ADP Canada National Employment Report

Introduction

The ADP Research Institute®, working in close collaboration with Moody's Analytics, Inc., has created the monthly ADP Canada National Employment Report which will report nonfarm payroll employment changes in Canada. The report seeks to align with the employment numbers published by the Statistics Canada payroll employment report, the Survey of Employment, Payrolls and Hours (SEPH).

The report is driven by data of 2 million workers and other variables to help strengthen the data, such as Statistics Canada data as well as industry specific variables such as confidence indices, housing permits and merchandise exports.

The methodology is described below.

Data Processing

The data processing involves a number of steps including the removal of outliers, identification of clients by industry in order to aggregate the individual data into industry/super sector classifications, the creation of matched pairs, and seasonal adjustment.

Then, the raw data is cleaned for outliers, anomalies, and inconsistencies.

Industry Classification

The North American Industrial Classification System (NAICS) is used for industry classification.

In both the ADP data and the Statistics Canada data, companies are classified into the 14 NAICS industry super sectors (NAICS codes in brackets): (1) natural resources and mining [11, 21]; (2) construction [23]; (3) manufacturing [31-33]; (4) trade, transportation, and utilities [22, 42, 44, 45, 48, 49]; (5) information [51]; (6) financial activities [52, 53]; (7) professional, scientific, and technical services [54]; (8) management of companies and enterprises [55]; (9) administrative and support services [56]; (10) education [61]; (11) healthcare [62]; (12) leisure and hospitality [71, 72]; (13) other services, excluding public administration [81]; and (14) public administration [91].

Matched Pairs

Once the data has been cleaned, matched pairs of clients that have reported employment in two consecutive months are created. Each month's data includes only the matched pairs available in that month. Matched pairs are then aggregated into monthly cells made up of employment levels for the 14 NAICS super sectors. The final step is to match the ADP sample to the SEPH composition of industries

Seasonal Adjustment

After aggregating matched pairs by month, the data is then seasonally adjusted using the well-known X-12 ARIMA method. This method is a filtering process that cleans the series of non-linearities such as trading day effects, as well as detects and corrects for extreme observations. Statistics Canada's methodology for payroll estimation also incorporates the use of the X-12 method. Deseasonalized trends for the industrial cells are recalculated with each new month of data. To prepare the data for estimation, growth rates for employment are computed by calculating the matched employment growth in every industry.

Regression and Results

A structural VAR model is used to estimate the monthly changes in payroll employment. Two variations of the model are utilized in order to generate forecasts for one and two months ahead. Separate specifications are necessary in order to account for the availability of data for the exogenous variables in the time period being forecasted. A description of the two-month-ahead model follows after the one-month-model. The structures of the two models are nearly identical.

One-month-ahead model

The model is used for forecasting the one-month-ahead change in payrolls estimates the monthly change in payrolls by regressing the most recent payroll growth rate reported by Statistics Canada in their Survey of Earnings, Payrolls and Hours (SEPH) for each super sector on a constant term and: (1) ADP matched-pair growth rates for each industry; (2) lagged values of the SEPH estimates of payroll growth for each industry; (3) current and lagged values of employment growth from Statistics Canada's Labour Force Survey (LFS); as well as industry specific exogenous variables such as confidence indices, housing permits and merchandise exports. The equations for all industries are estimated simultaneously.

Except in the case of the LFS, a lagged value of an exogenous period refers to a one-period lag. In the case of the LFS, the one and two-period lagged values are used.

The exogenous variables included in the model because they provide additional explanatory power in estimating the monthly growth in SEPH payrolls. The LFS is a timelier household survey of employment, providing a direct indicator of labour market performance.

Separately, estimating payrolls growth for each industry allows for different trends in growth across industries, in contrast to directly estimating total payrolls growth. The inclusion of other industries in each industry's equation helps capture cross-industry relationships, such as codependence between construction and finance via mortgage banking. Inclusion of lagged

employment growth in the regression controls for shifting differences between the SEPH sample and the ADP clientele. Inclusion of the other employment-related exogenous variables controls for differences in the definition of employment used by the SEPH and ADP and the differences in the sample firms.

The percent change in total payrolls is then calculated by computing a weighted average of the industry-level percent changes. The weights for this aggregation are calculated as a lagged four-month moving average of the industries' shares of total employment in the SEPH data. The change in the level of total payroll employment is then derived from the total percentage change and SEPH's reported level of total payrolls in the previous period.

The simple correlation between the monthly percentage change in ADP total payrolls and SEPH payroll employment is 0.831. The regression results closely track the estimates reported in SEPH. Furthermore, the ADP data significantly increases the equations' coefficients of determination, implying that the ADP data considerably improves the model's ability to explain the variability in the SEPH data beyond what publicly-available data would allow.

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

Industry	Correlation
Goods producing	
Natural resources and mining	0.898
Construction	0.814
Manufacturing	0.823
Services producing	
Trade, transportation and utilities	0.867
Information	0.668
Finance, insurance and real estate	0.687
Professional/business services	0.741
Management of companies	0.523
Administrative and waste services	0.730
Education	0.772
Healthcare	0.807
Leisure and hospitality	0.847
Other services	0.911

In the final step of the first model, the forecasted industry percent changes are used to construct differences in the levels by multiplying the growth rate by the most recently reported industry employment level from the SEPH.

Two-period-ahead model

The coverage period for the SEPH report is lagged two months behind the LFS. Thus, in order to forecast payroll growth for the month concurrent to the latest LFS figure a two-month-ahead forecast is required. Due to the constraints of the forecast production schedule, it will generally be the case that the LFS is the only release from Statistics Canada with data pertaining to that month.

Taking the one-month-ahead model as a starting point, we shift the lags of the endogenous and exogenous variables back one period, making them all lagged two months. This change is done for all the variables except the ADP and the LFS variables.

Just as with the one-month-ahead model, the percent change in total payrolls is calculated by computing a weighted average of the industry-level percent changes. The weights for this aggregation are calculated as a four-month moving average of the industries' shares of total employment in the SEPH data.

The simple correlation between the monthly percentage change in ADP total payroll employment and the SEPH payroll employment is 0.733. Given that the correlation is only slightly smaller than the one-month-ahead model, it stands to reason that the ADP data is providing most of the model's explanatory power.

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

Industry	Correlation
Goods producing	
Natural resources and mining	0.836
Construction	0.811
Manufacturing	0.748
Services producing	
Trade, transportation and utilities	0.676
Information	0.535
Finance, insurance and real estate	0.597
Professional/business services	0.544
Management of companies	0.550
Administrative and waste services	0.795
Education	0.730
Healthcare	0.620
Leisure and hospitality	0.679
Other services	0.752
Public administration	0.651

The two-months-ahead change in the level of total payroll employment is derived by combining the two-months-ahead forecasted percentage change from the two-month-ahead model and the one-month-ahead model's prediction for the one-month-ahead level of total payrolls.

**Total Payroll Employment**

Total Payroll employment, % change
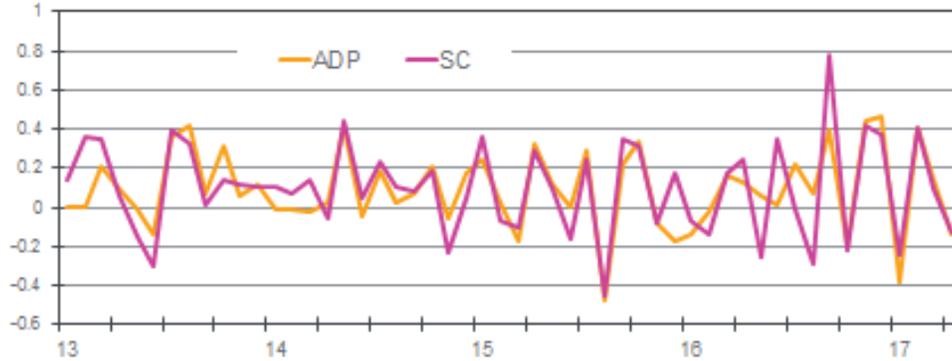
Similar to the procedure used for total payrolls, in the final step the two-month-ahead forecasts for industry percent changes are used to construct differences in the levels by multiplying the predicted industry growth rates by industry levels predicted by the one-month-ahead model.

Resources and Mining Payrolls
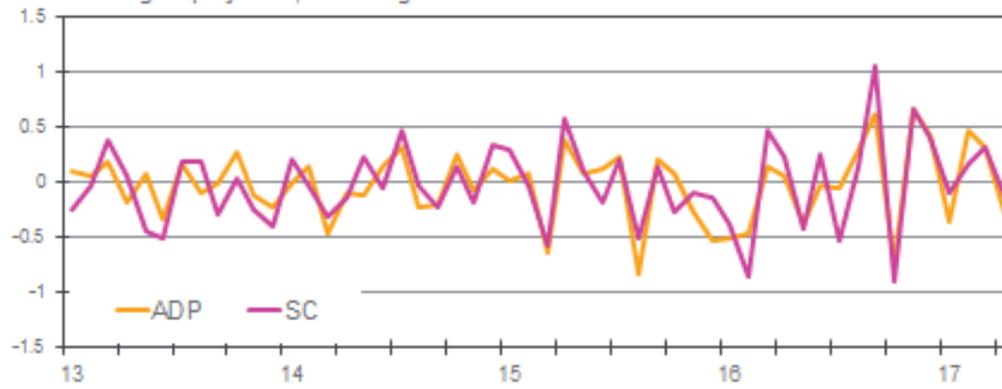
Resources and Mining employment, % change
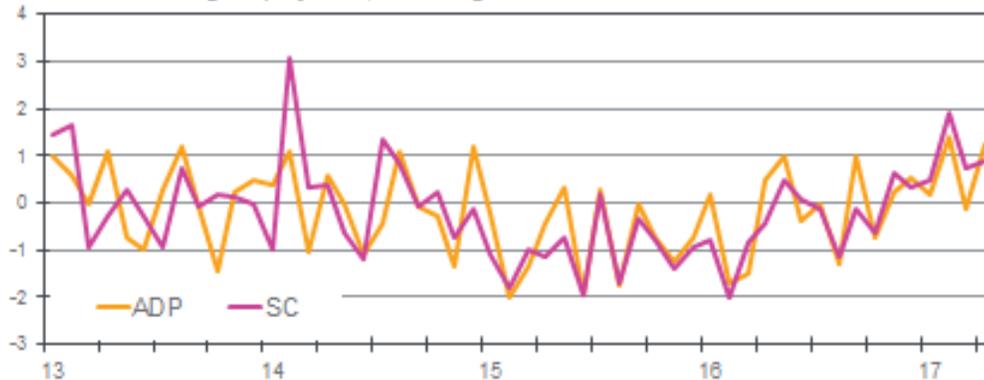
Manufacturing Payrolls

Manufacturing employment, % change

Trade, Transportation, and Utilities Payrolls

Trade, Transportation, and Utilities employment, % change
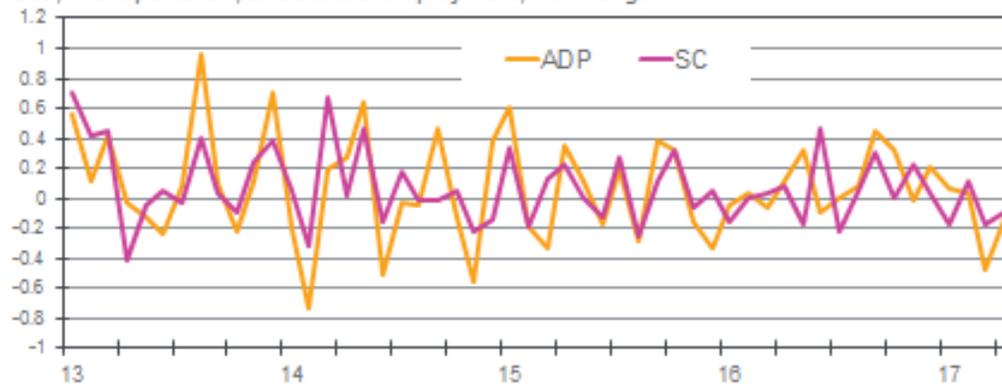
Information Payrolls

Information employment, % change