APPENDIX

Using ADP Data to Estimate Texas Private Job Growth

The equation using Automatic Data Processing (ADP) Inc. data to forecast change in the Current Employment Statistics (CES) first estimate of private job growth in month *t* is:[1]

$$\Delta CES_t = \beta_0 + \beta_1 * \Delta ADP_t + \beta_2 * \Delta CES_{t-n} + \varepsilon_t, \quad (1)$$

where ΔCES_t is the difference in natural logs between the first estimate of employment in month *t* and the second estimate of employment in month *t-1,* and ΔADP_t is the log difference of the first estimate of ADP employment in month *t* and the second estimate in month *t-1*. The regression is run with data from May 2005 to March 2015.

To ascertain the optimal fit, we first regress lags of the CES first-estimate series on itself to determine the predictive power of past growth on the current month's estimate. We find that the first three lags are statistically significant. We then incorporate the ADP data and find them statistically significant at a coincident timing. After these data are included, the first and second lags of CES job growth become statistically insignificant.

We use the Akaike information criterion to determine optimal model specification. After removing the first and second lags, the goodness of fit by this measure increases. Thus, the final model has only the current-month ADP estimate and the third lag of the job growth. As shown in Table 1, the coefficients on the ADP estimate and the lagged dependent variable are significant at the 10 percent level, the R^2 indicates a good fit for a growth-rate regression and the Ljung-Box Q statistic shows evidence that the errors are white noise.

Table 1: Forecast of CES First-Estimate Employment Growth

Coefficient	Estimate	Standard error	*t* statistic	*p* value
$\beta_0\ (intercept)$	0	0	0.066	0.948
$\beta_1(ADP)$	0.690	0.093	7.410	<0.001
$\beta_2(CES\ lag)$	0.139	0.082	1.698	0.0923

NOTE: R^2 = 0.472; Ljung-Box Q statistic for first 12 autocorrelations (df=9) = 9.15, *p* value = 0.69.

The equation used for forecasting revisions in employment growth from the first to second estimate is:[2]

$$CESRevision_t = \beta_0 + \beta_1 * ForecastError_t + \epsilon_t, \quad (2)$$

where $CESRevision_t$ is the difference between the first estimate of ΔCES and the second estimate of ΔCES for the same month, *t*, and $ForecastError_t$ is ε_t from equation 1: the deviation of the forecast growth rate from the actual growth rate in month *t*. The regression is run with data from May 2005 to March 2015; however, the December values for each year are excluded because second estimates were not available across the same generations of data. Also, the August and September 2013 values were not available due to missing data during these months as a result of a partial government shutdown. As shown in Table 2, the coefficient on the forecast errors from equation 1 has the expected sign and is statistically significant at the 1 percent level. The R^2 statistic shows a weak explanatory value and the Ljung-Box Q statistic shows evidence that the errors are white noise.

Table 2: Forecast of CES Employment Growth Revision

Coefficient	Estimate	Standard error	*t* statistic	*p* value
β_0 $(intercept)$	0.000	0.000	-1.145	0.255
β_1 $(Forecast\ error)$	0.124	0.043	2.884	0.0048

NOTE: R^2 = 0.074; Ljung-Box Q statistic for first 12 autocorrelations (df=10) = 17.18, p value = 0.14.

Notes

[1] See "ADP Payroll Processing Data Can Provide Early Look at Texas Job Growth," by Keith R. Phillips and Christopher Slijk, Federal Reserve Bank of Dallas *Southwest Economy*, Second Quarter 2015, p. 12.

[2] See "ADP Payroll Processing Data Can Provide Early Look at Texas Job Growth," p. 13.