arrive at the final estimates for hires, separations, and openings.

Because JOLTS estimates did not previously include this step, addition of the birth/death model will raise the levels and rates of the hires, separations, and openings measured by JOLTS, and allow the series to more accurately reflect the current labor market.

Modifications to Data Collection Procedures

As stated earlier, an implied measure of employment change can be derived from the JOLTS data by subtracting separations from hires for a given month. Aggregating these monthly changes in the current series, however, generally produces employment levels that overstate employment change as measured by CES, at the total nonfarm level. Research into this problem has shown that a significant amount of the divergence between the CES employment levels and the derived JOLTS employment levels can be traced to the Employment Services industry and to the State Government Education industry. In the former industry, businesses have a difficult time reporting hires and separations of temporary help workers. In the latter industry, employers have a difficult time reporting hires and separations of student workers. BLS plans to devote additional resources to the collection, editing, and review of data for these industries. BLS analysts will more closely examine reported data that do not provide a consistent picture over time, and will re-contact the respondents as necessary. Analysts will work with the respondents to adjust their reporting practices as possible. Units that cannot be reconciled but are clearly incorrect on a consistent basis will be dropped from the estimation process and imputed for using existing techniques.

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Establishment of an Alignment Procedure

Over time, employment change derived from JOLTS hires minus separations should track well with employment change measured through the CES. However, there are some definitional differences between the series that can cause legitimate differences for individual months. The major reasons for these month-to-month divergences are:

- 1) The reference periods of the two surveys are different. CES measures employment for the pay period including the 12th of the month, while JOLTS measures hires and separations for the entire month.
- 2) CES counts those who worked or received pay for the reference pay period, while JOLTS counts those who were hired or separated during the reference month. It is possible for a person to miss being paid for a given pay period without having been separated.

Both of these definitional differences can result in differing seasonal patterns between the two series, and therefore cause JOLTS to diverge from the CES in the short-term. Over time however, the computation of JOLTS hires minus separations should reflect employment changes that are consistent with the trends measured by the CES. The three changes to JOLTS that have been described above are expected to produce JOLTS series' that are much more consistent with the CES. The residual divergence will be controlled through a monthly alignment procedure that allows JOLTS to vary from CES for the reasons listed above, while ensuring that the long-term trends in JOLTS hires-minus-separations match those of the CES net employment change.

The goal of this process is to use current monthly CES employment trends to align the JOLTS implied employment trend (hires minus separations) to be approximately the same, but without forcing all the seasonal patterns to be the same between the surveys. This method takes advantage of the fact that the CES employment series for the current reference month is available prior to the production of JOLTS estimates for that same reference month.

The method works as follows:

- Each month, the initially computed seasonally adjusted JOLTS hires-minus-separations employment change estimate is adjusted to equal the CES seasonally adjusted net employment change estimate, through a proportional adjustment of the hires and separations estimates. By comparing the JOLTS and CES seasonally adjusted changes, the alignment procedure preserves legitimate differences in the seasonal patterns of underlying JOLTS and CES
- Proportional adjustment means that the two components (hires, separations) are adjusted in proportion to their contribution to the total churn (hires plus separations). For example, if hires is 40% of the churn for a given month, it will receive 40% of the needed adjustment and separations will receive 60% of the needed adjustment.
- In the next step, these adjusted hires and separations estimates are converted back to not seasonally adjusted data by reversing the application of the original seasonal adjustment factors.
- These trend-corrected not seasonally adjusted series are then put through the standard X-12 ARIMA seasonal adjustment process to create the final seasonally adjusted published series. These final seasonally adjusted series will not precisely equal the CES seasonally adjusted net employment change but will be very similar.

Revisions to Historical Series

The monthly JOLTS series begin with estimates for December 2000. All published estimates back to that point will be revised to reflect the addition of the revised birth-death model and the new alignment procedure, as well as selected adjustments to individual survey reports. New historical series for job openings, hires, total separations, quits, layoffs and discharges, and other separations will replace the currently available series. At that time, tables comparing the original and revised series will also be available.

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Reference-Attachment:

Proposed JOLTS Sample Weights Adjustment

Sarah Goodale

July 2008

Background:

The Job Opening and Labor Turnover Survey (JOLTS) is a stratified random sample with a sample size of 16,000 establishments. The 16,000 establishments are distributed over 25 panels; in which 1 panel is a certainty panel and the remaining 24 panels are noncertainty panels. Each month one panel enters the sample (rolls in) while another panel leaves the sample (rolls out).

Each year a sample is drawn, with which 12 panels will be used to enter the JOLTS sample. Since there are 24 panels that are in rotation, 12 panels of the sample can come from the new sample while the remaining panels are from previous samples. There is a possibility that there are 3 different samples present in JOLTS at once. When the first month of the new sample rolls into to JOLTS; there is 1 panel of the new sample, 12 panels of the sample taken the previous year, and 11 panels of the sample taken 2 years prior. Since the sample weights for JOLTS is currently determined when the establishments are selected to be a part of JOLTS, there can also be three different frames in which the establishments weight to. Also once an establishment has been rolled into JOLTS; it is only removed when the panel rolls out of JOLTS.

Younger establishments are represented proportionally for the frame on the current yearly sample selected. However, when this sample is added to the older samples to make up the 24 panels of JOLTS, the younger establishments are then disproportionate to the frame. Also the younger establishments are mostly represented in JOLTS by the most current sample and are not distributed among the different panels of JOLTS. The younger establishments may have different characteristics then the older establishments, and therefore should be properly represented on the sample.

Objectives:

- 1) To weight all establishments in JOLTS to the current frame
- 2) To weight the younger establishment to the represent the appropriate amount on the current frame for all 24 panels
- 3) To provide a birth refresh of new establishments to help improve the distribution of younger units

Procedure:

- 1) Draw the new annual sample
 - a) Draw the sample using the current sampling procedure
 - b) Keep the full frame file
 - c) Keep the full 24 panel sample

- 2) Update the previous samples
 - a) Create a subset containing the previous two samples
 - b) Remove any Out-of-Business Establishments
 - c) Place the establishments in the proper stratum
 - i) Merge the previous sample subset with the current full frame, keeping the stratum definition of the current frame dataset
- 3) Assign the age variable
 - a) Assign the age variable to each of the datasets
 - i) Age = 0 : establishments that come into existence on the JOLTS frame for the first time or since the last frame to the current frame
 - ii) Age = 1: establishments that have been on the JOLTS frame for a year
 - iii) Age = 2: establishments that have been on the JOLTS frame for at least two years
 - b) Assign a post stratification variable to the samples and the frame
 - i) Age = 0 or Age = 1 post stratification is age/industry/size
 - ii) Age = 2 post stratification is age/region/industry/size
- 4) Assign the panel to the new 12 panel sample (old samples only have the weights appended)
 - a) Separate the new sample (24 panels drawn earlier) remove the certainty units from the sample and find the count of establishments per stratum
 - i) Divide the count of establishments by 24 call this amt
 - b) Separate the new sample into the groups age = 0 and 1 and age = 2
 - i) If age = 0 or 1 then keep only the first 12 panels
 - c) All Age = 0 go into panel 1
 - i) Assign a new schedule number to the establishments
 - d) All Age = 1 go into panel 2
 - i) Assign a new schedule number to the establishments
 - e) All Age = 2 go into panel 3 – panel 12
 - i) Create amount = 10*amt (amt is the number per stratum in each panel)
 - ii) Sort the data in age = 2 into the post stratification variable in order of there original schedule number
 - iii) Assign a sequence number to these elements in the post stratification variable.
 - (1) Keep only those elements whose sequence number is less than or equal to the amount
 - iv) Assign the elements to new panel numbers
 - v) Join the sample with the certainty units, and age = 0 and 1.
 - vi) Assign a new schedule number to elements in the sample
- 5) Calculate the new weight
 - a) Join the new sample with the previous sample
 - b) Find the counts of the post stratification variable for the frame and the sample (panel 3 – 26 of the 36 panels of the 3 samples)
 - c) Using the post stratification calculate the new weights
$$weight_{age\ post\ strata} = \frac{N_{post\ strata}}{n_{post\ strata}}$$
- 6) Birth refresh: This will be done in between the yearly samples
 - a) Pull all units from the quarter of interest (from the LDB)

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- b) Assign the age variable, keeping only the units that are Age = 0
- c) Remove any OOB and OOS units
- d) Assign the post stratification units to the units
- e) Find the counts for the post stratification variable
- f) Find the amount to sample of birth per post strata by

$$n_{birth_{post_strata}} = \frac{N_{Q, post_strata}}{weight_{age_{post_strata}}}$$

- g) Distribute the births in the 3 panels
 - i) Q2 birth panel 4 – panel 6
 - ii) Q3 birth panel 7 – panel 9
 - iii) Q4 birth panel 10 – panel 12
- 7) Create the new full sample file