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I. Introduction

Government estimates of employment in the U.S. economy play fundamentally important information roles for policymakers, economic analysts, economic forecasters, the media, and the public at large. The monthly "Employment Situation" from the Bureau of Labor Statistics is perhaps the single most important government data release for information on the current economic situation. Two variables from that report receive particular attention: the reported monthly change in nonfarm payroll jobs and the unemployment rate. These measures of labor market performance come from two different surveys and two different measures of employment – one from "households" and the other from "establishments" – resulting in two potentially differing views about the status of the labor market at any given time. At the time this paper is being written, the two surveys are providing differing views about the change in employment over the past year and a half following the end of the recession. Estimates of employment from the "household" survey (from which the unemployment rate is determined) show an increase in employment over the past year and a half; in contrast, estimates of payroll jobs from the "establishment" survey have shown ongoing declines. This divergence has contributed to the uncertainty about the current economic situation and outlook, and has even attracted media attention.[1]

This paper examines the alternative measures of employment in more detail, with the particular focus on the behavior of the series at the critical business cycle phase we are now in: the early expansion phase following a recession. Because the employment series play such key roles in our economy, it is critically important that we understand as much as possible about the temporal performance of employment estimates, any possible cycle-dependent biases in the measures, and the relative reliability of the alternative measures of employment around business cycle turning points. This paper attempts to provide additional information on these issues -- although it must be noted up front that fundamental data comparability problems exist over the long time periods considered here that limit the confidence we have in the implied results. Nonetheless, the evidence indicates that at the critical point in the business cycle of the early expansion, the household employment series can be a more reliable measure of the general performance of employment in the labor market; the initial "real time" changes in household employment historically have provided information for subsequent revisions to the estimates of changes in payroll

[1] See, for example, Berry, "Dueling Surveys Cloud U.S. Employment Picture."

employment. These results suggest that, for purposes of analysis at the time this paper is being written, current data for the payroll jobs series likely are downwardly biased and overstating the decline in employment over the past year and a half following the NBER-designated end of the recession.[2] This initial downward bias in the payroll employment series likely will be "revised" away as subsequent establishment benchmarks occur and the "benchmark lag" effect is eliminated.[3]

The remainder of this paper is organized as follows. The second section presents additional discussion and comparisons of alternative employment series and a review of some of the technical issues and methodologies for the alternative employment estimates. The third section discusses the use and collection of "real time" data relative to "current vintage" data, and presents casual empirical comparisons as well as regression results for "stacked" data series across various cycle comparisons. The fourth section examines the possible implications of the results for the current situation, as well as the potential limitations of making such applications. The final section discusses the broader implications of the results and the issues addressed, including the potential relevance for the implementation of monetary and fiscal policies, for business cycle dating, and for the general issue of the information role of employment estimates for the general public.

II. Employment estimates

The Bureau of Labor Statistics presents extensive detailed discussion of the sampling and estimation methodologies used to produce estimates of employment.[4] As discussed in the "explanatory note" accompanying the monthly Employment Situation release from the Bureau of Labor Statistics (BLS):[5]

> This news release presents statistics from two major surveys, the Current Population Survey (household survey) and the Current Employment Statistics survey (establishment

[2] The "Business Cycle Dating Committee" of the National Bureau of Economic Research has become the official arbiter for determining the beginning and ending dates – the "turning points" – for the expansion and recession phases of business cycles in the United States. See,Hall, Feldstein, Frankel, Gordon, Romer, and Romer (2003).
[3] The BLS is scheduled to make a preliminary announcement on the size of the March 2003 benchmark revision in October 2003 and the full benchmark revision and detail are scheduled to be published in February 2004. For prior benchmark revisions, the publication of the revised data occurred in June of the subsequent year. The upcoming benchmark will be to March 2003 data; the revisions for the March 2004 benchmark (a year and a half from now) could also affect post-March 2003 data (e.g., "current" data) values through the BLS "wedge back" procedure. Hence, the hypothesis won't be absolutely confirmed or denied with the October preliminary benchmark statement.
[4] A complete discussion of the surveys and methodologies is beyond the scope of this paper. The interested reader is referred to the BLS website: www.bls.gov .
[5] See: http://www.bls.gov/news.release/empsit.tn.htm

survey). The household survey provides the information on the labor force, employment, and unemployment that appears in the A tables, marked HOUSEHOLD DATA. It is a sample survey of about 60,000 households conducted by the U.S. Census Bureau for the Bureau of Labor Statistics (BLS).

The establishment survey provides the information on the employment, hours, and earnings of workers on nonfarm payrolls that appears in the B tables, marked ESTABLISHMENT DATA. This information is collected from payroll records by BLS in cooperation with State agencies. The sample includes about 160,000 businesses and government agencies covering approximately 400,000 individual worksites. The active sample includes about one-third of all nonfarm payroll workers. …

Differences in employment estimates. The numerous conceptual and methodological differences between the household and establishment surveys result in important distinctions in the employment estimates derived from the surveys. Among these are:

-- The household survey includes agricultural workers, the self-employed, unpaid family workers, and private household workers among the employed. These groups are excluded from the establishment survey.
-- The household survey includes people on unpaid leave among the employed. The establishment survey does not.
-- The household survey is limited to workers 16 years of age and older. The establishment survey is not limited by age.
-- The household survey has no duplication of individuals, because individuals are counted only once, even if they hold more than one job. In the establishment survey, employees working at more than one job and thus appearing on more than one payroll would be counted separately for each appearance.

Chart 1 presents a comparison of the ratio of alternative household employment measures to the nonfarm payroll jobs measure from the establishment survey.[6] The top line shows total civilian employment from the household survey relative to total nonfarm payroll employment from the establishment survey. The ratio exceeds the unitary value in all cases reflecting the larger household employment measures from the greater coverage of the total household survey. The middle line shows

[6] Charts and tables are presented at the end of the paper.

non-agricultural household employment relative to nonfarm payroll employment. The bottom line shows non-agricultural wage and salary workers from the household survey relative to the establishment survey. This final ratio tracks closer to the unitary value historically, reflecting the closer comparability of the coverage of the employment series across the two surveys. Even so, a widening disparity did emerge in the mid- to late-1990s, perhaps because of increased multiple job holders or because of household survey undercounts of the population. The discontinuous jumps in the ratios in the chart at the beginning of 2000 and the beginning of 2003 reflect the incorporation of new population estimates associated with the 2000 census and subsequent population adjustments.[7] In general, the deviation from unity for the ratios and the volatility of the ratios over time illustrate the potential significantly divergent views of employment that can result from the alternative surveys.

The sampling and estimation methods employed by the BLS in making the employment estimates can introduce significant short-run volatility and inaccuracies.[8] Much of the volatility and inaccuracy is unavoidable, reflecting the fact that the estimates must be made from samples rather than a complete census. Nonetheless, even with more complete data and subsequent benchmarks to more complete data sets, errors will persist. For our purposes, the important issue is whether short-run employment estimates tend to illustrate persisting one-sided errors at key points in the business cycle and whether any information on the magnitude of such errors can be identified.

In many ways, this is an old issue, as BLS historically has recognized – and conducted extensive research on -- the tendency for its short-run establishment employment estimates to exhibit potential significant downward bias, because sampling cannot adequately capture the job changes associated with business births and deaths in the dynamic U.S. economy. As Kropf, Strifas, and Traetow (2003) state, "A bias adjustment is needed for the current CES quota estimates primarily to account for the employment growth of new firms and to reduce other components of non-sampling error in the survey." Although a comprehensive review of the history of employment estimation procedures is beyond the scope of this paper, a cursory review of analyses such as Both (1979), Cronkhite (1987), and Mueller (2001) shows that the "bias adjustment" methodology has been in place over the past several decades, and Kropf, Strifas, and Traetow (2003) state: "The bias adjustment factor model has been in effect since the early 1960s in the CES survey, in conjunction with the quota sample." Kropf, Strifas and Traetow present an

[7] See Bowler, Ilg, Miller, Robinson, and Polivka (2003) for information on the benchmarking of Current Population Survey (CPS) "household" data to the 2000 Census.
[8] See the BLS Handbook of Methods at http://www.bls.gov/opub/hom/home.htm ; Kropf, Strifas, and Traetow (2003); Bowler, Ilg, Miller, Robison, and Polivka (2003); and Strifas (2003) for recent technical discussions of the BLS methodologies underlying household and establishment employment estimates.

extensive discussion of the prior "bias adjustment" methodology and the new probability based and net birth/death modeling methodology that BLS has recently adopted.

For our purposes, the key issue is whether any approach based on recent historical data can adequately capture the dynamic behavior of payroll employment around turning points of the business cycle. Kropf, Strifas, and Traetow acknowledge this problem:

> … the most significant potential drawback to any model-based approach is that time series modeling assumes a predictable continuation of historical patterns and relationships. Therefore, a model-based approach is likely to have some difficulty producing reliable estimates at economic turning points or during periods in which there are sudden changes in trend. With the net birth/death model this difficulty is signficantly reduced, as imputation allows for such trends or turning points to be partially captured in the estimates. … Even so, accurate estimation of the business birth component of total nonfarm employment will continue to be the most difficult issue in CES employment estimation.

The nature of this problem historically is revealed, at least in part, by an examination of the "benchmark revisions" that have occurred over time and over various business cycle phases. Each year, BLS calibrates its CES sample-based estimates to the employment "population" based on data on employees covered by unemployment insurance. Strifas (2003) discusses the benchmark methods in detail. A key issue for our purposes is the "benchmark lag" of at least 15 months that exists in completing the benchmark revision.[9] For example, at the time this paper is being written, in August 2003, the last benchmark for current payroll employment data was for March 2002 – a point in time that was only several months removed from the recession trough of November 2001 (as recently determined by the NBER; see Hall, Feldstein, Frankel, Gordon, Romer, and Romer (2003)). As an illustration of the problem, consider the historical series of benchmark revisions from 1979 to 2002 shown in Chart 2.[10] In recession periods (shown by shading in the chart), the subsequent benchmark revisions for those years were negative in all cases; and in each recession case, for the initial year following the recession, the

[9] As noted above, the benchmark lag will be reduced by several months for future benchmark revisions; the benchmark revision next year is scheduled to be published in February rather than June.

[10] Chart 2 shows benchmark revision data for the 1977 to 2002 period; annual benchmark revision data are unavailable for the mid-1970s as a multi-year data revision occurred at that time.

benchmark revisions also tended to be negative (two negative, one effectively zero).[11] For the mid-expansion phases, a somewhat more random pattern emerges with negative, zero, and positive revisions, although the expansion of the 1990s with its strong labor market performance exhibited primarily positive benchmark revisions.[12] It is not an unexpected result that bias adjustments or the net birth/death model – both based on historical data – would yield a pattern of positive benchmark revisions during strong expansions and negative benchmark revisions during recessions. In other words, a strong lagged cyclical pattern for the benchmark errors would exist as the history-based estimate would lag the turning point, which is precisely what appears to have occurred.

In discussing the employment estimates and the methodologies used, one additional factor should be addressed before we move on. Thus far we have focused on the establishment data and methods for payroll jobs estimates. For the household employment data, significant changes from initial estimates can occur as well, in particular because of the calibration of employment estimates to population data. For example, Bowler, Ilg, Miller, Robison, and Polivka (2003) describe the revisions to household employment estimates to reflect benchmarking to the 2000 Census. The changes can be significant and can result in sharp discontinuities in the household employment estimates because prior data are not adjusted to reflect the transition to the new benchmarked levels. In recent household employment data series, significant discontinuities occur in January 2000 and January 2003. Such discontinuities create difficulties in making intertemporal comparisons based on the employment data from the household series.

III. Analysis of historical performance and relationships during early expansions

The primary focus of this paper is the issue of whether current estimates for payroll employment are understating the "true" jobs gains; in the context of the previous section's discussion, whether payroll employment estimates from this early expansion will be higher once benchmark revisions occur. Casual empirical evidence exists to support this view as observed in the earlier discussion; historical benchmark revisions to payroll estimates show the tendency for overstating payroll jobs estimates in recessions and

[11] The chart shows a large downward revision for the 1991 benchmark; BLS sources indicate that an initial error in the ES202 benchmark source data led to an overstatement of the size of the negative benchmark revision. The benchmark revision adjusted for the incorrect ES202 data would be smaller, but still negative.

[12] An earlier analysis by Juhn and Potter (1999) addressed the differences in the household and payroll employment series – but for the opposite reason for the motivation for this paper: Juhn and Potter were interested in trying to explain why the household employment measure had risen slower than the payroll employment measure. That observed result coincides with the positive benchmark errors of the late 1990s discussed here – e.g. an initial downward bias to the payroll employment estimates during the strong 1990s expansion.

understating payroll jobs estimates in early expansions. The other motivation for examining the issue, however, is the fact that the household employment data are showing substantial increases in employment while the payroll jobs estimates show ongoing declines. Key questions therefore arise: Can we glean any information from the household employment data that will help illustrate the extent of the bias in payroll jobs estimates? Can historical relationships across early expansions provide useful evidence?

Real-time data and current vintage data: A significant problem arises when we want to look at historical data comparisons for this issue. The historical employment data series that exist are "current vintage" data series – that is, they are data as constructed at the current point in time, based on the methodologies in place at this time. The recent "tail" of any data series, however, is in most cases based only on partial information and has not yet gone through a benchmark revision when more complete information can be incorporated. As discussed in the previous section, the "tail" for the payroll employment data series is at least 15 months long, reflecting the "benchmark lag." For example, at the time this paper is being written, the tail for the payroll employment data series is 16 months long, as the most recent payroll jobs estimate is for July 2003 and the last benchmark was for March 2002. In addition, at this time the tail of 16 months largely overlaps the early expansion phase of 20 months that exists from the end of the recession in November 2001. As a result of the benchmark lag and the preliminary nature of the data in this early expansion, the correct approach for making historical comparisons is to use the preliminary, pre-benchmark data that existed in the prior historical periods. Such data have come to be known as "real-time" data.

In order to examine the historical relationships, real time data series were collected for the early expansion phases for the business cycles that have occurred since 1960. The one exception is the short, one-year expansion phase from July 1980 to July 1981. The relevant NBER-determined trough dates are: February 1961; November 1970; March 1975; November 1982; and March 1991. Data for the real-time series were drawn from various past issues of the *Economic Report of the President*, *Employment and Earnings*, and *Supplement to Employment and Earnings*. In each early expansion case, the data series were collected such that 20 months of data could be drawn for the data vintage with the benchmark month closest to the recession trough – so as to conform to the current situation. As an example, consider the case of the 1981-82 recession and the early expansion phase following the November 1982 trough. The data series drawn therefore needed to cover the November 1982 to July 1984 period, based on the real time data series of the second half 1984 vintage. Data for the establishment nonfarm payroll jobs series were drawn from the *Supplement to Employment and Earnings*, July 1984 and from the February 1985

Economic Report of the President; data for nonagricultural employment for the household survey were taken from the February 1985 *Economic Report of the President*.

Charts 3a – 3e show the real-time data series for the early expansions along with current vintage data for nonagricultural household employment and nonfarm payroll employment. A visual review of the charts yields the casual empiricism that coincides with the observed benchmark revisions of Chart 2: the real-time estimates for payroll employment in early expansions understate the subsequent revised estimates. In every case, the real-time payroll employment series lies below the current vintage payroll series.

Additional views of these data are shown in Tables 1a - 1e (presented at the end of the paper). The tables show the changes in the employment estimates from the NBER-designated trough to 20 months later for the real-time and current vintage data. The third column shows the difference between the change in the household employment series and the change in the payroll employment series over the 20-month periods. In every case except for 1961-62, the change in household employment over the early expansion exceeded the real-time payroll employment change. Further, in all cases, the current vintage establishment data show greater increases over the early expansion phases than the real time data (see the cell for the "Difference, Current – Original" for the Establishment Survey column). Finally, note that for all but the 1961-62 case, the upward revisions to the establishment series changes are in the range of 40 to 70 percent of the difference between the original, real-time household series change and the original real-time establishment series change. For example, for the 1991-92 early expansion, the difference between the original, real-time household employment 20-month change and the original, real-time establishment employment 20-month change is 880 thousand; the difference between the current vintage establishment employment 20-month change and the original, real-time establishment employment 20-month change is 360 thousand – or about 41 percent of the 880 thousand.

The issue of whether the real-time household employment data changes can yield information for subsequent, revised establishment employment changes warrants further consideration. "Stacked data" series were created for the monthly changes in the household employment and establishment employment estimates for the real-time data series and the current vintage data series. That is, for each employment

measure the 20-month series of monthly changes from each early expansion were combined to form one long data series.[13] Regressions of the following form were estimated:

$$(1) \qquad \Delta E^{i}_{C,t} = \quad a + b\Delta E^{i}_{R,t} + e_t$$

where $E^{i}_{C,t}$ is the current vintage employment estimate for employment measure i (i = household, establishment), $E^{i}_{R,t}$ is the real-time data employment estimate, Δ is the first difference operator, e.g., $\Delta x_t = x_t - x_{t-1}$. If the real-time employment data for early expansions are unbiased estimates of the subsequent revised current vintage data, then the joint hypothesis of [a = 0, b = 1] should hold.

Table 2 presents the estimated regression results for equation (1). Lines 1 and 2 in the table show the results for estimating equation (1) in level changes as in the text equation; lines 3 and 4 show results for using percentage changes. The results for both the payroll employment and household employment measures indicate that the real time employment changes are biased estimates of the subsequent revised current vintage changes in employment: the constant coefficient estimates are significantly different from zero; the slope coefficients are significantly different from 1.0; and the F-statistic for testing the joint hypothesis [a = 0; b = 1] are significant at the 1 percent level for rejecting the hypothesis.

An extension of equation (1) can provide additional information on the relationships between real-time and current vintage employment estimates and the possible interactive information roles of the two series:

$$(2) \qquad \Delta E^{i}_{C,t} = \quad \alpha + \beta\Delta E^{i}_{R,t} + \gamma\Delta E^{j}_{R,t} + \varepsilon_t$$

Equation (2) is a specification that permits testing whether the real-time changes in one measure of employment carry information for subsequent revised current vintage changes in the alternative measure of employment. Table 3 presents results for estimated regressions of equation (2). The general interpretation from the results of Table 2 still hold for the results of Table 3: the joint hypothesis of [a = 0, b = 1] is rejected, indicating the real-time employment changes are biased estimates of the current vintage employment changes. The new information in Table 3 is that the real-time household employment changes carried information for the current vintage payroll employment changes (e.g., the

[13] Some observations were dropped from the stacked series of monthly changes because of the discontinuities resulting from household employment series benchmarks and because of household data unavailability in the real-time data series, inlcuding April 1962, December 1970, and January 1971.

observed significant estimates on the real-time household employment variable in lines 1 and 3 of Table 3). In contrast, the real-time payroll employment changes did not carry information for the current vintage household employment changes (the not significant coefficient estimates on real-time payroll employment changes in lines 2 and 4).

Table 4 presents results for the percentage change specifications for the restricted sample of the post-1973 early expansions, excluding those of 1961-62 and 1970-72. Somewhat different results are observed, notably that the joint [0,1] hypothesis cannot be rejected; the closest result for rejecting that hypothesis is shown in line 3 of Table 4 where the calculated value of the F-statistic of 2.41 is significant at about the 10 percent level for payroll employment. The specific result of real household employment changes carrying information for the subsequent current vintage payroll employment changes is maintained, however, as shown by the significant coefficient estimate on the real-time household employment variable in line 3 of Table 4.

IV. Implications for current situation

What do the various results presented above suggest for the current situation? Generally, the results point in the same direction – that the current measures of establishment payroll employment likely are downward biased. A more specific result suggests that the recent increases in the household employment series over this early expansion also point to better payroll employment estimates than we currently observe.

A review of the current data on the alternative employment measures shows that the establishment nonfarm payroll employment series shows a decline of 1.030 million jobs from November 2001 to July 2003, while the household nonagicultural employment series shows an increase of 1.260 million over the same period. The first thing to recognize is that the recent revisions to the CPS household survey data introduce a substantial upward jump to the household employment data in January 2003; Bowler, Ilg, Miller, Robison, and Polivka (2003) state that the effect was to boost household employment by 576,000. If we simply subtract that one-time jump from the nonagricultural employment change since November 2001, we have an adjusted 20-month change of 684,000 for the household nonagricultural employment. Although that is a substantial downward adjustment, an important discrepancy still remains as the household series continues to show increases while the payroll employment series shows the substantial decline of over 1 million. The difference between the 20-month change in the adjusted household nonagicultural employment series and the 20-month change in

establishment payroll employment is 1.714 million. As discussed earlier, Tables 1a – 1e showed the general result that the excess in real time household employment changes relative to payroll employment changes over the first 20 months of the expansion can predict the subsequent revision to changes in the payroll employment series, with about 40 to 70 percent of the excess household growth being reflected in the revised payroll employment growth. Combining that result with the observed changes in the current early expansion period indicates that we could see an upward revision to payroll employment of roughly 700,000 to 1 million at the 20-month horizon – e.g., for July 2003. At the lower end of that range, a revision of that magnitude would be about +0.5 percent of the estimated payroll employment level – a revision of similar size to those shown in Chart 2 for prior early expansion benchmark revisions (e.g., see the values for 1984 and 1993-94). On net, that would suggest that payroll employment has registered a smaller decline of around 300,000 or less – perhaps even roughly being flat – since November 2001 rather than the 1 million decline shown in current estimates which have yet to go through a benchmark revision.

Chart 4 shows the results if we apply the regression results from line 3 of Table 4 to the current situation. The chart shows two lines for the period prior to November 2001: current estimates of household nonagricultural employment; and current estimates of establishment nonfarm payroll employment. For the nonagricultural household employment series, an "adjusted" level is shown for January 2003 and subsequent periods, accounting for the upward adjustment from population controls that began in January 2003. For the establishment nonfarm payroll employment series, after November 2001 a "fitted revised" level is shown, based on applying the estimated relationship from line 3 of Table 4. Consistent with the casual 20-month change results described above, the fitted revised level shows a much smaller payroll employment decline over the period since the November 2001 trough; here, the decline is about 460,000, or about 570,000 less than currently estimated. Also, it should be noted that the payroll employment level would be roughly flat over the past year and a half rather than showing continuing declines as in current estimates.[14]

One must be very cautious in interpreting and applying these results. The real-time data on which the results are based have been drawn from disparate historical periods, and the sampling procedures and methodologies used to produce the employment estimates have changed substantially over time. As a result, the application of the results to the current situation and the possible changes that could occur to estimates under current methodologies are certainly not precisely the same as what has occurred in the

[14] The changes shown in the chart should be considered representative as any revision to the payroll employment estimates that occurred because of the benchmark would occur relative to the benchmark months. For example, BLS uses a "wedge back" procedure to distribute the revisions over the intervening months. See Strifas (2003).

past. To the extent, however, that any methodology relies on historical data – and much of which has not yet gone through an annual benchmark – for producing current estimates of employment, the approach applied here illustrates the rough relationships and biases that can be expected to occur at turning points in the business cycle. Clearly there is a substantial track record of the establishment payroll employment estimates underpredicting the "true" jobs performance in early expansions.

V. Broader implications

Employment estimates play a very prominent role in our economy and in the determination and evaluation of economic policies. A number of researchers have found that the announcements of the employment report and employment estimates lead to significant responses of prices and interest rates in domestic and international financial markets, including Harris and Zabka (1995), Fleming and Remolona (1997), Balduzzi, Elton and Green (2001), and Andersen, et al (2003). Monetary policymakers pay close attention to the employment report, and the policy statements from the Federal Reserve's Federal Open Market Committee (FOMC) often cite employment or labor market conditions. For example, in March 2003, the FOMC statement included: "While incoming economic data since the January meeting have been mixed, recent labor market indicators have proven disappointing." Fiscal policymakers also pay heavy attention to the employment numbers; for example, in January 2003 President Bush proposed tax relief as a "growth and jobs plan" and Congress ultimately passed H.R. 2 "The Jobs and Growth Tax Relief Reconciliation Act of 2003. Political claims regarding the successful or unsuccessful nature of a President's or political party's policies often rely on the number of payroll jobs gained or lost. In all these cases, the possible cycle-related disparity in employment estimates threatens to distort the information role of the employment numbers – and at the crucial times when policymakers would have to make key decisions about discretionary policy actions.

Economic analysts and researchers also can put a heavy weight on employment estimates in evaluating the performance of the economy. In particular, the NBER's Business Cycle Dating Committee pays close attention to payroll employment in making its determination of business cycle turning points:

> The traditional role of the committee is to maintain a monthly chronology, however, and the BEA's real GDP estimates are only available quarterly. For this reason, the committee refers to a variety of monthly indicators to choose the exact months of peaks and troughs. It places particular emphasis on two monthly measures of activity across

> the entire economy: (1) personal income less transfer payments, in real terms and (2) employment. In addition, the committee refers to two indicators with coverage primarily of manufacturing and goods: (3) industrial production and (4) the volume of sales of the manufacturing and wholesale-retail sectors adjusted for price changes. (Hall, et al (2003))

In making the determination of the recent trough in November 2001, however, the committee found the employment measures to be of limited value in determining the trough:

> The fluctuations in [payroll employment] are quite different from those in the broader, output-based measures. Employment reached a peak in February 2001and declined through July 2002. It rose slightly through November, took a sharp downturn in December, rose again in January 2003, but since then has declined through June 2003, the most recent reported month. It is now 394,000 below the start of the year, and 2.6 million below the February 2001 peak. The fact that employment has continued to decline while output-based measures have risen reflects the fact that productivity has risen substantially since late 2001. The divergent behavior of output and employment was a key reason why the committee waited a long time before identifying the trough. (Hall, et al (2003))

Note that the committee made the specific reference that "employment has continued to decline while output-based measures have risen reflects the fact that productivity has risen substantially." The results presented in this paper suggest that description could be modified by using "preliminary estimates of payroll employment" reflecting the fact that payroll estimates can undergo substantial revisions once they are subsequently benchmarked. Second, the results presented in this paper provide an alternative explanation beyond "productivity has risen substantially" for why payroll employment "has continued to decline." The results suggest that the current payroll employment estimates may be understating the true change in payroll jobs over the past year and a half. Finally, the results suggest that the dating committee perhaps could consider adjusting their approach for determining the dating of business cycle turning points. Certainly there is value in trying to determine the turning points as promptly as possible. Yet, the data that are used to determine the turning points can be subject to substantial revision through benchmarks and other subsequent revisions. An alternative approach would be for the committee to announce a "preliminary" determination of the turning point as soon as it deemed feasible given the preliminary data that were available. Then, at a predetermined horizon that was long enough to allow for

benchmark revisions, say 3 years from the "preliminary" turning point, the committee would make its "final" determination of the turning point. The problem essentially is one of having "real time" data that may not be as reliable as needed to properly make the turning point decision. The problem is exacerbated in situations like we have observed following the last two recessions when we have had slow recoveries.

VI. Summary and conclusions

Employment estimates published by the Bureau of Labor Statistics are critically important indicators of the economy's performance – particularly its short-run performance, including business cycle turning points. At the time this paper is being written, however, the two surveys that BLS uses for measuring employment – the household survey and the establishment survey – are providing different views of the employment situation; the household survey has shown rising employment over the past year and a half while the establishment survey has showed continued declines in nonfarm payroll jobs. The review of historical relationships during early expansion periods presented in this paper indicates that the recent decline in nonfarm payroll jobs likely is overstating the weakness in labor markets; estimates of nonfarm payroll employment growth typically lag the business cycle turning points and benchmark revisions show clear cyclical behavior. Statistical analysis of the relationships between real-time data and current vintage data show that the increases in household employment during early expansions carried significant information for the subsequent revisions to payroll employment growth. These results imply that, in the current situation, the gains in household employment observed over the past year and a half point to likely upward revisions to the nonfarm payroll employment estimates in subsequent benchmark revisions. The analysis in this paper suggests that nonfarm payroll employment estimates could be revised up by roughly 500,000 to 700,000 – an upward revision of about 0.4 to 0.5 percent of total nonfarm payroll employment, an amount similar to prior benchmark revisions for early expansion periods. With such an upward revision, nonfarm payroll employment would have remained roughly flat over the past year and a half, instead of showing ongoing declines.

The methodologies that BLS uses to construct payroll employment estimates prior to benchmarking are based on incomplete sample information and rely heavily at the margin on estimated historical relationships to explain unobservable job changes for firm closings and start-ups. Although BLS has made ongoing efforts to improve their methodologies, including replacing the "bias adjustment" approach with a probability-based net birth/death modeling approach, the reliance on historical relationships in those approaches will tend to lead to cyclical biases in the initial payroll employment

estimates. The "benchmark lag" of 15 months or more for the nonfarm payroll estimates is a key reason why subsequent payroll employment revisions exhibit cyclical behavior. These descriptions should not necessarily be viewed as implying improper estimation efforts on the part of BLS. Rather, the cyclical relationships observed for the payroll employment revisions reflect the typical situation for most cyclical economic indicators and relationships. For example, in 2002 the annual revisions for the National Income and Product Accounts (NIPA) data produced by the Bureau of Economic Analysis (BEA) showed that the pre-revision NIPA estimates had overstated real GDP growth in the second half of 2000; the revised data also showed that the decline in real GDP in 2001 had started earlier and was deeper than initially estimated (see Bureau of Economic Analysis (2002)). Similarly, the estimates of Federal government budget revenues by the Office of Management and Budget (OMB) and the Congressional Budget Office (CBO) typically have missed business cycle turning points, with estimation errors exhibiting significant pro-cyclical behavior (see Kitchen (2003). It should come as no surprise that payroll employment estimates wouldn't be able to overcome a problem that plagues virtually all cyclical indicators that must be estimated or forecast based on initially incomplete data.

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Chart 1
Ratios, Household Employment Measures Relative to Nonfarm Payroll Jobs

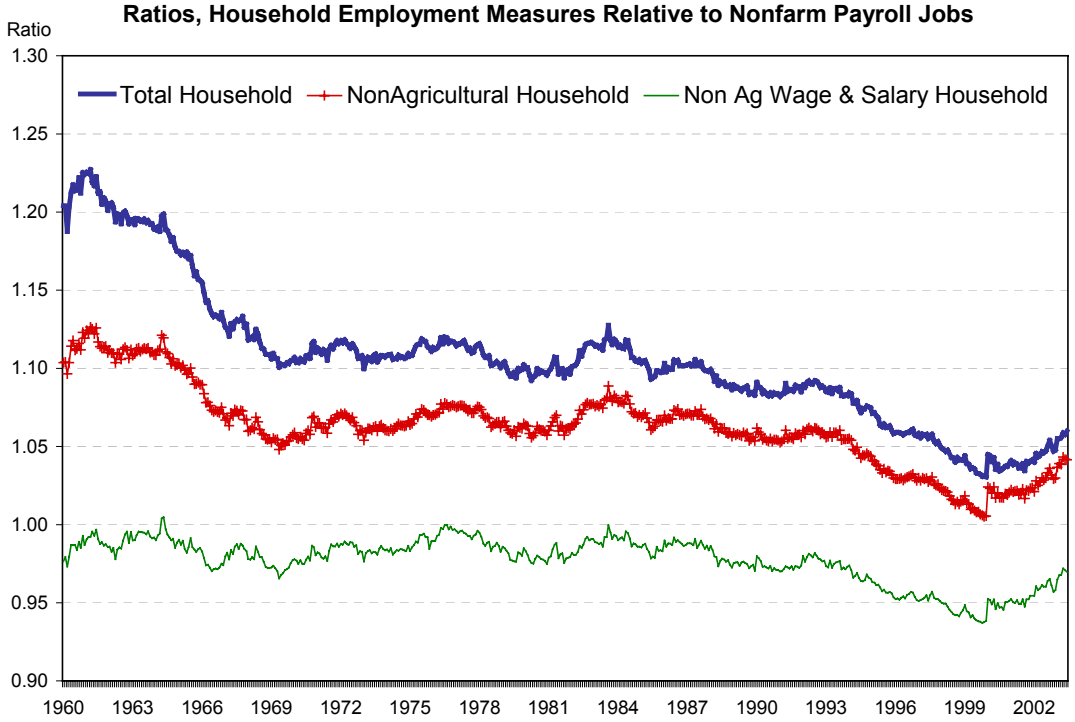
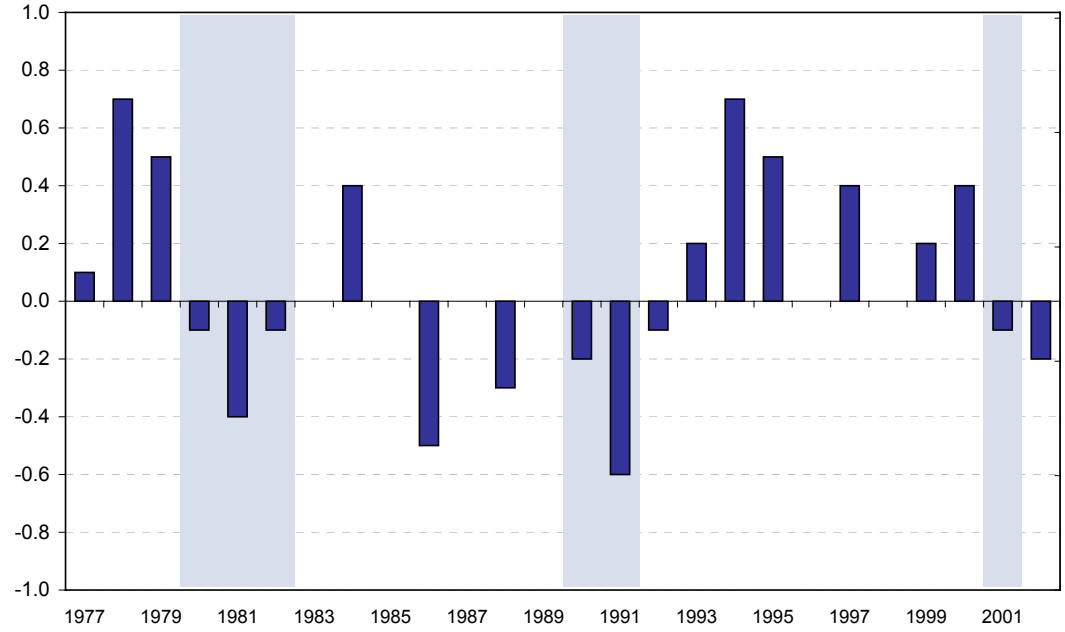


Chart 2
Benchmark Revisions to Nonfarm Payroll Employment, 1979-2002
Percent Difference for March of Benchmark Year



Source: Employment and Earnings, Bureau of Labor Statistics, various issues.
Shaded areas represent years during which the economy was in a recession.

Charts on real time and current vintage data series for nonagricultural household employment and nonfarm payroll employment in early expansions: 1961-62; 1970-72; 1975-76; 1982-84; 1991-92.

Chart 3a
Payroll and Household Employment Series -- Real Time and Current Vintage
End of Recession and Early Expansion, 1961-62

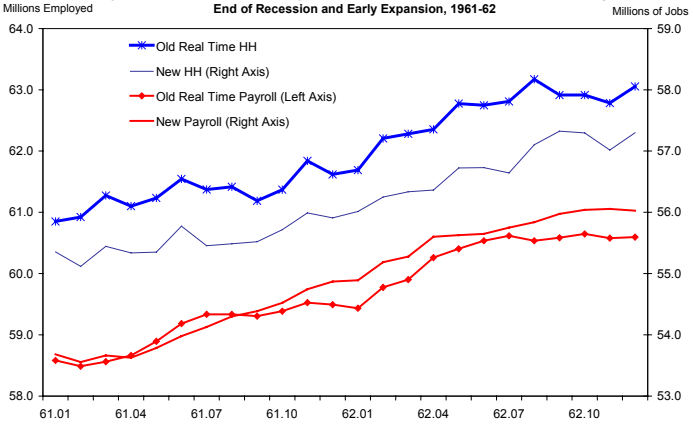


Chart 3b
Payroll and Household Employment Series -- Real Time and Current Vintage
End of Recession and Early Expansion, 1970-71

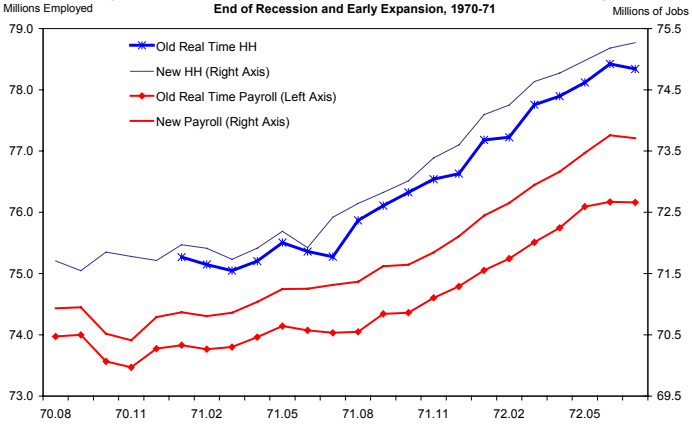


Chart 3c
Payroll and Household Employment Series -- Real Time and Current Vintage
End of Recession and Early Expansion, 1975-76

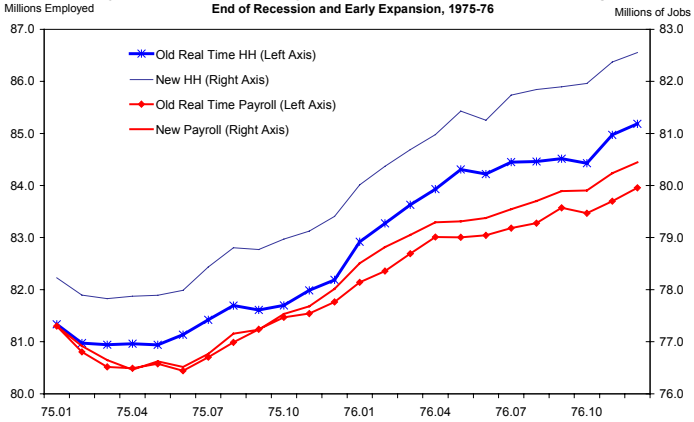


Chart 3d
Payroll and Household Employment Series -- Real Time and Current Vintage
End of Recession and Early Expansion, 1982-84

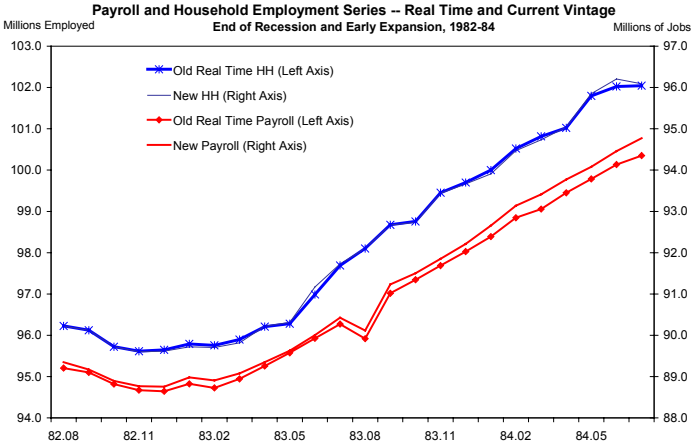
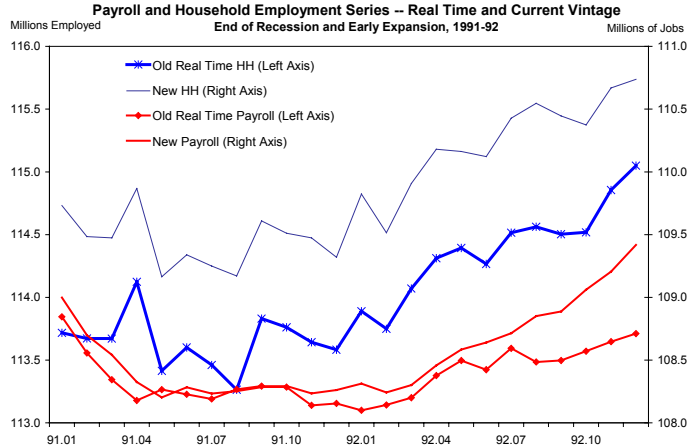


Chart 3e
Payroll and Household Employment Series -- Real Time and Current Vintage
End of Recession and Early Expansion, 1991-92



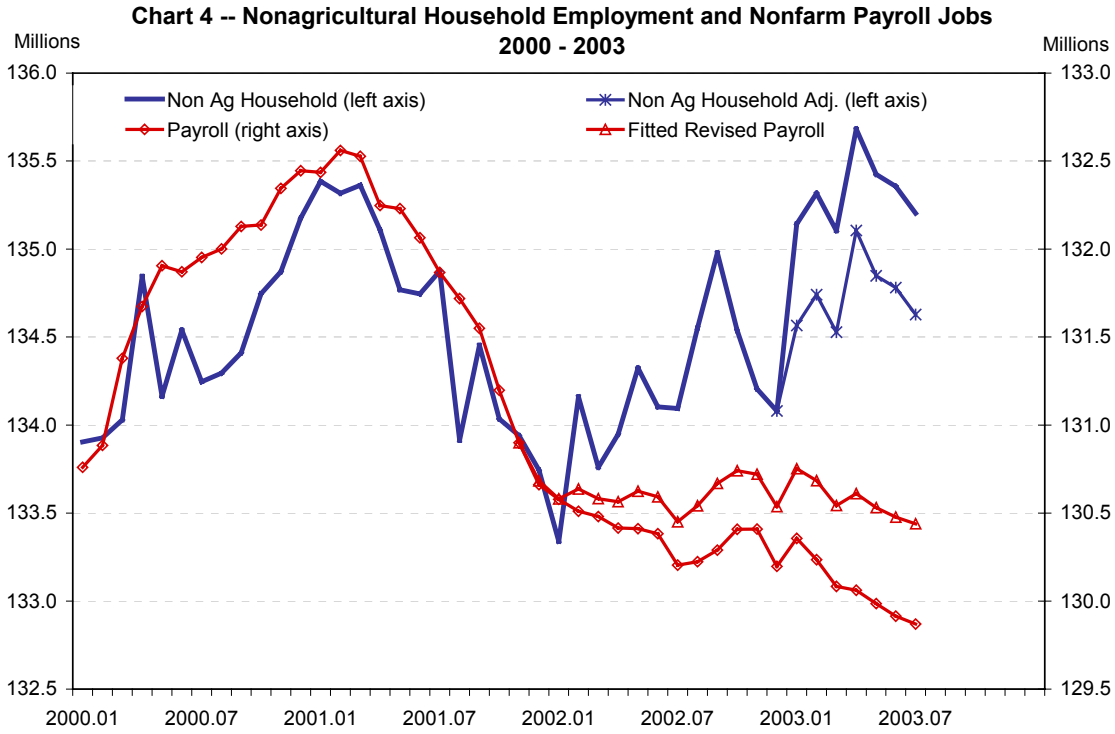


Chart 4 -- Nonagricultural Household Employment and Nonfarm Payroll Jobs
2000 - 2003
Millions
Millions
136.0
135.5
135.0
134.5
134.0
133.5
133.0
132.5
133.0
132.5
132.0
131.5
131.0
130.5
130.0
129.5
Non Ag Household (left axis)
Non Ag Household Adj. (left axis)
Payroll (right axis)
Fitted Revised Payroll
2000.01
2000.07
2001.01
2001.07
2002.01
2002.07
2003.01
2003.07

Table 1a -- 1961-62
Early Expansion Change in Employment: Real Time and Revised
Change, NBER Trough Plus 20 Months*
(millions of jobs and employed, and % differences)

	Household Survey	Establishment Survey	Difference
Original, Real Time Data	2.110	2.162	-0.052
Revised, Current Vintage Data	2.182	2.485	-0.303
Difference, Current - Original	0.072	0.323	
Percentage Difference	3.4	14.9	

Note: NBER recession trough in February 1961
Data: Bureau of Labor Statistics; Economic Report of the President, 1963
Household data adjusted for break in series in April 1962.

Table 1b -- 1971-72
Early Expansion Change in Employment: Real Time and Revised
Change, NBER Trough Plus 20 Months*
(millions of jobs and employed, and % differences)

	Household Survey	Establishment Survey	Difference
Original, Real Time Data	3.071	2.33	0.741
Revised, Current Vintage Data	3.298	2.843	0.455
Difference, Current - Original	0.227	0.513	
Percentage Difference	7.4	22.0	

Note: NBER recession trough in November 1970
Data: Bureau of Labor Statistics; Economic Report of the President, 1972
* Changes are for 18 months from January 1971.

Table 1c -- 1975-76
Early Expansion Change in Employment: Real Time and Revised
Change, NBER Trough Plus 20 Months
(millions of jobs and employed, and % differences)

	Household Survey	Establishment Survey	Difference
Original, Real Time Data	4.03	3.182	0.848
Revised, Current Vintage Data	4.542	3.588	0.954
Difference, Current - Original	0.512	0.406	
Percentage Difference	12.7	12.8	

Note: NBER recession trough in March 1975
Data: Bureau of Labor Statistics; Economic Report of the President, 1977

Table 1d -- 1982-84
Early Expansion Change in Employment: Real Time and Revised
Change, NBER Trough Plus 20 Months
(millions of jobs and employed, and % differences)

	Household Survey	Establishment Survey	Difference
Original, Real Time Data	6.429	5.676	0.753
Revised, Current Vintage Data	6.489	6.004	0.485
Difference, Current - Original	0.06	0.328	
Percentage Difference	0.9	5.8	

Note: NBER recession trough in November 1982
Data: Bureau of Labor Statistics; Economic Report of the President, 1984

Table 1e -- 1991-92
Early Expansion Change in Employment: Real Time and Revised
Change, NBER Trough Plus 20 Months
(millions of jobs and employed, and % differences)

	Household Survey	Establishment Survey	Difference
Original, Real Time Data	1.183	0.303	0.880
Revised, Current Vintage Data	1.194	0.663	0.531
Difference, Current - Original	0.011	0.360	
Percentage Difference	0.9	118.8	

Note: NBER recession trough in March 1991
Data: Bureau of Labor Statistics; Economic Report of the President, 1993

Table 2
Regression Results for Current Vintage Employment Changes on Real Time Employment Changes
Full Sample Results for Early Expansions of 1961-62, 1970-71, 1975-76, 1982-84, 1991-92

		Real Time Explanatory Variables				
		Constant	Payroll Employment	Household Employment	Adjusted R-squared	F-statistic
	Current Vintage Dependent Variable					
	Level changes:					
1.	Payroll employment	35.02**	0.89**		0.814	6.29*
		(9.94)	(0.04)			
2.	Household Employment	36.57*		0.85**	0.756	5.21**
		(15.16)		(0.05)		
	Percentage changes:					
3.	Payroll employment	0.053**	0.85**		0.766	8.07**
		(0.014)	(0.05)			
4.	Household Employment	0.058**		0.77**	0.665	8.85**
		(0.020)		(0.06)		

Standard errors shown in parentheses.
* denotes significant at the 5% level.
** denotes significant at the 1% level.
F-statistic is the calculated value of the F-statistis for a Wald test of the joint hypothesis: a = 0, b = 1.

Table 3

Regression Results for Current Vintage Employment Changes on Real Time Employment Changes

Full Sample Results for Early Expansions of 1961-62, 1970-71, 1975-76, 1982-84, 1991-92

		Real Time Explanatory Variables				
		Constant	Payroll Employment	Household Employment	Adjusted R-squared	F-statistic
	Current Vintage Dependent Variable					
	Level changes:					
1.	Payroll employment	28.11**	0.83**	0.10**	0.831	7.90**
		(9.98)	(0.04)	(0.03)		
2.	Household Employment	34.25*	0.03	0.84**	0.753	5.17**
		(16.60)	(0.08)	(0.05)		
	Percentage changes:					
3.	Payroll employment	0.046**	0.78**	0.10**	0.785	10.54**
		(0.014)	(0.05)	(0.04)		
4.	Household Employment	0.058**	0.01	0.77**	0.661	8.46**
		(0.022)	(0.08)	(0.06)		

Standard errors shown in parentheses.
* denotes significant at the 5% level.
** denotes significant at the 1% level.
F-statistic is the calculated value of the F-statistis for a Wald test of the joint hypothesis: a = 0, b = 1.

Table 4

Regression Results for Current Vintage Employment Changes on Real Time Employment Changes

Restricted Sample Results for Early Expansions of 1975-76, 1982-84, 1991-92

		Real Time Explanatory Variables				
		Constant	Payroll Employment	Household Employment	Adjusted R-squared	F-statistic
	Current Vintage Dependent Variable					
	Percentage changes:					
1.	Payroll employment	0.028	0.95**		0.867	1.90
		(0.014)	(0.05)			
2.	Household Employment	0.020		0.95**	0.881	0.88
		(0.016)		(0.05)		
3.	Payroll employment	0.014	0.89**	0.12**	0.880	2.41
		(0.015)	(0.05)	(0.05)		
4.	Household Employment	0.016	0.04	0.93*	0.880	0.96
		(0.017)	(0.06)	(0.05)		

Standard errors shown in parentheses.
* denotes significant at the 5% level.
** denotes significant at the 1% level.
F-statistic is the calculated value of the F-statistis for a Wald test of the joint hypothesis: a = 0, b = 1.