A Short Note on Decomposing the One-Month Change in the Unemployment Rate

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Let U_t denote the number of unemployed seasonally adjusted (SA), LF_t the size of the labor force (SA), Pop_t the size of the civilian population ages 16+, Pay_t the number of nonfarm payroll jobs (SA), $LFPR_t$ $[\frac{100LF_t}{Pop_t}]$ the labor force participation rate (SA), Emp_t^{HH} the level of employment according to the household survey (SA), and $Emp_t^{HHSmooth}$ the measure of Emp_t^{HH} smoothed out by the Census Bureau to account changes in population controls (SA). The subscript t denotes a particular month. Define the following four terms

$$UR_t = \frac{100U_t}{LF_t}$$

$$Pop_t^{Smooth} = Pop_t \frac{Emp_t^{HHSmooth}}{Emp_t^{HH}}$$

$$\alpha_t = \frac{100Emp_t^{HH}}{LF_{t-1}} \approx 100 - UR_t$$

$$\beta_t = \frac{Emp_{t-1}^{HHSmooth} Pop_{t-1}}{Emp_{t-1}^{HH} Pop_t^{Smooth}} \approx 1$$

Then the sum of the following three contributions very closely approximate the one-month change in the unemployment rate:

$$LFPR_t^{Cont} = \alpha_t(\frac{LFPR_t}{LFPR_{t-1}} - 1)$$

$$HHPayDisc_t^{Cont} = \alpha_t\beta_t(\frac{Pay_t}{Pay_{t-1}} - \frac{Emp_t^{HHSmooth}}{Emp_{t-1}^{HHSmooth}})$$

$$PayPop_t^{Cont} = \alpha_t\beta_t(\frac{Pop_t^{Smooth}}{Pop_{t-1}^{Smooth}} - \frac{Pay_t}{Pay_{t-1}})$$

I.e.

$$\Delta UR_t = LFPR_t^{Cont} + HHPayDisc_t^{Cont} + PayPop_t^{Cont} + \varepsilon_t$$

where ε_t is a small approximation error that has not been larger than 0.005 in absolute value since 1994. For decomposing multi-month changes in the unemployment rate, one can take the sum of all of terms in the above equation. The summed approximation errors remain close to zero.