Research Department
Federal Reserve
Bank of
San Francisco

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Unemployment Seasonals

The economic data we use generally are seasonally adjusted, thus allowing us to make a direct comparison of, say, a July figure with one from last February. Adjustment is especially important for series with large seasonal movements, such as the closely-watched unemployment rate—the total number of unemployed as a percentage of the civilian labor force. The series became even more closely watched last week, when the Bureau of Labor Statistics reported that it had turned upward after a prolonged year-long decline.

Actually, the seasonally adjusted unemployment series has moved through three distinct phases over the past year—a high plateau close to the recession peak of 8.9 percent from May through November of 1975, a steep drop last winter to 7.5 percent in March 1976, and finally an increase from 7.3 to 7.5 percent this June. Some observers have attributed most of the puzzling movement in this series to difficulties with seasonal factors—rightly so, it would seem, in regard to the accelerated decline reported early this year. (An alternate approach shows the drop taking place at a steadier pace and over a longer period, from November 1975 through May 1976, rather than the reported steep drop from November through March.) In contrast, the lengthy period of stability after the recession peak probably did occur just as reported. As for the June increase reported last week, it seems to reflect an essentially unsolvable problem in setting the month's seasonals.

Unadjusted unemployment

Seasonal movement in unemployment is dominated by three factors: the weather, Christmas, and the school schedule. The highest unemployment rates occur in January and February; the lowest are in September and October. Thus, for the entire 1948-75 period, the overall jobless rate averaged 4.94 percent, but the monthly rates on an unadjusted basis ranged between 5.69 percent (February) and 4.26 percent (October). This difference reflects basically the influence of the weather on outdoor activities, although the low numbers in the fall also indicate the return of temporary labor-force members to school.

Superimposed on this cycle are two very sharp seasonal swings. From December to January, the unadjusted unemployment rate increases by an average of .88 percentage point, from 4.69 to 5.57 percent, as a result of post-Christmas layoffs of temporary workers. From May to June, the rate increases by an average of .78 percentage point, from 4.59 to 5.37 percent, as a result of increased jobseeking at the end of the school year. (These are the average swings of the 1948-75 period, which of course are not repeated in every single year.) In both cases, the addition to the rate is absorbed over roughly a four-month span by a combination of added seasonal employment and decreased jobseeking by temporary workers. The months which present difficult adjustment problems—primarily January, February and June—are the

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ones most strongly affected by large seasonal swings or by shifts in underlying factors such as weather.

Constructing seasonals

To handle these problems, seasonal adjustments may be made in either of two ways—additive or multiplicative. In the additive approach, the unadjusted unemployment rate is adjusted each month by the difference between the average monthly figure and the average annual figure—in February's case, by adding -.75 percent, or the difference between the 5.69-percent historical February average and the 4.94-percent annual average for 1948-75. In the multiplicative approach, the unadjusted rate is adjusted each month by the ratio of the monthly seasonal and the monthly long-term average—in February's case, by using a blow-up factor of -13.2 percent, or -.75 percent divided by 5.69 percent.

The standard seasonal adjustment program—the Census X-11 program— is basically a complex multiplicative mechanism which allows for continuously shifting seasonals. Yet despite the sophistication of this and other approaches, seasonal adjustment remains more of an art than a science. Choices must be made among the various alternative approaches that are available, and arbitrary decisions must be made regarding the stability of actually observed seasonal movements—so that different statisticians can reach strikingly different conclusions about any single month's adjustment.

The two basic approaches, additive and multiplicative, will yield similar results in those months which exhibit little seasonal movement—or in those months where a series fluctuates around its mean, with little deviation from its trend line. Differences occur in the more extreme cases, however. With an additive adjustment, the amount of adjustment is assumed to be constant; with a multiplicative adjustment, the amount of adjustment is assumed to be proportional to the distance of the series from the mean. For example, multiplicative seasonals imply that in a recession, when unemployment is high, larger than normal swings occur in seasonal unemployment—a somewhat questionable assumption. This approach says, quite reasonably, that unemployment will be abnormally high in a recession January or February, but it also says that the absorption of that unemployment will be abnormally rapid in the following March and April. While we might expect a limited amount of behavior of this type, the major share of any seasonality in the unemployment rate would normally be additive.

Considerations of this kind thus should influence the selection of an adjustment method. As a rule of thumb, variables that grow over time (such as GNP) usually require seasonals that also grow—that is, multiplicative adjustment. But variables that do not grow (such as the unemployment rate) usually require additive seasonals because of the peculiar cyclical implications of multiplicative adjustment.

Additive adjustments

Some new light is thrown on the nation's jobless data when we compare an additive approach with the standard multiplicative approach (the Census X-11 program) that is utilized in the monthly series published by the Bureau of Labor Statistics. Actually, the two series have moved closely together through most of the 1974-76 period. Still, several differences have occurred which might help explain some of the puzzling movements in the data over the past year. In this exercise, three-month moving averages were used to smooth the series and thus limit the effect of statistical "noise."

Most of the monthly figures were largely impervious to method of adjustment, showing once again that some months have far more reliable seasonal patterns than others. But the February figure, when additively adjusted, was 0.4 percentage point higher than the published figure in each of the last two years—8.5 percent in 1975 and 8.0 percent in 1976. The difference resulted from the tendency of multiplicative methods to produce very large (downward) adjustments to extreme months containing very high unemployment. The effect was highlighted in the moving average series, since the February moving average contains the two months (January and February) with the largest seasonals. The standard multiplicative adjustment thus produced a slower rise to the recession peak than the additive adjustment method, and compressed most of the recent decline in the rate within a relatively brief period.

Another major anomaly was the change occurring in the May-to-June seasonal pattern over the past several decades. The swing in the unadjusted data from May to June rose from an average 0.4 percent in 1948-56 to 0.8 percent in 1957-63 and then to 1.2 percent in 1964-75. As a result, any adjustment method is forced to incorporate both the large size of the annual May-June swing and the (hard to measure) shift in that swing over time. We should thus take the unexpected June 1976 increase in published unemployment with a grain of salt until the more trustworthy July and August data arrive.

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BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT
(Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding 6/30/76	Change from 6/23/76	Change from year ago Dollar	Change from year ago Percent
Loans (gross, adjusted) and investments*	89,120	+ 391	+ 3,204	+ 3.73
Loans (gross, adjusted)—total	67,459	+ 471	+ 2,579	+ 3.98
Security loans	1,538	34	+ 431	+ 38.93
Commercial and industrial	22,482	+ 90	– 639	– 2.76
Real estate	20,123	+ 62	+ 453	+ 2.30
Consumer instalment	11,214	+ 50	+ 1,232	+ 12.34
U.S. Treasury securities	9,651	– 73	+ 1,070	+ 12.47
Other securities	12,010	– 7	– 445	– 3.57
Deposits (less cash items)—total*	90,438	+ 2,270	+ 4,206	+ 4.88
Demand deposits (adjusted)	25,030	+ 1,095	+ 1,047	+ 4.37
U.S. Government deposits	531	+ 84	+ 256	+ 93.09
Time deposits—total*	63,119	+ 699	+ 2,705	+ 4.48
States and political subdivisions	6,170	– 65	– 510	– 7.63
Savings deposits	26,172	+ 331	+ 5,563	+ 26.99
Other time deposits‡	28,235	+ 267	– 949	– 3.25
Large negotiable CD's	13,081	+ 369	– 2,880	– 18.04

Weekly Averages of Daily Figures	Week ended 6/30/76	Week ended 6/23/76	Comparable year-ago period
Member Bank Reserve Position			
Excess Reserves	1	8	82
Borrowings	10	20	258
Net free(+)/Net borrowed (–)	– 9	– 12	– 176
Federal Funds—Seven Large Banks			
Interbank Federal fund transactions			
Net purchases (+)/Net sales (–)	– 548	+ 370	+ 859
Transactions of U.S. security dealers			
Net loans (+)/Net borrowings (–)	+ 62	+ 176	+ 355

*Includes items not shown separately. ‡Individuals, partnerships and corporations.

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