4th floor
Ropemaker Place
25 Ropemaker Street
London
EC2Y 9LY
United Kingdom

tel +44 20 7260 2000
fax +44 20 7260 2001
www.markit.com

Markit Economic Research

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United States

PMI™-based advance indicators of BLS non-farm payroll data

- **PMI survey data provide accurate advance guide to non-farm payrolls**
- **Correlations of up to 96%, including breakdown for manufacturing and services**
- **PMI consistent with 122k non-farm payroll rise in March (and an average 146k rise in Q1)**

Markit's US PMI survey coverage encompasses private sector services as well as manufacturing. The surveys include a number of indicators, such as output, new orders, prices and employment. While the output index acts as a reliable guide to GDP, the employment index also provides an accurate advance guide to the official non-farm payroll data published by the Bureau for Labor Statistics.

The correlations are high: the manufacturing PMI Employment Index exhibits a 96% correlation with manufacturing payroll changes[1] while the weighted average of the PMI employment indices for manufacturing and services exhibits a correlation of 87% against private sector payroll growth. As would be expected, the correlation drops when the PMI is used to predict changes in total non-farm payrolls, as the latter includes government and construction jobs, but at 84% remains high[2].

A longer run of the manufacturing PMI can also be used as a proxy for total employment changes, extending the back series for our comparisons shown in the charts[3].

Inferring payroll growth from PMI readings

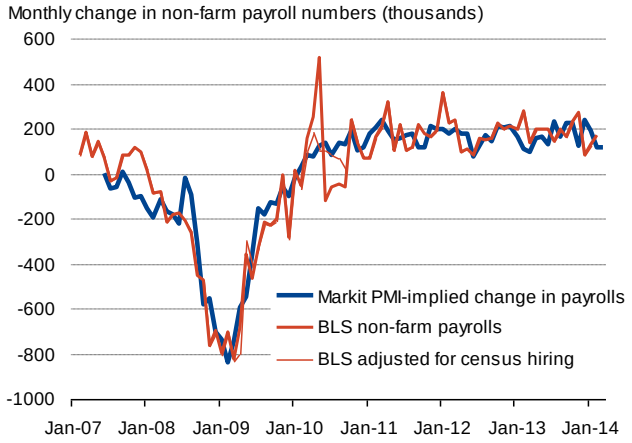
Given the strength of the correlations, regression analysis can be used with the PMI as an explanatory variable for non-farm payroll numbers. The resulting formula gives a non-farm payroll equivalent for any corresponding PMI reading. The adjusted r-squared for the regressions are high, rising to 0.92 for manufacturing with a standard error of just 17k. An r-squared of 0.71 for the PMI against total non-farm payrolls adds validation to the exercise (see table 1). This lower r-squared (and correlation) compared to manufacturing in part reflects the fact that the longer history of the manufacturing PMI includes the full 2008-9 recession.

The correlations indicate a 122k rise in non-farm payrolls in March, with a larger 134k rise in private sector employment (which breaks down further into an approximate 118K rise in services and a 15k rise in manufacturing).

However, we caution against using the PMI for estimating single-month non-farm payroll growth in isolation, mainly because the non-farm payroll data are subject to major revision and a sampling error of +/-90,000. It is preferable to also use the PMI to gauge underlying payroll growth trends by looking at a three months average.

Over the three months of the first quarter, the all-sector PMI employment index has averaged 52.8, signalling an average 146k monthly increase. By comparison, the average PMI reading for the fourth quarter averaged 54.0, which signalled a 197k monthly rise in non-farm payrolls. The official data show an average 198k rise over this period.

Chart 1: Non-farm payrolls[4]



Source: Markit, Bureau of Labor Statistics.

[1] The official payroll numbers are smoothed using a three-month average to remove some of the volatility in the official data series.

[2] Note that the correlations are calculated for manufacturing from June 2007 (when the manufacturing PMI data were first collected) and December 2013 (the latest month for which we believe reliable official data are available). For private sector and total payroll comparisons, the correlations are calculated from October 2009 though to December 2013, as this start data represents the first month for which service sector PMI data are available.

[3] The regression adjusted R-squared for the manufacturing PMI employment index against total non-farm payrolls is an impressive 0.89, rising to 0.91 if the latter is restricted to just private sector employment (exhibiting 95% correlations in both cases)

[4] *pre-September 2009 regression based on manufacturing only PMI data*

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Table 1: Correlations of Markit PMI data with month-on-month changes in BLS non-farm payrolls

Sector coverage	PMI index used as explanatory variable	Correlation	Adj. R2	SE	Constant	Coefficient
Whole economy payrolls	Weighted composite PMI Employment Index	0.84	0.71	52	-2176	43.9
Private sector payrolls	Weighted composite PMI Employment Index	0.87	0.73	50	-2182	44.3
Services payrolls	Services PMI Employment Index	0.82	0.65	39	-1295	27.2
Manufacturing payrolls *	Manufacturing PMI Employment Index	0.96	0.92	17	-369	7.1

* Manufacturing uses data back to June 2007 whereas other correlations refer to October 2009 onwards due to shorter history of services data.
A three-month centred moving average of the BLS data is used in the regression.
Correlation for the whole economy is based on series adjusted for government census hiring.

About the surveys

PMI™ surveys are based on data provided by 860 companies in manufacturing and services, the latter including financial services, hotels & restaurants, business to business services and consumer services. In total the surveys cover some 67% of all economic activity in the US and 77% of all private sector economic activity.

The surveys also cover 79% of total employment and 94% of private sector staffing, meaning the employment indices act as useful and accurate indicators of non-farm payrolls. (The surveys do not cover state-provided services, construction, agriculture, energy and retail.)

Methodology

The PMI surveys ask respondent companies if their employment has risen, fallen or remained unchanged on the prior month. Part-time employees are included, counted as half a full-time employee, but seasonal and temporary workers are excluded.

The percentages reporting an increase, fall or no change are converted into a single diffusion index, which includes a weighting system to take into account company size and the importance of the sector to which the company belongs. The index varies around 50, with readings above 50 signalling an increase in industry employment compared to the previous month, while readings below 50 signal a reduction. The indices are seasonally adjusted to remove usual variations in hiring for the time of year.

The data for manufacturing and services can be weighted together according to each sector's contribution to gross domestic product to derive composite indicators of private sector employment trends.

In comparing the resulting PMI data with non-farm payrolls data, Markit use a simple regression analysis to derive an implied change in the equivalent non-farm payrolls data from the PMI survey results. The current month's PMI reading is regressed against a centred three-month moving average of the change in the BLS data in order to remove some of the volatility in the official data series.

Access to data

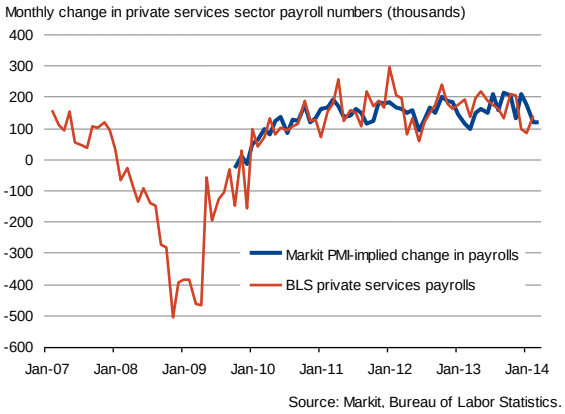
The historical data for Markit's PMI Employment Indices are currently available via subscription from economics@markit.com.

Data are updated on the first working day of each month for manufacturing, with services (and composite) data published on the third working day. Preliminary 'flash' PMI data are also published approximately one week prior to the final data. Click here for a calendar of release dates.

Further information

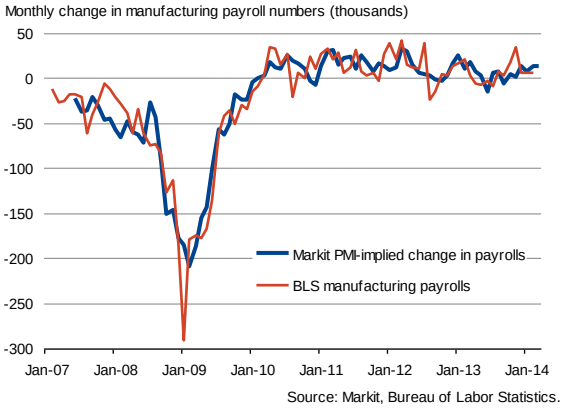
Email: economics@markit.com
Click here for more PMI and economic commentary.
For further information, please visit www.markit.com

Services (private sector) payrolls



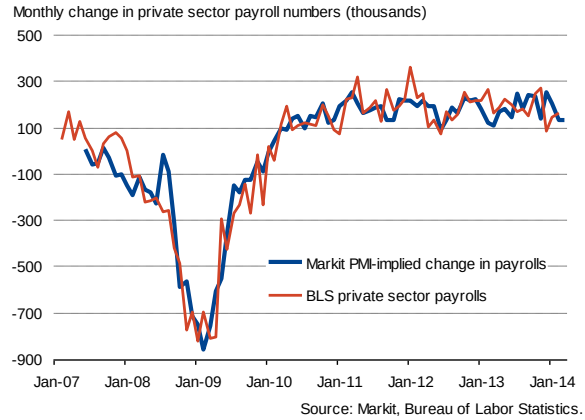
Source: Markit, Bureau of Labor Statistics.

Manufacturing payrolls



Source: Markit, Bureau of Labor Statistics.

Private sector non-farm payrolls[5]



Source: Markit, Bureau of Labor Statistics.

[5] *pre-September 2009 regression based on manufacturing only PMI data*