

Iowa Leading Indicators Index: Fourth 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 2007 and posted the reports on the IDR Web site (<http://www.state.ia.us/tax/taxlaw/econindicators.html>). The ILII, signaling a coming recession in August 2008, successfully forecasted the contraction in Iowa employment experienced between November 2008 and May 2010. Likewise, the negative signals from the ILII were followed by a 3.1 percent drop in State revenues during FY 2010.

Annually the Department assesses how well the ILII has met the goals behind its development, gauges the validity of the existing components, considers any additional components that may have been suggested, and carries out the necessary annual updates. This paper documents the fourth 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 2010

The ILII experienced drops during the first three months of fiscal year 2010, falling from 95.3 in July 2009 to 94.5 in September 2009, ending an unprecedented drop from a peak of 107.5 in March 2008 (see Figure 1). The index then turned and started a steep nine-month climb upwards, reaching 100.6 in June 2010. In November 2009, the index moved out of recession-signal territory, based on the six-

month annualized change in the index and the six-month diffusion value, where it had been mired since August 2008.¹ However, it was not until June 2010 that the non-farm employment coincident index, the 12-month moving average of non-seasonally adjusted, non-farm employment, showed a sign of ending its 19 month streak of declines with a flat reading.

With 2009 state gross domestic product (GDP) slated for release in November 2010, it is unknown at this time whether that measure of Iowa economic activity will follow employment downward in 2009, but personal income and State revenues did experience a significant dip. GDP for the state experienced steady growth in the two prior years, increasing a real 4.4 percent in 2007 and 2.2 percent in 2008 (see Figure 2). Real personal income in Iowa increased an average of 3.1 percent in 2007 and 1.6 percent in 2008, but decreased 1.3 percent in 2009 (see Figure 2). State revenues, measured using 12-month moving averages and adjusted using the Consumer Price Index (CPI) to 2009 dollars, fell steadily throughout fiscal year 2010 with all sources of revenue experiencing declines except tobacco taxes (see Figure 3).

Net individual income tax revenues, a revenue stream that more directly relates to Iowa employment, are plotted against the ILII to demonstrate the ability of the index to signal the direction of State revenues (see Figure 4). Net individual income tax revenues are a 12-month moving average of withholding plus estimates plus final return payments minus refunds, all adjusted to 2009 dollars using the CPI. Note that individual income taxes comprise over 50 percent of total State revenues. The initial drop in individual income tax revenues in 1999 reflects the individual income tax cut

¹ These recession-signal metrics are based on analysis from The Conference Board, whose techniques for constructing a leading indicators index were used to create the ILII. 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.

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. During fiscal year 2010, individual income tax receipts accounted for 53 percent of the overall 2.7 percent drop in receipts while individual income tax refunds were smaller than fiscal year 2009.

The main goal for the Iowa Leading Indicators Index is to serve as an additional tool in 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, catching up with the slowing national economy and presaging the slowing tax revenues in 2009. The index continued to show weakening signs for the economy, bottoming out in September 2009. For the remaining nine months in fiscal year 2010, the index recovered, moving out of recession signal territory in November, suggesting that the Iowa economy should start seeing employment gains by mid to late summer. Results over the past two years suggest that the ILII has indeed proved to be a helpful tool in predicting a turning point in Iowa non-farm employment.

Validity of Existing Components

When the 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. Such components include 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 6.4 percent of

Iowa gross domestic product (GDP) in 2008, bolstered by the growing bio-energy sector and increases in commodity prices. 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 20.8 percent of GDP and 14.9 percent of non-farm employment in 2008, although manufacturing employment fell to 13.8 percent of non-farm employment in 2009. 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 transport of agricultural commodities. The finance sector accounted for 10.5 percent of GDP and 6.7 percent of non-farm employment in 2008, inching up to 6.9 percent in 2009. The 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. It is useful to annually consider if the index and all of the individual components continue to display these same attributes:

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.

Iowa economic activity continued its slowdown during the first half of fiscal year 2010 but exhibited signs of a recovery during the second half. The ILII continued to record drops during the first three months of fiscal year 2010, although slowing from the steep declines seen during the middle of the prior year. In October, the index moved into positive territory for the first time in 18 months, and by November, the index no longer was signaling recession with the annualized six-month changes moving above -2.0 percent and the six-month diffusion index reaching 50.0. The positive monthly signals continued and gained strength, with a 1.0 percent gain in March and a 1.2 percent gain in April when all eight components contributed positively. The gains slowed in May and June, but still continued to signal that employment gains are to be expected in the near future.

In line with the recession signals from the ILII during the prior six to nine months, state non-farm employment fell an average of 0.3 percent monthly during the first half of FY 2010. Beginning in January 2010, the declines in non-farm employment began to taper off, with no change in employment during June 2010, a hopeful sign that gains in employment are looming. Likewise, State revenues fell 2.7 percent during FY 2010, although the final quarter of the fiscal year showed signs of growth in individual estimate payments, sales and use receipts, and corporate estimate payments. Therefore, it appears the ILII demonstrated conformity with the current business cycle.

During FY 2010, five of eight components experienced gains, each contributing to the recovery in the ILII (see Table 1). The largest contribution was made by the new orders index which rose from 34.6 in June 2009 to 64.2 in June 2009. Another large positive contribution was made by average weekly manufacturing hours which rose from 38.4, below full time, to 40.4. While unemployment insurance claims and new residential building permits also contributed positively to the index over the year, the levels of those components have not returned to historical levels, suggesting that weakness remains in

the labor market and housing sector, despite gains from the depths of the recession in mid-2009. The agricultural sector continued to contribute negatively to the index as grain prices continued to fall from 2008 highs while high input costs remained. The national yield spread and diesel fuel consumption were also negative contributors, reflecting the continued weakness in the national economy. Thus although the components moved in different directions, the individual signals representing different sectors of the economy appeared to conform to the current stage of the business cycle – moving into recovery.

A similar conclusion can be drawn regarding the consistent timing of the components and index after FY 2010. The additional year of data confirmed prior views that the components and index exhibit a consistent timing pattern as a leading indicator of future economic activity, where the indicators signaled an end to the contraction in employment, beginning in December 2009, seven months prior to the first flat month for employment in June 2010.

Currency of the ILII's components proved to be very reliable during FY 2009. All 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. During FY 2010, only one month, October 2009, experienced any revision to the level of the index, increasing 0.1 percent in the November report. The October revision reflected positive revisions to the break-even series for corn and soybeans offsetting a downward revision in manufacturing hours.

It was necessary to make a revision to the construction of the agricultural futures profits index during the year. In January, the break-even series for hogs was changed from a 50 pound feeder pig series to

a 12 pound weaned pig series. The change was necessary because Dr. John Lawrence at Iowa State University discontinued the former series beginning in January 2010. The series was discontinued because the industry has moved from trading 40-50 pound pigs to trading weaned pigs because of concerns about animal health and changes in business structure. Unfortunately, the 12 pound weaned pig series is only available from January 2007 forward, so the 50 pound feeder pig series was kept as the break-even series prior to that date. The impact of this change on the ILII was at most a 0.1 percentage point change in any month over the history of the index.

Nothing in the past twelve months has changed previously stated opinions about the economic significance of the eight components. The majority of the components moved from negative to positive contributors during the year, reflecting the move from recession into recovery that occurred in the state. The only exception was the yield spread which contributed negatively in three of the last five months during the year, reflecting the shifting expectations about inflation and efforts by the Federal Reserve to keep interest rates near zero to boost the economy.

Views about the statistical adequacy of the data are likewise unchanged for the components as sources for all the data series continue to be reliable. Tracking the stock value for the companies in the stock market index required watching the news to monitor the progress of two mergers of companies in the stock index with publicly-traded companies not in the index. Both companies stopped trading under the existing ticker symbol, so data were adjusted to account for price movements of the purchasing company once the merger was complete.²

² Percentage changes in the share price of the purchasing company were calculated from the date of the merger and applied to the price of the original company at the date of the merger. Shares outstanding for the original company were fixed at the most recent value available. Then the valuation of the original company was calculated by multiplying the price by total shares outstanding, as is done for all the companies in the index.

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 for all but the yield spread using 12-month moving averages) increased for seven of eight components as the economy continued to experience volatility (see Table 2). The largest increase, 15.0 percent, was observed for average weekly manufacturing hours which plummeted to 38.3 in September 2009, the lowest value for the 12-month moving average of the series since January 1999, then rose to 40.4 by June 2010. This volatility bumped manufacturing hours from its perch as least volatile series for the first time since the inception of the index. The next largest change was 12.8 percent observed for the new orders index which increased throughout the year after logging its lowest historical value for the 12-month moving average at the end of FY 2009. All other components experienced less than a ten percent change in volatility while the national yield spread actually experienced a decrease in volatility as both long-term and short-term rates remained near historical lows. Recall that 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.

Another method for assessing the ILII and its components is to consider the sensitivity of the overall index to the exclusion of each separate component (see Figure 5). Each panel in the figure presents the non-farm employment coincident index and ILII as seen in Figure 1, with an additional series, the dotted line, showing what the path of the ILII would have been if the listed component were not included in the index. For example, Panel B indicates that the ILII would have had lower values in the last year if the Iowa stock market index was not one of the components. Conversely, Panel D indicates that the ILII would have had higher values over the last year if building permits was not one of the components. The impacts of the stock market and building permits on the ILII are expected, but less obvious are the large impacts from average manufacturing hours, Panel F, and diesel fuel consumption,

Panel H. Although these indicators did have a distinct and consistent impact on the index over the past year, pulling down the index in the case of manufacturing hours and pushing up the index in the case of diesel fuel, the large change in the level of the index when either indicator is dropped reflects their high standardization weights. Because both of the series have relatively low volatility, their standardization weight is larger. Removing either indicator shifts a share of its large weight onto the remaining indicators (the sum of the standardization weights must equal one), thus having a significant impact on the level of the index.

An additional way to consider sensitivity is to focus on six-month percentage changes in the index and six-month diffusion index values (see Table 3). The Conference Board, who publishes the National Leading Economic Indicators after which the ILII was modeled, identifies a contraction signal as the point when the annualized six-month percentage change declines by over two percent and the six-month diffusion index falls below 50.0. The ILII was deep into this territory at the start of FY 2010, with an annualized six-month change of -10.2 percent and a six-month diffusion index of 12.5. No single component was responsible for the bleak outlook as the index values were similar with any seven of the eight components. The index slipped out of contraction signal territory in December. Without the AFPI or diesel fuel, the end of the contraction signal would have appeared as early as November. Without the new orders index, the end of the contraction signal would not have been realized until January. With just a one or two month change in the signal's timing, it does not appear that any one component drove the index to signal the end of the contraction. In January through July 2010, the ILII gained strength, signaling recovery in employment, regardless of whether any one component was removed from the index.

Changes and Additions to ILII Components

During the past year, no new series were suggested as possible components for the ILII but concerns were raised that by choosing to use a 12-month moving average for seven of the eight ILII components rather than seasonally-adjusted series, the ability of the index to provide a leading signal was reduced. This is a result of effectively using data that is almost one year old to look for leading signals. Although the index did provide a signal of a coming recession, that signal was only seen three months prior to the first drop in the non-seasonally adjusted total non-farm employment index. Would it be possible to increase the lead time of that signal by moving to seasonally-adjusted series without compromising the ILII's current record of signaling turning points?

Eight of the ten component series used in the National Leading Indicators Index are seasonally-adjusted data: average weekly manufacturing hours, average weekly initial unemployment insurance claims, manufacturers' new orders for consumer goods and materials, manufacturers' new orders for nondefense capital goods, new residential building permits, diffusion index for vendor deliveries, money supply, and index of consumer expectations. The remaining two series are not seasonally-adjusted: S& P 500 stock index and the yield spread. The Conference Board is able to use series that are seasonally adjusted by the agency responsible for the data, such as Bureau of Labor Statistics, the Census Bureau, or the Federal Reserve. Unfortunately, none of the eight component series used in the ILII are available in a seasonally-adjusted format. Thus, during the development of the ILII, it was decided that seasonality would be addressed by using the 12-month backward moving averages for all Iowa-based series. (Recall that the national yield spread series is not a moving average.)

The first step in addressing concerns about this decision is to reassess whether all seven Iowa-based series include seasonality. By plotting the monthly values of each of the series, six of the seven

contained obvious seasonality: average weekly hours, building permits, new orders index, unemployment insurance claims, the AFPI, and diesel fuel consumption. The Iowa stock market index, however, did not exhibit signs of seasonality. Therefore, that series was changed to the straight monthly series (see Figure 6). This matches the Conference Board's use of the S & P 500 series with no seasonal adjustment. The change in the treatment of the Iowa stock market index reduced the magnitude of the peak prior to the recent recession, but did little to change the steepness of the fall and recovery. The ILII's signal for the 2000-2001 recession was improved by the change, however. The largest impact of this change was on the standardization factor for the Iowa stock market index. Moving from the 12-month moving average to the monthly series increased the volatility of the component by over 280 percent and reduced its standardization factor by 71 percent (see Table 4). With the lower weight, monthly changes in the index will have a lower impact on the ILII than comparable changes in the 12-month index, although those changes will be more timely with a focus on investors' opinions today compared to the previous month rather than the previous year.

The next step was to test the impact on the ILII of moving from 12-month moving averages for the remaining six component series. Seasonally adjusted series were calculated for each of these six series plus non-farm employment, and the changes in the seasonally-adjusted series were used to compute the monthly movements in the ILII over its eleven and a half year history.³ Although seasonal adjustment removes some of the movements in the series within the year, the resulting series are still much more volatile than a 12-month moving average. Not surprisingly, using these seasonally-adjusted series as the components for the ILII substantially increased the volatility of the index (see Figure 7). With this volatility, the frequency with which the ILII meets the criteria of a recession signal increases. The recession signal for the 2000-2001 recession is pushed back to November 2000 from July 2001 which

³ Seasonally-adjusted series were computed in SAS using the U.S. Census Bureau X-12-Arima method.

suggests the seasonally-adjusted series would have been able to provide more of a lead for signaling that recession. However, the change had no impact on the timing of the recession signal in 2008. Most troubling, false recession signals are seen in October 2002, September 2004 through January 2005, July 2005 through October 2005, March 2006 through April 2006, and July 2006. These numerous false signals weaken the usefulness of the ILII, and are sufficient reason to refrain from making the change to seasonally-adjusted series.

Updates for the Fourth Year

Given that the original eight components continue to meet the Moore-Shiskin criteria while no new series were considered, the steps required to prepare the ILII for FY 2011 was an update to the Iowa stock market index to account for business changes that occurred during the last year and the annual update to the AFPI incorporating the most recent cash income data.

Updates to the Iowa Stock Market Index

During fiscal year 2010, two companies in the Iowa stock market index were purchased by existing publicly-traded companies. At the time, the valuation for the original company was adjusted based on changes in the valuation of the purchasing company. However, as part of the annual update, the original companies' series were replaced with the historical series of the purchasing companies.

Terra Industries Inc., (TRA) a fertilizer manufacturer headquartered in Sioux City, merged with CF Industries Holdings Inc., a fertilizer manufacturer headquartered in Deerfield, Illinois, with the merger finalized on April 15, 2010. Terra Industries became a wholly-owned subsidiary of CF Industries, trading under the CF ticker symbol on the New York Stock Exchange. Because it is believed the new company will maintain a major presence in Iowa, and given the importance of fertilizer to the Iowa

agricultural economy, it was decided that CF Industries should replace Terra Industries in the Iowa stock market index. Because CF Industries only became a publicly-traded company in 2005, while Terra Industries has been publicly-traded since the inception of the Iowa stock market index, the historic valuation of Terra Industries was used prior to the availability of CF Industries valuations in computing the index.⁴ At the time of the merger, CF Industries issued 22 million additional shares, significantly increasing the value of the company.

Iowa Telecommunications Services, Inc., (IWA) a telecommunications company headquartered in Newton, was acquired by Windstream Corporation, a telecommunications company headquartered in Little Rock, Arkansas, with the acquisition finalized on May 28, 2010. Windstream trades under the WIN ticker symbol on the New York Stock Exchange. Because Windstream continues to offer telecommunications services to a large part of Central Iowa, it was decided that the company should replace Iowa Telecom in the Iowa Stock Market Index. Windstream became a publicly-traded company in February 2005, only four months after Iowa Telecom became publicly-traded company. Although not providing a lot of additional history, to be consistent, the valuation of Iowa Telecom was appended to the history of Windstream.⁴ At the time of the merger, Windstream issued 26.7 million additional shares, increasing the value of the company.

Replacing TRA with CF and IWA with WIN in the Iowa Stock Market Index increased the value of the index between 0.75 and 2.00 points each month starting in 2006 reflecting the fact that the valuation of the merged companies exceeds those of the original companies. However, the impact on the ILII was less than 0.1 percentage point in each month.

⁴ This was possible because the historical valuation of the original company was of similar magnitude as the valuation of the purchasing company at the time the latter became publicly-traded.

Updates to the AFPI

The Agricultural Futures Profits Index requires annual updates to the index to account for newly available data on the distribution of cash farm income 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.

In the fall, cash farm income numbers for the previous calendar year are reported by the Economic Research Service of the U.S. Department of Agriculture and subsequently published in the Iowa Agricultural Statistics Bulletin produced by the Iowa office of the National Agricultural Statistics Service. The distribution of total farm income credited to the four commodities included in the AFPI is used to weight the four commodity profits within the index. With the release of the 2009 cash farm income, all AFPI values for January 2009 and later were updated to reflect the distribution of Iowa farm income for calendar 2009. In 2009, total cash farm income for Iowa fell 10.3 percent as prices for most commodities fell from the highs seen in 2008. Total corn income fell 13.3 percent, hog income fell 6.9 percent and cattle income fell 14.3 percent compared to 2008. Conversely, soybean income rose 4.7 percent with strong production gains outweighing the drop in prices. In response to these changes, the distribution of income between the four commodities changed. The income share of corn dropped from 43.8 percent to 40.7 while the income share of soybeans rose from 21.7 to 23.2. The hog share rose from 21.5 to 23.2 percent and the cattle share dropped from 13.0 to 12.9 percent. In addition, the USDA made minor revisions to 2007 income numbers but some significant changes to 2008 income, lowering total crop and livestock income by 5.4 percent and shifting the distribution from crop income to livestock income. The changes were enough to lower the ILII for June 2008 through December 2008 by 0.1 percent.⁵

⁵ The AFPI also uses standardization factors to equalize the volatility among the four commodities. The standardization factors, computed as the inverse of the standard deviation of the monthly changes in each of the four series, decreased for

As a result of the change to the AFPI and updates to the standardization factors for all series, the historical values of the ILII and several of the components will change in the July 2010 report. These changes can be seen by comparing the index levels, percentage changes, and diffusion index values (see Tables 5 and 7). The level of the index is lower with the change from the 12-month moving average to the monthly series for the Iowa stock market index and the monthly changes in the index are smaller over the last six months. While the index rose 6.1 points between the September 2009 trough peak and June 2010 under the FY 2010 configuration, the rise is only 4.7 points under the FY 2011 configuration. The smaller monthly declines in the index also lower the magnitude of the six-month changes in the index, although the emergence out of the contraction signal still occurred in December 2009.

For the values of the components themselves, the largest change is the value of the Iowa stock market index where the 12-month moving average has been replaced with the monthly series (see Tables 6 and 8). Partly because the low months of late 2009 are no longer part of the stock market value and partly because the valuation of the two purchasing companies exceeded the valuation of the original companies, the index values are higher. The updates made to the AFPI do not change the underlying profitability measures for each of the four commodities, but do change the value of the AFPI itself. Those values, which were added to the tables in italics, are higher after the update reflecting the higher weight for 2009 and later on the more profitable soybeans.

corn and rose for soybeans, hogs, and cattle. Because only one set of factors is used to calculate the full history of the series, this update caused small changes in all AFPI values.

Conclusions

The Iowa Leading Indicators Index is a work in progress. However, after four years, it appears that the ILII can provide guidance in predicting the direction of Iowa non-farm employment. The additional year of data and close observation of the eight component series suggested only one change was needed. Because the Iowa stock market index does not display strong seasonal variation, it is no longer considered as a 12-month moving average. This change reduced the peak of the ILII during 2008 and decreased the magnitude of the last six months of upward movements in the ILII. The timing of the start and end of the recent contraction signal, August 2008 through November 2009, was unchanged.

With the success of the ILII in providing a leading contraction signal, 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 in the State.

Figure 1. Iowa Leading Indicators Index and Iowa Non-Farm Employment Coincident Index: January 1999-June 2010

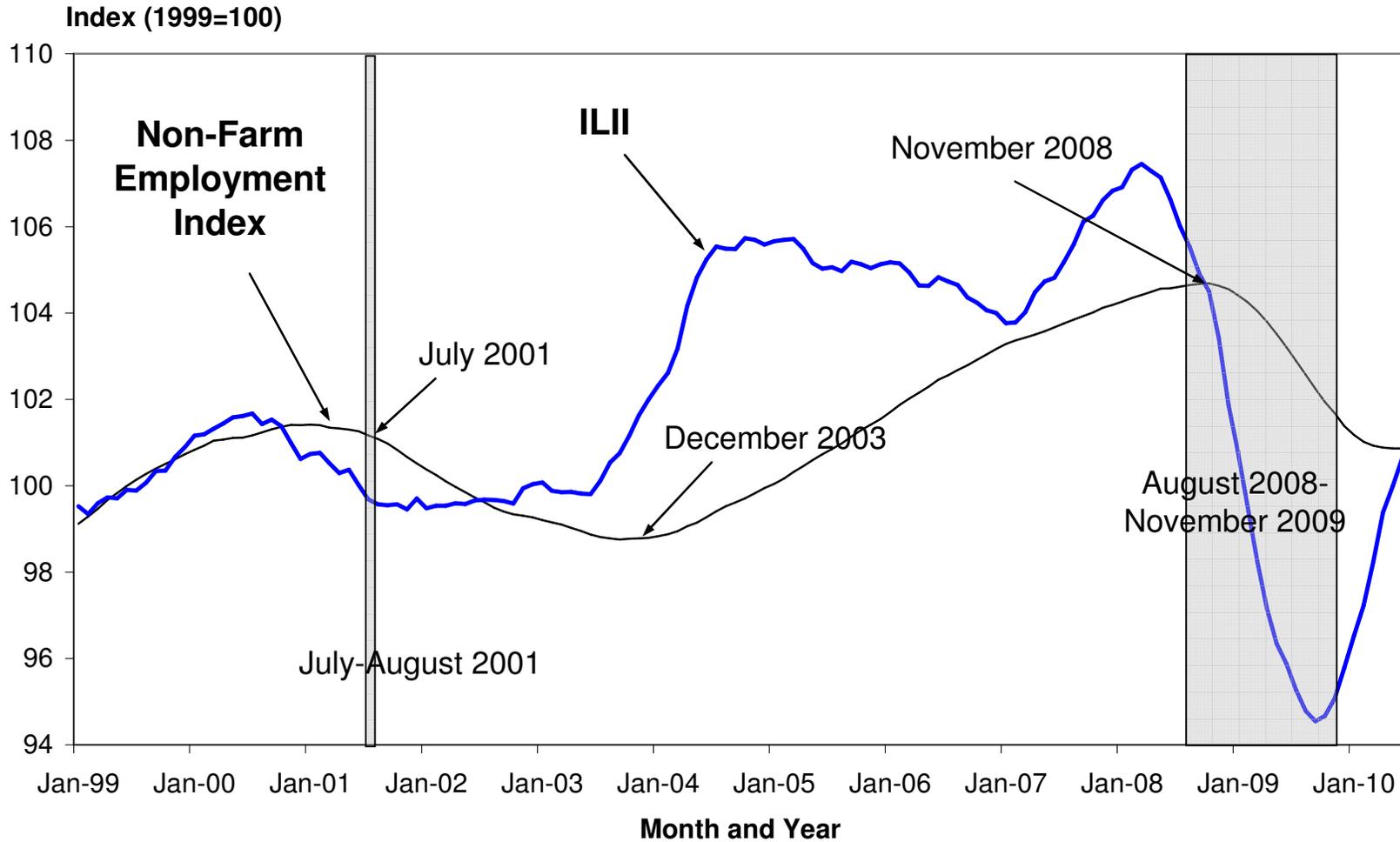
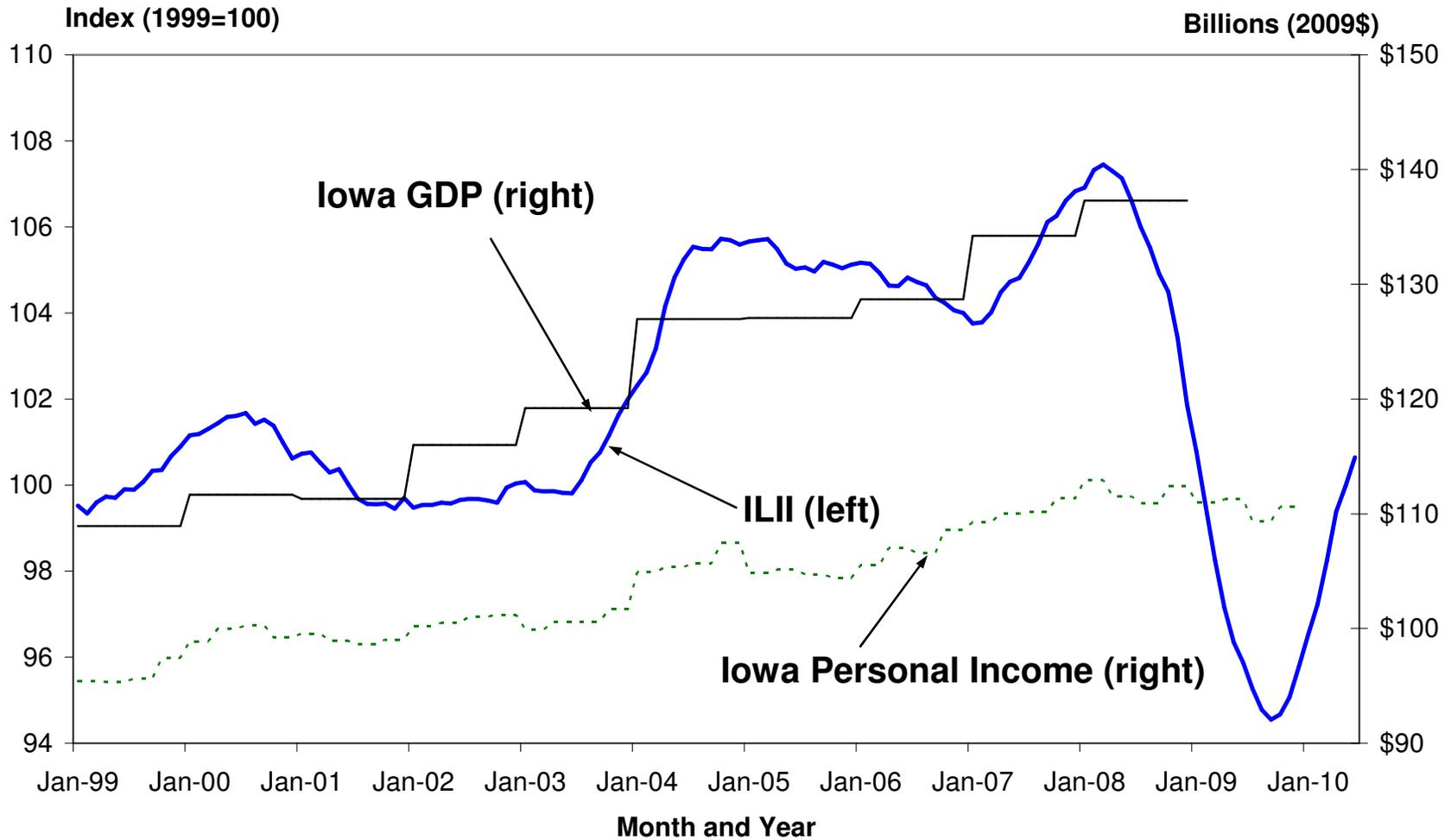


Figure 2. Iowa Leading Indicators Index, Iowa GDP, and Iowa Personal Income: January 1999-June 2010



**Figure 3. Iowa Leading Indicators Index and Iowa Real Tax Revenues:
January 1999-June 2010**

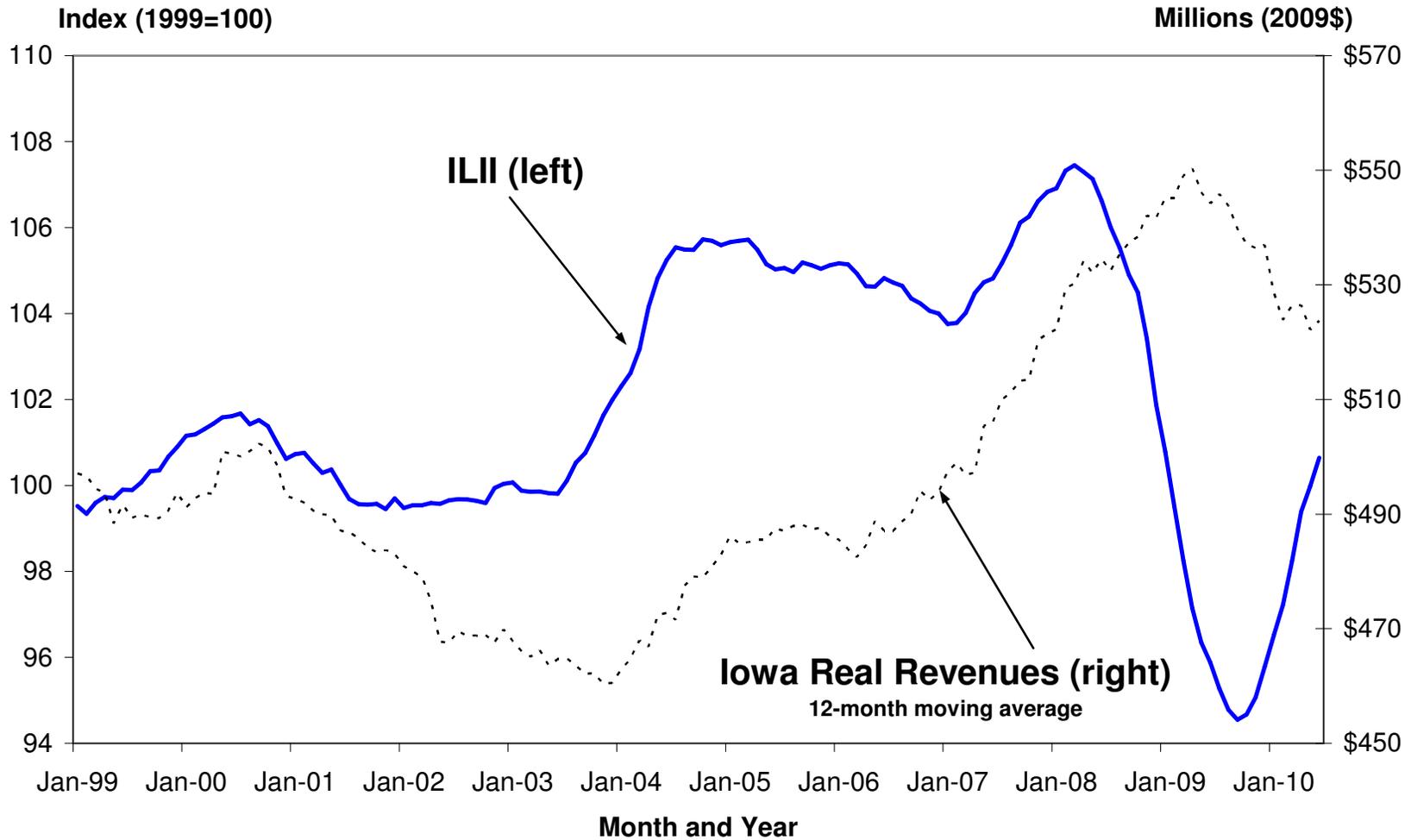


Figure 4. Iowa Leading Indicators Index and Iowa Real Net Individual Income Tax Revenues Index: January 1999-June 2010

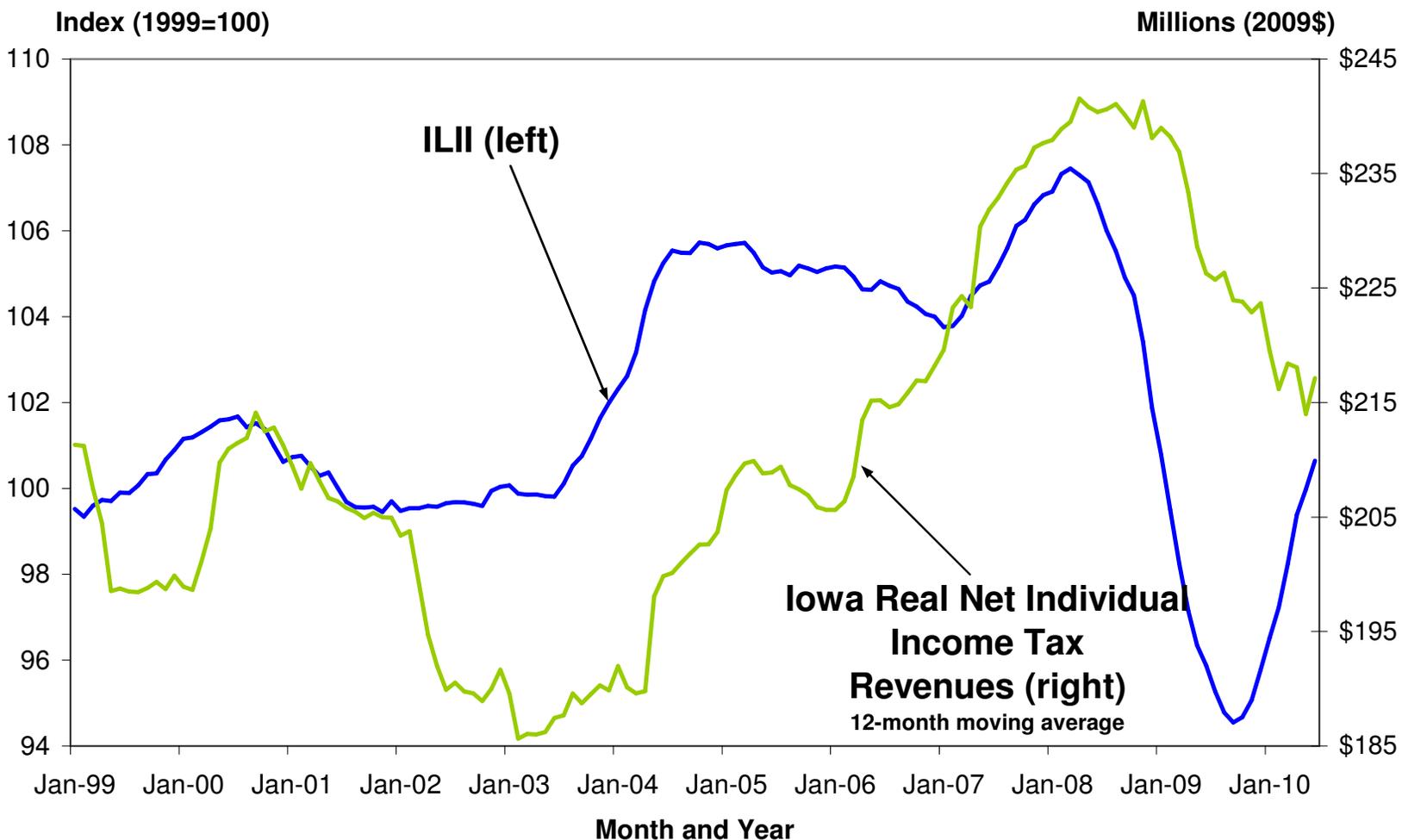


Table 1. Iowa Leading Indicators Index Components: Annual Overview

| Component Series Monthly Values ^a | 2009 June | 2010 June | Contribution to ILII Change |
|---|--------------|--------------|--------------------------------|
| AFPI ^b ↓ ^c | | | -0.72 |
| Corn Profits (cents per bushel) | 141.3 | 14.7 | |
| Soybean Profits (cents per bushel) | 323.7 | 149.9 | |
| Hog Profits (cents per pound) | 8.7 | 15.2 | |
| Cattle Profits (cents per pound) | -9.4 | 0.8 | |
| Iowa Stock Market Index (10=1984-86) ↑ | 48.75 | 60.57 | 1.28 |
| Yield Spread (10-year less 3-month) ↓ | 3.54 | 3.08 | -0.13 |
| Building Permits ↑ | 545 | 672 | 0.72 |
| Average Weekly Unemployment Claims ^d ↑ | 7,114 | 6,124 | 0.49 |
| Average Weekly Manufacturing Hours ↑ | 38.4 | 40.4 | 1.50 |
| New Orders Index (percent) ↑ | 34.6 | 64.2 | 1.89 |
| Diesel Fuel Consumption (mil gallons) ↓ | 52.69 | 52.18 | -0.17 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 4, 2010

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 August 21, 2009).

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.

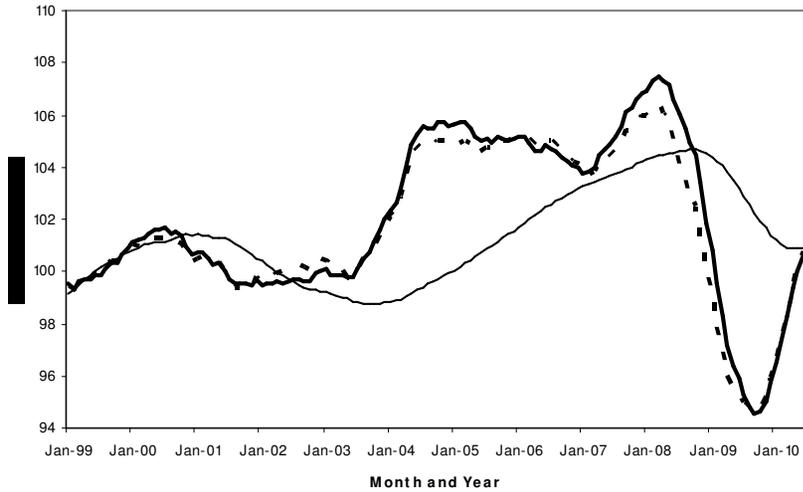
Table 2. Changes in ILII Standardization Factors Accounting for FY 2010 Data

| Leading Indicator | Jul-2009 Standard Deviation | Jul-2010 Standard Deviation | Percent Change in Standard Deviation | Jul-2009 Standardization Factor | Rank | Jul-2010 Standardization Factor | Rank | Percent Change in Standardization Factor |
|------------------------------------|--|--|---|--|-------------|--|-------------|---|
| Agricultural Futures Profits Index | 1.563 | 1.709 | 9.3% | 0.052 | 6 | 0.050 | 6 | -3.5% |
| Iowa Stock Market Index | 1.389 | 1.513 | 8.9% | 0.059 | 5 | 0.057 | 5 | -3.2% |
| Yield Spread | 0.283 | 0.275 | -2.7% | 0.289 | 2 | 0.313 | 1 | 8.4% |
| Building Permits | 2.382 | 2.434 | 2.2% | 0.034 | 7 | 0.035 | 7 | 3.2% |
| Average Weekly Unemployment Claims | 2.473 | 2.607 | 5.4% | 0.033 | 8 | 0.033 | 8 | 0.0% |
| Average Weekly Manufacturing Hours | 0.274 | 0.315 | 15.0% | 0.298 | 1 | 0.273 | 2 | -8.3% |
| New Orders Index | 1.284 | 1.449 | 12.8% | 0.064 | 4 | 0.059 | 4 | -6.5% |
| Diesel Fuel Consumption | 0.476 | 0.481 | 1.1% | 0.172 | 3 | 0.179 | 3 | 4.3% |

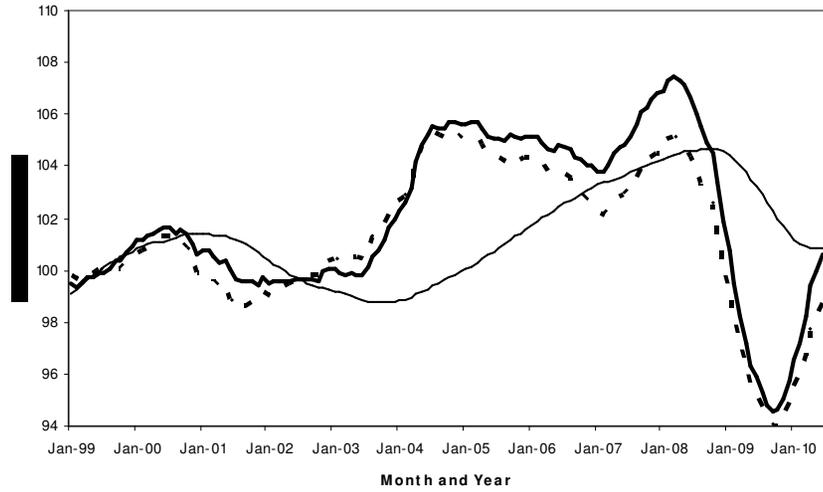
Each data series considers month-to-month changes over January 1999 to June 2009 for July 2009 values and January 1999 to June 2010 for July 2010 values. For all series except for the yield spread, which is the only national series, the changes are based on 12-month backward moving averages. The yield spread and new orders index changes are simple arithmetic changes; changes for the other six components are computed as symmetric percentage changes.

Figure 5. Iowa Leading Indicators Index: Sensitivity to Exclusion of Individual Components

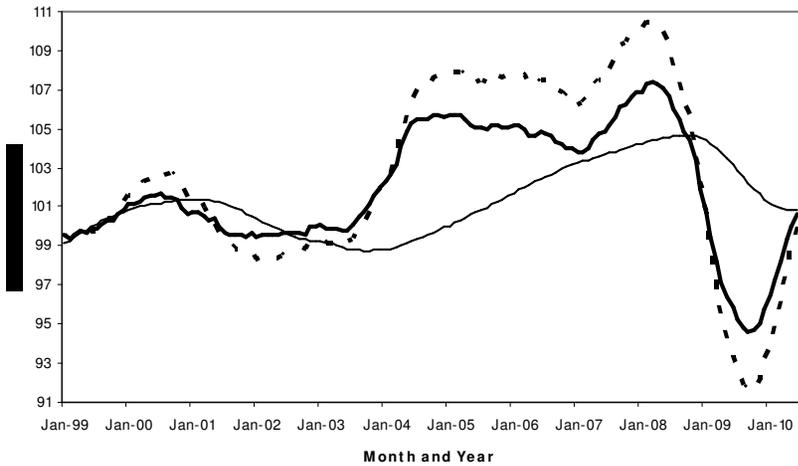
A. Dropped Agricultural Futures Profits Index



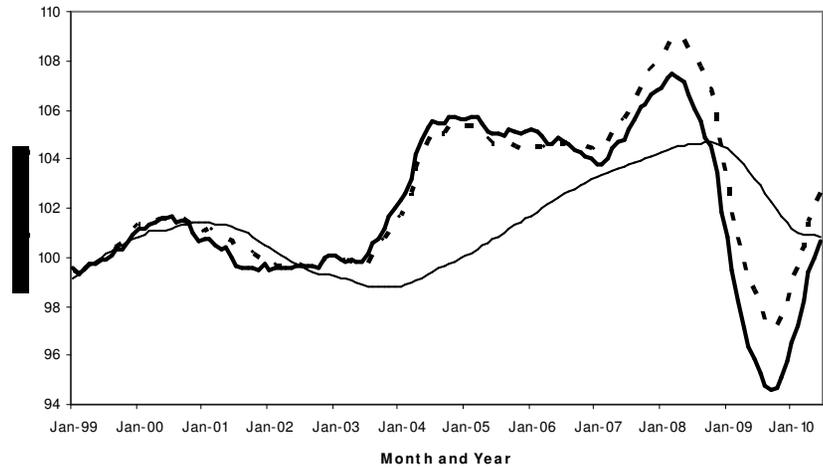
B. Dropped Iowa Stock Market Index



C. Dropped Yield Spread



D. Dropped New Residential Building Permits



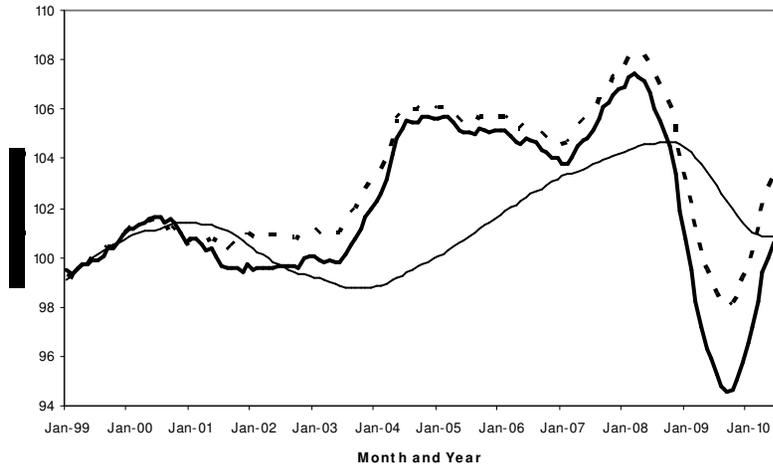
———— ILII

..... ILII Excluding Listed Component

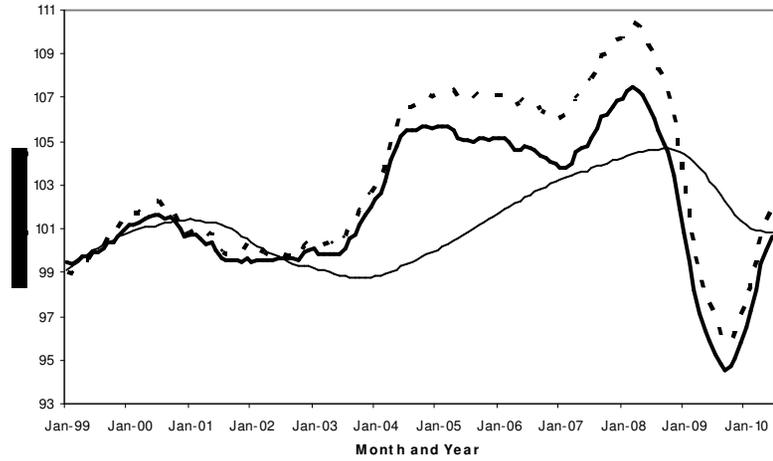
———— Non-Farm Employment

Figure 5 cont. Iowa Leading Indicators Index: Sensitivity to Exclusion of Individual Components

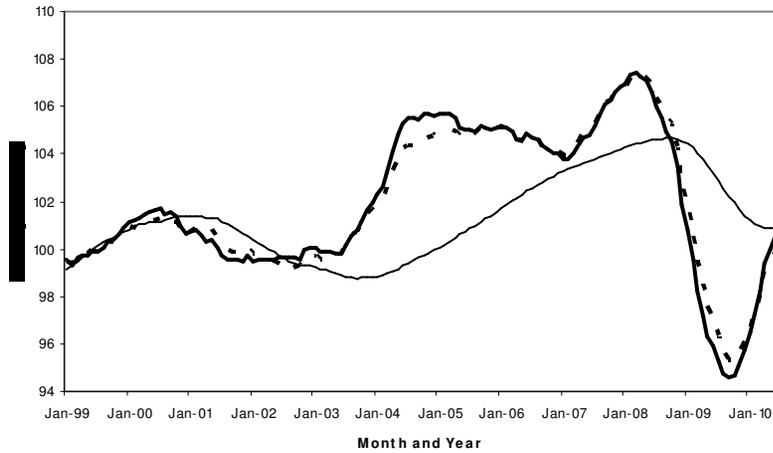
E. Dropped Unemployment Insurance Claims



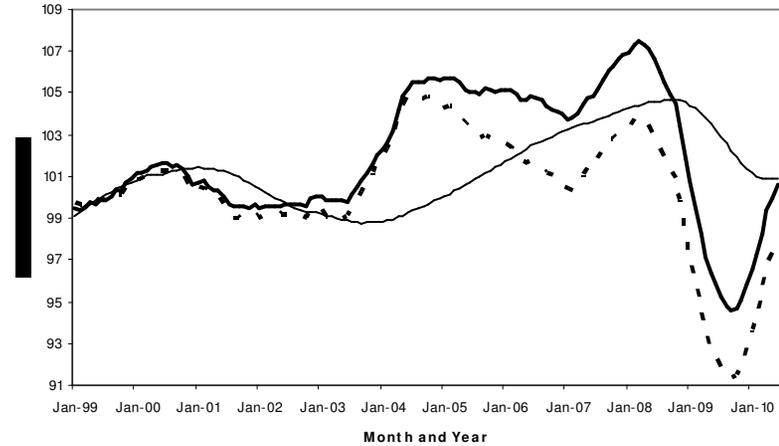
F. Dropped Average Weekly Manufacturing Hours



G. Dropped New Orders Index



H. Dropped Diesel Fuel Consumption



ILI
 ILI Excluding Listed Component
 Non-Farm Employment

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) | -10.7% | -9.3% | -7.4% | -5.1% | -2.7% | -0.3% | 2.4% | 4.8% | 7.5% | 9.6% | 10.0% | 9.7% |
| Diffusion Index | 12.5 | 12.5 | 25.0 | 37.5 | 50.0 | 56.3 | 62.5 | 75.0 | 87.5 | 100.0 | 87.5 | 87.5 |
| ILII without AFPI | | | | | | | | | | | | |
| Percentage Change (Annualized) | -8.4% | -6.8% | -4.7% | -2.5% | -0.4% | 1.4% | 3.6% | 5.6% | 7.8% | 9.9% | 10.3% | 10.0% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 42.9 | 57.1 | 64.3 | 71.4 | 85.7 | 85.7 | 100.0 | 85.7 | 85.7 |
| ILII without Iowa Stock Market | | | | | | | | | | | | |
| Percentage Change (Annualized) | -9.2% | -8.1% | -6.5% | -4.6% | -2.6% | -0.6% | 1.8% | 3.8% | 5.8% | 7.7% | 8.1% | 7.9% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 42.9 | 57.1 | 50.0 | 57.1 | 71.4 | 85.7 | 100.0 | 85.7 | 85.7 |
| ILII without Average Manufacturing Hours | | | | | | | | | | | | |
| Percentage Change (Annualized) | -12.4% | -11.1% | -8.8% | -6.3% | -3.8% | -1.1% | 1.7% | 4.4% | 7.7% | 10.1% | 10.5% | 10.2% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 42.9 | 42.9 | 50.0 | 57.1 | 71.4 | 85.7 | 100.0 | 85.7 | 85.7 |
| ILII without Yield Spread | | | | | | | | | | | | |
| Percentage Change (Annualized) | -16.2% | -14.1% | -11.2% | -7.8% | -4.1% | -0.5% | 3.2% | 6.9% | 10.7% | 13.7% | 14.7% | 14.8% |
| Diffusion Index | 0.0 | 0.0 | 14.3 | 28.6 | 42.9 | 57.1 | 57.1 | 71.4 | 85.7 | 100.0 | 100.0 | 100.0 |
| ILII without Diesel Fuel | | | | | | | | | | | | |
| Percentage Change (Annualized) | -10.7% | -9.4% | -7.2% | -4.4% | -1.6% | 0.7% | 3.9% | 6.7% | 9.5% | 11.6% | 11.5% | 11.2% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 42.9 | 57.1 | 64.3 | 71.4 | 85.7 | 100.0 | 100.0 | 85.7 | 85.7 |
| ILII without New Orders Index | | | | | | | | | | | | |
| Percentage Change (Annualized) | -10.9% | -9.8% | -8.3% | -6.4% | -4.3% | -2.0% | 0.7% | 3.1% | 5.8% | 8.0% | 8.3% | 8.1% |
| Diffusion Index | 14.3 | 14.3 | 14.3 | 28.6 | 42.9 | 50.0 | 57.1 | 71.4 | 85.7 | 100.0 | 85.7 | 85.7 |
| ILII without Unemployment Claims | | | | | | | | | | | | |
| Percentage Change (Annualized) | -8.9% | -7.8% | -6.2% | -4.0% | -2.0% | 0.2% | 2.6% | 4.7% | 6.9% | 8.6% | 8.9% | 8.4% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 42.9 | 57.1 | 64.3 | 71.4 | 71.4 | 85.7 | 100.0 | 85.7 | 85.7 |
| ILII without Building Permits | | | | | | | | | | | | |
| Percentage Change (Annualized) | -10.4% | -9.0% | -7.4% | -5.3% | -3.2% | -0.9% | 2.1% | 4.3% | 6.8% | 8.6% | 9.0% | 9.0% |
| Diffusion Index | 14.3 | 14.3 | 28.6 | 28.6 | 42.9 | 50.0 | 57.1 | 71.4 | 85.7 | 100.0 | 85.7 | 85.7 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 16, 2010 using updated standardization factors through June 2010.

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.

Figure 6. Iowa Leading Indicators Index and Iowa Non-Farm Employment Coincident Index: January 1999-June 2010

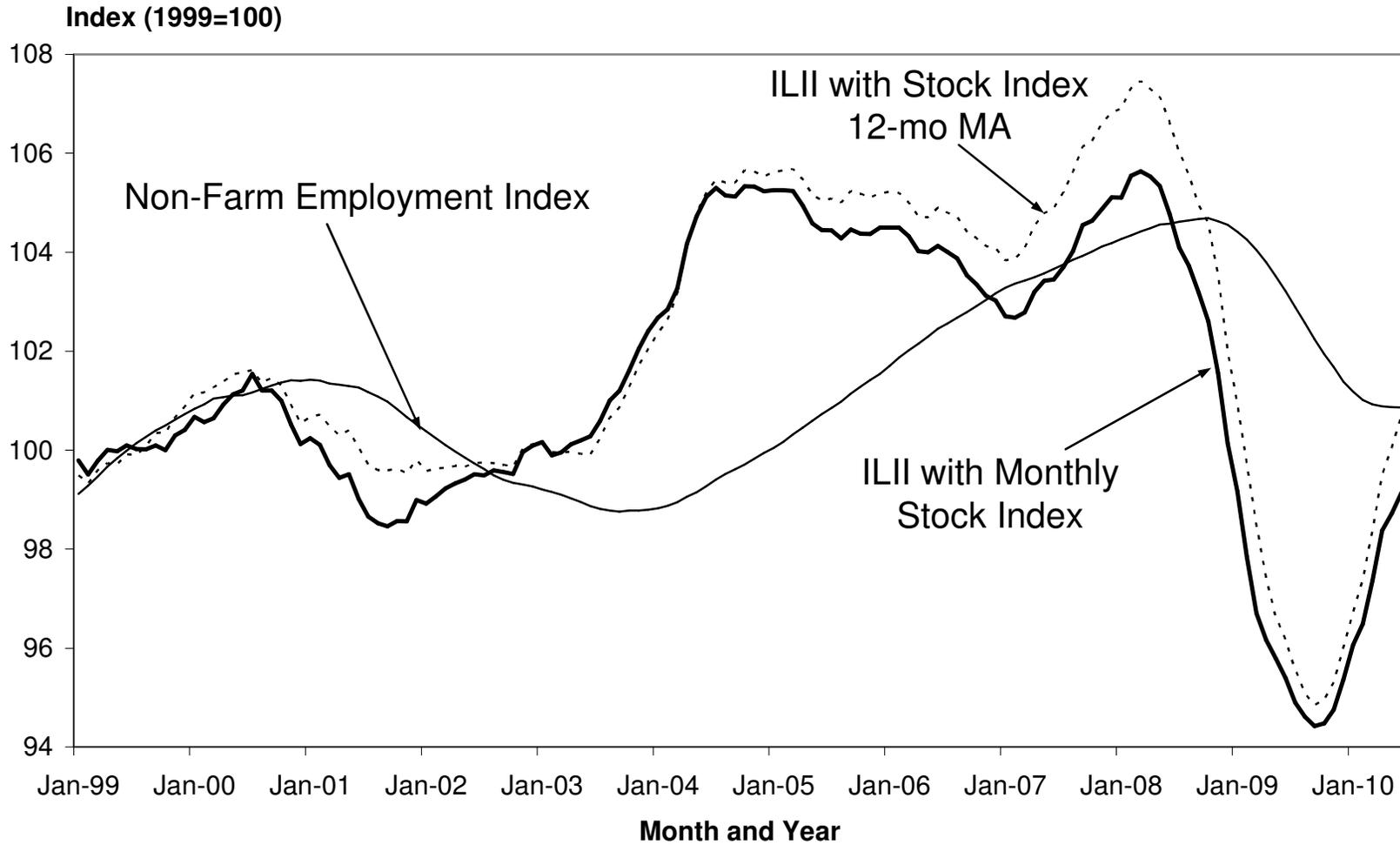


Table 4. Changes in ILII Standardization Factors After Iowa Stock Market Index and AFPI Updates

| Leading Indicator | Jul-2009 Standard Deviation | Jul-2010 Standard Deviation | Percent Change in Standard Deviation | Jul-2009 Standardization Factor | Rank | Jul-2010 Standardization Factor | Rank | Percent Change in Standardization Factor |
|------------------------------------|-----------------------------------|-----------------------------------|--|---------------------------------------|------|---------------------------------------|------|--|
| Agricultural Futures Profits Index | 1.563 | 1.663 | 6.3% | 0.052 | 6 | 0.054 | 5 | 3.2% |
| Iowa Stock Market Index | 1.389 | 5.292 | 281.0% | 0.059 | 5 | 0.017 | 8 | -71.2% |
| Yield Spread | 0.283 | 0.275 | -2.7% | 0.289 | 2 | 0.326 | 1 | 12.8% |
| Building Permits | 2.382 | 2.434 | 2.2% | 0.034 | 7 | 0.037 | 6 | 7.4% |
| Average Weekly Unemployment Claims | 2.473 | 2.607 | 5.4% | 0.033 | 8 | 0.034 | 7 | 4.1% |
| Average Weekly Manufacturing Hours | 0.274 | 0.315 | 15.0% | 0.298 | 1 | 0.284 | 2 | -4.6% |
| New Orders Index | 1.284 | 1.449 | 12.8% | 0.064 | 4 | 0.062 | 4 | -2.7% |
| Diesel Fuel Consumption | 0.476 | 0.481 | 1.1% | 0.172 | 3 | 0.186 | 3 | 8.5% |

Each data series considers month-to-month changes over January 1999 to June 2009 for July 2009 values and January 1999 to June 2010 for July 2010 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 7. Iowa Leading Indicators Index Using Seasonally-Adjusted Components: January 1999-June 2010

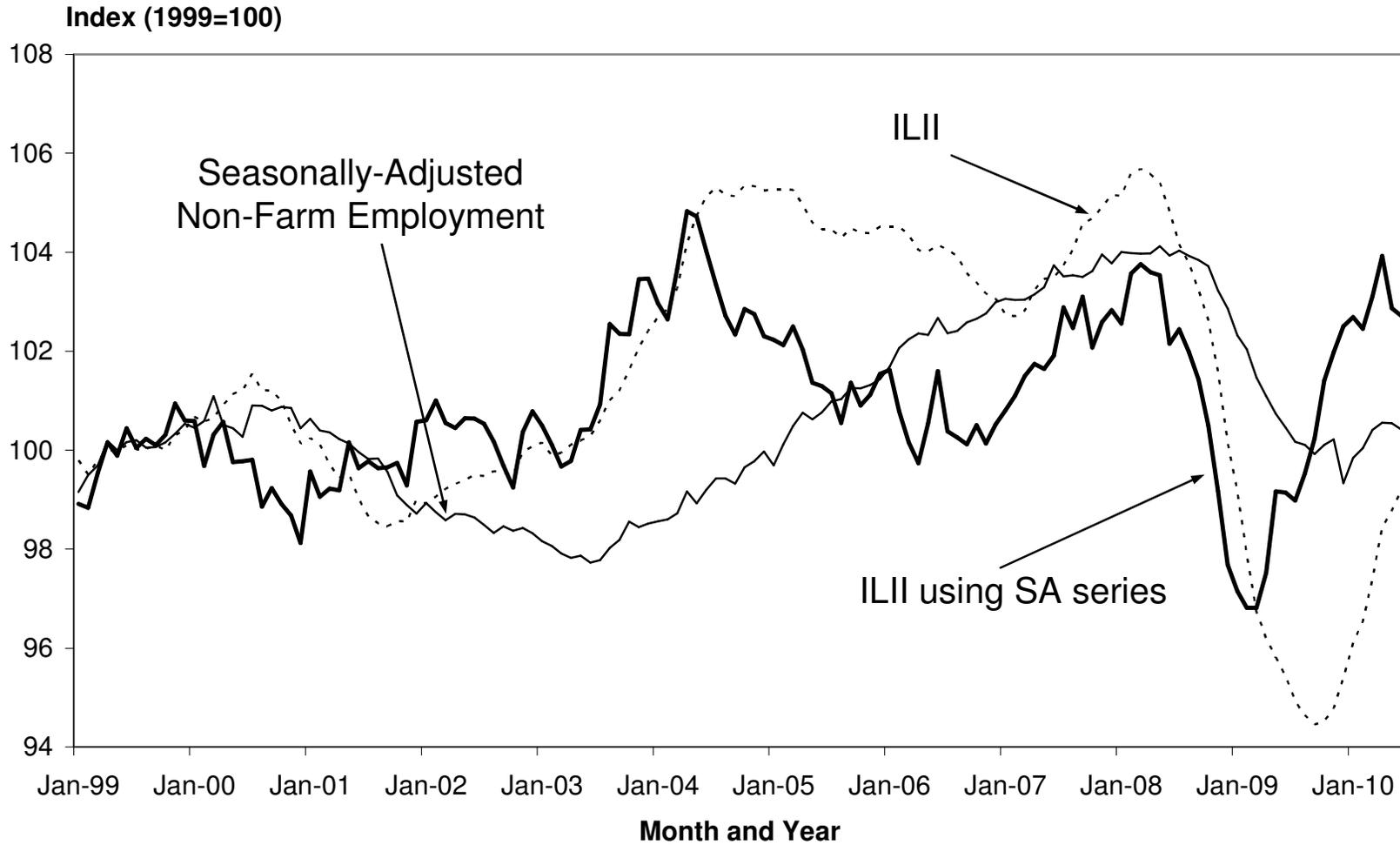


Figure 8. Comparison of Iowa Leading Indicators Index FY 2010 and FY 2011: January 1999-June 2010

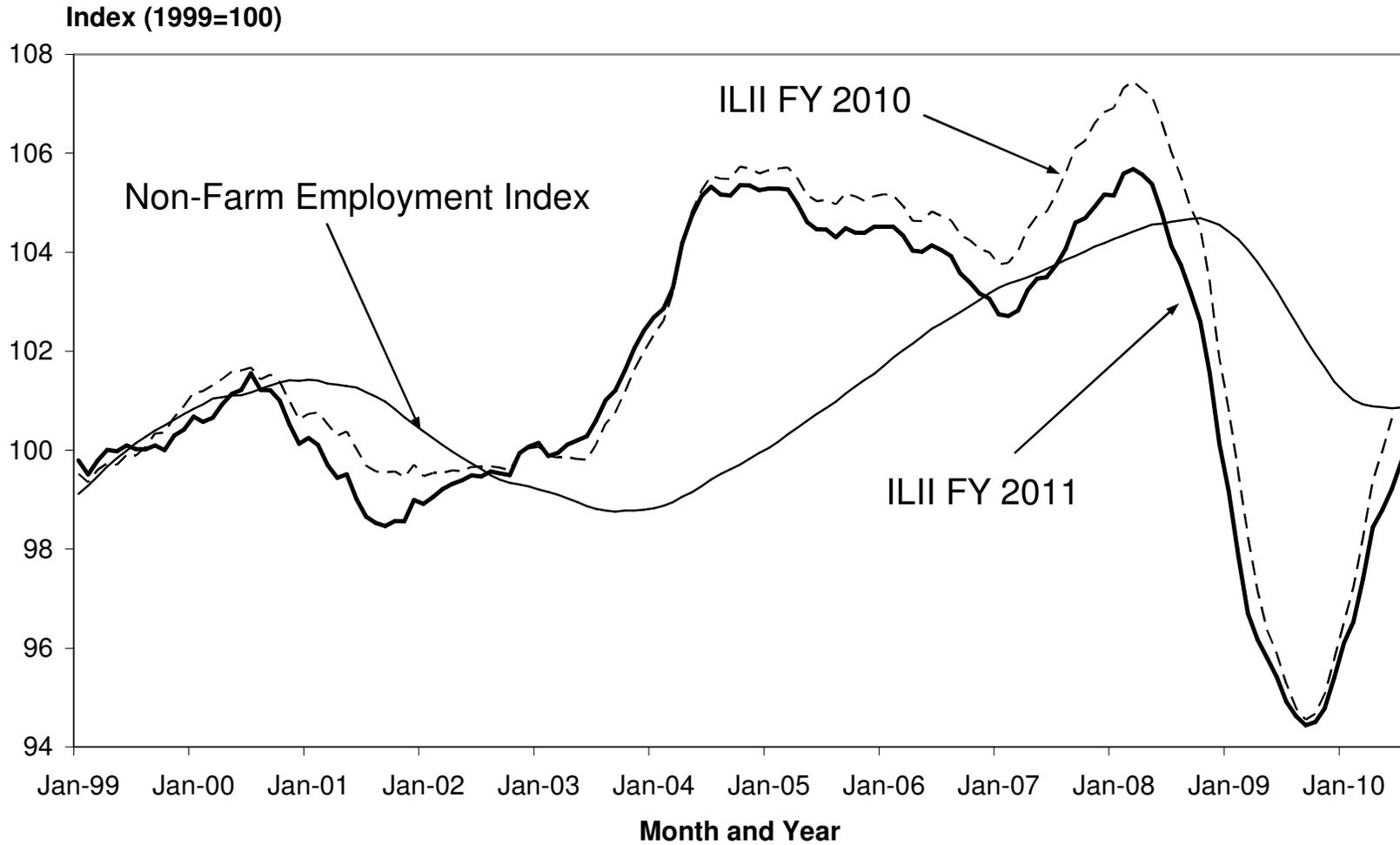


Table 5. Iowa Leading Indicators Index: Six Month Overview for June 2010 Prior to the FY 2011 Annual Update

| Monthly Values | 2010 | | | | | |
|--------------------------------|-----------------|-----------------|---------------|--------------|------------|-------------|
| | January | February | March | April | May | June |
| ILII | 96.5 | 97.2 | 98.2 | 99.4 | 100.0 | 100.6 |
| Percentage Change ^a | 0.8% | 0.7% | 1.0% | 1.2% | 0.6% | 0.7% |
| Diffusion Index ^b | 81.3 | 75.0 | 93.8 | 100.0 | 75.0 | 75.0 |
| Six-Month Values | July to January | Aug to February | Sept to March | Oct to April | Nov to May | Dec to June |
| ILII | | | | | | |
| Percentage Change | 1.3% | 2.6% | 3.9% | 5.0% | 5.2% | 5.1% |
| Annualized Percentage Change | 2.6% | 5.2% | 7.8% | 10.0% | 10.4% | 10.2% |
| Diffusion Index | 62.5 | 75.0 | 87.5 | 100.0 | 87.5 | 87.5 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 27, 2010.

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 Components: Six Month Overview for June 2010 Prior to the FY 2011 Annual Update

| Component Series Monthly Values ^a | | 2010 | | | | | |
|---|----------------|---------|----------|-------|-------|-------|-------|
| | | January | February | March | April | May | June |
| AFPI ^b | ↑ ^c | -0.04 | 0.42 | 0.40 | 0.28 | -0.10 | 1.57 |
| Corn Profits (cents per bushel) | | 42.2 | 37.5 | 31.6 | 23.9 | 14.4 | 14.7 |
| Soybean Profits (cents per bushel) | | 196.6 | 189.3 | 185.3 | 173.8 | 153.4 | 149.9 |
| Hog Profits (cents per pound) | | 7.1 | 8.3 | 9.4 | 11.1 | 13.1 | 15.2 |
| Cattle Profits (cents per pound) | | -6.5 | -5.2 | -3.5 | -1.7 | -0.3 | 0.8 |
| Iowa Stock Market Index (10=1984-86) | ↑ | 51.42 | 53.41 | 56.03 | 58.36 | 59.62 | 60.57 |
| Yield Spread (10-year less 3-month) | ↓ | 3.67 | 3.58 | 3.58 | 3.69 | 3.26 | 3.08 |
| Building Permits | ↓ | 591 | 605 | 641 | 668 | 673 | 672 |
| Average Weekly Unemployment Claims ^d | ↑ | 7,564 | 7,298 | 6,980 | 6,675 | 6,435 | 6,124 |
| Average Weekly Manufacturing Hours | ↑ | 39.1 | 39.4 | 39.6 | 40.0 | 40.2 | 40.4 |
| New Orders Index (percent) | ↑ | 50.9 | 53.0 | 55.7 | 59.1 | 61.6 | 64.2 |
| Diesel Fuel Consumption (mil gallons) | ↑ | 51.30 | 51.10 | 51.32 | 51.63 | 51.97 | 52.18 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 27, 2010.

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 August 21, 2009).

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 7. Iowa Leading Indicators Index: Six Month Overview for June 2010 After the FY 2011 Annual Update

| Monthly Values | 2010 | | | | | |
|--------------------------------|-----------------|-----------------|---------------|--------------|------------|-------------|
| | January | February | March | April | May | June |
| ILII | 96.1 | 96.5 | 97.4 | 98.4 | 98.8 | 99.2 |
| Percentage Change ^a | 0.7% | 0.4% | 0.9% | 1.1% | 0.4% | 0.4% |
| Diffusion Index ^b | 81.3 | 62.5 | 93.8 | 100.0 | 75.0 | 62.5 |
| Six-Month Values | July to January | Aug to February | Sept to March | Oct to April | Nov to May | Dec to June |
| ILII | | | | | | |
| Percentage Change | 1.3% | 2.0% | 3.1% | 4.2% | 4.2% | 4.0% |
| Annualized Percentage Change | 2.5% | 4.0% | 6.3% | 8.3% | 8.5% | 8.0% |
| Diffusion Index | 62.5 | 75.0 | 87.5 | 100.0 | 87.5 | 87.5 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 31, 2010.

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 8. Iowa Leading Indicators Index Components: Six Month Overview for June 2010 After the FY 2011 Annual Update

| Component Series Monthly Values ^a | | 2010 | | | | | |
|---|----------------|---------|----------|-------|-------|-------|-------|
| | | January | February | March | April | May | June |
| AFPI ^b | ↑ ^c | 0.05 | 0.53 | 0.54 | 0.45 | 0.08 | 1.65 |
| Corn (cents per bushel) | | 42.2 | 37.5 | 31.6 | 23.9 | 14.4 | 14.7 |
| Hog Profits (cents per pound) | | 196.6 | 189.3 | 185.3 | 173.8 | 153.4 | 149.9 |
| Soybeans (cents per bushel) | | 7.1 | 8.3 | 9.4 | 11.1 | 13.1 | 15.2 |
| Cattle Profits (cents per pound) | | -6.5 | -5.2 | -3.5 | -1.7 | -0.3 | 0.8 |
| Iowa Stock Market Index (10=1984-86) | ↑ | 64.22 | 62.46 | 67.01 | 71.55 | 67.20 | 62.00 |
| Yield Spread (10-year less 3-month) | ↓ | 3.67 | 3.58 | 3.58 | 3.69 | 3.26 | 3.08 |
| Building Permits | ↓ | 591 | 605 | 641 | 668 | 673 | 672 |
| Average Weekly Unemployment Claims ^d | ↑ | 7,564 | 7,298 | 6,980 | 6,675 | 6,435 | 6,124 |
| Average Weekly Manufacturing Hours | ↑ | 39.1 | 39.4 | 39.6 | 40.0 | 40.2 | 40.4 |
| New Orders Index (percent) | ↑ | 50.9 | 53.0 | 55.7 | 59.1 | 61.6 | 64.2 |
| Diesel Fuel Consumption (mil gallons) | ↑ | 51.30 | 51.10 | 51.32 | 51.63 | 51.97 | 52.18 |

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 31, 2010.

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 annual share of the commodity to Iowa cash farm income.

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 2010

