Methodological Changes in the Job Openings and Labor Turnover Survey

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I. Background

The Job Openings and Labor Turnover Survey (JOLTS) conducted by the Bureau of Labor Statistics (BLS) provides valuable information on labor demand, hiring, and turnover for the US labor market. While the US has maintained a reliable measure of labor supply (the unemployment rate) for decades, measures of labor demand (job vacancies) have been more difficult to come by. Prior to the establishment of JOLTS, there was no measure of labor demand that was directly comparable to the unemployment rate as a measure of labor supply. Without this measure, it is more difficult to discern whether unemployment is due to micro factors such as job matching problems, or to macro-level factors such as deficient demand.

The job openings rate can be compared to the unemployment rate to establish a rough aggregate measure of whether there are enough jobs available to absorb the existing excess supply of labor. If the job openings rate is higher than the unemployment rate, then there are enough jobs to go around, and better job matching efforts are needed to find work for the unemployed. *(The author acknowledges that many of the vacant jobs may not be suitable for the available candidates, in that the vacancies may require specific skills, education, or certification that the available unemployed workers to not possess. Conversely, the available jobs along with their associated working conditions may not be attractive to the available workers at the prevailing wage. These issues fall under the heading of job matching problems.)* If on the other hand the job openings rate is lower than the unemployment rate, then filling all available jobs will still result in unemployed workers left over. In this case an increase in demand for labor is needed to absorb the remaining unemployed.

A. JOLTS Program History

BLS has collected job openings and labor turnover data in the past, but most of these efforts were restricted to selected industries or to specific states. In 1954 BLS began the Monthly Report on Labor Turnover, which lasted until 1981. (This program was limited primarily to manufacturing industries.) In 1969 the collection of job openings data was added to the labor turnover survey, but this collection was dropped in 1973. In 1979 and 1980 and again in 1990 and 1991 the Bureau conducted pilot surveys to test the feasibility of collecting detailed job openings data by occupation, limited again to selected states (in the former) and to selected industries (in the latter). In FY1999 funding was made available to BLS to develop the existing program.

B. Description of the JOLTS Survey

In a monthly survey of 16,000 business establishments, data are collected for total employment, job openings, hires, and separations. Data collection methods include computer-assisted telephone interviewing (CATI), touchtone data entry (TDE), fax, e-mail, and mail. The JOLTS program covers private non-farm establishments as well as federal, state, and local government entities in the 50 states and the District of Columbia. JOLTS produces monthly estimates of rates and levels of job openings, hires, quits, layoffs and discharges, other separations, and total separations.
JOLTS also produces estimates of monthly hires and separations of employees. JOLTS estimates of hires and separations can be used to approximately disaggregate the net monthly employment change measured in the BLS "Employment Situation" news release on the first Friday of each month. A hire is any addition to the payroll, including newly hired or rehired employees; full-time or part-time employees; permanent, short-term, or seasonal employees; employees who were recalled to a job at the reporting establishment following a layoff lasting more than seven days; on-call or intermittent employees who have returned to work after having been formally separated; workers who were hired and separated during the month; and transfers from other locations. The hires count does not include transfers or promotions within the reporting establishment; employees returning from strike; or employees of temporary help agencies, employee leasing companies, outside contractors, or consultants. A separation is any separation from the payroll, whether voluntary (quits), involuntary (layoffs and discharges) or other separations. The Quits count includes all employees who left voluntarily (except for

retirements and transfers to other locations). The Layoffs and Discharges count includes layoffs with no intent to rehire; layoffs (formal suspensions from pay status) lasting or expected to last more than seven days; discharges resulting from mergers, downsizing, or closings; firings or other discharges for cause; terminations of permanent or short-term employees; and terminations of seasonal employees (regardless of whether they are expected to return next season). The other separations count includes retirements; transfers to other locations; separations due to employee disability; and deaths. None of the separations categories include transfers within the reporting establishment; employees on strike; or employees of temporary help agencies, employee leasing companies, outside contractors, or consultants. (Please reference the JOLTS program home page at http://www.bls.gov/jlt/ for more detailed information on JOLTS data elements and collection methods.)

C. Uses and Users

Estimates of the job openings rate from JOLTS can be used as demand-side indicators of labor shortages. These national-level indicators of labor shortages can greatly enhance policy makers' understanding of imbalances between the demand for and supply of labor. At pesent there is no other comprehensive economic indicator of labor demand with which to assess the presence of labor shortages in the U.S. labor market. The number or rate of job vacancies is an important measure of tightness of job markets, parallel to existing measures of unemployment. JOLTS statistics reveal structural labor market conditions, such as the effectiveness of job matching and training processes, the implications of unemployment insurance and welfare, and deficient demand for labor. JOLTS statistics can be used as a potential indicator of business cycles. In addition, JOLTS statistics allow businesses to compare their turnover rates to national rates. JOLTS data have been used by national-level planners and policy makers, and by researchers in government and academia. They have also been used by numerous businesses, in assessing their individual turnover rates against national averages.

II. Problem Statement

Although not originally designed for this purpose, the JOLTS hires and separations data can be combined to produce an implied measure of monthly employment change. However, from the beginning of the JOLTS program in December 2000 through December 2008 the change implied by the JOLTS data did not track well with the larger and better-known Current Employment Statistics (CES) Survey. JOLTS hires minus separations fairly consistently produced an overstatement of employment change when compared to the net change measured by the CES.

Differing month-to-month measures of net employment change can be expected between two independent sample surveys. For example both surveys are subject to sampling error. The two programs will have differing levels of reliability, because the CES collects data from far more establishments (~400,000) than does JOLTS (~10,000). Also, CES was specifically designed to measure net monthly employment change, while JOLTS was not. In addition, differences in definitions and reference periods between the two surveys can cause month-to-month differences in measures of employment change. One would expect most of these issues to balance over long periods of time, resulting in two series that track relatively closely. However, this proved not to be the case.

By early 2002, it was clear that in addition to incidental differences between the surveys as described above, a more serious upward bias was at work in the net JOLTS hires minus separations data. BLS took several steps to mitigate the bias, such as carefully reviewing and re-evaluating all micro-data reported to date, retraining all JOLTS telephone interviewers, interviewing selected survey respondents, re-contacting and re-educating all survey respondents, and making system modifications to identify the divergence at the micro-data level at the time the data are first reported.[1] In addition, JOLTS modified its sample design to begin taking an independent sample of the Employment Services industry (NAICS 5613). The re-evaluation of our reported data pointed to Temporary Help firms as one source of error in the reported data, and Temporary Help firms are included in the Employment Services industry. We modified the sample structure to isolate this industry so we could monitor it more closely.

Over the remainder of 2002 and into 2003 the JOLTS/CES divergence was cut by two thirds. It appeared that our efforts to remove the overstatement of net employment change implied by the JOLTS hires and separations data had been largely

[1] Werking, Clayton, Phillips, Wohlford, 2003

successful. (See Chart 1) However, as JOLTS progressed through 2008, the divergence returned and grew larger. In addition, the effect of even small divergences in 2002 through 2005 began to accumulate. (See Chart 2)

Chart 1

[redacted]

Chart 2

[redacted]

III. Approach to Solving the Problem

BLS embarked on a detailed research effort to understand the root causes of the divergence between CES monthly employment change and JOLTS hires minus separations data and to identify ways to permanently mitigate them. We conducted a thorough review of the data already collected, and we re-examined our sampling and estimation methodologies..

In studying the divergence on an industry basis, we knew that there were a number of industries that tracked fairly closely with the CES, and a few industries that overstated the CES by large amounts. Two industries in particular appeared to be driving most of the divergence.

Chart 3

[redacted]

The industries that overstated employment change by a significant amount were *Professional and Business Services* and *State and Local Government.* Within *Professional and Business Services* we were able to look at the *Employment Services* industry, since we had begun sampling that industry back in 2003. That industry is broken out into three components: *Placement Services* (NAICS 561310), *Temporary Help Services* (NAICS 561320), and *Professional Employee Firms*

(NAICS 561330). Since we did not sample below the four-digit NAICS level, we could only review micro-data to see which of these breakouts was likely to be contributing most to the divergence problem. Our review of the micro-data indicated that *Temporary Help Services* appeared to be contributing most to the problem. Within *State and Local Government*, our review of the micro-data indicated that State level education establishments were having the most impact on the divergence.

A. Employment Services

BLS conducted a Response Analysis Survey (RAS) in the Employment Services industry, concentrating on Temporary Help firms in our existing sample. We began by visiting a Temporary Help firm for a lengthy interview to help us narrow our search to specific areas that were most likely to be causing problems. We then designed our interview instrument, developed procedures, selected a sub-sample of Temporary Help respondents, and began telephone interviews.

We sub-sampled 27 of the 197 Temporary Help firms in our sample, and learned that about half of these firms had difficulty reporting hires, but a great deal more than half experience trouble reporting separations. The respondents were split virtually evenly between units that could report hires (52%) and those that could not (48%). However, these same respondents had a great deal more difficulty reporting quits (70%), layoffs and discharges (59%), other separations (67%), and total separations (59%).

B. State Education

We also studied State Government Education. Most of the sample units from this industry were large state universities. Given the smaller number of these establishments, we began calling universities, beginning with the largest ones. In every case, the results were similar. State universities do a good job of identifying and reporting when people are hired, but not such a good job of reporting when people are separated from employment. This problem is especially pronounced with certain classes of workers, such as student workers and adjunct professors. As a result, thousands of hires were being reported each autumn, with no corresponding separations appearing the following spring. Universities with 10,000 employees were appearing to double their employment over the brief history of the survey.

C. Birth/Death Model

We also explored the impact of new business units on the JOLTS estimates. From the initial conception of JOLTS, the need for a birth/death model was identified. The JOLTS sample is drawn from the Bureau's Longitudinal Database (LDB), which is in turn built from the quarterly files submitted to BLS by the states as part of the Quarterly Census of Employment and Wages (QCEW). This sampling frame provides virtually complete national coverage of wage and salary employment since it includes all employees covered by state Unemployment Insurance programs as well as the Unemployment Compensation for Federal Employees (UCFE) program. Covered businesses file quarterly contribution reports covering their employees, the wages paid them, and the associated UI tax due the state. When a new business begins reporting, it will show up as a birth in the sampling frame within about one year. This time lag is of consequence for JOLTS, since new businesses are likely to have an initial burst of hiring and separating during their first year in existence. JOLTS is not able to capture this initial activity through the sample, because these new birth units are not yet represented on the sampling frame.

We also compared JOLTS estimates to research using different data sources and gathered additional evidence that we may have been understating both hires and separations. Fallick and Fleischman[2] used CPS gross flows data to estimate that hires and separations rates averaged approximately 6.5% – 6.6% over a period of years spanning the last recession and recovery. Using State Unemployment Insurance wage records from eight states for the period 1978 - 1984, Anderson and Meyer concluded that total separations averaged at least 19.5% per quarter, or 6.5% per month.[3] In contrast, the JOLTS total separations measure averaged 3.3% from the beginning of the series in December 2000 through December 2008, while the hires rate averaged 3.4% over that same span. Even after allowing for coverage and definitional differences between these studies, it still appeared that JOLTS may be undercounting both hires and separations.

[2] Fallick and Fleischman, 2004
[3] Anderson and Meyer, 1994

D. Sample Design

We also re-examined the sample design to see whether there may be some subtle impact on the estimates not previously detected. The initial JOLTS design called for a set of sample panels including a certainty panel and a number of non-certainty panels. The certainty panel consisted of units whose probability of selection was virtually 100%. The non-certainty panels were each drawn as stand-alone samples representative of the entire (non-certainty) sampling frame. The certainty sample was initiated in at the beginning of the JOLTS data collection process, and one non-certainty panel was initiated each month after that. Each year a new sample was drawn. The certainty panel was adjusted based on changes in the LDB, and a new set of non-certainty panels (currently 24) was drawn. (Since only twelve of the non-certainty panels were initiated over the previous year, the unused panels were made available for sampling again.) Since one panel was initiated each month, the last panel to be initiated had been sitting on the shelf for an additional year between the time it was selected and the time it was initiated. This further exacerbates the problem described above, wherein younger establishments tend to show more hires and separations activity than more mature units. The longer the delay before a new unit begins reporting data, the more the early volatility escapes measure.

E. Estimation Methodology

We also conducted a review of our estimation methodology. Collected JOLTS data are reviewed and adjusted for outlier values, adjusted for item and unit non-response, and then "benchmarked" to the current universe employment level. This benchmarking consists of ratio-adjusting the JOLTS employment estimate to the current CES employment level, and then applying that same ratio to all JOLTS estimates. This process accounts for changes in the universe level of employment since the time the JOLTS sample was originally selected. However, while this process controls JOLTS weighted employment to the universe, JOLTS does not publish an employment estimate. The hires and separations estimates, used to derive the implied JOLTS employment change, were not controlled to the over-the-month CES change. When JOLTS was designed, minor divergences between JOLTS implied employment change and CES measured employment change were assumed, but it was assumed that these would be small and would balance out over time, explained by differences in reference periods and definitions of survey concepts.

IV. Designing the Solution

The resulting program improvements affected three distinct areas: sample design, data collection, and estimation.

A. Sample Design

The sample design was modified in several ways to increase our ability to capture hires and separations from newer (younger) establishments. First, the process used to roll in new sample panels was revised. Under the old process each panel could stand alone as a representative sample of the (non-certainty) universe. One panel was initiated each month, while the remaining panels waited their turn. In order to more quickly capture the impact of newer units, the revised sample methodology examines all sample panels for "new" units (that is; units that appeared on the sampling frame for the first time during the current sampling process). These units are now moved to the front of the queue, and initiated immediately. Thus the individual sample panels no longer each constitute a representative sample of the universe. (Of course, the full JOLTS sample is still representative.)

In addition to the annual sampling process, the sampling frame is now examined at each quarterly update, and "new" units are identified. A sample of these new units is now drawn and sent to the Data Collection Center for initiation each quarter. These two steps (initiating new units first, and adding quarterly "birth" supplements) gives us as much as can be obtained from the sampling process given the timing limitations of the sampling frame. At the time each annual sample is drawn, out-of-business units are now dropped from the existing sample, and all sample units are re-weighted to represent the current universe.

B. Data Collection

Changes have also been made to the collection and data review processes. Given the amount of the divergence that was being contributed by the Employment Services industry and the State Government Education industry, special emphasis is now placed on them. 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 and other seasonal employees such as adjunct professors. The reported micro-data from these two industries are now reviewed by experienced senior economists. Establishments that show a large unexplained divergence are reviewed carefully against their own past history as well as current and historical trends in the industry. Interviewers re-contact these establishments and work more closely with them to improve their reporting practices where possible. Units that are clearly and consistently incorrect but cannot be reconciled are dropped from the estimation process and imputed for using existing techniques.

C. Estimation

Improvements to estimation consist of the addition of a birth/death model and an alignment process. The birth/death model allows us to account for hires and separations at establishments too young to be represented on the sampling frame, and the alignment process allows us to control the JOLTS measure of hires minus separations to monthly CES employment change.

1. Birth/Death Model

The birth model provides estimates of the numbers of job openings, hires, and separations that are occurring in those units that have recently entered existence but have not yet appeared on the sampling frame. As with any sample survey, the JOLTS sample can only be as current as its sampling frame. Since new 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 the current month by examining the birth/death activity from previous years on the LDB and projecting forward to the present using X-12 ARIMA modeling. 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 are then 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 raised the levels and rates of the hires, separations, and openings measured by JOLTS, and helped the series to more accurately reflect the current labor market.

2. Alignment Process

We also implemented an alignment process that controls hires and separations to CES employment change on a monthly basis. 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: a) 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. b) 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 (sampling changes, special collection procedures for problem industries, and the addition of the birth/death model) produce JOLTS series' that are much more consistent with the CES. The residual divergence is now controlled through the monthly alignment procedure, allowing 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. This method takes advantage of the availability of the CES employment series for the current reference month prior to the production of JOLTS estimates for that same reference month.

Each month, the initially computed JOLTS estimates are seasonally adjusted using X-12 Arima. The JOLTS hires-minus-separations measure is then compared to that month's CES employment change, and any difference is calculated. This difference is then used to proportionally adjust the seasonally adjusted hires and separations measures. This proportional adjustment is done by computing the total churn (hires plus separations) for the month, and then apportioning the adjustment

according to the proportion of each to the total. For example, if CES employment changed by a negative 500,000 and JOLTS hires minus separations equaled negative 400,000, the difference would be negative 100,000. If hires made up 60% of total churn and separations made up the remaining 40%, then the 100,000 difference would be adjusted by subtracting 60,000 hires and adding 40,000 separations to the seasonally adjusted JOLTS levels.

Once the seasonally adjusted JOLTS levels have been proportionally adjusted, we reverse the application of the seasonal factors to "back out" the seasonal adjustment, and obtain aligned unadjusted level estimates. These aligned estimates are then passed back through X-12 Arima to produce a final seasonally adjusted set of estimates. This final JOLTS series will not precisely equal the CES seasonally adjusted net employment change but will be very similar. In this manner we can remove the trend difference between the two series, while maintaining the differing seasonal patterns of the two surveys.

V. Implementing the Solution

As part of the implementation of all of the changes discussed as well as the production of a revised time series, historical micro-data had to be revisited. At the time these changes were implemented, JOLTS micro-data had been reported over a period of eight years. Clearly it was not feasible to re-contact all respondents in the problem industries and expect to obtain corrected micro-data so long after the fact. Instead, JOLTS staff reviewed all reported micro-data in these two industries and manually adjusted the worst offenders based on their reported employment and the historical patterns in each industry.

The birth model was used to calculate the contributions of births over the life of the JOLTS series, and then the entire time series was regenerated. The alignment process was run on the entire series, and the full set of historical estimates was replaced. As expected, the levels of hires and separations were slightly higher in the new series (See Table 1) but the overall pattern of the estimates over time was little changed. (See Charts 4 & 5)

Table 1: Results of All Adjustments
(in thousands)

Year	Hires Before	Hires After	Level Difference	Percent Difference		Separations Before	Separations After	Level Difference	Percent Difference
2001	54578	63768	9190	17%		54556	65611	11055	20%
2002	49718	59800	10082	20%		49597	60410	10813	22%
2003	49294	57788	8494	17%		48294	57849	9555	20%
2004	54721	61615	6894	13%		51779	59671	7892	15%
2005	57491	64502	7011	12%		54609	62087	7478	14%
2006	59158	64911	5753	10%		55199	62626	7427	13%
2007	57778	63381	5603	10%		54641	62104	7463	14%
2008	51113	56496	5383	11%		52864	59343	6479	12%
Total	433851	492261	58410	13%		421539	489701	68162	16%

Chart 4, Before Adjutments:

Chart 5, After Adjustments:

The two industries that were significantly overstating employment growth now display results more consistent with employment change. For the eight year period from January 2001 through December 2008, the divergence between JOLTS and CES in the Professional & Business Services Industry went from 4,679,000 before the adjustments to 22,000 after. For State and Local Government, the divergence decreased from 4,035,000 to -38,000 over the same time period.

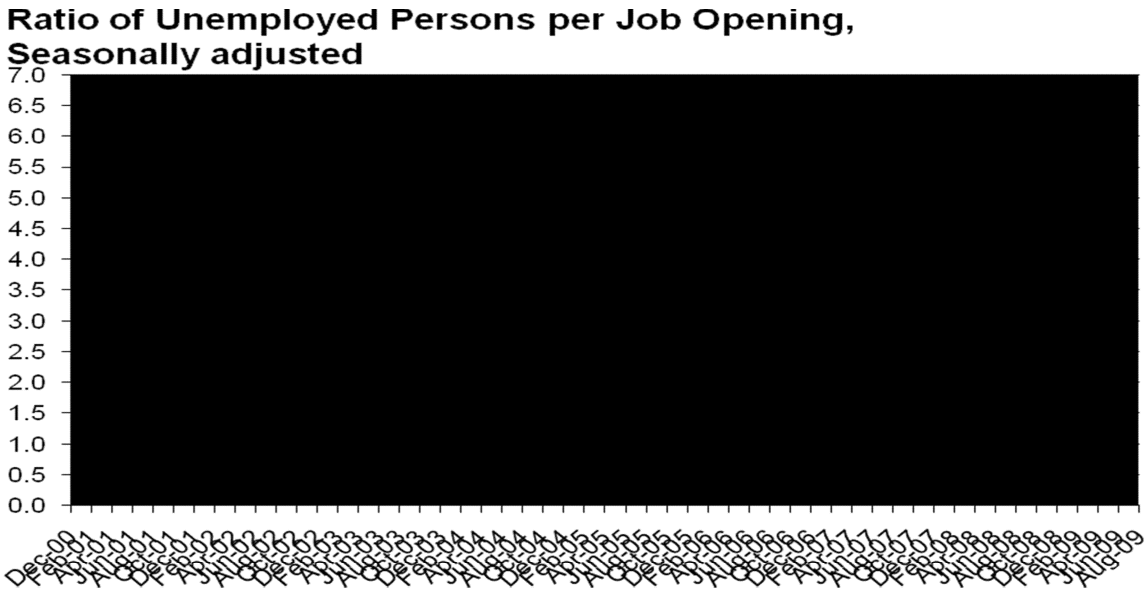
Most importantly, the trend divergence between the JOLTS hires and separations compared to CES net employment change was largely removed, while the independent seasonal patterns of the JOLTS series were maintained. (See Chart 6)

Chart 6

VI. Results

After implementing these improvements, the entire historical JOLTS series was recalculated and re-published on March 10, 2009. The revised data series now helps illustrate more clearly the factors underlying monthly net employment change, and also shows some additional interesting properties. For example, one can compare the levels of available supply of labor (the unemployment rate) with excess demand for labor (the job openings rate) and see that the current recession generated a ratio of unemployed persons per job opening that is well above the last recession. (See Chart 7)

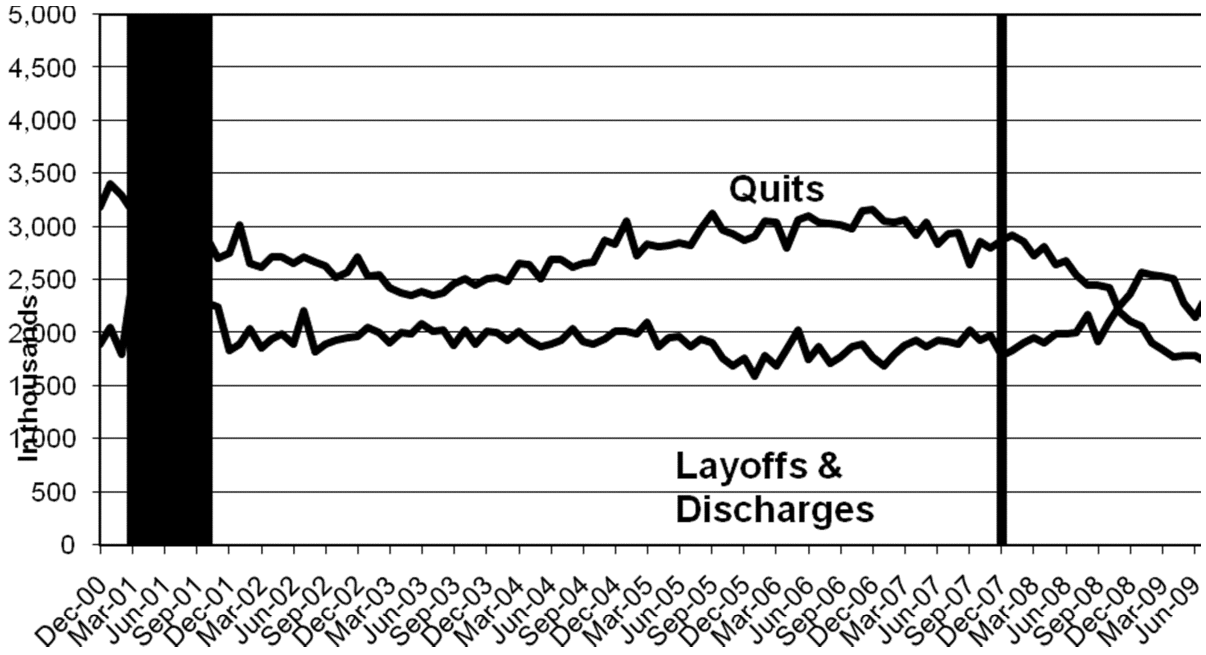
Chart 7



Another distinction between the last two recessions is illustrated by the behavior of quits (voluntary separations) when compared to layoffs & discharges (involuntary separations). (See Chart 8) In the last recession layoffs & discharges spiked upwards at the beginning of the recession and then quickly dropped back to a relatively stable level before moving upward again at the end of the recession. Over the entire previous recession and recovery, however, the level of layoffs & discharges remained well below the level of quits. In the current recession, layoffs & discharges remained relatively stable for several months after the recession began, only to move up dramatically as the recession entered its second year. In addition, the level of quits has fallen well below the low point of the previous recession, and well below the current level of layoffs & discharges.

Chart 8

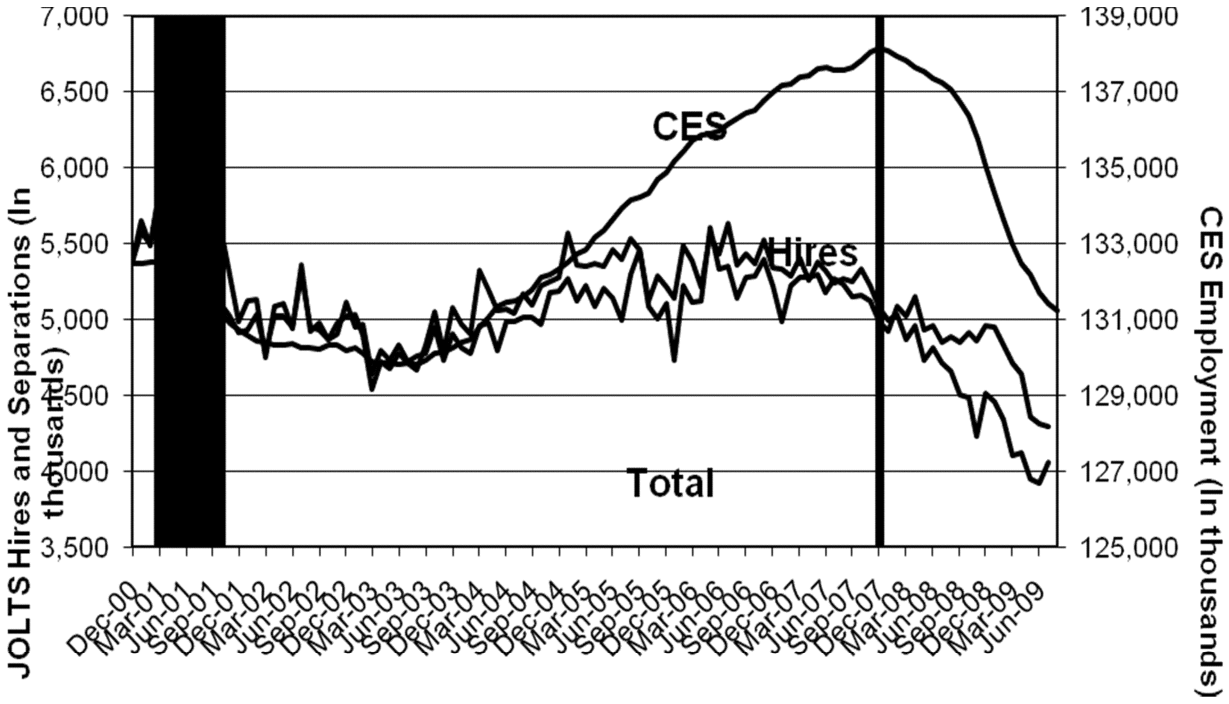
JOLTS Quits and Layoffs & Discharges Levels, Total Nonfarm, Seasonally adjusted



Another observation is that the labor market may have begun cooling prior to the beginning of the current recession. (See Chart 9) In the year prior to the beginning of the recession, both hires and separations were declining, while total nonfarm employment was continuing to grow. Even though hires were declining, total separations were also declining during this period. As long as hires remained greater than separations, employment continued to grow even though the level of activity was falling.

Chart 9

JOLTS Hires and Total Separations and CES Employment, Total Nonfarm, seasonally adjusted



VII. Conclusion

JOLTS provides valuable information about the US labor market. BLS devoted significant time and effort to assessing the quality of the JOLTS data and making improvements in a number of areas. Improvements in sample design, data collection, and estimation have increased the value of the data to planners and researchers, and have allowed us all to better understand developments over the past business cycle.