

Iowa Leading Indicators Index: Ninth Annual Assessment and Update

Tax Research and Program Analysis Section
Iowa Department of Revenue
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In 2006, the Iowa Department of Revenue (IDR) created the Iowa Leading Indicators Index (ILII) as a tool to predict turning points in Iowa employment. By foreshadowing changes in the level of employment, which is closely linked to the level of individual income tax and sales tax receipts, the ILII also provides a signal of changes in these major revenue sources for the State. IDR has issued monthly ILII reports since the start of fiscal year (FY) 2007 and posted the reports on the IDR website. During FY 2015, the ILII exhibited three months with positive changes and nine months with negative changes, ending down 1.8 percent from the end of FY 2014. Employment increased throughout the year, with the gains ranging from 0.06 to 0.15 percent and averaging 0.12 percent per month. Matching the steady employment growth, State tax receipts increased 5.0 percent during FY 2015.

Annually, the Department assesses how well the ILII has met the goals underlying its development, gauges the validity of the existing components, considers any additional components that may have been suggested in the past year, and carries out the necessary annual updates. This paper documents the ninth annual assessment and update to the index. A step-by-step presentation of how the ILII is computed can be found in appendix A. The calculation of the diffusion index is discussed in appendix B.

Assessment of the Iowa Leading Indicators Index for Fiscal Year 2015

During FY 2015, the ILII started the year by increasing from 109.7 in July 2014 to an all-time high of 109.9 in September 2014 before falling to 107.6 in June 2015 (see Figure 1). The ILII experienced both positive and negative changes during the first six months, then experienced six consecutive months of negative changes during the remainder of the fiscal year. The annualized six-month percent change began the fiscal year at a high of 3.4 percent in July 2014 then experienced a steady decrease, ending at a low of -3.4 percent in June 2015. Weakness in the index seen at the end of the year was fairly widespread, although during the first quarter the six-month diffusion index held steady at 75.0, dipped to 62.5 from October through January, fell to 37.5 in March, rebounded to 50.0 in April before falling to a low of 31.3 in June. In contrast with negative signals from the index, the non-farm employment coincident index, the 12-month moving average of non-seasonally adjusted, non-farm employment, experienced continued growth during the year, and extending its positive streak that started in October 2010 to nearly five years.

Between 1999 and 2014, the index signaled a contraction twice, from December 2000 through September 2001 and from August 2008 through November 2009. The initial contraction signals were followed by declines in employment stretching from July 2001 through December 2003 and November 2008 through October 2010, respectively.¹ However, with the downturn experienced by the ILII during the last fiscal year, a third dip signaling a future contraction was seen in the fourth quarter of FY 2015. The expected ensuing weakening in employment has yet to be seen.

¹ December 2006 through February 2007 also meet the metrics of a contraction signal, but only in retrospect after seven years of data revisions. At the time of those reports, the index changes did not meet the metrics.

During 2014, the most recent data available, Iowa gross domestic product (GDP) rose, although at a slower pace than recent years. Iowa real GDP grew an estimated 0.8 percent in 2014, less than the revised 2.9 percent growth measured for 2013 and 4.4 percent growth in 2012 (see Figure 2). Real personal income in Iowa grew 1.5 percent in 2014 after an estimated -0.97 percent growth in 2013 (see Figure 2). It is difficult to gauge the ability of the monthly ILII to signal changes in either state GDP or state personal income because these series are released infrequently, annually and quarterly respectively, and are subject to major revisions. Therefore the ILII is compared, on a monthly basis, to non-farm employment in Iowa, as reported by the Bureau of Labor Statistics. However, another test of the usefulness of the ILII is to compare movements in the index to the level of State General Fund revenues (see Figure 3). Iowa real receipts are measured using the 12-month moving average of individual, sales and use, corporation, inheritance, insurance premium, and franchise receipts, all adjusted using the Consumer Price Index (CPI) to 2014 dollars. Receipts increased throughout FY 2015. Withholding, a component of individual income tax receipts, and sales and use tax receipts experienced steady gains throughout the year, driving the overall gains.

Although the Department forecasts all sources of revenue for the State, the ILII is best suited to signal the future direction of taxes on employment and wages, or individual income tax revenues. Individual income taxes comprise over 50 percent of State General Fund receipts. Net individual income tax revenues are measured as the 12-month moving average of withholding plus estimate payments plus final return payments minus refunds, all adjusted to 2014 dollars using the CPI (see Figure 4). The initial drop in individual income tax revenues

in 1999 reflects the individual income tax cut implemented during the 1998 tax year. Individual income tax revenues were strong in the spring of 2000, but fell in 2001 and 2002 with the national recession. Revenues began to rise again in 2004 and remained relatively strong through 2008, with a slight dip in 2005 and 2006. Net individual income tax revenues turned down in February 2009, following the ILII drop that started in April 2008. Revenues began to rise steadily in 2012 with a sharp jump in April reflecting behavioral changes pushing income into tax year 2012 resulting from federal tax law effective in tax year 2013. As expected, revenues reversed one year later, but the weakness continued through the end of fiscal year 2014 pulled down by estimate payments. Fiscal year 2015 saw a steady increase in revenues as estimate payments recovered and withholding experienced steady gains. These gains were in contrast to the negative signals demonstrated by the ILII in the last quarter of fiscal year 2015, but the leading nature of the index suggests that the growth in revenues will slow in 2016.

The main goal for the creation of the Iowa Leading Indicators Index in 2006 was to serve as an additional tool for predicting the direction of the State economy. Indeed, the ILII began to decline in April 2008 and showed a contraction signal in August 2008. Three months later, the Iowa non-farm employment index began to show declines, following the path of the slowing national economy. The index reached a bottom in September 2009, and then moved out of recession signal territory in November 2009, suggesting that the Iowa economy would see employment gains by mid to late summer. Those gains did not materialize until fall 2010, but employment has continued to rise since October 2010, following the positive changes in the index. The six months of consecutive declines at the end of the fiscal year, with contraction signals in the last three months, signal that employment should experience a

slowdown beginning in the fall. Overall, results over the past eight years demonstrate that the ILII is a helpful tool in predicting the direction and turning points in Iowa non-farm employment, while the signals at the end of the ninth year have yet to be proven accurate.

A final comparison between the ILII and the National Leading Economic Indicators (LEI) produced by The Conference Board is presented (see Figure 5). The two series moved similarly between 1999 and 2005, the ILII dipped during the middle of the 2000's while the LEI bounced between positive and negative changes. The two series dived prior to the Great Recession, although the LEI started its drop in April 2007 (with the national recession starting in late 2007) while the ILII started to drop in February 2008 (with Iowa employment dropping in late 2008). Both series signaled a recovery, with the LEI logging strong positive gains beginning in April 2009 and the ILII in October 2009. While the ILII continued to post strong increases through April 2011, the LEI had more muted changes in April 2010. Both series showed parallel growth from 2011 through 2014, except for a small dip in the LEI during the middle of 2012. During FY 2015 the series experienced a dramatic divergence; the LEI demonstrated steady growth throughout the year, with eleven positive changes and one month of no change, while the ILII had steady negative changes during the last six months of the year after weak gains and losses during the first six months.

Validity of Existing Components

When the Iowa Leading Indicators Index was established in 2006, one method used to select components was to identify series of Iowa data that were equivalent to those used as leading economic indicators by other states and regions. This method resulted in the selection of Iowa unemployment insurance claims, average manufacturing hours in Iowa, and the new

orders index for Iowa manufacturers. A second method used to select components was to identify series that predicted economic activity in the key sectors of the Iowa economy: agriculture, manufacturing, and finance. Agriculture comprised 7.4 percent of Iowa GDP in 2014, according to the Bureau of Economic Analysis. To capture the agriculture sector, an index of expected profits for producers of the four leading commodities in the state, corn, hogs, soybeans, and cattle was created. Manufacturing accounted for 18.7 percent of GDP and 16.9 percent of total non-farm employment in 2014, according to the Quarterly Census of Employment and Wage conducted by the Bureau of Labor Statistics. Along with average manufacturing hours and the new orders index, diesel fuel consumption was added to the index to measure demand for the transport of manufacturing inputs and final products within and through the state. Diesel fuel consumption also indicates demand for the production and transport of agricultural commodities. The insurance and finance sector accounted for 10.2 percent of GDP and 8.1 percent of non-farm employment in 2014. The insurance and finance sector is heavily represented in the Iowa stock market index, created as another component for the index.

During the development of the ILII, all potential indicators were weighed against six desired attributes of leading indicators that are known as the Moore-Shiskin criteria:

1. conformity – series must conform well to the business cycle
2. consistent timing – series must exhibit a consistent timing pattern over time as a leading indicator
3. currency – series must be published on a reasonably prompt schedule and not be subject to major revisions

4. economic significance – cyclical timing of the series must be economically logical
5. statistical adequacy – data must be collected and processed in a statistically reliable way
6. smoothness – month-to-month movements in the series must not be too erratic.

Continuing the success of the prior eight years, during fiscal year 2015 the ILII generally continued to exhibit all of these attributes. During 2015, the index demonstrated negative signals in nine months while the non-farm employment coincident index, the 12-month moving average of non-seasonally adjusted, non-farm employment, experienced increasing growth each month during the year. However, the strongest negative signals were seen at the end of the year, so if the index continues to demonstrate conformity and consistency, its signals suggests a fall in employment should be seen in the next few months.

During FY 2015, three of eight components experienced gains (see Table 1). The largest positive contribution was made by diesel fuel consumption which added 0.11 points to the index between June 2014 and June 2015 and was a positive contributor six months during FY 2015. The other positive contributors over the fiscal year were average weekly unemployment claims (inverted) and average weekly manufacturing hours. The new orders index was the largest negative contributor to the ILII in 2015 largely due to pullbacks by agricultural equipment manufacturers in the state. Declines in Iowa's agricultural sector were a contributing factor to the decreases in the new orders index and the agricultural futures profits index (AFPI) was the second largest negative contributor to the index in 2015. The AFPI was dragged down by continued declines in corn and soybean expected profits as well as the reversal in 2015 of the tremendous increases in hog and cattle profits in 2014. The

three other components also were negative contributors over the year. The majority of components and the ILII showed negative signals in contrast to the continued positive growth in Iowa employment, so time will tell whether the ILII continues to demonstrate consistent timing with economic activity.

Nothing in the past twelve months has changed opinions about the economic significance of the eight components as all continue to logically lead the economic cycle. Currency of the ILII's components proved to be reliable for almost all components during FY 2015. Seven of the eight components were available within four weeks after the close of the month for all months except January. In that month, labor force data including average manufacturing hours and non-farm employment were delayed by several weeks because the Bureau of Labor Statistics (BLS) was undertaking its annual benchmarking. Breakevens for corn for the 2014 crop year were revised in June, resulting in a minor upward revision of expected profits for the June 2014 through May 2015 values for that commodity. Views about the statistical adequacy of the data are unchanged as sources for all the data series continue to be reliable.

Assessments of the components' smoothness did not change with the additional 12 months of data. The standard deviation of month-to-month changes in the components (measured using 12-month moving averages for all but the yield spread and stock market index) increased for three of the eight components including agricultural future profits index, building permits, and new orders index, all changes were small (see Table 2). The ILII is computed by weighting changes in the individual series by the standardization factors, calculated as the inverse of the standard deviation, normalized across all the components to one (see Appendix A). Updates to the standardization factors accounting for the observed volatility

during FY 2015 suggest the factors for all components will not change much. Three components experienced small declines, with the largest decline being 9.1 percent for AFPI. Four other components experienced small positive increases with no realized change to diesel fuel consumption. The only potential change in the ranking of the standardization factors among the components is building permits (from 6th to 7th) and average weekly unemployment claims (inverted) (from 7th to 6th). The final standardization factors will be computed after any individual component updates are completed.

An additional way to consider sensitivity is to focus on six-month percentage changes in the index and six-month diffusion index values under various modified versions of the index where, in each case, one of the eight components is excluded (see Table 3). Following The Conference Board, who publishes the national Leading Economic Indicators after which the ILII was modeled, a contraction signal is the point when the annualized six-month percentage change declines by over two percent and the six-month diffusion index falls below 50.0.² The six month changes to the ILII remained in positive territory for the first five months of FY 2015 independent of the signal from most components. However, the six-month change experienced a precipitous decline from December 2014 through June 2015. The analysis suggests the agricultural future profits index and new orders index contributed the bulk of the negative influence to the index. Without the agricultural future profits index, the diffusion index would be higher but still below 50.0 while a -2.0 percent annualized six-month change would not be reached during FY 2015. Without the new orders index, the diffusion index

² The -2.0 percent annualized decline was the threshold for a recession signal prior to the 2001 revisions to the National Leading Indicators Index. At that time, The Conference Board moved to forecasting several of the components in the index, those not available until more than three weeks after the close of a month. With those revisions, the threshold for a recession signal was lowered to -3.5 percent. However, because the ILII relies on actual data series, the -2.0 percent threshold is still used.

would also be higher but still below 50.0 while the -2.0 percent annualized change would not be realized in April or May, but would still be reached in the final month of FY 2015.

Updates for the Ninth Year

Given that the original eight components continue to meet the Moore-Shiskin criteria and no new components were added, two major steps were taken to prepare the ILII for FY 2016. First, two new stocks were added to the Iowa stock index. Second, the annual update to the agricultural futures profits index incorporating 2014 cash farm income was completed. In addition, the final annual update to the standardization factors for the ILII was applied, causing a revision to the entire history of the ILII.

Updates to the Iowa Stock Market Index

During fiscal year 2015, one company in the Iowa stock market index, Windstream Holdings, experienced a 6-to-1 reverse stock split in April. At the time, the valuation for the company fell to below to 1/6th its previous value. This change was incorporated immediately in the index, so no additional adjustment was required during the update.

During FY 2015, two public companies were identified as possible additions to the Iowa stock market index. Voya Financial, previously ING, is a financial, retirement, investment and insurance company with a large employment presence in Des Moines. Voya began as ING U.S., the United States operating subsidiary of ING Group. That company was spun off in 2013 and established independent financial backing through an initial public offering. In April 2014, the company, maintaining its significant Iowa presence, rebranded itself as Voya Financial. Based on the Iowa presence, VOYA was added to the stock market index.

The second company was started in Iowa and went public during FY 2015. Workiva, (WK) headquartered in Ames, employs more than 950 people with offices in 15 cities. The company, originally called WebFilings, was founded in 2008 specializing in software as a service. The technology company has been publicly traded since December 2014.

The Iowa stock market index now contains values for 35 Iowa-based companies or companies with a significant Iowa presence. Twelve of those companies are in the finance and insurance sector, seven are durable manufacturers, and two are nondurable manufacturers. The others include three utilities (electricity and telecommunications), three energy companies (gas stations and ethanol production facilities), two publishers, two chemical companies, one fertilizer company, one biopharmaceutical company, one transportation company, and now one technology company.

Adding VOYA and WK decreased the value of the index by approximately 10 points on average in recent years. The Iowa stock market index is standardized to an average value of 100 for the 1984-1986 period; with the addition of two new stocks (where the values of all stocks are extrapolated back to the earliest date based on the first capitalization value observed), the total valuation for that period increased. When the value for the base period rises through the addition of stocks, the entire index falls once it is standardized by dividing by the higher base. Despite the noticeable change in the monthly values of the Iowa stock market index, the impact on the ILII of the update to the component rounded to zero in most months.

Updates to the Agricultural Futures Profits Index

The AFPI requires annual updates to the index to account for newly available data on the distribution of annual cash receipts among the four commodities in the index and to incorporate the last 12 months of data in the standardization factors used to weight the index. Additionally, in some years, updated historical breakeven costs for corn and soybeans are incorporated. Because those updates were incorporated in June 2014, none of the changes reported here reflect that final step.

Each fall annual cash receipts for various farm commodities in Iowa for the previous calendar year are released by the Economic Research Service of the U.S. Department of Agriculture. The distribution of cash receipts between the four commodities included in the AFPI is used to weight the four profits series in the index. With the release of the 2014 cash receipts, all AFPI values for January 2014 and later were updated to reflect the distribution of farm cash receipts for calendar year 2014. In 2014, total farm cash receipts for Iowa dropped 1.4 percent with corn receipts falling 17.7 percent and soybean receipts falling 10.7 percent. In contrast to crop receipts, Iowa's livestock receipts experienced positive growth. Hog receipts jumped 15.6 percent, while cattle receipts increased 20.8 percent compared to revised numbers for 2013. In response to these changes, the distribution of cash farm income between the four commodities changed significantly. The corn share of cash receipts between the four commodities dropped from 36.6 to 30.5 percent and the soybeans share dropped from 21.2 to 19.2 percent. The hog share rose from 28.5 to 33.4 percent and the cattle share rose from 13.8 to 16.9 percent. This was the first year since 2005 where the income share of hogs was higher than corn. In addition, the USDA made revisions to corn, soybean, and hog 2010-2013 income numbers.

Iowa State University extension service prepares breakeven costs for Iowa farmers. In July 2015, the 2015 crop year costs were released and the 2014 crop year costs were updated. The changes were incorporated with the June 2015 report, so no additional changes were necessary during this update. The livestock breakevens, also prepared by Iowa State University extension, are not subject to annual revisions.

The update to the weights between commodities used to compute the AFPI had a noticeable impact on the ILII series beginning in July 2014, raising the monthly ILII values between 0.2 and 0.5 basis points. The differential impact reflects the shift in the cash income shares away from grains and toward livestock. However, the pattern and magnitude of changes between months was mostly unchanged.

Assessment of Update Impacts on the ILII

After updates to the AFPI and the Iowa stock market index for 2015 were completed, the standardization factors were finalized (see Table 4). Updates to the standardization factors after the component updates resulted in the AFPI and Iowa stock market index experiencing the most dramatic changes, with the AFPI factor falling 17.1 percent, reflecting an increase in its measured volatility, and the Iowa stock market index factor increasing 4.1 percent, reflecting a decrease in its measured volatility with the introduction of the two new stocks. The updates to the AFPI and Iowa stock market index had variable but minor impact on the index prior to April 2011 (see Figure 6). As a result of the updates, values of the ILII for the last twelve months are higher. For the July 2014 through June 2015 period, the index is 0.4 to 0.5 points higher each month (see Tables 5 and 6). However, the monthly percentage

changes remained unchanged during those months. The level of the six-month annualized percentage change was 0.5 percentage points lower during January, 0.3 percentage points lower during February, and 0.1 percentage points lower each month since. The one-month diffusion index was unchanged as a result of the revisions, while the six-month diffusion index was higher in February as a result of the revisions.

For the values of the components, the AFPI and Iowa stock market index values dropped as a result of the update and expansion (see Tables 7 and 8). All other components were unchanged.

Conclusions

The Iowa Leading Indicators Index established a good record during the recession and recovery spanning 2008 through 2014. During 2015, the index demonstrated negative signals in nine months while the non-farm employment coincident index experienced growth each month during the year. However, the contraction signals were seen only during the last three months of the year, suggesting economic activity will begin to slow in the first few months of fiscal year 2016. With the past success of the ILII in providing leading signals, the Department will continue to closely monitor the ILII with the hope that it will continue to inform policy makers about the direction of future economic activity and revenues in the State.

Figure 1. Iowa Leading Indicators Index and Iowa Non-Farm Employment Coincident Index: January 1999-June 2015

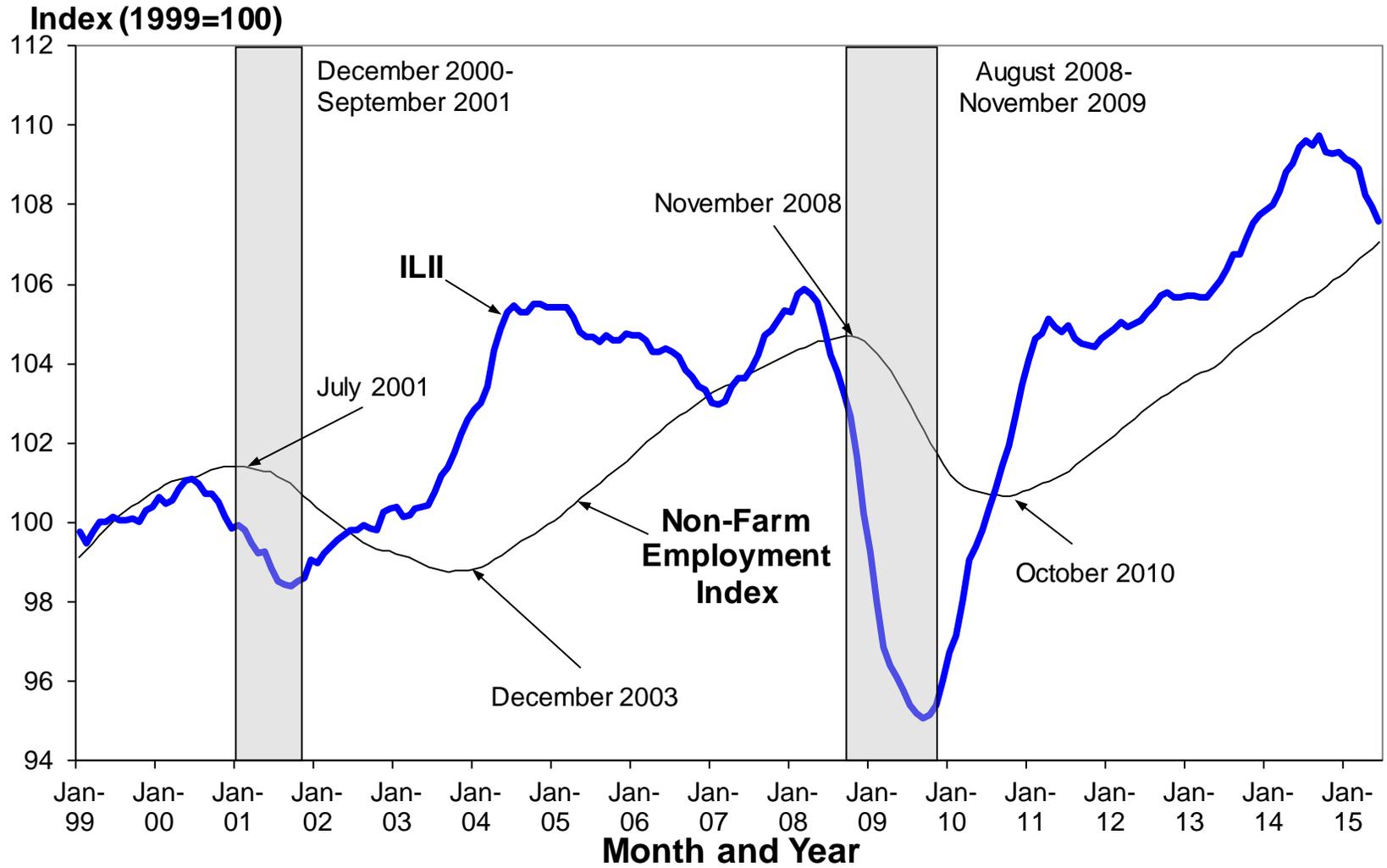
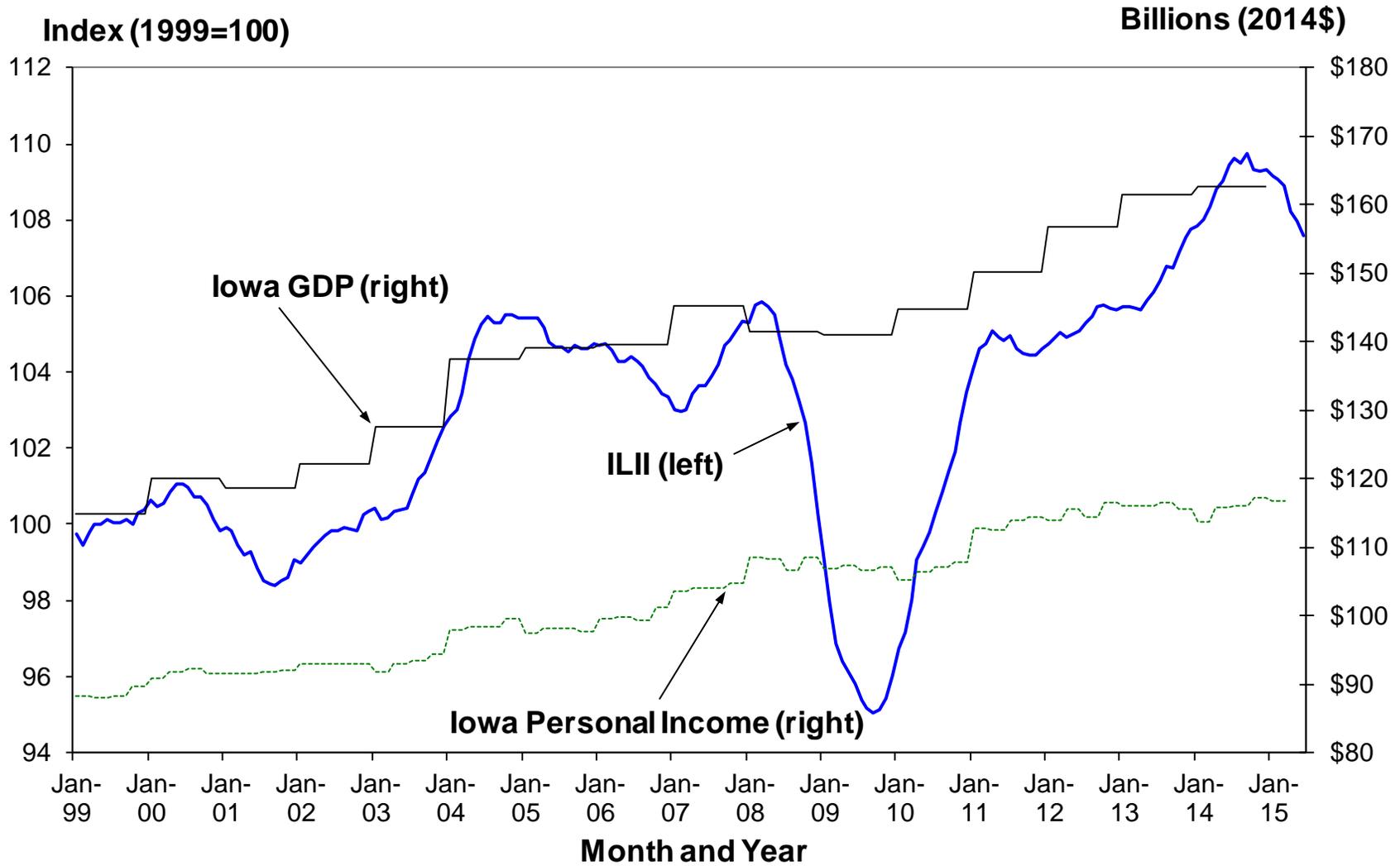


Figure 2. Iowa Leading Indicators Index, Iowa GDP, and Iowa Personal Income: January 1999-June 2015



**Figure 3. Iowa Leading Indicators Index and Iowa Real Tax Receipts:
January 1999-June 2015**

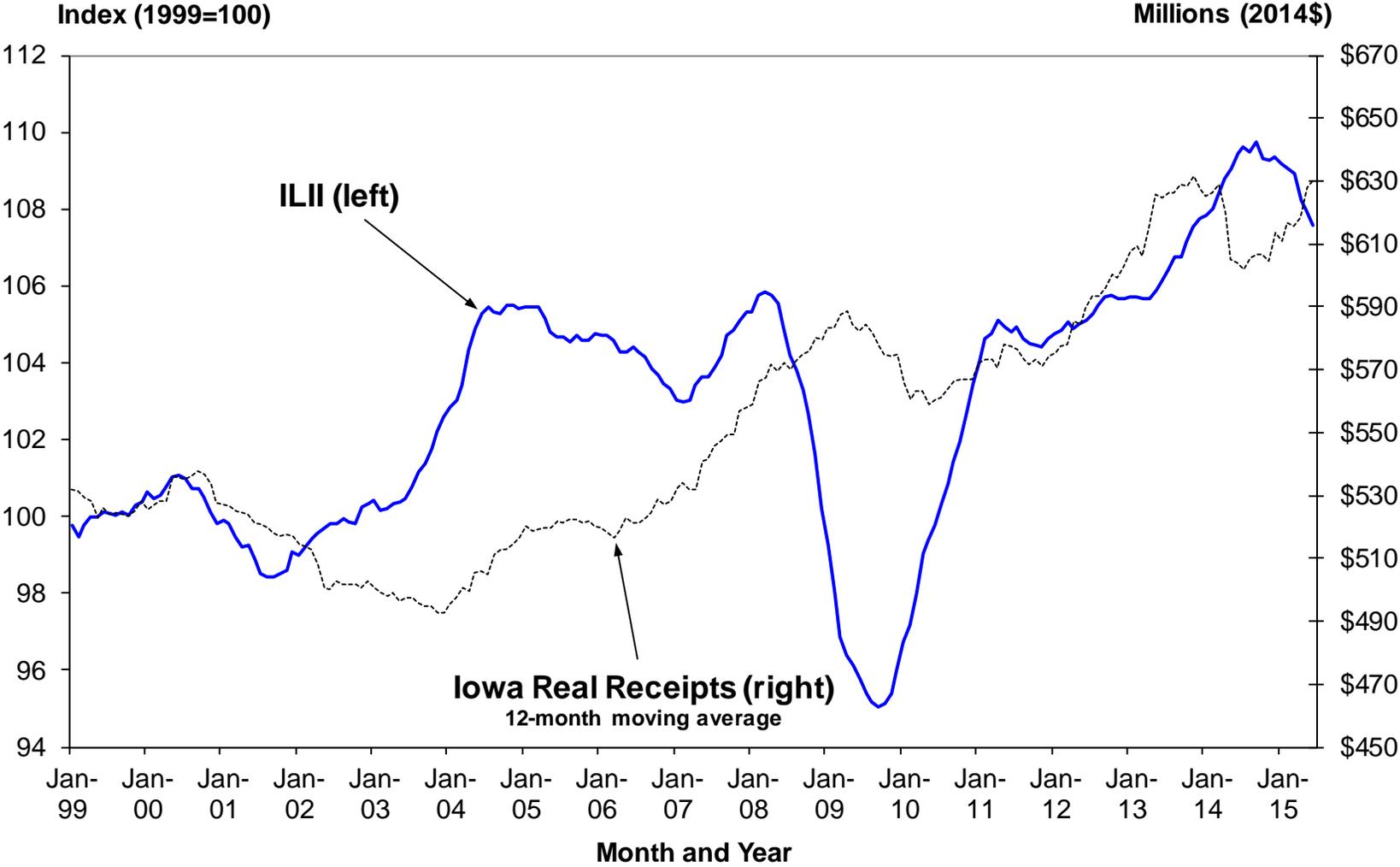


Figure 4. Iowa Leading Indicators Index and Iowa Real Net Individual Income Tax Revenues Index: January 1999-June 2015

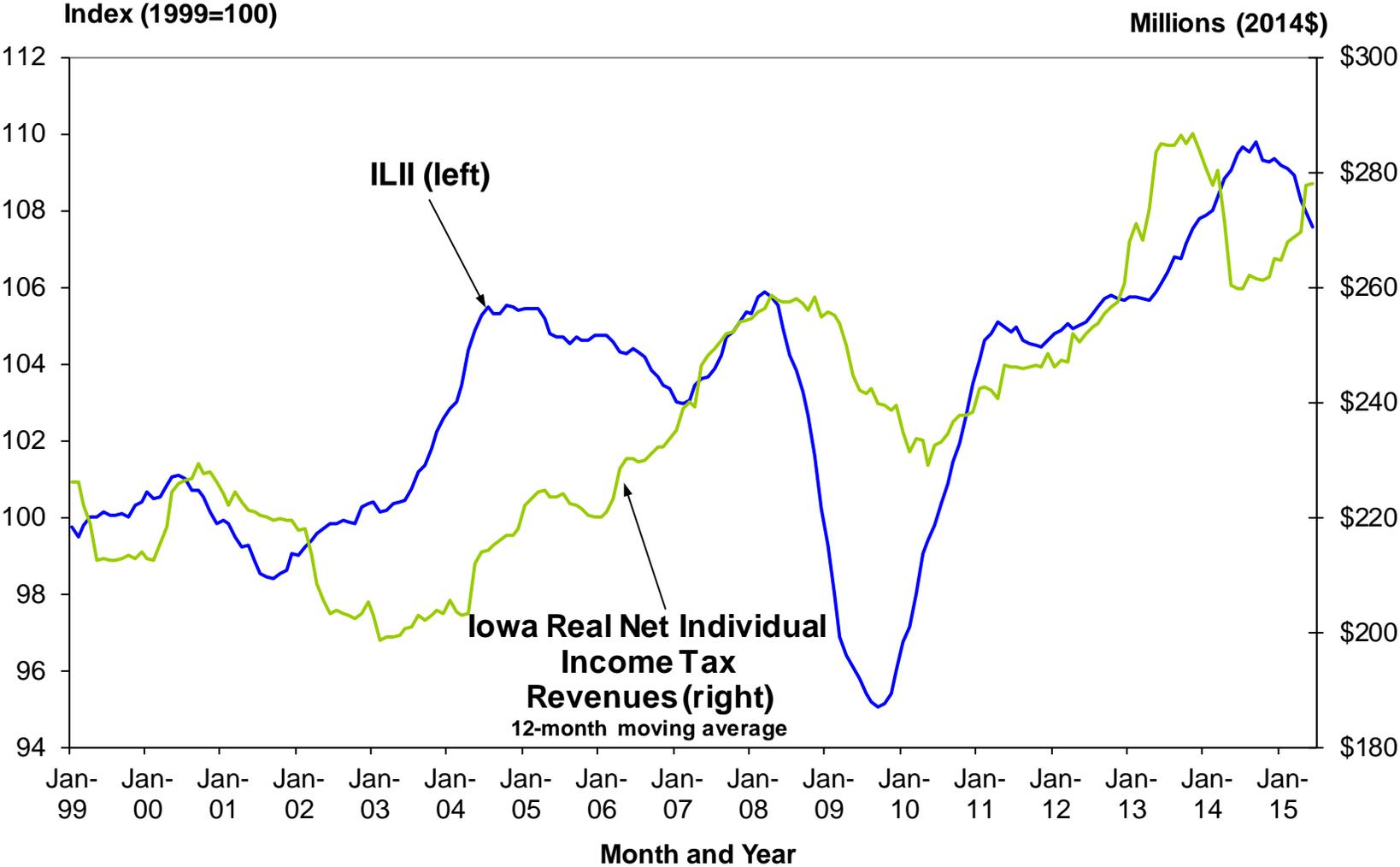


Figure 5. Iowa Leading Indicators Index Compared to U.S. Leading Economic Indicators: January 1999-June 2015

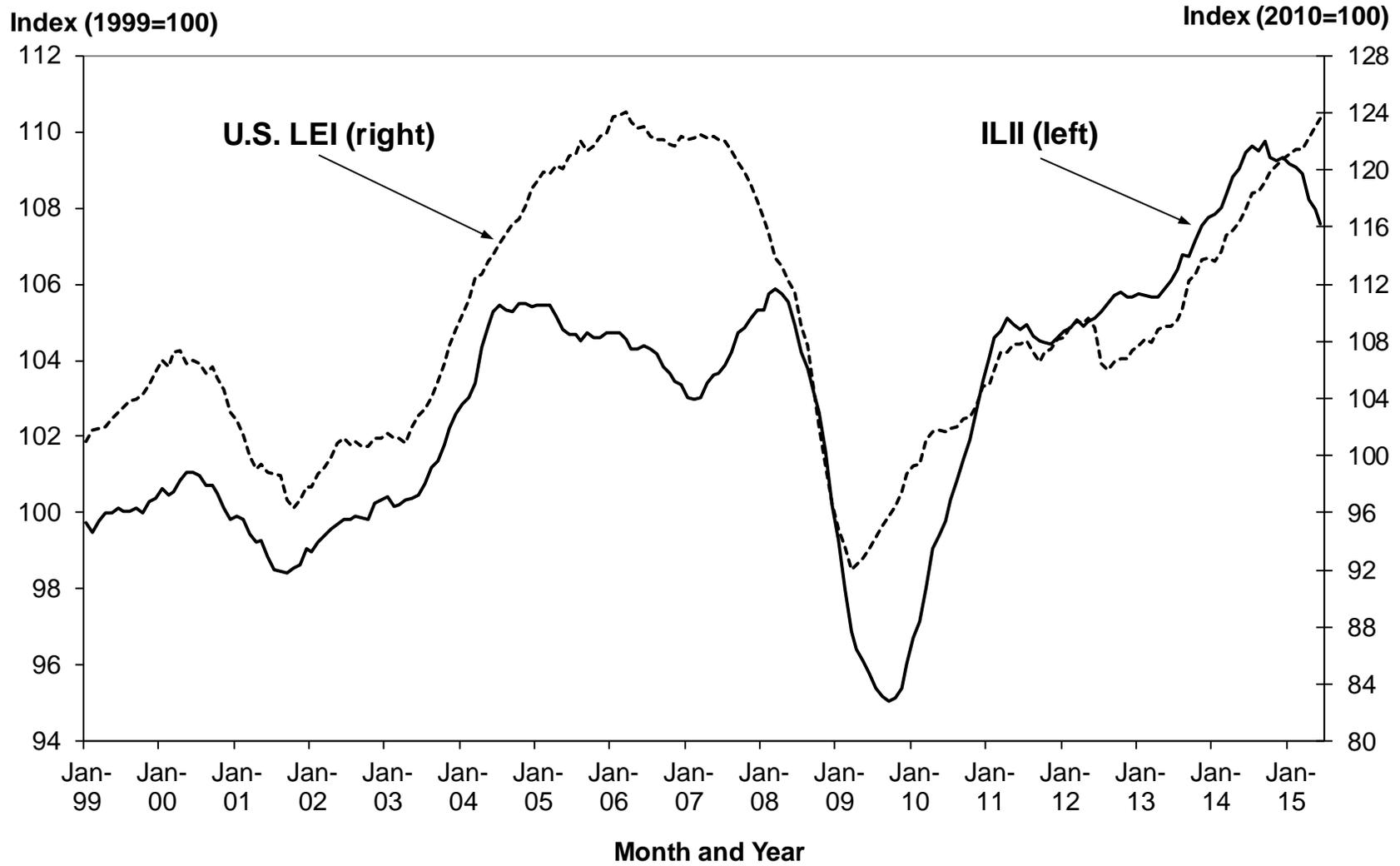


Table 1. Iowa Leading Indicators Index Components: Annual Overview

Component Series Monthly Values ^a	2014 June	2015 June	Contribution to ILII Change
AFPI ^b ↓ ^c			-0.74
Corn Profits (cents per bushel)	70.8	19.9	
Soybean Profits (cents per bushel)	326.1	143.4	
Hog Profits (cents per pound)	37.0	25.1	
Cattle Profits (cents per pound)	2.0	6.0	
Iowa Stock Market Index (10=1984-86) ↓	109.04	105.83	-0.05
Yield Spread (10-year less 3-month) ↓	2.56	2.34	-0.07
Building Permits ↓	939	881	-0.22
Average Weekly Unemployment Claims ^d ↑	3,121	3,043	0.09
Average Weekly Manufacturing Hours ↑	41.9	42.0	0.07
New Orders Index (percent) ↓	68.2	53.6	-0.92
Diesel Fuel Consumption (mil gallons) ↑	58.67	59.02	0.11

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 26, 2015

a. For all component series except for the yield spread (the only national series) the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated November 18, 2014).

c. Arrows indicate the direction of the series' contribution to the ILII over the last 12 months

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

Table 2. Changes in ILII Standardization Factors Accounting for FY 2015 Data

Leading Indicator	Jul-2014 Standard Deviation	Jul-2015 Standard Deviation	Percent Change in Standard Deviation	Jul-2014 Standardization Factor	Rank	Jul-2015 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Profits Index	1.918	2.027	5.7%	0.046	5	0.042	5	-9.1%
Iowa Stock Market Index	4.725	4.623	-2.2%	0.018	8	0.018	8	1.9%
Yield Spread	0.258	0.254	-1.8%	0.332	1	0.334	1	0.6%
Building Permits	2.483	2.541	2.3%	0.035	6	0.033	7	-4.7%
Average Weekly Unemployment Claims	2.521	2.453	-2.7%	0.034	7	0.035	6	1.6%
Average Weekly Manufacturing Hours	0.301	0.294	-2.6%	0.285	2	0.289	2	1.3%
New Orders Index	1.339	1.340	0.1%	0.064	4	0.063	4	-1.1%
Diesel Fuel Consumption	0.462	0.456	-1.4%	0.186	3	0.186	3	0.0%

Each data series considers month-to-month changes over January 1999 to June 2014 for July 2014 values and January 1999 to June 2015 for July 2015 values. For all series except for the yield spread and the Iowa stock market index, the changes are based on 12-month backward moving averages. The yield spread and new orders index changes are simple arithmetic changes; changes for the other six components are computed as symmetric percentage changes.

Table 3. Iowa Leading Indicators Index Component Sensitivity

Six-Month Values	Jan to July	Feb to August	Mar to September	Apr to October	May to November	June to December	July to January	Aug to February	Sept to March	Oct to April	Nov to May	Dec to June
ILII												
Percentage Change (Annualized)	3.4%	2.9%	2.7%	1.0%	0.4%	-0.2%	-0.9%	-0.8%	-1.6%	-2.1%	-2.5%	-3.4%
Diffusion Index	75.0	75.0	75.0	62.5	62.5	62.5	62.5	56.3	37.5	50.0	37.5	31.3
ILII without AFPI												
Percentage Change (Annualized)	2.2%	1.6%	1.6%	0.0%	-0.4%	-0.8%	-1.1%	-0.6%	-0.9%	-0.8%	-0.8%	-1.3%
Diffusion Index	71.4	71.4	71.4	57.1	57.1	57.1	57.1	64.3	42.9	57.1	42.9	35.7
ILII without Iowa Stock Market												
Percentage Change (Annualized)	3.1%	2.5%	2.5%	0.9%	0.2%	-0.3%	-0.9%	-1.0%	-1.7%	-2.2%	-2.4%	-3.2%
Diffusion Index	71.4	71.4	71.4	57.1	57.1	57.1	57.1	50.0	28.6	42.9	42.9	35.7
ILII without Average Manufacturing Hours												
Percentage Change (Annualized)	3.8%	3.3%	3.2%	0.9%	0.4%	-0.5%	-1.4%	-1.1%	-2.2%	-3.1%	-3.7%	-4.7%
Diffusion Index	71.4	71.4	71.4	57.1	57.1	57.1	57.1	57.1	42.9	42.9	28.6	28.6
ILII without Yield Spread												
Percentage Change (Annualized)	5.4%	4.6%	4.2%	1.8%	0.9%	0.1%	-0.6%	-0.8%	-1.9%	-2.8%	-3.6%	-5.2%
Diffusion Index	85.7	85.7	85.7	71.4	71.4	71.4	71.4	64.3	42.9	57.1	42.9	21.4
ILII without Diesel Fuel												
Percentage Change (Annualized)	3.0%	2.6%	2.4%	0.6%	0.2%	-0.6%	-1.5%	-1.5%	-2.5%	-2.9%	-3.3%	-4.1%
Diffusion Index	71.4	71.4	71.4	57.1	57.1	57.1	57.1	50.0	28.6	42.9	28.6	35.7
ILII without New Orders Index												
Percentage Change (Annualized)	3.8%	3.4%	3.4%	1.6%	1.2%	0.7%	0.0%	0.1%	-0.9%	-1.4%	-1.7%	-2.5%
Diffusion Index	85.7	85.7	85.7	71.4	71.4	71.4	71.4	64.3	42.9	57.1	42.9	35.7
ILII without Unemployment Claims												
Percentage Change (Annualized)	3.2%	2.7%	2.5%	0.8%	0.4%	-0.3%	-0.9%	-0.9%	-1.9%	-2.3%	-2.8%	-3.6%
Diffusion Index	71.4	71.4	71.4	57.1	57.1	57.1	57.1	50.0	28.6	42.9	28.6	21.4
ILII without Building Permits												
Percentage Change (Annualized)	3.3%	2.8%	2.3%	1.3%	0.7%	0.2%	-0.6%	-0.8%	-1.3%	-1.7%	-2.6%	-3.4%
Diffusion Index	71.4	71.4	71.4	71.4	71.4	71.4	71.4	50.0	85.7	57.1	42.9	35.7

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 14, 2015 using updated standardization factors through June 2015.

A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0. The Conference Board considers a contraction signal reliable when the index declines by at least two percent over a six-month period (using an annualized rate) and a majority of the individual components also decline over those six months measured as a six-month diffusion index value below 50.

Table 4. Changes in ILII Standardization Factors Accounting for FY 2015 Data and All Updates

Leading Indicator	Jul-2014 Standard Deviation	Jul-2015 Standard Deviation	Percent Change in Standard Deviation	Jul-2014 Standardization Factor	Rank	Jul-2015 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Profits Index	1.918	2.290	19.4%	0.045	5	0.037	5	-17.1%
Iowa Stock Market Index	4.725	4.495	-4.9%	0.018	8	0.019	8	4.1%
Yield Spread	0.258	0.254	-1.8%	0.333	1	0.335	1	0.8%
Building Permits	2.483	2.541	2.3%	0.035	6	0.034	7	-3.3%
Average Weekly Unemployment Claims	2.521	2.453	-2.7%	0.034	7	0.035	6	1.7%
Average Weekly Manufacturing Hours	0.301	0.294	-2.6%	0.285	2	0.290	2	1.6%
New Orders Index	1.339	1.340	0.1%	0.064	4	0.064	4	-1.1%
Diesel Fuel Consumption	0.462	0.456	-1.4%	0.186	3	0.187	3	0.4%

Each data series considers month-to-month changes over January 1999 to June 2014 for July 2014 values and January 1999 to June 2015 for July 2015 values. For all series except for the yield spread and the Iowa stock market index, the changes are based on 12-month backward moving averages. The yield spread and new orders index changes are simple arithmetic changes; changes for the other six components are computed as symmetric percentage changes.

Figure 6. Comparison of Iowa Leading Indicators Index in FY 2015 and Update for FY 2016: January 1999-June 2015

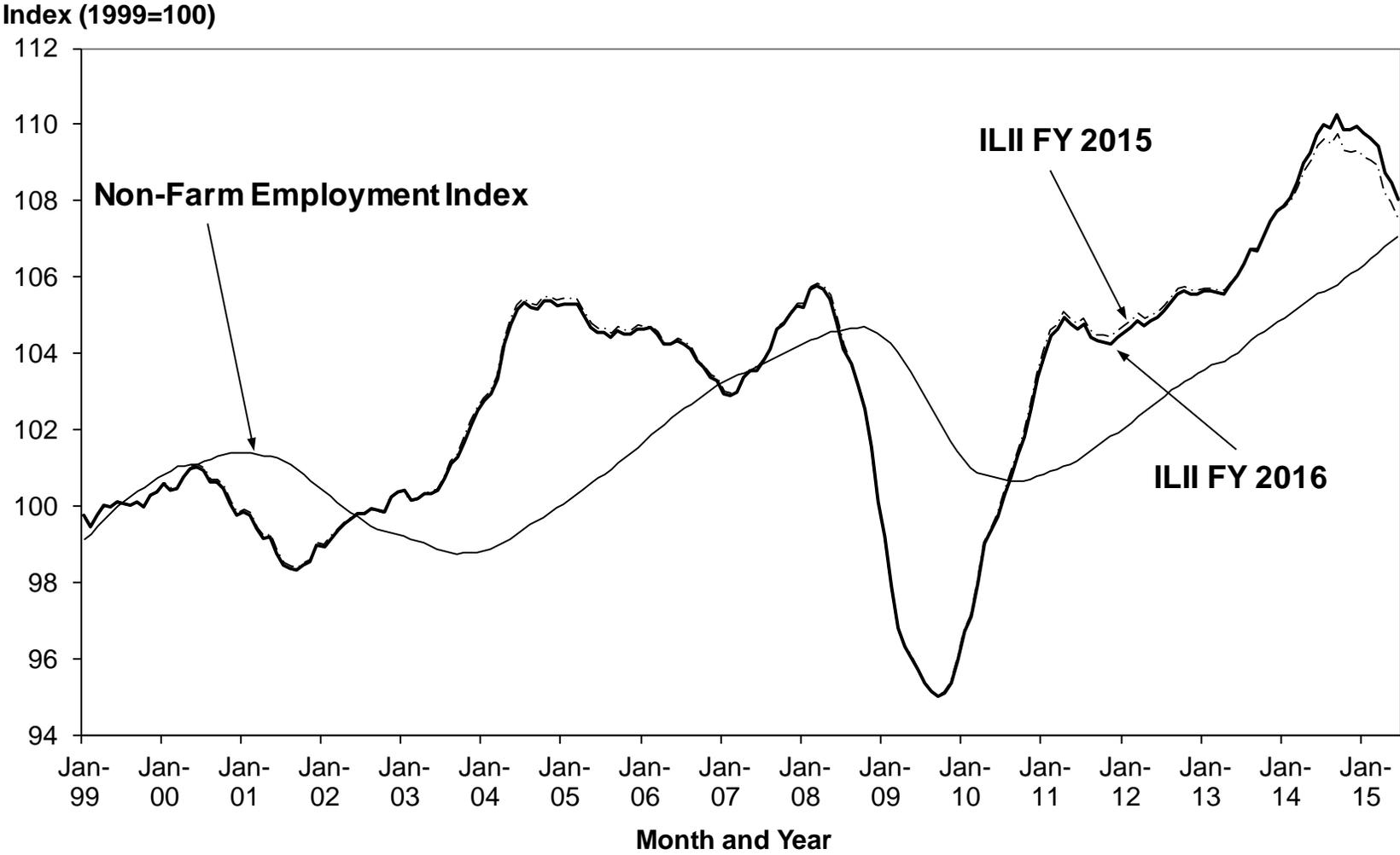


Table 5. Iowa Leading Indicators Index: Six Month Overview for June 2015 Prior to the FY 2016 Annual Update

Monthly Values	2015					
	Jan	Feb	Mar	Apr	May	June
ILII	109.3	109.2	109.0	108.3	108.0	107.6
Percentage Change ^a	-0.2%	-0.1%	-0.2%	-0.6%	-0.3%	-0.4%
Diffusion Index ^b	25.0	56.3	43.8	25.0	25.0	37.5
Six-Month Values	July to Jan	Aug to Feb	Sept to Mar	Oct to Apr	Nov to May	Dec to June
ILII						
Percentage Change	-0.4%	-0.4%	-0.8%	-1.0%	-1.3%	-1.7%
Annualized Percentage Change	-0.9%	-0.8%	-1.6%	-2.1%	-2.5%	-3.4%
Diffusion Index	62.5	56.3	37.5	50.0	37.5	31.3

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 14, 2015.

a. Percentage changes in the ILII do not always equal changes in the level of the ILII due to rounding.

b. A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0.

Table 6. Iowa Leading Indicators Index: Six Month Overview for June 2015 After the FY 2016 Annual Update

Monthly Values	2015					
	Jan	Feb	Mar	Apr	May	June
ILII	109.8	109.6	109.4	108.8	108.5	108.0
Percentage Change ^a	-0.2%	-0.1%	-0.2%	-0.6%	-0.3%	-0.4%
Diffusion Index ^b	25.0	56.3	43.8	25.0	25.0	37.5
Six-Month Values	July to Jan	Aug to Feb	Sept to Mar	Oct to Apr	Nov to May	Dec to June
ILII						
Percentage Change	-0.2%	-0.3%	-0.7%	-1.0%	-1.3%	-1.8%
Annualized Percentage Change	-0.4%	-0.5%	-1.5%	-2.0%	-2.6%	-3.5%
Diffusion Index	62.5	68.8	37.5	50.0	37.5	31.3

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 26, 2015.

a. Percentage changes in the ILII do not always equal changes in the level of the ILII due to rounding.

b. A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0.

Table 7. Iowa Leading Indicators Index Components: Six Month Overview for June 2015 Prior to the FY 2016 Annual Update

Component Series Monthly Values ^a	2015						
	Jan	Feb	Mar	Apr	May	June	
AFPI ^b	↓ ^c	-1.7	-3.0	-5.5	-5.5	-4.3	-4.4
Corn Profits (cents per bushel)		47.0	45.2	40.3	32.7	25.1	19.9
Soybean Profits (cents per bushel)		265.3	250.9	229.1	199.7	168.3	143.4
Hog Profits (cents per pound)		42.0	39.5	34.8	30.3	28.0	25.1
Cattle Profits (cents per pound)		15.0	13.7	11.6	10.2	8.3	6.0
Iowa Stock Market Index (10=1984-86)	↑	108.58	112.03	111.05	108.79	105.66	105.83
Yield Spread (10-year less 3-month)	↑	1.85	1.96	2.01	1.92	2.18	2.34
Building Permits	↑	889	902	906	849	876	881
Average Weekly Unemployment Claims ^d	↓	3,093	3,088	3,029	3,014	3,029	3,043
Average Weekly Manufacturing Hours	↓	42.04	42.02	41.98	42.04	42.01	41.98
New Orders Index (percent)	↓	61.1	59.6	58.9	57.6	55.6	53.6
Diesel Fuel Consumption (mil gallons)	↓	59.48	59.47	59.70	59.47	59.31	59.02

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 14, 2015.

a. For all component series except for the yield spread and the Iowa stock market index, the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated November 14, 2015).

c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

Table 8. Iowa Leading Indicators Index Components: Six Month Overview for June 2015 After the FY 2016 Annual Update

Component Series Monthly Values ^a	2015						
	Jan	Feb	Mar	Apr	May	June	
AFPI ^b	↓ ^c	-2.4	-4.0	-7.1	-6.7	-5.5	-5.9
Corn Profits (cents per bushel)		47.0	45.2	40.3	32.7	25.1	19.9
Soybean Profits (cents per bushel)		265.3	250.9	229.1	199.7	168.3	143.4
Hog Profits (cents per pound)		42.0	39.5	34.8	30.3	28.0	25.1
Cattle Profits (cents per pound)		15.0	13.7	11.6	10.2	8.3	6.0
Iowa Stock Market Index (10=1984-86)	↑	97.95	101.11	100.31	98.24	95.52	95.76
Yield Spread (10-year less 3-month)	↑	1.85	1.96	2.01	1.92	2.18	2.34
Building Permits	↑	889	902	906	849	876	881
Average Weekly Unemployment Claims ^d	↓	3,093	3,088	3,029	3,014	3,029	3,043
Average Weekly Manufacturing Hours	↑	42.04	42.02	41.98	42.04	42.02	41.98
New Orders Index (percent)	↓	61.1	59.6	58.9	57.6	55.6	53.6
Diesel Fuel Consumption (mil gallons)	↓	59.48	59.47	59.70	59.47	59.31	59.02

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 26, 2015.

a. For all component series except for the yield spread and the Iowa stock market index, the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated August 26, 2015).

c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

Appendix A: Computation of the Iowa Leading Indicators Index

The ILII was computed following the five step process presented in the *Business Cycle Indicators Handbook* by The Conference Board.

1. Calculate month-to-month changes for each component. For the components already in percent form (including the yield spread and the new orders index) simple arithmetic differences are calculated. For the other components, a symmetric percent change formula is used because this formula will return the original value if equal positive and negative changes occur in consecutive months.

$$= 200 * (\text{current month value} - \text{last month value}) / (\text{current month value} + \text{last month value})$$

2. Multiply each component's month-to-month changes by the standardization factor. Standardization factors, the inverse of the standard deviation of the changes in the series normalized across all series to sum to one, equalize the volatility of each component in the index (see Table 4 for the standardization factors currently being used).
3. Add the standardized month-to-month changes across all eight indicators to compute each monthly ILII change.
4. Compute preliminary values of the index using a cumulative symmetric percent change formula. The initial month's value is set to 100, then to compute the cumulative

change of the index, each of the index's value is multiplied by the following monthly change:

$$ILII_0=100$$

$$ILII_1= ILII_0*(200 + \text{month one ILII change})/(200 - \text{month one ILII change})$$

5. Rebase the index to average 100 in the base year (1999). The preliminary levels are multiplied by 100 and divided by the average preliminary value over the 12 months in 1999.

Because many of the series are subject to a lot of seasonal variation, before calculating month-to-month changes all series except the yield spread and the Iowa stock market index are smoothed by taking 12-month backward moving averages.

The standardization factors are recalculated and any revisions to historical data (beyond the previous two months) are incorporated annually during the summer.

The Non-Farm Employment Coincident Index is computed following this same method; however, with only one component, steps 2 and 3 are unnecessary.

Appendix B: Computation of the Diffusion Index

A diffusion index measures the proportion of components rising in a given time period. Components experiencing an increase of more than 0.05 percent are assigned a value of 1.0; components experiencing a change in absolute value of 0.05 percent or less are assigned a value of 0.5; components experiencing a decrease of more than 0.05 percent are assigned a value of 0.0. These assigned values are then summed over all of the components. The sum is multiplied by 100 and divided by the number of components. Thus a value below 50 indicates more than half of the components declined in value during the period of interest.

The diffusion index is based on the actual changes in the components, not the standardized contributions used to compute the ILII. A diffusion index is computed for one-month and six-month symmetric percent changes in the components (see Figure B1).

**Figure B1. Iowa Leading Indicators Index One-Month and
Six-Month Diffusion Indexes: Jan. 1999-June 2015**

