

The ADP National Employment Report

There are few economic releases that attract as much attention from economists and financial analysts and move global financial markets as much as the Bureau of Labor Statistics' monthly Current Employment Statistics survey (CES). The quest for an accurate predictor of the CES report has been akin to the search for the Holy Grail for many economic and financial institutions.

Automatic Data Processing, Inc. (ADP) has joined with Moody's Analytics in order to use ADP's large payroll data set to predict private-sector employment prior to the release of the CES report. The collaboration of ADP with Moody's Analytics gives birth to the new ADP National Employment Report.

ADP processes the payrolls of about half a million private establishments in the U.S. These establishments employ nearly 20% of private-sector workers. Although ADP's client base does not precisely match the distribution of employment as reported by the BLS, Moody's Analytics adjusts the ADP data to match the CES. The methodology used by Moody's Analytics is described below.

Data

The analysis begins with the processing of files from 2001 through the most recent month. The steps involved include the removal of outliers, classification by industry and size class, the creation of matched pairs, seasonal adjustment, and adjustments to mimic the industry and size distribution of the BLS' employment data.

The files are monthly through 2006 and biweekly thereafter. Since August 2009 ADP has also created weekly files. Moody's Analytics uses the following data fields from ADP's weekly files: number of employees, frequency of payment, processing date of payment, industry and location of establishment (where payrolls are processed), and whether the establishment is active or terminated. A company may process the payrolls of employees that work in a number of locations in one central location or a company may process payrolls in several locations.

Moody's Analytics checks the raw data for outliers, anomalies and inconsistencies. This includes adjusting records for which there are missing or incorrect data fields. If the correct data field (such as the industry or location) cannot be determined, the record is excluded.

Moody's Analytics also assigns to each record an industry from the North American Industrial Classification System (NAICS) used by the BLS. Since some ADP clients still classify their businesses using the Standard Industrial Classification (SIC), which was in effect prior to the introduction of the NAICS in 1997, Moody's Analytics uses a NAICS-SIC mapping to reclassify those establishments into NAICS industries. Compa-

nies are classified into the 10 NAICS private industry super sectors: (1) natural resources and mining, (2) construction, (3) manufacturing, (4) trade, transportation and utilities, (5) information, (6) financial activities, (7) professional and business services, (8) education and healthcare, (9) leisure and hospitality and (10) other services.

Once the data have been cleaned, Moody's Analytics creates matched pairs of establishments that have reported employment in two consecutive months. There are more than 400,000 such matched pairs, representing more than 23 million employees in the U.S. Each month's data include only the matched pairs available in that month. Matched pairs are aggregated and matched-pair growth rates of employment are computed into cells made up of nine size classes and the 10 NAICS super sectors.

The CES measures the number of people on payrolls during the pay period that includes the 12th of the month (the reference period). A pay period can be any length of time; the most common pay frequency is weekly. But a pay period can also cover two weeks; it can be bimonthly, monthly, etc. Since the ADP records provide pay dates rather than pay periods, matched pairs must be constructed using interpolation. By combining the pay date and the frequency of pay, Moody's Analytics matches the BLS pay period concept as closely as possible.

In the most straightforward case, the derived pay period includes the 12th of the month. If there is no recorded employment for the pay period that includes the 12th, but a record exists for either a later or earlier pay period during the month, Moody's Analytics estimates employment for the reference period by linearly interpolating between the level of employment on the prior record and the record for the later pay period. The maximum time range for linear interpolation to capture missing employment on the 12th depends on the payment frequency of an establishment. If the previous record falls out of this range, the recorded employment in the same month immediately after the 12th is used for the employment on the 12th.

Seasonal adjustment

Employment growth in each of the 90 size class/industry cells is seasonally adjusted using the Census Bureau's X-12 ARIMA method, with the default ARIMA outlier criterion modified to resemble the corresponding CES criterion. Deseasonalized trends for the industrial cells are recalculated with each new month of data.

Each observation in an industrial cell is then compared with the trend value, and outlier observations are removed. Matched employment growth for the 90 size classes is calculated for the second time using the cleaned data. Each cell employment growth is seasonally adjusted again using the same X-12 ARIMA method.

An additional adjustment is made for months in which there are five weeks between survey reference weeks. This is done by regressing the growth rate in each cell on a dummy variable, which if significant, is used to eliminate the long-month effect.

Adjusting the ADP Data to Align with the BLS Sample

Although ADP processes the payrolls of companies representing 20% of all U.S. employment, the composition of those firms does not exactly match the size and industrial composition of the firms sampled by BLS in the CES. Therefore the Quarterly Census of Employment and Wages (QCEW), which is a complete count of payroll employment derived from unemployment insurance tax records, is employed to adjust the ADP data. The QCEW data by the nine size classes are only available for March of every year. This is the month to which BLS benchmarks its CES estimates against the QCEW data. The seasonally adjusted matched-sample growth rates by industry are computed by taking a weighted average of the matched sample growth rates by size within each industry. The weights are based on monthly interpolations of the QCEW March values. For the time period after the last benchmark, the weights are extrapolated forward to the latest month using the ADP matched-pair growth rates within each size class.

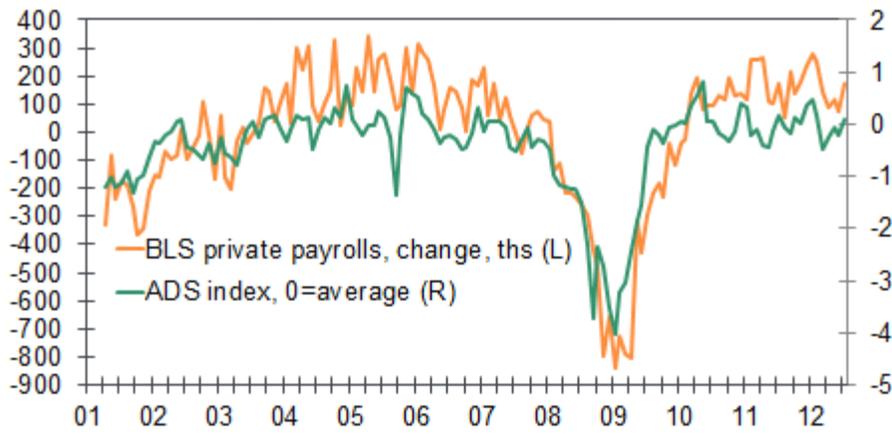
The final result of this extensive process is a set of 10 series of the growth rates of size-weighted super sector industries from April 2001 to the most recent month.

Regression and Results

Moody's Analytics uses a restricted structural VAR model to estimate the monthly change in private payrolls by regressing the most recent payroll growth reported by the BLS for each super sector on a constant term and: (1) ADP matched-pair growth rates by industry; (2) lagged values of BLS estimates of growth of employment by industry with industry specific restrictions; and (3) the Philadelphia Federal Reserve's Aruoba-Diebold-Scotti Business Conditions Index (ADS). The equations for all industries are estimated simultaneously. Thus, the model is made up of 10 endogenous variables—the 10 BLS super sector industries, and 11 exogenous variables—the 10 ADP super sector industries and the ADS index.

The ADS index was chosen because it incorporates the timeliest data and is updated on a daily basis as new data are released. The estimation uses a weekly average of the daily index for the week that includes the 12th of the month. The index is based on the following seven indicators: weekly initial jobless claims, monthly payroll employment, industrial production, personal income less transfer payments, manufacturing sales, trade sales, and quarterly real GDP. The average value of the ADS index is zero. Progressively bigger positive values indicate progressively better-than-average conditions, whereas progressively more negative values indicate progressively worse-than-average conditions. The index is seasonally adjusted.

The ADS Index Captures Turning Points



Sources: BLS, Federal Reserve Bank of Philadelphia, Moody's Analytics

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The equation for each industry is constructed as follows:

For example,

% change in construction = - 0.009 + 0.943 * % change in size weighted ADP construction + 0.048 lagged growth in natural resource and mining + 0.189 * lagged growth in manufacturing + 0.025 * lagged growth in construction + 1.347 lagged growth in trade/transportation/utilities - 0.814 * lagged growth in professional/business services - 0.067 * lagged growth in information + 0.753 * lagged growth in financial activities - 0.686 * lagged growth in education/healthcare - 0.289 * lagged growth in leisure/hospitality + 0.198 * lagged growth in other services + 0.068 * ADS index.

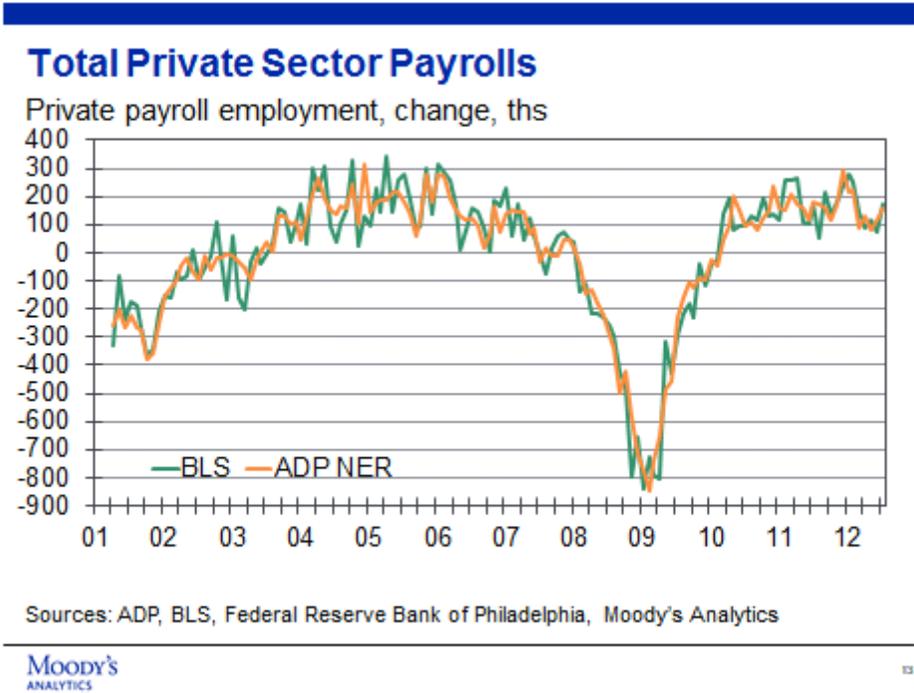
This method allows different trends of employment by size of payroll within industries, while assuming that the other industry-wide relationships implied by the regressions hold for all size classes within an industry. Inclusion of lagged employment in the regressions controls for shifting differences between the BLS sample and the ADP customer base, and inclusion of other employment-related variables controls for differences in the definitions of employment used by BLS and ADP and the difference in sampled firms. The industry-level data are then aggregated to total private employment using industry weights from the BLS' QCEW.

The resulting growth rate estimates are then converted into differences. The simple correlation between the monthly percentage change in total nonfarm private employment as generated by Moody's in-sample forecast and as currently reported by the BLS is 0.96 since April 2001. The regression results track the BLS' CES closely.

The table below lists the simple correlation between the growth rates generated from the regression results and the BLS data for each reported super sector.

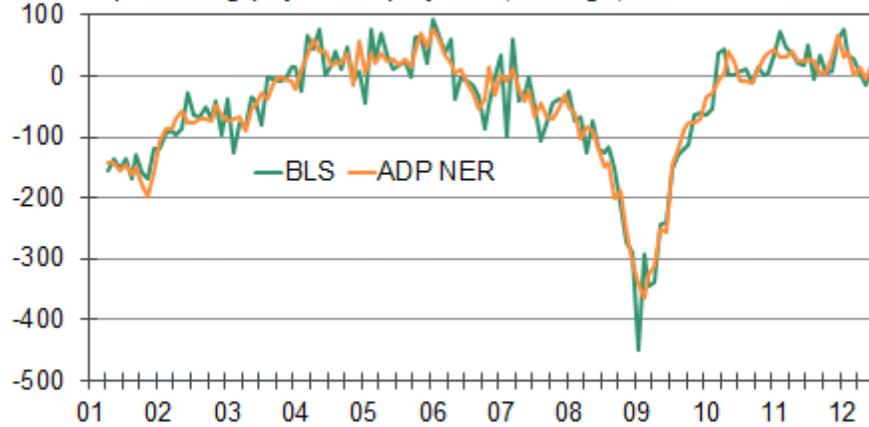
Industry	Correlation
Goods producing	
Construction	0.86
Manufacturing	0.95
Services	
Trade, transportation & utilities	0.90
Financial activities	0.83
Professional & business services	0.91

The final step of the process is to use the estimation results to predict the current month's BLS number by super sector and size class, which can then be aggregated into total private sector employment.



Goods Producing Payrolls

Goods producing payroll employment, change, ths



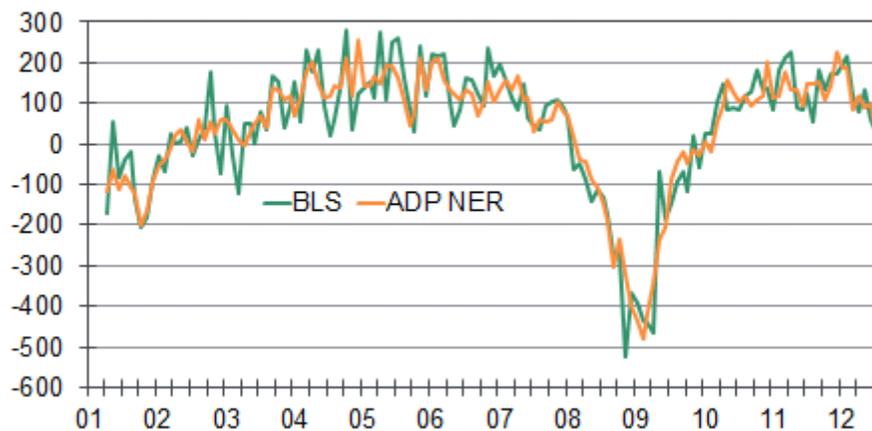
Sources: ADP, BLS, Federal Reserve Bank of Philadelphia, Moody's Analytics

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Service Producing Payrolls

Service producing payroll employment, change, ths



Sources: ADP, BLS, Federal Reserve Bank of Philadelphia, Moody's Analytics

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Company-Level Estimates

ADP data are used to construct employment by five company size classes: small companies (1-19, 20-49), medium companies (50-499) and large companies (500-999, 1,000+).

Each control unit in the cleaned ADP data sets with outliers removed is matched to a company, identified by the Employer Identification Number (EIN). The size of the control unit may coincide with the size of the company or the company can be comprised of many control units. The employment of all the control units with a common EIN is summed up to generate the company level employment.

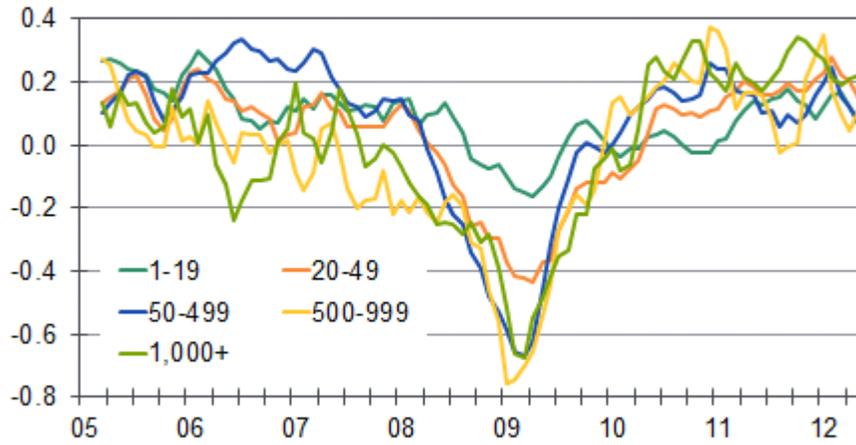
The companies in each super sector are then grouped into 9 cells according to their sizes, and the matched pair employment growth for each of the 90 industry-company cells is calculated. Using BLS methodology, if a company includes control units from more than one industry, each control unit is allocated to the appropriate industry. However, the company size to which the control unit is allocated is the company size of the combined control keys. For example, if a company is made up of two control units each with 15 employees in two industries, they are allocated to company size 20-49 but the number of employees allocated in this company size to each industry is still 15. The matched employment growth for each industry-company cell is then seasonally adjusted and the long week effects are removed.

The QCEW establishment-based industry cell sizes and shares of each company cell within every establishment cell are used to construct the company-based industry cell size in the each year's March benchmark month. The benchmarked company cells are then extrapolated to grow at the matched cell employment growth rates. Monthly distributions of company cells in every super sector are calculated from the extrapolated company cell employment levels.

The monthly industry distribution of company cells and the forecasted industry employment growth are then combined to produce the forecasted employment growth for company cells in the NER.

Job Growth By Size Class

Employment growth by company size, 3-mo MA



Sources: ADP, BLS, Moody's Analytics

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