Iowa Leading Indicators Index: Tenth Annual Assessment and Update

Tax Research and Program Analysis Section
Iowa Department of Revenue
September 2016

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 2016, the ILII exhibited three months with positive changes and nine months with negative changes, ending down 1.5 percent from the end of FY 2015. In contrast, employment increased throughout the year, with the gains ranging from 0.03 to 0.12 percent and averaging 0.09 percent per month. Despite the steady employment growth, State tax receipts increased only 2.2 percent during FY 2016.

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 tenth 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 2016

During FY 2016, the ILII experienced an eight-month long stretch of negative changes, decreasing from 107.7 in June 2015 to 105.2 in February 2016 (see Figure 1). Following the stretch of negative signals, the ILII then experienced the first two consecutive months of positive change in over a year during March and April 2016. The index ended the fiscal year with little movement in the last two months. The annualized six-month percent change began the fiscal year at -3.7 percent in July 2015, falling to a low of -4.5 percent in September 2015, before slowly improving to 0.01 percent in June 2016. Weakness in the index was seen throughout the year, with the six-month diffusion index maintaining a level of 25.0 or lower for 10 of the 12 months with June 2016 recording a yearlong high of 43.8. These weak six-month values during nearly all of FY 2016 met the requirements to signal a contraction beginning in May 2015 through March 2016, only the third period since the ILII's history. 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 extended its positive streak that started in October 2010 to nearly six years.

Between 1999 and 2014, the index signaled a contraction twice, from December 2000 through September 2001 and from July 2008 through October 2009 (see Figure 1). The initial contraction signals were followed by declines in employment stretching from July 2001 through September 2003 and November 2008 through September 2010, respectively.[1]

[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.

However, with the contraction signals experienced by the ILII from May 2015 through March 2016, the expected ensuing weakening in employment was not experienced.

During the first three quarters in FY 2016, the most recent data available, Iowa gross domestic product (GDP) increased 0.6 percent and then decreased 0.7 percent the last two quarters (see Figure 2). Iowa real GDP grew 0.8 percent in calendar year 2015, less than the revised 2.8 percent growth measured for 2014 and 0.6 percent growth in 2013. Real personal income in Iowa grew during the first three quarters of FY 2016 at 0.4 percent, 0.8 percent and 0.6 percent (see Figure 2). Real personal income growth was only 0.6 percent during calendar year 2015, down from 3.2 percent in 2014 and 1.2 percent in 2013. Both of these measures of economic outcomes in the state showed signs of weaker growth during calendar year 2015 and the first quarter of 2016, not surprising given the negative signals in the ILII during that time period. However, the monthly ILII is not compared to either state GDP or state personal income because the Bureau of Economic Analysis only releases these series quarterly and often applies major revisions. Rather the ILII is compared, on a monthly basis, to non-farm employment in Iowa, as reported by the Bureau of Labor Statistics. As noted above, that series did not demonstrate weakness during the last 12 months.

Ultimately, the purpose of the ILII is to serve as a tool for forecasting turning points in the Iowa economy to better forecast State revenues. Therefore, it is important to compare historic 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 2015 dollars. Receipts increased in most months during FY

2016. Withholding, a component of individual income tax receipts experienced steady gains throughout the year, driving the overall gains. Sales and use tax receipts also increased over the prior year, although at a rate that was short of half of what had been observed in FY 2015. There were three months of year-over-year drops in revenues, the largest in April which was a result of the individual, corporation, and franchise tax return due date falling on a weekend and thus shifting revenue from April into May this year.

Although State revenue forecasts include all sources of revenue, if the ILII captures turning points in employment, it would be best suited to signal the future direction of taxes most closely associated with employment, 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 2015 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. Individual income

tax revenues continued to grow until April 2016 when final return payments experienced a drop from the prior year. The drop was partly a result of the weekend due date noted above, but the gains in May were not enough to completely offset the decline. Despite this dip in spring 2016, the weakness signaled by the ILII during the May 2015 through March 2016 period was not matched by drops in individual income tax revenue which were at a higher level at the end of the fiscal year than at the beginning.

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. From May 2015 through March 2016, the ILII signaled contraction for 11 consecutive months. In stark contrast to the negative signals from the ILII, the Iowa non-farm employment index has continued to rise for the fifth consecutive year since the Great Recession. Overall, results over the first eight years of ILII reporting 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 and through the duration of the tenth year exposed concerns about the efficacy of the ILII. These concerns are the focus of this year's annual update.

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 the second half of FY 2015 and the first half of FY 2016 the series experienced a dramatic divergence; the LEI demonstrated steady, subtle growth, while the ILII demonstrated steady negative changes during the year.

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 5.9 percent of Iowa GDP in 2015, 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 18.3 percent of GDP and 16.7 percent of total non-farm employment in 2015, 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 10.8 percent of GDP and 8.2 percent of non-farm employment in 2015. The insurance and finance sector is heavily represented in the Iowa stock market index, created as the eighth and final 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.

In contrast to the prior nine years, during fiscal year 2016 the ILII only appeared to coincide with five of the six attributes. During FY 2016, the index demonstrated negative signals in eight consecutive months, and nine in total, while the non-farm employment coincident index experienced increasing growth each month during the year.

During FY 2016, seven of eight components experienced losses (see Table 1). The largest negative contribution was made by the Agriculture Futures Profits Index (AFPI) which accounted for -0.78 points of change in the index between June 2015 and June 2016 and was a negative contributor eight months during FY 2016. The other negative contributors over the fiscal year were the new orders index, national yield spread, Iowa stock market index, diesel fuel consumption, average weekly manufacturing hours, and average weekly unemployment claims (inverted). The only component to show positive change over the year was residential building permits. The Iowa housing market has been experiencing a surge in activity in calendar year 2016. Declines in commodity prices drove the AFPI drops and associated weakness in durable manufacturing related to the agricultural sector contributed to making the new orders index the second largest negative contributor. The AFPI was dragged down by continued declines in corn and soybean expected profits for the first half of the year as well as the continued reversal in 2015 and 2016 of the tremendous increases in hog and cattle profits from 2014. With the majority of components and the ILII showing negative signals while continued positive growth was observed in Iowa employment, the conformity and consistent timing of the ILII come into question. Later analysis will present an analysis of which components were to blame for this divergence from the ideal attributes of a leading indicator.

Currency of the ILII's components proved to be reliable for almost all components during FY 2016. 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. The ILII was revised the following month five times during FY 2016 including the December value as a result of both the BLS benchmarking and an update to crop breakevens released in January. The other times reflected updates to the crop breakevens released in October and revised January average manufacturing hours in February. The fourth revision reflected corrections to the October Iowa stock market value in November and the fifth revision reflected a correction of the weights used in the AFPI implemented in April; neither were an issue with the currency of the component data.

With no changes to the eight components from last year, the economic logic behind inclusion of each component is unchanged and thus economic significance of the components continues to exist. Views about the statistical adequacy of the component data are also unchanged from prior years 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 the AFPI, Iowa stock market index, and diesel fuel consumption, but 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 2016 show the factors for all components will not change much. Four components experienced small declines, with the largest decline being 3.2 percent for AFPI which experienced the largest increase in volatility. The four other components experienced small positive increases. There were no changes in the ranking of the standardization factors among the components. The final standardization factors will be computed after any individual component updates are completed.

With the divergence from consistent timing and conformity, it is critical to determine the sensitivity of the negative signals, measured using the six-month percentage changes in the index and six-month diffusion index values, to each of the eight components. This sensitivity is demonstrated 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 negative territory for the first 11 months of FY 2016 independent of the signal from most components. The analysis suggests the AFPI contributed the bulk of the negative influence on the index. Without the AFPI, the six-month diffusion index for the revised ILII would have been higher but still below 50.0 throughout the entire year but the

[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.

annualized six-month change would have fallen to or below -2.0 percent in only six months during the fiscal year rather than the nine months the ILII signaled contraction.

This sensitivity analysis suggests that the concern about the conformity of the ILII can be directed to a concern about the conformity of the Agriculture Futures Profit Index. The AFPI registered as the largest negative contributor for 11 of the 12 months in FY 2016 and was the determining component for indicating an economic contraction for 3 of the 9 months

Updates for the Tenth Year

Given that seven of the original eight components continued to meet the Moore-Shiskin criteria and no new components were added, the updates were focused solely on the AFPI this year. Three major steps in revising the AFPI as a component were taken to prepare the ILII for FY 2017. The AFPI methodology was revised, crop breakevens annual updates were implemented, and 2015 agriculture receipts were incorporated into shares and weights of the AFPI.

Updates to the Agricultural Futures Profits Index

In June 2016, the Department met with agricultural economics experts to discuss the negative signals in the Iowa Leading Indicators Index during FY 2016 dominated by the Agricultural Futures Profits Index.[3] The discussion resulted in three suggestions:

1. Use a 10-year backward average of the Iowa cash farm income shares to weight the four commodities in the AFPI rather than the most current year. It was suggested this would

[3] The Department would like to extend our gratitude to Dr. Chad Hart, Dr. Dermot Hayes, Ann Johanns, Dr. Lee Schulz, and Dr. Joshua Rosenbloom for meeting with staff to discuss our concerns about how to best capture the leading aspect of the agricultural sector on the overall Iowa economy.

create more stability in the index by reducing the influence of anomalous years when price spikes for one commodity may upset the distribution of income among the commodities.

2. Use the November/ December futures new crop contract for soybeans/corn during the entire year rather than shifting to the July current crop contract each winter. This was suggested because high prices might be realized in the July contract if a drought caused shortages while many farmers have already have sold their crop and so would not benefit from the high prices.

3. Move from using near futures prices less breakevens to measure expected profits for hogs and cattle to ISU's crush margins. It was suggested this would better measure the profits that Iowa livestock farmers expect given that half of hogs are raised on contract or are hedged.

The first step that was implemented in the revisions to the AFPI was adjusting the annual shares used to weight the commodities from just the previous year's share of cash receipts to a 10-year rolling average. This adjustment resulted in the average annual change in each commodity's share to fall from 1.01 percent based on annual fluctuations to only 0.06 percent based on the rolling average; thus, creating less volatility in the weights from year to year. This adjustment also eliminated variation in the ranking of the commodities across the years. Corn consistently has the highest share, maintaining over 30.0 percent of the cash farm income among the four major commodities, followed by hogs, soybeans and cattle over the 17 years of the AFPI calculations. As expected, the 10-year rolling average is less prone to outlier seasons experienced by the commodities and thus creates more stability.

The next adjustment was replacing the July futures current crop contract prices with the November/December futures new crop contract prices for years 1998 through 2015. For example, when the 2015 corn futures new crop contract closed in December 2015, previously July contract future prices for the crop harvested in fall 2015 were gathered during the months of January 2016 through May 2016. Now, December contract futures prices for the crop to be planted in 2016 are gathered beginning in January 2016 and throughout the year. Expected profits continue to be measured as the average monthly futures closing price less a monthly breakeven cost as presented by the Iowa State University Ag Decision Makers website. The price adjustment created only small changes in the historical data because July current crop prices and the November/December new crop prices were not that far off from each other very often, the biggest change was seen in January-May 2013 when the drought pushed up current crop prices for the 2012 harvest compared to the new crop 2013 prices seen during those months. The new crop contracts are slightly less volatile than the current crop prices, resulting in the standard deviations of the two profits series changed from 10.38 cents per bushel to 9.51 cents per bushel for corn and from 19.38 cents per bushel to 18.31 cents per bushel for soybeans.

The most dramatic adjustments in the revisions occurred with the livestock variables. The ISU faculty noted that using futures prices less breakevens for hogs and cattle might overstate expected profits for many Iowa farmers. In particular, they noted that between one-third and one-half of the hogs raised in Iowa are not owned by the farmer raising them. Rather those farmers are paid a set amount per hog per day, and only the owner, often located outside of Iowa, would be reacting to the ups and downs of expected profits that are reflected in the market. Alternatively, livestock farmers that do own the animals often hedge

their contracts, thus they do not react to the ups and downs of expected profits in the market because their profits are already established. Therefore, they recommended using their crush margin series to measure expected profits. The crush margin provides an indicator of return that takes into account only the variables with the greatest price risk. It is also tied to the futures market that can be used to manage price risk for several months before the livestock are sold. The crush margin for hogs is defined by Iowa State University as the value of the hog less the cost of the weaned pig, corn, and soybean meal; and for cattle as the value of the fed steer less the cost of the feeder steer and corn.

Dr. Lee Schulz of Iowa State University provided the current and historical crush margin data. Monthly values representing hog and cattle profitability were calculated as expected crush margins recorded for the month of observation, averaging the expected crush margin for weaned pigs or feeder cattle purchased or placed in the current month and the next 11 months. For example, the values used for January 2016 are the crush margin expected for the January 2016 placement recorded in January 2016 and expected crush margins for placements that will occur in February 2016 the December 2016 recorded in January 2016.

The crush margins were converted from a per head measure to a per pound measure to stay consistent with the current measurement of expected profits per pound used for livestock. The entire series of cattle crush margins were divided by 1,250 and the entire series of hog crush margins were divided by 200. The transformation is based on the assumed live weight of the finished animals underlying the crush margins.

The adaption from the current AFPI measures of expected profits for livestock to the crush margins resulted in significant changes. Using the crush margin methodology narrowed the range on each series compared to the current expected profits methodology. The standard deviation of the two time series from 1999 through 2015 changed from 10.22 cents per pound to 2.74 cents per pound for cattle and from 11.74 cents per pound to 4.52 cents per pound for hogs.

Due to the shift to a 10-year average of the commodity income shares and the introduction of the livestock crush margins as the measure in place of livestock expected profits, the revised version of the AFPI incorporates significantly changed weighting of the four commodity components. Livestock income share weights decreased and crop income share weights increased, while simultaneously the standardization weights of the livestock components increased and crop components decreased.

Along with the move to a 10-year rolling average, the distribution of 2015 cash farm income was incorporated during the update. The AFPI was also updated by incorporating the last 12 months of data in the standardization factors among the four commodities used to weight the index.

Iowa State University extension service prepares breakeven costs for Iowa farmers. In July 2016, the 2016 crop year costs were released and the 2015 crop year costs were updated. The changes were incorporated with the June 2016 report, so no additional changes were necessary during this update. The livestock breakevens, also prepared by Iowa State

University extension, are no longer utilized in the AFPI methodology which relies solely on crush margins to measure expected profits.

Assessment of Update Impacts on the ILII

After revisions and updates to the AFPI for 2016 were completed, the ILII standardization factors for FY 2017 were finalized (see Table 4). Adding another year of data into the calculation of the standardization factors did modify the rank and changed the values of the eight components. The AFPI changes had the most noticeable impact. By adopting the crush margin methodology for the livestock commodities in place of the 12-month backward moving average of expected profits, the month to month changes in the livestock commodity markets are more apparent in the AFPI. The standard deviation of the AFPI increased 14.9 percent resulting in a 13.7 percent drop in its standardization factor and a lowering in its rank to 6th. Unemployment claims, with a 2.8 percent drop in its standard deviation, experienced a 2.0 percent increase in its standardization factor and moved to 5th.

The revision to the AFPI resulted in an average monthly 0.88 point reduction in the level of the ILII, although the impact varied widely across the seventeen years (see Figure 6). The most apparent change is seen between 2011 and 2016, the revised ILII does not reach the highs that were experienced under the old AFPI methodology in 2014 (a high of 109.8 in September 2014 was reduced to 107.7). The monthly change was much less extreme during the time frame of January 2014 through September 2014, going from an average monthly increase of 0.22 percent to 0.12 percent. The monthly change from October 2014 through February 2016 was less extreme as well, going from an average monthly change of -0.25 percent to -0.16 percent.

Historical contraction signals were maintained with the revised AFPI methodology. The ILII indicates contraction signals intermittently for six months between December 2000 and September 2001, and consistently between August 2008 and October 2009 as a forecast of the Great Recession, essentially matching the previous methodology.[4] Where the revised AFPI methodology differs in indicating contraction signals is during the period of May 2015 through March 2016. Under the previous AFPI methodology, the ILII indicated contraction signals for 11 straight months. Under the revised AFPI methodology, the ILII only indicates a contraction signal in the months of August and September 2015.

Clearly, the revision to the AFPI methodology has eliminated the false contraction signals that were observed during the last year. This suggests that with the changes to the AFPI, the ILII is again demonstrating currency and consistent timing.

The revisions to the ILII resulted in an average reduction of 0.4 points for the most recent six months but made only small tweaks to two of the monthly changes (see Tables 5 and 6). The most significant change apparent in the last six months is the annualized percentage change. Previously, in January the annualized six-month percentage change was -3.7 percent; the revised value is -1.7 percent.

For the values of the components during the months of January through June, each component of the AFPI changed as a result of the update (see Tables 7 and 8). The corn and

[4] The revised methodology also indicates contraction signals during the two months of January and February 2007, which as noted above, were not observed at the time that those monthly reports were released.

soybean profits reflect a shift to the November/December 2016 contract rather than the July 2016 contract. The hog and cattle profits reflect the change to crush margins which moved the cattle profits from negative to positive values. Other than the small revision to June average weekly manufacturing hours released with the July 2016 hours, 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 and 2016, the index demonstrated negative signals in 11 months while the non-farm employment coincident index experienced growth each month during the two years. The revisions made to the AFPI tempered the contraction signals from the past year while maintaining the historical signals. Despite the contradictions experienced in FY 2016, the Department has confidence the ILII as modified will provide useful 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 2016

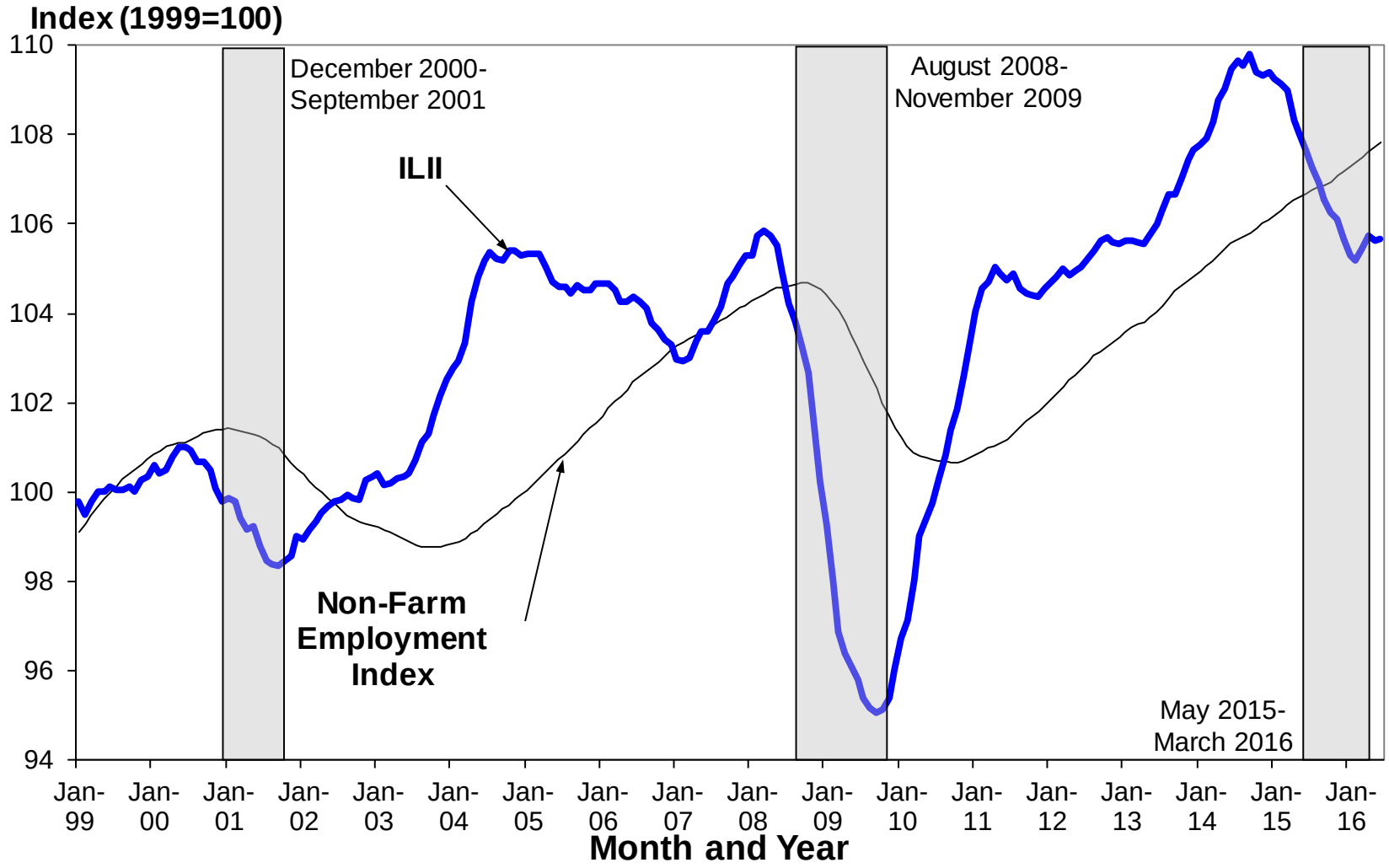

Figure 2. Iowa Leading Indicators Index, Iowa GDP, and Iowa Personal Income: January 1999-June 2016

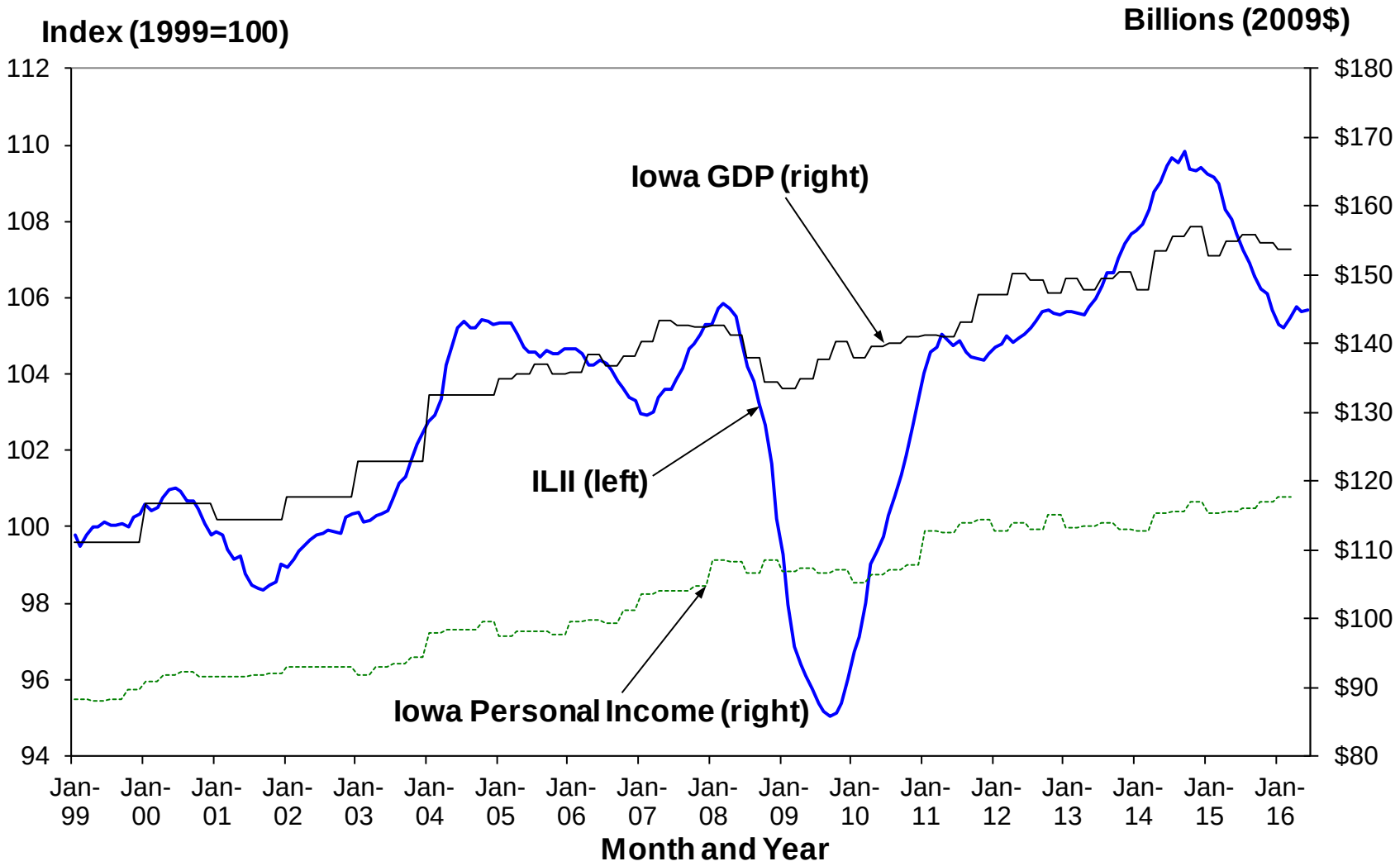

Figure 3. Iowa Leading Indicators Index and Iowa Real Tax Receipts: January 1999-June 2016

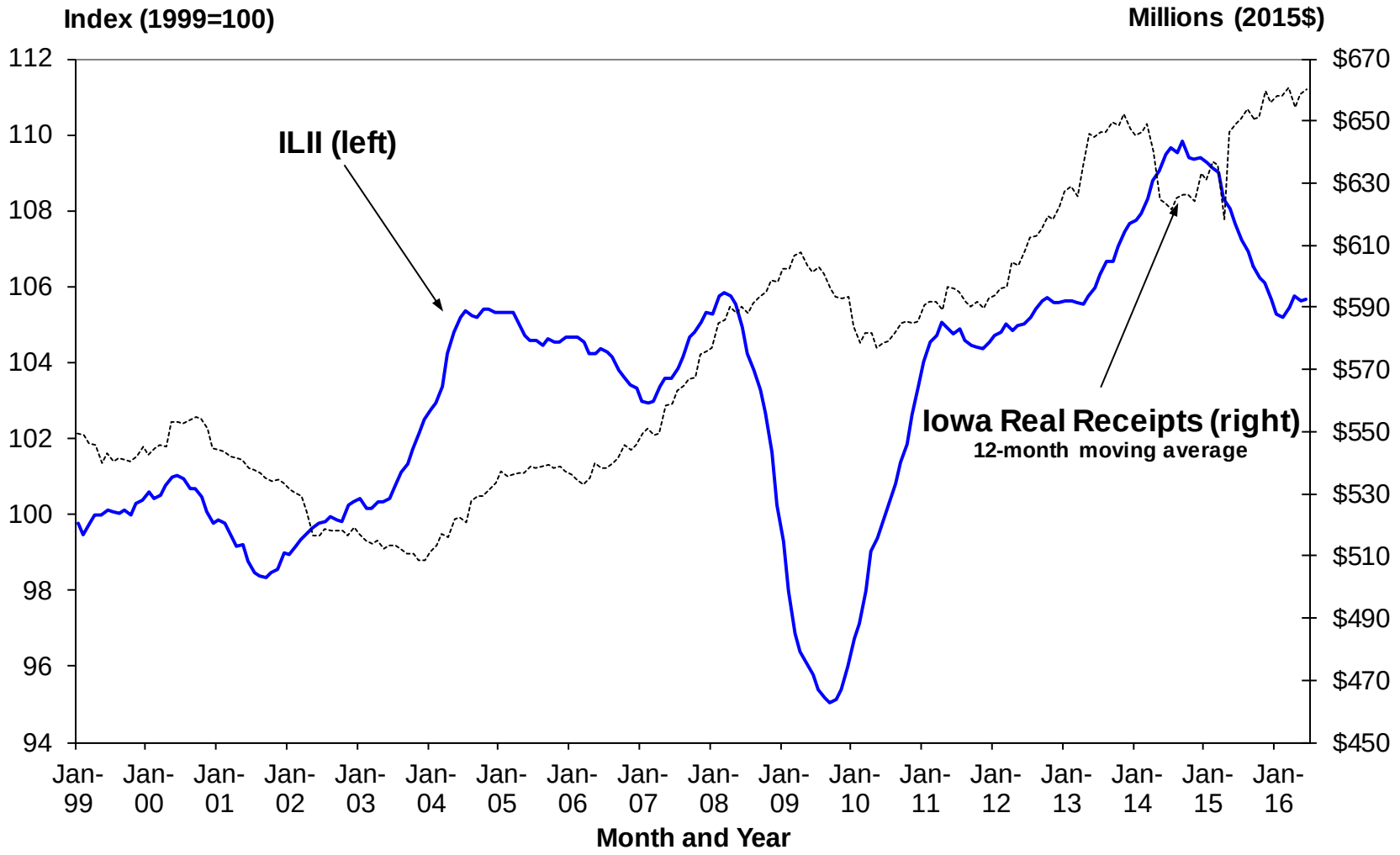

Figure 4. Iowa Leading Indicators Index and Iowa Real Net Individual Income Tax Revenues Index: January 1999-June 2016

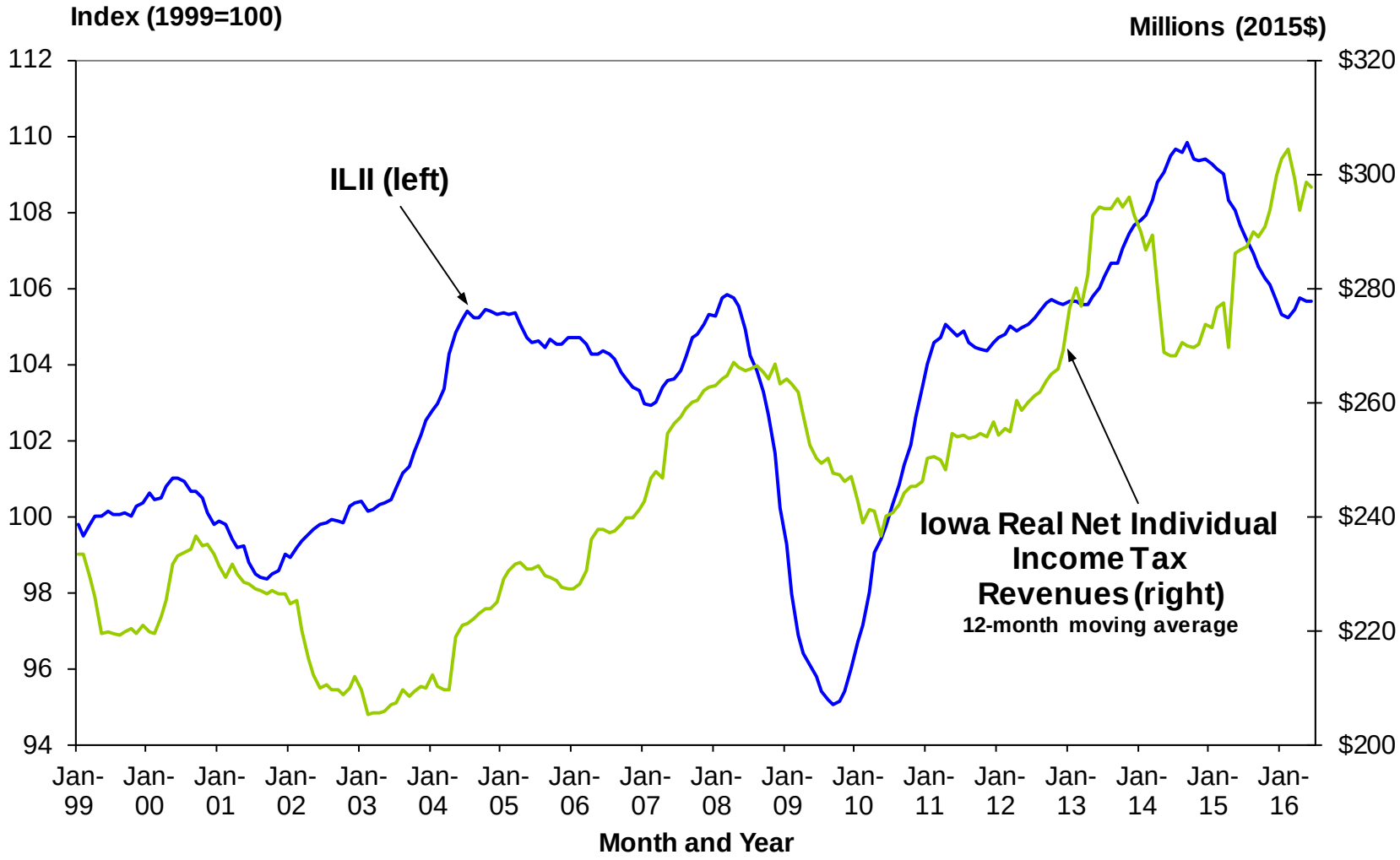

Figure 5. Iowa Leading Indicators Index Compared to U.S. Leading Economic Indicators: January 1999-June 2016

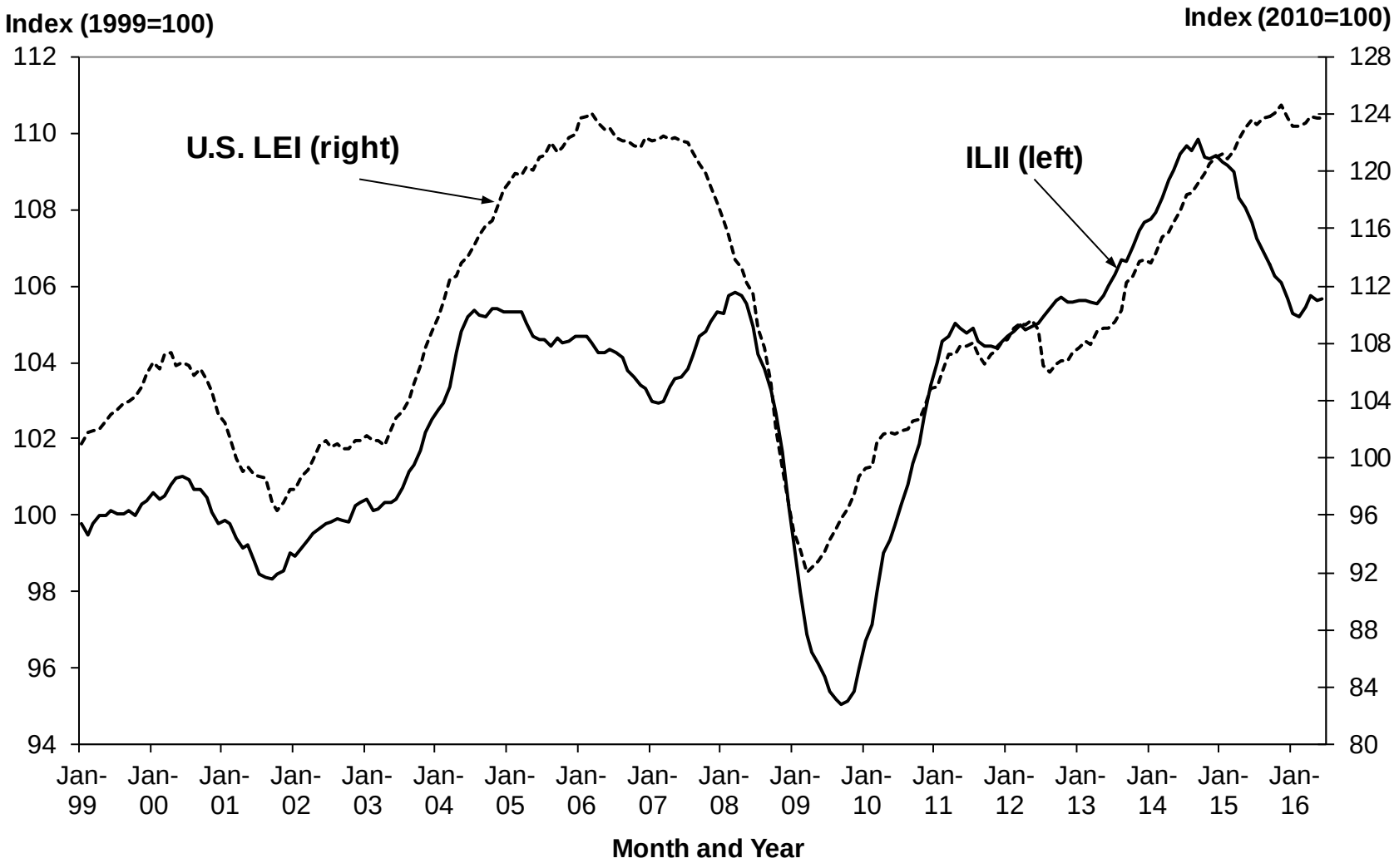

Table 1. Iowa Leading Indicators Index Components: Annual Overview

Component Series Monthly Values[a]		2015 June	2016 June	Contribution to ILII Change
AFPI[b]	↓[c]			-0.78
Corn Profits (cents per bushel)		12.7	35.0	
Soybean Profits (cents per bushel)		115.8	43.5	
Hog Profits (cents per pound)		25.1	19.6	
Cattle Profits (cents per pound)		6.0	-24.3	
Iowa Stock Market Index (10=1984-86)	↓	95.80	83.82	-0.25
Yield Spread (10-year less 3-month)	↓	2.34	1.37	-0.32
Building Permits	↑	881	935	0.20
Average Weekly Unemployment Claims[d]	↓	3,043	3,091	-0.05
Average Weekly Manufacturing Hours	↓	42.0	41.9	-0.06
New Orders Index (percent)	↓	53.6	46.9	-0.42
Diesel Fuel Consumption (mil gallons)	↓	59.02	58.49	-0.17

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 25, 2016

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 March 9, 2016).

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 2016 Data

Leading Indicator	Jul-2015 Standard Deviation	Jul-2016 Standard Deviation	Percent Change in Standard Deviation	Jul-2015 Standardization Factor	Rank	Jul-2016 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Profits Index	2.165	2.208	2.0%	0.039	5	0.038	5	-3.2%
Iowa Stock Market Index	4.495	4.510	0.3%	0.019	8	0.019	8	-1.6%
Yield Spread	0.254	0.249	-1.8%	0.335	1	0.336	1	0.5%
Building Permits	2.541	2.532	-0.4%	0.033	7	0.033	7	-1.0%
Average Weekly Unemployment Claims	2.453	2.385	-2.8%	0.035	6	0.035	6	1.5%
Average Weekly Manufacturing Hours	0.294	0.286	-2.5%	0.289	2	0.293	2	1.2%
New Orders Index	1.340	1.313	-2.0%	0.063	4	0.064	4	0.7%
Diesel Fuel Consumption	0.456	0.460	1.0%	0.186	3	0.182	3	-2.3%

Each data series considers month-to-month changes over January 1999 to June 2015 for July 2015 values and January 1999 to June 2016 for July 2016 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)	-3.7%	-4.1%	-4.5%	-3.8%	-3.6%	-3.7%	-3.7%	-3.2%	-2.1%	-0.9%	-0.9%	0.0%
Diffusion Index	25.0	31.3	12.5	18.8	12.5	12.5	25.0	18.8	25.0	18.8	12.5	43.8
ILII without AFPI												
Percentage Change (Annualized)	-1.5%	-2.0%	-2.6%	-2.1%	-1.9%	-2.1%	-2.3%	-2.0%	-1.1%	-0.2%	-0.7%	-0.2%
Diffusion Index	28.6	35.7	14.3	21.4	14.3	14.3	28.6	21.4	28.6	21.4	14.3	35.7
ILII without Iowa Stock Market												
Percentage Change (Annualized)	-3.6%	-3.8%	-3.9%	-3.4%	-3.5%	-3.5%	-3.1%	-2.8%	-2.1%	-0.8%	-0.6%	0.3%
Diffusion Index	28.6	35.7	14.3	21.4	14.3	14.3	28.6	21.4	28.6	21.4	14.3	50.0
ILII without Average Manufacturing Hours												
Percentage Change (Annualized)	-5.1%	-5.8%	-6.2%	-5.4%	-5.2%	-5.4%	-5.2%	-4.5%	-3.0%	-1.2%	-0.9%	0.4%
Diffusion Index	28.6	28.6	14.3	14.3	0.0	0.0	14.3	14.3	14.3	21.4	14.3	50.0
ILII without Yield Spread												
Percentage Change (Annualized)	-5.9%	-6.3%	-6.8%	-5.8%	-5.4%	-5.2%	-5.0%	-4.2%	-2.5%	-0.9%	-0.7%	0.7%
Diffusion Index	14.3	21.4	0.0	7.1	14.3	14.3	28.6	21.4	28.6	21.4	14.3	50.0
ILII without Diesel Fuel												
Percentage Change (Annualized)	-4.1%	-4.5%	-4.9%	-3.9%	-3.7%	-3.7%	-3.4%	-3.1%	-1.7%	-1.1%	-1.0%	-0.5%
Diffusion Index	28.6	35.7	14.3	21.4	14.3	14.3	28.6	21.4	28.6	14.3	14.3	35.7
ILII without New Orders Index												
Percentage Change (Annualized)	-2.7%	-3.3%	-3.8%	-3.2%	-3.2%	-3.3%	-3.4%	-3.0%	-1.7%	-0.5%	-0.6%	0.3%
Diffusion Index	28.6	35.7	14.3	21.4	14.3	14.3	28.6	21.4	28.6	21.4	14.3	50.0
ILII without Unemployment Claims												
Percentage Change (Annualized)	-3.9%	-4.4%	-4.6%	-3.9%	-3.6%	-3.7%	-3.7%	-3.3%	-2.0%	-0.8%	-0.8%	0.0%
Diffusion Index	14.3	21.4	14.3	21.4	14.3	14.3	28.6	21.4	28.6	21.4	14.3	42.9
ILII without Building Permits												
Percentage Change (Annualized)	-3.6%	-3.9%	-4.1%	-3.8%	-3.4%	-3.5%	-3.9%	-3.4%	-2.6%	-1.9%	-1.6%	-0.7%
Diffusion Index	28.6	35.7	14.3	21.4	14.3	14.3	14.3	7.1	14.3	7.1	0.0	35.7

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 30, 2016 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 2016 Data and All Updates

Leading Indicator	Jul-2015 Standard Deviation	Jul-2016 Standard Deviation	Percent Change in Standard Deviation	Jul-2015 Standardization Factor	Rank	Jul-2016 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Profits Index	2.165	2.488	14.9%	0.039	5	0.034	6	-13.7%
Iowa Stock Market Index	4.495	4.510	0.3%	0.019	8	0.019	8	-1.2%
Yield Spread	0.254	0.249	-1.8%	0.335	1	0.338	1	0.9%
Building Permits	2.541	2.532	-0.4%	0.033	7	0.033	7	-0.5%
Average Weekly Unemployment Claims	2.453	2.385	-2.8%	0.035	6	0.035	5	2.0%
Average Weekly Manufacturing Hours	0.294	0.286	-2.5%	0.289	2	0.294	2	1.6%
New Orders Index	1.340	1.313	-2.0%	0.063	4	0.064	4	1.1%
Diesel Fuel Consumption	0.456	0.460	1.0%	0.186	3	0.183	3	-1.9%

Each data series considers month-to-month changes over January 1999 to June 2015 for July 2015 values and January 1999 to June 2016 for July 2016 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 2016 and Update for FY 2017: January 1999-June 2016

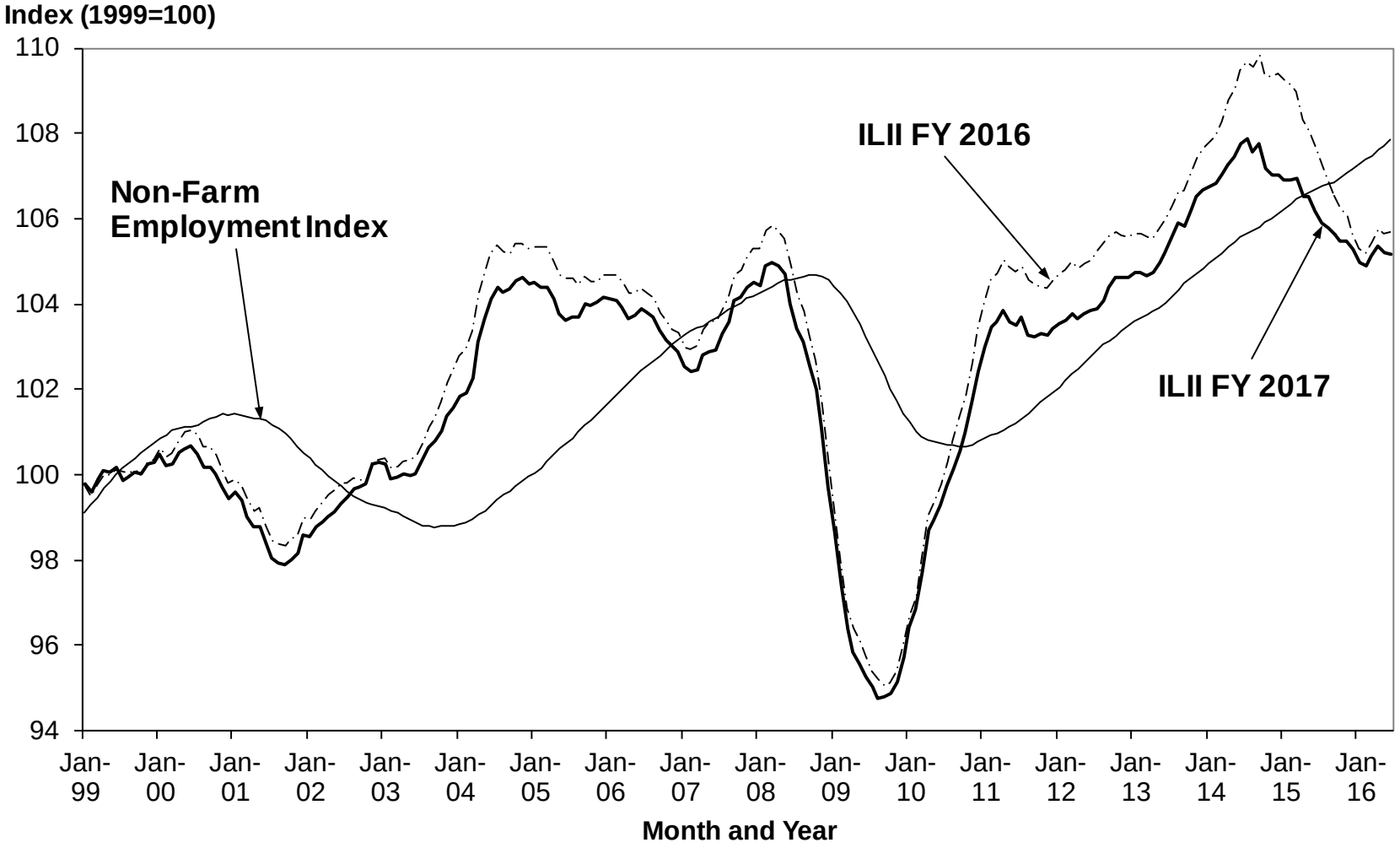

Table 5. Iowa Leading Indicators Index: Six Month Overview for June 2016 Prior to the FY 2017 Annual Update

Monthly Values	2016 Jan	Feb	Mar	Apr	May	Jun
ILII	105.3	105.2	105.5	105.8	105.6	105.7
Percentage Change[a]	-0.4%	-0.1%	0.2%	0.3%	-0.1%	0.0%
Diffusion Index[b]	25.0	50.0	68.8	43.8	31.3	50.0

Six-Month Values	Jul to Jan	Aug to Feb	Sept to Mar	Oct to Apr	Nov to May	Dec to Jun
ILII						
Percentage Change	-1.8%	-1.6%	-1.0%	-0.5%	-0.4%	0.0%
Annualized Percentage Change	-3.7%	-3.2%	-2.1%	-0.9%	-0.9%	0.0%
Diffusion Index	25.0	18.8	25.0	18.8	12.5	43.8

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 27, 2016.
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 2016 After the FY 2017 Annual Update

Monthly Values	2016 Jan	Feb	Mar	Apr	May	Jun
ILII	105.0	104.9	105.1	105.3	105.2	105.2
Percentage Change[a]	-0.3%	-0.1%	0.2%	0.2%	-0.1%	0.0%
Diffusion Index[b]	37.5	50.0	68.8	31.3	31.3	50.0

Six-Month Values	Jul to Jan	Aug to Feb	Sept to Mar	Oct to Apr	Nov to May	Dec to Jun
ILII						
Percentage Change	-0.9%	-0.9%	-0.5%	-0.1%	-0.2%	-0.1%
Annualized Percentage Change	-1.7%	-1.7%	-1.0%	-0.3%	-0.5%	-0.2%
Diffusion Index	37.5	31.3	37.5	18.8	25.0	43.8

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 31, 2016.
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 2016 Prior to the FY 2017 Annual Update

Component Series Monthly Values[a]		2016 Jan	Feb	Mar	Apr	May	Jun
AFPI[b]	↑[c]						
Corn Profits (cents per bushel)		27.9	27.4	27.0	28.3	32.5	35.0
Soybean Profits (cents per bushel)		41.0	30.7	23.2	22.8	31.5	43.5
Hog Profits (cents per pound)		13.9	15.2	16.7	17.9	18.6	19.6
Cattle Profits (cents per pound)		-21.2	-23.0	-23.9	-24.9	-24.8	-24.3
Iowa Stock Market Index (10=1984-86)	↓	80.87	80.15	84.20	83.71	84.25	83.82
Yield Spread (10-year less 3-month)	↓	1.83	1.47	1.59	1.58	1.53	1.37
Residential Building Permits	↑	878	878	905	950	929	935
Average Weekly Unemployment Claims[d]	↑	3,084	3,075	3,098	3,103	3,113	3,091
Average Weekly Manufacturing Hours	↓	42.04	42.04	42.03	41.99	41.93	41.89
New Orders Index (percent)	↓	48.4	48.6	48.1	47.7	47.6	46.9
Diesel Fuel Consumption (mil gallons)	↑	57.61	57.72	57.88	58.40	58.33	58.49

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 27, 2016.
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 May 26, 2016).
c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.
d. Changes in average weekly initial unemployment insurance 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 2016 After the FY 2017 Annual Update

Component Series Monthly Values[a]		2016 Jan	Feb	Mar	Apr	May	Jun
AFPI[b]	↑[c]						
Corn Profits (cents per bushel)		45.6	46.3	47.0	48.8	53.5	58.6
Soybean Profits (cents per bushel)		70.0	67.1	66.8	72.2	85.9	104.9
Hog Profits (cents per pound)		21.1	20.7	21.2	19.5	18.3	16.6
Cattle Profits (cents per pound)		9.9	10.0	9.7	8.8	11.2	11.2
Iowa Stock Market Index (10=1984-86)	↓	80.87	80.15	84.20	83.71	84.25	83.82
Yield Spread (10-year less 3-month)	↓	1.83	1.47	1.59	1.58	1.53	1.37
Residential Building Permits	↑	878	878	905	950	929	935
Average Weekly Unemployment Claims[d]	↑	3,084	3,075	3,098	3,103	3,113	3,091
Average Weekly Manufacturing Hours	↓	42.04	42.04	42.03	41.99	41.93	41.88
New Orders Index (percent)	↓	48.4	48.6	48.1	47.7	47.6	46.9
Diesel Fuel Consumption (mil gallons)	↑	57.61	57.72	57.88	58.40	58.33	58.49

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 31, 2016.
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 31, 2016).
c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.
d. Changes in average weekly initial unemployment insurance 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*(current month value – last month value)/(current month value + 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 + month one ILII change)/(200 - 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 2016