

# Analyzing CPS data using gross flows

*Improved gross flow data provide the necessary linkage between stocks and flows; therefore, they may prove useful in analyzing movements in labor force measures*

Randy Ilg

Each month, the Bureau of Labor Statistics (BLS) publishes estimates of employment and unemployment derived from the Current Population Survey (CPS). These measures are highly scrutinized by business economists, policy analysts, and financial investors for information about the state of the labor market.

The published labor force data show the net change in the number of employed or unemployed persons (the stocks) over any given time period. The specific sources of the net change, however, are not discernible from the published data because there is a significant amount of “churning” as individuals move from one labor force status to another. These dynamic “gross flows” underlie the net changes in the labor force measures. Researchers from the BLS Office of Employment and Unemployment Statistics recently developed several new seasonally-adjusted gross-flow series. The improved gross flow data provide the necessary linkage between stocks and flows and, therefore, may prove useful in analyzing movements in labor force measures.

This article provides some background and conceptual information on the new gross-flow series. (A more complete description is provided in an accompanying article in this issue.<sup>1</sup>) In addition, it demonstrates some uses of the gross-flow series by examining changes in various labor force stock measures and reconciling those movements with the seasonally adjusted gross-flow series over selected time periods.

The gross-flow data presented in this article support information collected in other BLS sur-

veys; during the recession, flows out of employment were greater than flows into employment.<sup>2</sup> Indeed, the decline in the employment-population ratio during the past two labor market downturns reflected increased flows out of employment, rather than reduced flows into employment. The data also show that the jobless rate appeared to be more sensitive to the pace of rising or declining flows into unemployment, rather than to changes in the level of flows out of unemployment.

### Gross-flow measures

Each month, the CPS is administered to about three-quarters of the same households (sample) as in the previous month.<sup>3</sup> This month-to-month overlap allows for the calculation of “flows” in labor force status from one month to the next. However, while all eight “rotation” groups in the CPS are represented in the stock data, only six are represented in the flow data.<sup>4</sup> Moreover, some of the flows involve movements into or out of the survey scope. While these flows contribute to the change in stock measures, they are not captured in the sample overlap. Thus, the sum of the flows does not match the change in the stock estimates. Due to these discrepancies between the flows and changes in the monthly labor force measures (stocks), BLS has not published gross-flow data on a continuous basis since 1952, other than periodically in some research.<sup>5</sup> Despite such limitations, however, gross-flow data have been shown to provide useful information in analyzing short-term labor force developments.<sup>6</sup>

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The newly-developed gross-flows series have been adjusted to account for the discrepancies outlined above so that they closely correspond to the labor force stocks.<sup>7</sup> This “matching” property greatly aids in the comparative analysis of changes in the stock estimates of employment, unemployment, and persons not in the labor force. In addition, the new gross-flow series have been *seasonally adjusted* to allow for month-to-month types of analyses.

*Types of flows.* The nine labor force flows are discussed in more detail below.

<i>Status in prior month</i>	<i>Status in current month</i>		
	<i>Employed</i>	<i>Unemployed</i>	<i>Not in the labor force</i>
Employed .....	EE	EU	EN
Unemployed .....	UE	UU	UN
Not in the labor force .....	NE	NU	NN

*Flows into employment.* For simplicity, the flows into employment are represented by EE, UE, and NE. EE represents all individuals who remained employed from last month to the current month. UE reflects the number of unemployed persons who became employed. NE represents the transition from not in the labor force last month into employment this month.

*Flows into unemployment.* The flows into unemployment are represented by EU, UU, and NU. EU represents the total transitions from employment last month into unemployment this month; those transitions could include quits, terminations, and layoffs. UU represents all individuals who remained unemployed from month to month. The transition from not in the labor force last month into unemployment this month (NU) represents reentrants and new entrants to the labor force.

*Flows into not in the labor force.* The total transitions from employment last month into not in the labor force this month (EN) could include retirements as well as completed spells of seasonal employment. It also could represent persons who lost their jobs and left the labor force, rather than seek other employment. UN represents the total transitions from unemployment into not in the labor force. Reasons for such transitions would include, but are not limited to, discouragement over job prospects.<sup>8</sup> NN represents all persons who continue in a not-in-a-labor-force state, for reasons such as retirement, school, disability, family responsibilities, or discouragement.

This article focuses primarily on the six flows where labor force status changed, rather than on the flows (represented as EE, UU, and NN), where labor force status continued in the

same state. (UU flows, however, do provide a measure of persistence of unemployment and will be briefly discussed.)

As described in the article by Duff and colleagues in this issue, BLS statisticians have developed a method that forces mathematical reconciliation between the gross flows and stock estimates. Adjustments also are made to the “core” flows (as presented in the illustration above) for persons flowing in scope and out of scope between months for each of the labor force categories. These adjustments expand the 3X3 core matrix to account for persons who just turned 16 years of age, for persons who immigrated, and for standardized death rates. Clearly, there are constant inflows to employment from out of scope (due to increasing population), so employment stock would increase even in the absence of net inflows in the 3X3 matrix; it simply would increase at a faster pace when employment within the 3X3 matrix is net positive. Due to their marginal influence in analyzing short-term changes to labor force estimates, however, such adjustments are not discussed in more detail in this article.<sup>9</sup>

## Recent developments tied to gross flows

Discussion in this section focuses on the stock changes in labor force measures during the 2001 recession and its aftermath, with comparisons to the recession of the early 1990s. When linking these changes in stock data to the gross-flow series, it is worth noting that the gross-flow data can be viewed from two different perspectives. The primary focus here is to view the data from the current month’s perspective; that is, from which labor force status individuals came. Thus, we can use gross-flow data to help determine what contributed to the stock changes in employment, unemployment, and not in the labor force over selected time periods. The discussion also touches upon what happens to unemployed individuals in any particular labor force status in the next month. This latter perspective addresses the likelihood of unemployed individuals finding employment, remaining unemployed, or leaving the labor force.

*Changes in employment.* Following a long-term period of employment growth from 1991 through 2000, employment declined in 2001. In 2002, employment growth was rather tepid, but increased substantially again in 2003 and 2004.<sup>10</sup> The employment-population ratio—that is, the proportion of the population that is employed—peaked at 64.7 percent in April 2000 and trended downward until the end of 2001. Throughout most of 2002, the ratio showed little movement until late in the year and then continued to trend down again until mid-2003. From mid-2003 until mid-2004, the ratio remained in a fairly narrow range of 62.1 to 62.3 percent, even as employment rose sharply.<sup>11</sup> The ratio finally began

to drift upward only in the last half of 2004. How would these trends look when analyzed with gross-flow data?

Chart 1 presents the flows in and out of employment as a percent of the population from March 1990 through December 2004, seasonally-adjusted 3-month-moving averages.<sup>12</sup> Recall that UE plus NE represent inflows to employment, while EU plus EN represent outflows from employment.

Beginning in 2000, flows out of employment as a share of the population began trending up, and in 2001, outflows accelerated and rose sharply. Outflows from employment as a share of the population peaked above 2.8 percent in mid-2001. While flows into employment also increased somewhat, outflows were consistently and substantially higher throughout the year. Disaggregating the outflows into the two components shows that the employment decline in 2001 was associated with relatively high flows out of employment into not in the labor force (EN), but also into unemployment (EU). As a result, the employment-population ratio fell by 1.5 percentage points.

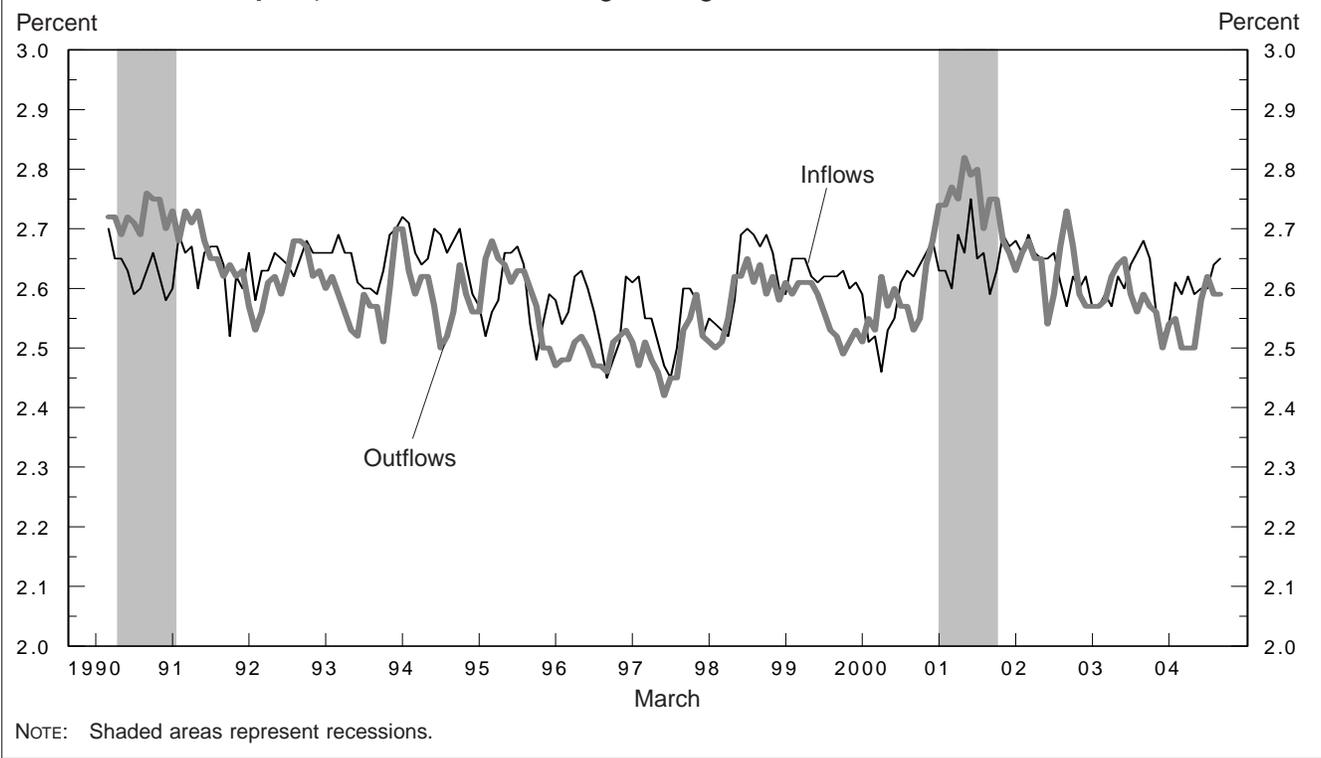
From the beginning of 2002 through mid-2003, the difference between inflows and outflows lessened. Both flows trended down from their highs in 2001, although outflows tended to fluctuate more widely. Since mid-2003, flows into employment have exceeded outflows. However, there seemed

to have been a time lag between when inflows exceeded outflows and when the employment-population ratio began to rise. The ratio began to drift upward in the latter half of 2004, only after a considerable time period during which flows into employment were sufficiently larger than outflows.

During the early 1990s, the employment-population ratio peaked at 63.2 percent in the first quarter of 1990 then declined by 2 full percentage points by the end of 1991. (The National Bureau of Economic Research designated the period from July 1990-March 1991 as a recession. However, many labor market measures showed little, if any, growth for several months following the official end of the recession.) As shown in chart 1, there also were relatively large flows out of employment into the other labor status categories during this period, a scenario quite similar to that in 2001. In the intervening years between these periods of labor market weakness, inflows into employment nearly always exceeded outflows, resulting in a steady rise in the employment-population ratio.

Looking more closely at the flows into employment, persons from outside the labor force (NE) have usually contributed a larger share of employment growth than have the unemployed (UE). Over the last 4 years in particular, individuals from outside the labor force contributed an even larger

**Chart 1. Employment flows as a percent of the population, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



share than they did during the early 1990s, or even the majority of the 90s overall. In contrast, a larger proportion of employment came from the ranks of the unemployed during the early 1990s than during the recent downturn. (See chart 2.)

*Changes in unemployment.* In and around recessionary periods, the unemployment rate receives ample attention from economists and policymakers because it is viewed as a barometer of the economy's health. The recent economic downturn was no exception. The unemployment rate rose to a high of 6.3 percent in June 2003, from 3.9 percent in December 2000. From that peak, the jobless rate trended down to 5.6 percent by mid-2004. Throughout the remainder of the year, it was either 5.5 or 5.4 percent.

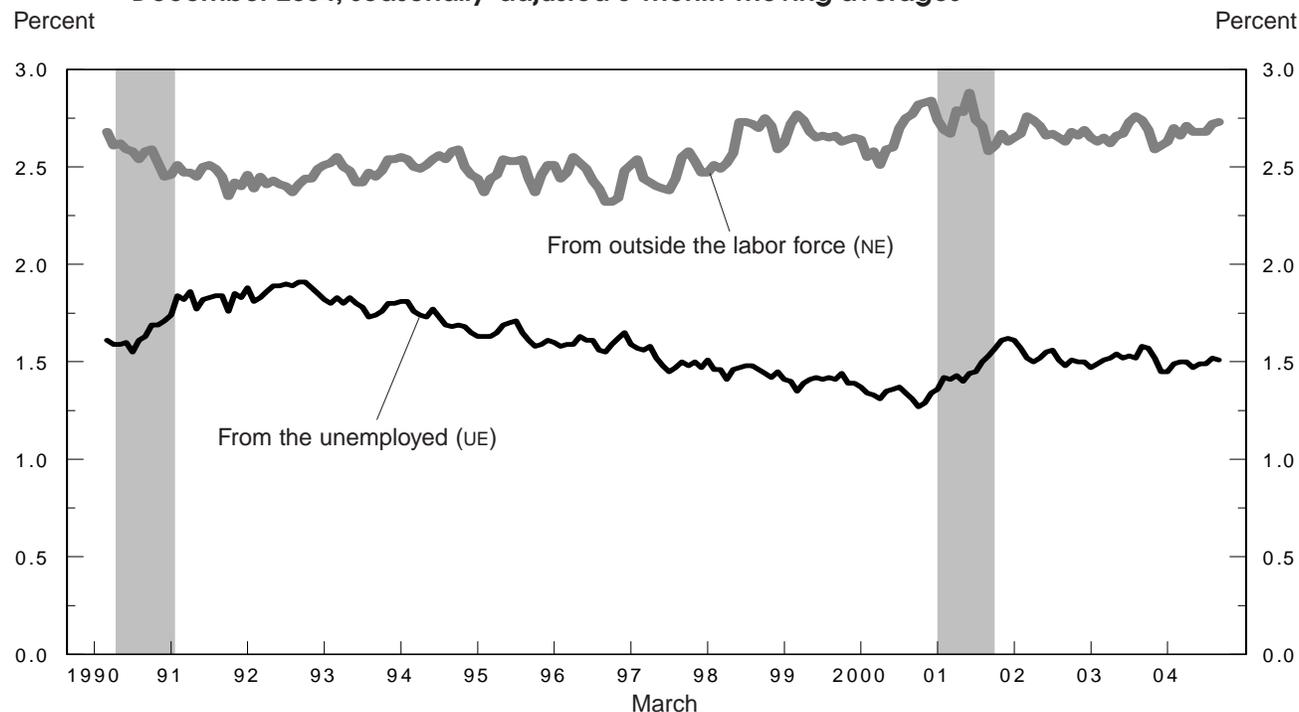
Chart 3 presents the flows in and out of unemployment as a percent of the labor force from March 1990 through December 2004, again using seasonally-adjusted 3-month-moving averages. EU plus NU represent inflows into unemployment, while UE plus UN represent outflows from unemployment. The chart also includes the series history of UU, the share of the labor force who remained unemployed from one month to the next. In addition, the chart illustrates the share of the labor force comprised of persons who have been unemployed for 27 weeks and longer,

thereby providing some comparison of the extent of long-term unemployment.

During the rapid economic expansion of the second half of the 1990s and most of 2000, the share of the labor force comprised of flows into and out of unemployment trended down, with outflows slightly exceeding inflows. As a result, the unemployment rate declined over this period. Beginning in 2001, however, both flows into and out of unemployment swelled, with inflows rising faster than outflows. The unemployment rate rose accordingly. Since about mid-2003, flows into unemployment have declined at a faster pace than outflows, and the unemployment rate has trended down. The pattern during the early 1990s was quite similar. The jobless rate was driven upward when inflows rose faster than outflows. Conversely, it descended when inflows into unemployment receded at a faster pace than exits.

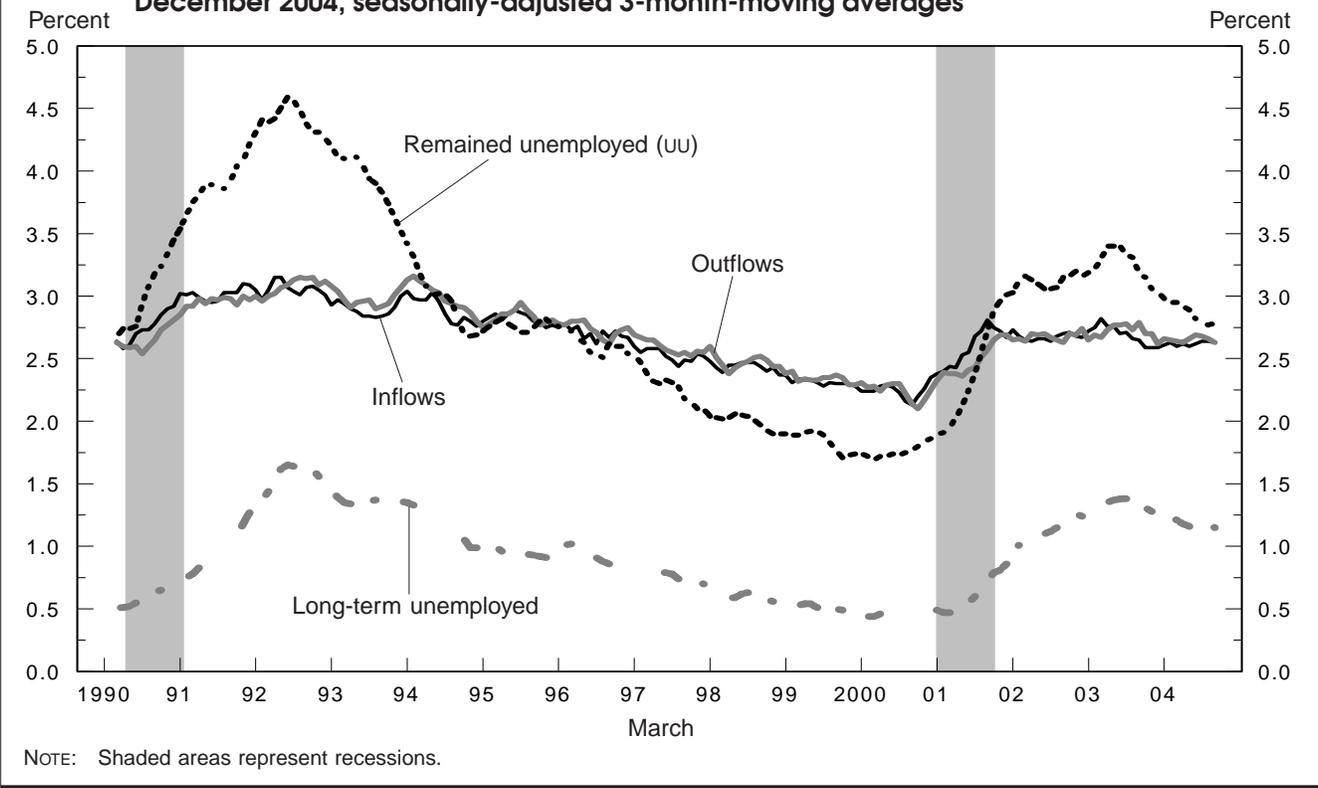
During economic downturns, the number of persons who remain unemployed from month to month (UU) far exceeds other transitions to and from unemployment. The share of the labor force made up of persons who remained unemployed from month to month rose to nearly 3.5 percent in the aftermath of the recent recession and reached more than 4.5 percent during the early 1990s. The unemployed also remained

**Chart 2. Share of employment provided from unemployment and not in the labor force, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



NOTE: Shaded areas represent recessions.

**Chart 3. Unemployment flows and duration as a percent of the labor force, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



unemployed even longer during these periods. Thus, the overall rise in the unemployment rate reflected to a large degree an increased likelihood of remaining unemployed, as well as a somewhat higher likelihood of becoming unemployed. In the aftermath of the recent downturn, the share of the labor force that was unemployed for 27 weeks and more not only rose but sustained that level for an extended time period. As of December 2004, unemployed persons who had been unemployed for 27 weeks and more exceeded 1 percent of the labor force for 33 consecutive months.

*Not in the labor force.* There is a fair amount of “churning” going on in the labor market during any given point in the business cycle. As more individuals move from one labor force status to another, it is more pronounced. Beginning in 2001, flows from employment increased, as shown in chart 1. In addition, flows in and out of the not in the labor force category also rose, as shown in chart 4. Indeed, both the flows of employment into not in the labor force (EN) and vice versa (NE) were higher than historical levels. (See charts 2 and 5.) One similarity between the most recent recession and that of the early 1990s was the relatively high and sustained level of transition from unemployment into not in the

labor force (UN). During periods of labor market weakness, more unemployed individuals opt out of the labor force (for various reasons, including discouragement over job prospects). (See chart 5.)

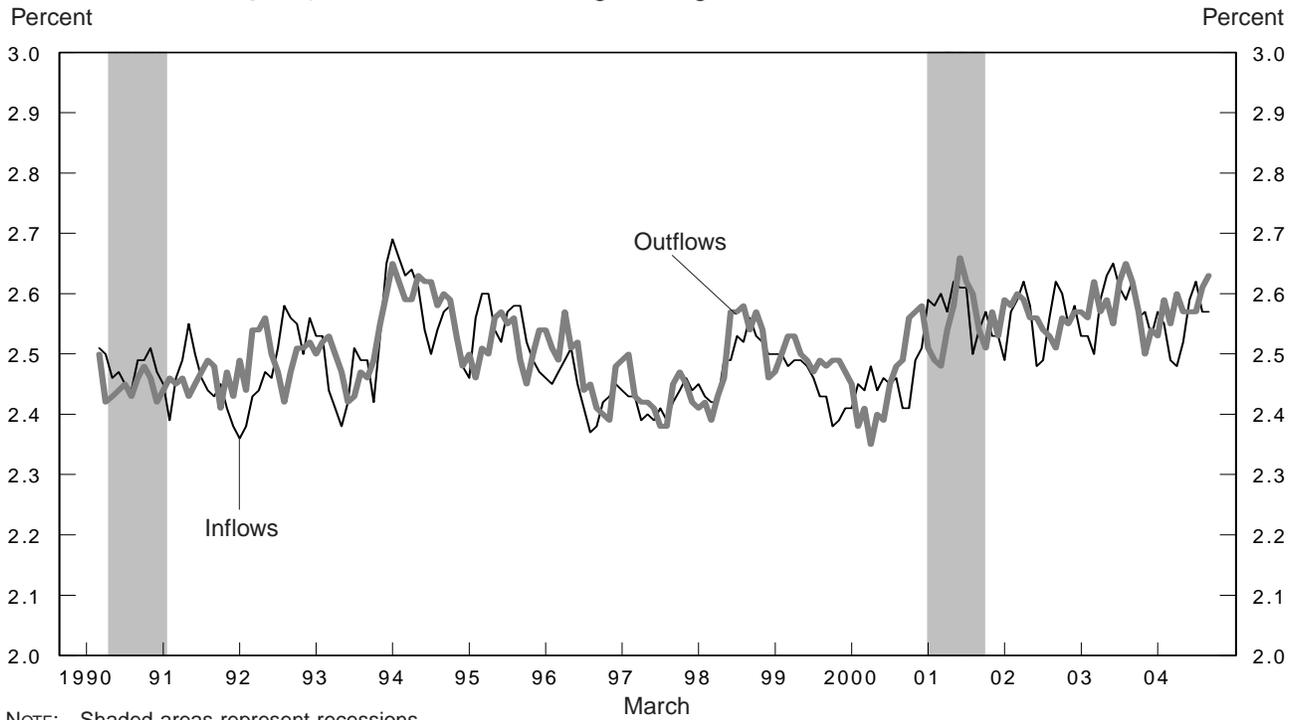
**A closer look at unemployment**

While gross flows provide useful information with regard to labor force behavior in and around recessions, they also are practical for assessing shorter-term changes in stock measures. For example, a closer examination of unemployment for 2003 provides a stark contrast between the first and second half of the year.<sup>13</sup> (See tabulation below.)

	<i>Unemployment changes in 2003</i>	
	<i>January-June</i>	<i>June-December</i>
Unemployment ....	+744,000	-829,000
Unemployment rate .....	+0.5	-0.6

As previously noted, employment increased substantially in 2003. In the first half of 2003, however, the number of unemployed persons and the unemployment rate rose; both measures declined in the second half of the year.

**Chart 4. Not in the labor force flows as a percent of the population, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



**Chart 5. Share of not in the labor force provided by employment and unemployment, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



As shown in table 1, the average inflows into unemployment from both employment (EU) and not in the labor force (NU) were substantially smaller during the second half of 2003 compared with the first half. Conversely, average outflows into both employment (UE) and not in the labor force (UN) were considerably larger during the second half of the year. The combination of reduced flows into unemployment and increased outflows ((EU+NU)–(UE+UN)) resulted in a large net stock decline in unemployment during the second half of the year, thus offsetting rising unemployment during the first part of the year.

The average monthly increase in UE and decrease in EU reflect improvements in the labor market to some extent. More unemployed workers found jobs, and fewer employed individuals became unemployed. Other flows, however, may not provide an unambiguous view of an improving labor market. More unemployed individuals quit searching for work (UN), and fewer individuals began a search (NU). We do not know the extent to which those decisions are independent of labor market conditions. The decrease in NU could reflect the possibility that entrants to the labor force were more successful in finding employment or that fewer individuals attempted a job search because they viewed their prospects as poor.

*What happens to the unemployed?* As previously mentioned, gross-flow data can provide information from different perspectives. Having examined where individuals in various labor force categories came from, focus now switches to what happens to individuals in a particular la-

bor force status, specifically unemployment. This latter assessment (using total unemployment as the base) sheds some light concerning the likelihood of individuals leaving their current state of unemployment and finding employment, remaining unemployed, or leaving the labor force. (See chart 6.)

As might be expected, unemployed individuals were less likely to find employment (UE) and more likely to stay unemployed (UU) in each of the last two recessions than during the intervening period of economic expansion. In the aftermath of the most recent recession, the likelihood of remaining unemployed was slightly lower (better) than during the deeper recessionary period of the early 1990s, although the prospect for finding employment (UE) was about the same. There was a greater likelihood that the unemployed would exit the labor force (UN) altogether in recent years compared with the early 1990s.

IN SUM, gross-flow data can provide additional insight into changes in stock labor force estimates. During the last two recessionary periods, employment declines were linked to increased flows out of employment, rather than reduced flows into employment. In addition, the jobless rate appears to be more sensitive to the pace of rising or declining flows into unemployment, rather than exits from unemployment. Finally, in the aftermath of the recent recession, there was a relatively high degree of “churning” as employed persons exited the labor market and new individuals entered. At the same time, an increasing number of unemployed individuals opted out of the labor force.

**Table 1. Monthly flows to and from unemployment and average flows for selected months in 2003, seasonally adjusted**

[Numbers in thousands]

Month	Flows into unemployment		Flows out of unemployment	
	Employed to unemployed (EU)	Not in the labor force to unemployed (NU)	Unemployed to employed (UE)	Unemployed to not in the labor force (UN)
February .....	1,902	2,003	1,970	1,795
March .....	1,933	1,950	2,033	2,016
April .....	2,003	2,120	2,067	1,744
May .....	2,022	2,031	2,059	1,901
June .....	1,973	2,262	2,115	1,847
July .....	1,910	1,942	2,095	1,983
August .....	2,046	1,994	2,150	2,015
September .....	1,952	2,035	2,036	1,920
October .....	1,764	2,123	2,120	1,991
November .....	1,808	2,039	2,123	1,847
December .....	2,011	1,933	2,306	1,913
February-June average .....	1,967	2,073	2,049	1,861
July-December average .....	1,915	2,011	2,138	1,945

NOTE: Flows of unemployment are based on the current month. Thus, the flows from employment to unemployment shown in column 2, for example, reflect a portion of the stock change in unemployment due to transitions from employment over the January-February period.

**Chart 6. Likelihood of the unemployed finding employment, remaining unemployed, or leaving the labor force, May 1990–December 2004, seasonally-adjusted 3-month-moving averages**



NOTE: Shaded areas represent recessions.

Whether these trends reflect the changing labor market conditions, individual preferences, or both cannot be determined from the gross-flow data but certainly warrants further research.

By itself, the unemployment rate has proven to be a historically good indicator of slack in the labor market. As a single measure, however, the unemployment rate does not

provide a complete picture of general labor market conditions. For many years, BLS researchers have strived to produce other tools, including a set of alternative measures of labor underutilization. The new seasonally adjusted gross-flow series presented in this article offer one more tool in an ongoing endeavor to provide useful information to data users and policymakers. □

## Notes

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<sup>1</sup> See Harley J. Frazis, Edwin L. Robison, Thomas D. Evans, and Martha A. Duff, "Estimating gross flows consistent with stocks in the CPS," pp. 3–9, for additional information on methodology, measurement concepts, limitations, and seasonal adjustment.

<sup>2</sup> For example, data collected in the Bureau's Business Employment Dynamics (BED) program showed that substantial increases in gross job losses were accompanied by declining gross job gains during the recent recession.

<sup>3</sup> The Current Population Survey (CPS) is a scientifically-selected sample survey of about 60,000 households conducted each month by the Bureau of the Census. For an explanation of the survey's coverage and concepts, see

"Explanatory Notes and Estimates of Error," *Employment and Earnings*, January 2005, pp. 267–86.

<sup>4</sup> Part of the CPS sample is changed each month. Each monthly sample is divided into eight representative subsamples or rotation groups. A given rotation group is interviewed for a total of 8 months, divided into two equal periods. It is in the sample for 4 consecutive months, leaves the sample during the following 8 months, and then returns for another 4 consecutive months. In each monthly sample, one of the eight rotation groups is in the first month of enumeration, another rotation group is in the second month, and so on. Under this system, 75 percent of the sample is common from month to month, and 50 percent is common from year to year for the same month. This procedure provides a substantial amount of month-to-month and year-to-year overlap in the sample.

<sup>5</sup> Gross flow data have been tabulated and used on occasion by BLS analysts who were knowledgeable about the data's limitations. For example, see "Gross Flow Data From the Current Population Survey, 1970-80," U.S. Department of Labor, Bureau of Labor Statistics, March 1982.

<sup>6</sup> For example, see Anthony J. Barkume and Francis W. Horvath, "Using gross flows to explore movements in the labor force," *Monthly Labor Review*, April 1995, pp. 28-35.

<sup>7</sup> See Frazis et al, "Estimating gross flows..."

<sup>8</sup> In the CPS, discouraged workers are individuals who want and are available for a job and who have looked for work sometime in the past 12 months, but who are not currently looking for work specifically because they believe that no jobs are available for them.

<sup>9</sup> The adjustments account for persons who just turned 16, for persons who immigrated, and for standardized death rates. The sum of the control totals for the prior month will then equal the sum of the control totals for the current month. This article essentially ignores these in-scope and out-of-scope flows because of their marginal con-

tribution. For more information on these adjustments, see Frazis et al, "Estimating gross flows..."

<sup>10</sup> Population adjustments to the household survey had some impact on employment estimates. The comparability of historical employment estimates has been affected at various times by methodological changes in the Current Population Survey. For an explanation, see the Explanatory Notes and Estimates of Error section of *Employment and Earnings*, a monthly BLS periodical.

<sup>11</sup> *Ibid.*

<sup>12</sup> To help discern the overall trends, the data presented in the charts were smoothed using 3-month-moving averages. Note that the titles of the charts reference May 1990 because 3-month moving averages are used—the underlying data series begin in March 1990, and so each of these moving-average series begin in May 1990. Series data from March 1990 forward are available upon request. Separate series for men and women also are available; diagnostics for other demographic groups did not meet the criteria for seasonal adjustment.

<sup>13</sup> Official CPS series on unemployment can be accessed on the Internet at <http://www.bls.gov/cps/cpsatabs.htm>.