Modeling Nonresponse Adjustments for Labor Turnover

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Abstract
The Job Openings and Labor Turnover Survey (JOLTS) estimates the number of hires, separations, and job openings that exist for a given month in the US labor market. The current study tried to estimate nonresponse bias in the survey. Administrative data from the Quarterly Census of Employment and Wages (QCEW) is used to model some of the labor dynamics by matching the survey respondents and nonrespondents to their labor force estimates from the same period. The change in employment between months measured by the administrative data is related to the change of employment within months as measured by the JOLTS survey. The estimates from those models are used to study potential nonresponse effects for the survey.

Key Words: Nonresponse bias, Labor survey, JOLTS

1. Introduction

Wohlford et al. (2003) and the BLS JOLTS home page describe the Job Openings and Labor Turnover Survey (JOLTS). JOLTS data are solicited from a sample of approximately 16,000 establishments (of which approximately 10,500 provide data) covering all private nonfarm establishments as well as Federal, State, and local government entities in the 50 States and the District of Columbia. All sizes of establishments are represented in the sample. The JOLTS sample consists of one “certainty” panel and 24 non-certainty panels. The certainty panel is made up of virtually all frame units larger than a predetermined employment size. The non-certainty panels are constructed to represent all JOLTS cells equally, to avoid panel effects. Once each year, new certainty units are identified and rolled into the sample. At the same time, new non-certainty panels are selected. One of these new non-certainty panels is loaded into the sample each month and, at the same time, the oldest panel in the sample is rolled out. In this way, the total sample size is maintained while panels are inserted into and removed from the collection process.

JOLTS sample units are provided to the JOLTS Data Collection Center (DCC) located in Atlanta, Georgia. Virtually all JOLTS data collection is done in the Atlanta DCC. Trained interviewers in the DCC refine the addresses of the sample units and then contact them to request their voluntary participation in the survey. Data are collected via Computer Assisted Telephone Interviewing (CATI) for six months, and respondents are then encouraged to move to self-reporting for the remainder of their time in the survey (generally an additional 18 months). JOLTS is a multi-mode survey with self-reporting options that include Touchtone Data Entry (TDE), web, fax, e-mail, and surface mail. On
occasion, JOLTS also has entered into direct data collection arrangements with very large companies that have requested this approach.

Monthly estimates are summarized in the monthly press release and are available on the internet. Monthly “Graphs and Highlights” provide graphs and a short discussion of data from JOLTS and other BLS series. These materials illustrate and discuss the historical behavior of JOLTS data elements alone and compared to the other series as the economy moves through the business cycle. Significant change tables provide analysis for over-the-month and over-the-year change.

Annual estimates of rates and levels of hires, quits, layoffs and discharges, other separations, and total separations are released with the January news release each year. The JOLTS annual level estimates for hires, quits, layoffs and discharges, other separations, and total separations are the sum of the 12 published monthly levels. The annual rate estimates are computed by dividing the annual level by the CES annual average employment level, and multiplying that quotient by 100. Annual estimates are not calculated for job openings. Job openings are a stock, or point-in-time, measurement for the last business day of each month. Only jobs still open on the last day of the month are counted. Hires and separations are flow measures and are cumulated over the month with a total reported for the month. Therefore, the annual figures can be created by summing the monthly estimates.

Time series data are accessible via internet using LABSTAT (the searchable on-line database of BLS data). JOLTS-based articles from the Monthly Labor Review are also available on the JOLTS web page, along with additional outputs including documents such as American Statistical Association (ASA) papers, Issues in Labor Statistics papers, methodology papers, and public information sheets.”

2. Method

Data from the JOLTS survey from 2010 was matched with data from the same firms reporting employment in the Longitudinal Data Base (LDB). The changes in employment between months measured by the LDB are related to the internal monthly changes as measured by JOLTS. Attempts to predict the job turnover estimates for nonresponders on the JOLTS survey using the LDB data were done using regression models for each of the North American Industry Classification System (NAICS) industry 2-digit classifications.

For Example:

\[
\text{Jolts\_total\_Separations} = \text{Employment\_difference (LDB)} + \text{total\_employment (LDB)} + \text{interaction (between the Employment difference and total employment)} + \text{error}
\]

The total employment and the interaction between total employment and the change in employment are used to control for firm size. The interaction allows the relationship between employment change between months to vary for different sized firms.

The relative bias for each industry was calculated using the difference between the predicted values of the JOLTS estimates and the JOLTS estimates relative to the predicted estimates for each industry.
Relative_bias = Mean of ((Predicted estimate - JOLTS estimate) / Predicted estimate).

Each model also gave an R-square measure of fit. I use plots of the relative bias and the model fit (where each point is an industry) to examine the potential for bias, and the potential for adjustment.

3. Results

Figure 1 is a plot from the regression model described above for the Transportation, Warehousing, and Utilities industry. The skewed distribution of differences contributes to the high R-square. A log transformation reduces the R-square slightly, but the relative contribution to bias remains.

Figure 1: Regression of difference scores on JOLTS total turnover

In Figure 2, the log transformation reduces the R-square slightly, but the relative contribution to bias remains. Because some of the predicted values for nonresponders are less than zero, a truncated regression was used. A Beta regression would also work.
Figure 2: Regression of log of the difference scores on JOLTS total turnover

Figure 3 shows the R-square and estimated bias from each of the regressions from the industry groups. For example, Transportation, Warehousing, and Utilities (which we just saw) it has the highest R-square but very low bias. The areas of concern are the upper left and right quadrants—high predictability and high bias. The line is a quadratic regression to show the relationship between predictability (R-squared) and relative bias. The largest two negative biases were in Public Administration (PA, which would be many government establishments) and Transportation (Trans); the largest two positive biases were in Retail and Administrative and Support Services (Admin), with Agriculture (not farms, but including forestry) having the best predictability of separations. The worst prediction of separations was in Other Services and Information. The central tendency of the relative biases was between 0 and .1, which connotes low overall bias.

Figure 3: Total Separations by Industry
In Figure 4, TWU (Trans) and Other Services had the two largest negative biases for “Quits”, and Administrative services (Admin) and Construction had the two largest positive biases. The best predictability was in Utilities and Finance and Insurance (Finance).

Figure 4: Quits by Industry

In Figure 5, “Other Separations” (which has a small number relative to quits), the two largest negative biases were in Transportation (Trans) and Public Administration. The largest two positive biases were in Finance and Agriculture. The best prediction was with Real Estate and Rental and Leasing and Management of Companies (closely followed by “Other Services”).

Figure 5: Other Separations by Industry

For Figure 6, “Laid Off” (which also had small numbers) the two largest negative biases were for Public Administration and Healthcare and Social Services (Health). The two
largest positive biases were for Administrative services (Admin) and Construction. The best prediction was for Agriculture and Utilities.

Figure 6: Laid Off by Industry

For Figure 7, Healthcare and Transportation had the two largest negative biases were in terms of “Job Openings”. The two largest positive biases were in Real Estate and Rental and Leasing and Administrative services. The best predictability was in Professional/Scientific/Technical services and Finance.

Figure 7: Job Openings by Industry

In Figure 8, “Hires”, the two largest negative biases were in Transportation and Utilities. The largest two positive biases were in Administrative services and Finance. The best
predictability was in Utilities, Management of companies, Professional services, and Finance.

![Relative Bias and R square for “Hires”](image)

**Figure 8:** Hires by Industry

### 4. Discussion

The JOLTS survey has increased in popularity as more economists become familiar with the estimates. The information it provides is unique compared to other employment statistics, which has the drawback of making estimates of nonresponse bias more difficult.

The predictability varied dramatically between industries and estimates. This could be due to differences in patterns of labor dynamics, for example, in industries which are growing or declining the turnover within months would be more related to turnover between months. For industries with steady rates, the relationship would likely vary much more and be harder to predict. The overall bias appears small for each of the estimates. Administrative services often had positive biases, which could indicate either more steady employment patterns affecting the estimation process, or that nonresponders could have lower turnover. Transportation often had negative biases, which could have been affected by different patterns of turnover between months compared to within months, or the nonresponders could have higher turnover.

The idea that the between month estimates could be related to within month estimates is problematic. There could be confounding between employment trends and accounting practices. The usefulness of these estimates to improve the JOLTS is unclear. Only the “Unsuccessful” and “Refusal” categories are used in the estimation of nonresponse bias. The role of the other outcomes (such as “Pending”) should also be examined.

Future research examining the stability of the biases over time might be interesting. Are the same nonresponders contributing bias over time, or is it too dynamic? Other sources of estimation need to be investigated. Can the Business Employment Dynamics
estimates relate to JOLTS? Is the Current Population Survey industry coding sufficiently compatible with JOLTS to provide the employee view of the employment dynamics? Other regression models, such as beta regression may fit better. Multivariate models could be used to look at the components of separations, job openings, and hires simultaneously.

References


