REMI
PI⁺ v1.5
(changes from PI⁺ v1.4)

Major Economic Data Sources

Employment

County	BEA REIS (sector industries; 2001-2011)[1]
	BLS QCEW (summary industries; 1990-2011)[2]
	CBP (detail industries; 2010)
State	BEA SPI (summary industries; 1990-2011)[3]
	BLS QCEW (summary industries; 1990-2011)
	CBP (detail industries; 2010)
National	BEA SPI (summary industries; 1990-2011)[3]
	BLS QCEW (summary industries; 1990-2011)
	CBP (detail industries; 2010)
	BLS EP (detail industries; 1993-2010 and 2020)[4]

Wages

County	BEA REIS (total; 2001-2011)
	BLS QCEW (summary industries; 1990-2011)
	CBP (detail industries; 2010)
State	BEA SPI (summary industries; 1990-2011)
	BLS QCEW (summary industries; 1990-2011)
	CBP (detail industries; 2010)
National	BEA SPI (summary industries; 1990-2011)
	BLS QCEW (summary industries; 1990-2011)
	CBP (detail industries; 2010)

Personal Income and Earnings

County	BEA REIS (components and summary industries; 2001-2011)
State	BEA SPI (components and summary industries; 1990-2011)
National	BEA SPI (components and summary industries; 1990-2011)
	BLS EP (components; 1993-2010 and 2020)
	RSQE (components; 2012-2015)[5]

Compensation

County	BEA REIS (components and summary industries; 2001-2011)
State	BEA SPI (components and summary industries; 1990-2011)
National	BEA SPI (components and summary industries; 1990-2011)

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[1] The county BEA REIS data used for PI⁺ v1.5 is based on their 11/26/2012 release.
[2] Initial estimates of county-level 70 sector employment and wage data for the states of Michigan and Nevada were provided by the University of Michigan.
[3] The state and national BEA SPI data used for PI⁺ v1.5 is based on their 09/25/2012 release.
[4] The national BLS EP data used for PI⁺ v1.5 is based on their 02/01/2012 release.
[5] The 18 March 2013 forecast from RSQE is used for PI⁺ v1.5.

Commuter Flows
    County to County   BEA (gross flow of earnings by county; 1990-2011)
                              BEA (total number of workers commuting between counties of residence and counties of work; 1990, 2000)
                              BEA (commuting patterns between counties of work and counties of residence by major industry; 2000)

Technology Matrix
    National   BLS (detail sectors; 1993-2010 and 2020)

Final Demand
    National   BEA (components; 1990-2011)
                              RSQE (components; 2012-2015)[5]
                              BLS EP (components and industry value added; 1993-2010, 2020)

Occupation Matrix
    National   BLS EP (employment by industry and occupation; 2010 and 2020)

Major Demographic Data Sources

Population
    County   BEA (total; 1990-2011)
    County   Census (age, sex, race; 1990-2011)

Demographic Components of Change
    County   Census (1990-2011)

Labor Force
    County   BLS (total; 1990-2011)

Natality Rates
    Nation   Census (1999-2100)

Birth Rates
    State   CDC (1990-2010)

Survival Rates
    Nation   Census (1999-2100)

Net International Migrants
    Nation   Census (1999-2100)

Participation Rates
    Nation   BLS (1990-2050)

Active Military
Base   DoD (total; 1994-2009)
Nation   DoD (total, sex, race; 1990-2011)

Military Dependents
Nation   DoD (total; 1990-2005)

Prisoners
County   Census (sex, race, facility; 2000; 2010)
Nation   Bureau of Justice Statistics (facility; 1990-2011)

PI+

Data Suppression Methodology

The suppressed data estimation system was originally designed to implement a formulation to find data that most closely approximates a set of estimates while also summing up to known regional and industry totals, as described in the 1996 paper "Optimal Estimation of Suppressed Data using all Available Information." Gauss, the software chosen to implement the formulation has a limited number of options for solvers, and a general constrained optimization solver was used. The general solver had trouble finding initial starting points and returned with errors even when solving only state level data. It could not handle more than 1800 variables, would take as much as 24 hours for a problem of that size, and was inconsistent in whether or not it would solve. Due to this, the RAS procedure was implemented to solve the problem at the county level.

In effort to improve upon the RAS results, we obtained the open source interior point quadratic optimization solver Clp from COIN OR and integrated it with the existing system written in Gauss. Interior point solvers are the current best technique for solving quadratic problems with bounds.

Farm Custom Industry Option

The custom industry feature now includes the ability to customize the intermediate inputs, compensation, and productivity assumptions for the aggregate or detailed farm industries.

Employment by Occupations

The Extra Detail, Detail Level and Summary Level occupations now include a "Military" category for placing military industry/occupation employment. In addition, a display of "Employment by Occupation and Industry" is now available as a results table.

Customization of Non-Existent Industries

Users now have the ability to customize industries that do not currently exist in their local economy.

Employment Update Procedure

Employment Update was modified to allow users to enter values for multiple industry aggregations, including total employment, 23, 70, or 160 sectors, as applicable.

Detailed Industry PV's

The detailed industry policy variables have been reconciled with their applicable more aggregate industry (the detailed industry policy variables are based on the BEA 2002 IO table, while the more aggregate industries are based on the BLS IO table for a more recent year (currently 2010)).

Endogenous Residence Adjustment

A new commuter flow equation has been implemented that takes into account the spatial distance and relative cost of living between places of residence and places of work, allowing the earnings shares to endogenously shift in the forecast in response to both direct and indirect policy variable changes. See "*New Residence Adjustment Calculation for PI+ v1.5 Models*" for a more detailed description.

New Commuter Earnings Policy Variables

Commuter Earnings (amount) by place of work and place of residence
Gross Earnings Inflow (amount)
Gross Earnings Outflow (amount)

New Commuter Earnings Results

Region to Region Flows of Commuter Earnings

Policy and Results Variable Lists

PI+ is now able to display a complete list of all policy variables available for use, as well as all results variables available for display. Click on the Model Details button on the Home ribbon, and then select "Policy Variable List" or "Results Variable List".

Unemployment Rate

The model region's Unemployment Rate is now displayed in the results on a new table available under the Economic list. The historical rate is derived from the BLS Local Area Unemployment Statistics (LAUS) program. The forecasted rate is estimated based on a new equation, described in "*New Residence Adjustment Calculation for PI+ v1.5 Models*".