Iowa Leading Indicators Index after One Year: An Assessment and Update
Tax Research and Program Analysis Section
Iowa Department of Revenue
August 2007

During the summer of 2006, the Iowa Department of Revenue developed the Iowa Leading Indicators

Index (ILII) to serve as another tool for forecasting State revenue. Monthly reports on changes in the

ILII have been issued since July 2006, and these reports receive regular coverage in the Des Moines

Register. All reports are available on the Department web site

(http://www.state.ia.us/tax/taxlaw/econindicators.html).

After one year, it is useful to step back and assess how well the ILII has met the goals behind its

development, gauge the validity of the existing components, consider additional components that have

been suggested along the way, and carry out the annual updates necessary for such an index. This

paper documents these steps.

Assessment of the Iowa Leading Indicators Index for Fiscal Year 2007

The ILII remained fairly steady for the first six months of fiscal year 2007, starting at 105.2 in July

2006 and reaching 105.4 in December only to slip to 105.3 in January 2007 (see Figure 1). Beginning

in February the ILII has been on a strong incline, rising to 106.8 by June 2007. Throughout fiscal year

2007, the non-farm employment coincident index has been increasing 0.1 percent each month (the rate

of increase was around 0.15 percent in July 2006 through December 2006 until Bureau of Labor

Statistics data revisions conducted at the start of the 2007 reduced employment levels for the last half

of calendar 2006). Likewise, gross domestic product for Iowa has experienced slow and steady growth

the last two years, increasing a real 2.5 percent in 2005 and 1.8 percent in 2006 (see Figure 2). State

revenues, measured using 12-month moving averages and adjusted using CPI-U to 1999 dollars, have

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also been increasing, although at a slower 0.2 percent on average per month between January 2005 and June 2007 (see Figure 3). After a two year rise through November 2005, revenues dipped through March 2006, eight months after the ILII dip in March-June 2005. Between March 2006 and January 2007, real revenues rose 2.3 percent while the ILII remained relatively steady. Since the ILII upswing started in February 2007, real revenues have increased 1.4 percent through June 2007.

The main goal for the Iowa Leading Indicators Index was to serve as an additional tool in predicting the future direction of the State economy. Results over the past year suggest that the ILII can provide some guidance in predicting the direction of Iowa non-farm employment, although without any significant turning points in economic activity, the indicators have not yet been put to a true test.

Validity of Existing Components

When the leading indicators index was established in 2006, one method for choosing economic series to serve as components was to identify Iowa equivalent series to those used by other states and regions as leading economic indicators. A second method for choosing economic series was identifying those that predicted economic activity in the key sectors of the Iowa economy, agriculture, manufacturing and finance. Those sectors continue to stand out as the most important regarding employment and economic activity in the State. Agriculture comprised 3.3 percent of Iowa gross domestic product (GDP) in 2005 and has been bolstered by the growing bio-energy sector. Manufacturing accounted for 21.8 percent of GDP in 2005 and 15.4 percent of non-farm employment in 2006 while the finance sector accounted for 9.9 percent of GDP in 2005 and 6.7 percent of non-farm employment in 2006.

During the development of the ILII all potential indicators were tested for six desired attributes of leading indicators that are known as the Moore-Shiskin criteria. After a year of computing and

reporting the ILII, it is useful to consider if the index, with all of the components working together, displays 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 did not exhibit any notable changes during fiscal year 2007. With employment steadily expanding, State individual income tax withholding and final returns receipts remained strong. The flat ILII values in the first half of FY 2007 suggested flat economic activity for the second half of the fiscal year. Indeed sales tax receipts slowed in the third quarter, while corporate income tax receipts weakened in the fourth quarter. The strong growth in the ILII for the second half of FY 2007 suggests strengthening in economic activity for the first half of FY 2008. Only time will tell whether this apparent conformity of the indicators continues to hold.

A similar conclusion must be drawn regarding the consistent timing of the components and index. With such a short window of additional information about the components and the index, and little change in overall economic activity this past year, no change is called far regarding the assessment of the consistent timing attribute.

Currency of the ILII's components proved to be very reliable. All data series were available within four weeks after the close of the month for all months except February and March. In those months, labor force data including average manufacturing hours and non-farm employment were delayed by several weeks because the Bureau of Labor Statistics was undertaking annual benchmarking. Although attempts were made to select components with limited revisions, nearly every month some small revision in one or more component, and thus the ILII, did occur. The largest percentage revision to the index, a drop of 0.3 percent, occurred in December as a result of a large downward revision to the average manufacturing hours worked component. This component was responsible for most of the revisions to the ILII. Average manufacturing hours changed at least 0.1 hours in 11 of the last 12 months which lead to five of seven revisions to the ILII during that same period. The only other components that recorded revisions were the Iowa stock market index and the agricultural futures price index (AFPI). Stock market revisions were caused by late data on shares outstanding which are collected from SEC quarterly 10Q and 10K reports and used to weight share prices for the following quarter. AFPI revisions had two causes, the first was the USDA's release in September of 2005 cash income share by commodity used to weight the commodity prices which caused minor revisions in AFPI numbers for 2005 and later. The second cause for AFPI changes was the June 2007 revision of January through May break-even costs for hogs by John Lawrence at ISU. However, only the break-even adjustment amounted to as much as a 0.1 percent revision in two months of ILII results.

Nothing in the past twelve months has changed previously stated opinions about the economic significance of all but one of the eight components. The one component about which some questions have arisen is the yield spread. During fiscal year 2007, the yield spread was negative for ten months. Historically, a negative yield spread which results from an inverted yield curve has signaled a recession. However, economic activity continued apace despite the negative signal from this

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component. The yield spread has been a good indicator of a coming recession in the past because negative spreads were the result of bond investors bidding down long-term rates below the prevailing short-term rates because they viewed the latter as too high and ripe for cuts by the Federal Reserve attempting to avert a recession. Unlike these past periods of negative yield spreads, during the recent period current short-term rates were not particularly high, rather long-term rates were unusually low, possibly reflecting bond investors views that inflation was tame and growth was stable. Another possible explanation for low long-term rates was high international demand for the relative safety of the U.S. Treasury bond market. These factors may have altered the historic role of the negative yield spread as providing an indication of a coming recession. Amidst all of the current turmoil in the credit markets, the economic significance of the yield spread, which had returned to positive territory in June and July, is difficult to discern and thus its impact on the ILII will be watched closely during the next fiscal year.

Views about the statistical adequacy of the data are likewise unchanged for most of the components. The one component for which questions arise is the Iowa stock market index. During the last twelve months, two of the Iowa-based companies (AmerUs and Bandag) were bought out by international companies (AVIVA of England and Bridgestone of Japan) whom do not trade on the U.S. stock markets and do not file regular 10Q/10K reports with the SEC. Thus daily close prices for these stocks since the ownership change (November for AmerUs and June for Bandag) have been approximated by adjusting the price at time of merger for changes in the price of the international stocks as traded intermittently on the over-the-counter market in the U.S. Additionally, the numbers of shares outstanding have been left at the number reported in the last SEC filing of the Iowa companies prior to the merger. Obviously, this is not a long-term solution as it relies on outdated information. Options include replacing these stocks with other Iowa-based companies (17 companies have been identified)

or keeping the two companies and attempting to update the stocks with international data. The choice was made to do the former, see below for more discussion.

Assessments of the components' smoothness did not change with the additional 12 months of data. While the standard deviation of month-to-month changes in the components (measured for all but the yield spread using 12-month moving averages) did increase for three components, it fell for the remaining five components (see Table 1). The largest increase, 8.4 percent, was observed for the AFPI reflecting swings in the distribution of cash farm income for 2006 and repeated, large increases in the index's value as the bio-energy boom drives corn and soybean prices up. The next largest change was 6.5 percent observed for average manufacturing hours which experienced a few large swings in the past few months, although the series still remains the least volatile in the index. The largest drop in volatility, -3.4 percent, was experienced by the new orders index indicator. Recall that the ILII is computed by weighting changes in the individual series by the standardization factors presented in Table 1. A discussion about updates to the standardization factors appears in the following section.

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 4). Each panel of the figure includes 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 much lower values in the last two years if the Iowa stock market index were not one of the components, although the most recent upswing would persist. Conversely, Panel C indicates that the ILII would have had much higher values over the last three years if the yield spread were not one of the components, although, again, the most recent upswing would persist.

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 2). The Conference Board, using these two metrics, identifies a recession 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 Board does not specify the converse as necessarily identifying an expansion signal, most likely because that turning point is less crucial to capture. Prior to March, excluding any one of the strongest three components dropped the percentage change from a positive value to a negative value and the diffusion index below 50, while dropping one of the weakest components pushed the percentage change near to or above one percent and the diffusion index above 50. Since March, the rise in the ILII has been widespread such that the diffusion index remains 50 or above regardless of which component is dropped and the percentage change in the index remains near three percent when dropping all but the AFPI or Iowa stock market index. This suggests that no one indicator is driving the direction of the ILII, although some indicators are clearly stronger than others mirroring the uneven strength in the economy.

Additional Series as Potential ILII Components

During the past year, several potential additional leading indicators have been suggested including durable manufacturing employment, residential building declaration of value, drawdown of trade adjustment assistance job training funds, new car sales, and new retail business starts. Of these series, the middle three were quickly ruled out due to problems with currency and statistical adequacy. The first and last data series, however, proved adequate to pass those criteria and were thus formally analyzed as potential new indicators.

The assessment of Iowa durable manufacturing employment (or its share of total non-farm employment) revealed that the series fails to meet two key criteria for serving as a leading indicator,

consistent timing and economic significance.   The series appears to follow total non-farm employment quite closely, but with more exaggerated movements. This lead to the conclusion that the series exibits coincident timing rather leading timing. Therefore, the decision was made to not add durable manufacturing employment as an additional leading indicator at this time.

The assessment of business/retail starts revealed a possible leading indicator based on the economic significance of the series and conformity seen since 1998. However, in discussion with those at the Iowa Department of Revenue responsible for the data, it was determined that revisions are potentially substantial. Each month it is possible that data as far back as three years could be revised, which raised concerns about the statistical adequacy and currency of the series. Without information of just how significant those revisions can be, these concerns lead to the rejection of new retail business starts as an additional leading indicator at this time.

Updates After the First Year

Given that the original eight components continue to meet the Moore-Shiskin criteria while no new series did, the ILII did not undergo major revisions this July. The updates to the index that were needed included adjustments to the stocks included in the Iowa stock market index to account for recent mergers, reweighting of the agricultural futures price index using newly released cash income data for 2006, and recalculation of standardization factors based on observed volatility through June 2007.

The publicly-traded companies included in the Iowa stock market index were based on a list of top Iowa companies found in the Des Moines Register on June 4, 2006. From the 35 companies listed in that article, including 20 based in Iowa and 15 with large Iowa interests, 29 were chosen. One Iowa

company was dropped because its shares only traded on the over-the-counter markets and thus its price data was only intermittent. Four of the non-Iowa companies were dropped, Wal-Mart, Gannett, Berkshire Hathaway, and Bon-Ton Stores, because it was believed the Iowa share of economic activity was not adequately significant for their share value to reflect Iowa's economy, and another, Whirlpool, was not included because its Iowa presence was known to be decreasing in the near future.

As noted above, during the last twelve months, two of the Iowa-based companies (AmerUs and Bandag) were bought out by international companies (AVIVA of England and Bridgestone of Japan) whom do not trade on the U.S. stock markets and do not file regular 10Q/10K reports with the SEC. Thus it is not possible to gather daily closing prices for these companies in U.S. dollars or determine quarterly shares outstanding. In addition, the once wholly Iowa-based companies now comprise a small piece of the international companies by whom they were purchased. Although offices and jobs remain in Iowa, AVIVA and Bridgestone were designated as companies where the Iowa share of economic activity was not adequately significant for their share value to reflect Iowa's economy. Dropping the two companies from the stock market index did not significantly change the contributions of this indicator to the ILII. Over the past 12 months, the ILII value would have been 0.1 lower in five months.

The updates to the Iowa stock market index did not stop there. A Des Moines Register article in January 2007 identified an additional fifteen publicly-traded companies headquartered in Iowa. Therefore it was possible to replace the two companies dropped from the index. As before, only those companies currently traded on a major index, such as NASDAQ, NYEX, or AMEX, were considered, reducing to ten the additional companies for consideration. All of these were added to the index with the aim of replacing the dropped companies with similar companies and an attempt to expand the

index's ability to capture investor sentiment about economic activity across the state. Art's Way Manufacturing, a truck and agricultural equipment manufacturing company, was chosen as the replacement for Bandag, a tire retreading manufacturing company. Although no additional insurance companies were available, four banks were added to bolster the finance sector portion of the index as a replacement for AmerUs. The banks were also included because they are regional banks from parts of the State not previously included in the index, First Federal Bank headquartered in Sioux City, First Federal Savings Bank headquartered in Fort Dodge, Meta Financial Group headquartered in Storm Lake, and MidWest One headquartered in Oskaloosa. Regional banks in the original index are headquartered in Dubuque (Heartland Financial USA) and Ames (Ames National Corporation) while the rest of the financial companies are headquartered in the Des Moines metro area.

The stock market index was also expanded with five companies capturing other sectors of Iowa economic activity. The five include Green Plains Renewable Energy, an ethanol production company located in Shenandoah, Flexsteel, an outdoor/RV furniture manufacturing company located in Dubuque, Smithway Motors Express Corporation, a truckline headquartered in Fort Dodge, Cycle Country Accessories Company, an ATV parts/golf cart hub cap manufacturer in Milford, and MACC Private Equities, a small business investment company headquartered in Cedar Rapids. With the growing importance of bio-fuels, adding an ethanol company will help the stock market capture a new key business. A furniture manufacturer and small vehicle parts manufacturer should add information about consumer spending, an important part of economic activity. Although the index already includes one truckline, Heartland Express, it is headquartered in Coralville, so it seemed useful to add a truckline headquartered in the northern part of the State. Finally, the small business investment company should provide a useful signal about expectations for the future for one of the most risky

parts of the economy, entrepreneurial activity, and add a little diversification to the types of financial companies considered.

Adding these ten companies raised the current and historical values of Iowa stock market index series, but did not significantly change the historic values of the ILII. Indeed, none of the ILII values in the past year were altered from the values computed with the original stocks in the index versus the index comprised of the new mix of 37 stocks. The increase in the historical value of the stock market index reflects the lower historical capitalization value of the ten new companies relative to the two dropped stocks. Because the new companies comprise only one-seventh of the capitalization value of those dropped, the base value for the 1984 to 1986 period used to standardize the index fell which raised its standardized value in all months. The insignificant impact on the ILII reflects the fact that the ten companies' stock values were moving in offsetting directions over the past year and thus did not change the overall signal from the stock market.

Although the number of finance-related stocks has risen from 11 to 15, the capitalization share of these finance companies relative to the entire index fell from 45.6 percent in June 2007 to 45.3 percent. Note that when the index was created in summer 2006, the capitalization value of the 11 finance companies was 50.8 percent. Likewise, with the 15 finance companies in the new stock market index, the capitalization value would have been 50.5 percent in June 2006. Clearly the market value of financial companies has been suffering relative to the rest of the stock market and shifting from the highly valued AmerUs to the relatively smaller combined value of the five new finance-related companies does not alter this downward trend.

Second, the annual update to the AFPI was completed. Although not officially released, the Iowa office of the National Agricultural Statistics Service shared USDA data on 2006 cash income by commodities. The distribution of total farm income credited to the four commodities included in the AFPI is used to weight the four commodity prices or profits. Current practice is to use the most recent data on cash farm income shares, which had been 2005, to weight the index components for all months in that year and later. Therefore, the receipt of new data for 2006 precipitated revisions in all AFPI values for January 2006 and later. These changes were significant as the income share of corn rose from 27.7 to 30.8 percent, surpassing the income share of hogs which fell from 32.8 to 30.4 percent. The soybeans income share fell slightly, 20.9 to 20.2 percent, while the cattle income share rose from 18.5 to 18.6 percent. Because corn prices were so strong in 2006 and 2007, the corresponding increase in its weight raised the AFPI values for the last 18 months. The added strength in the AFPI component increased the ILII value by 0.1 point in July through November 2006, February 2007, and May 2007. In addition, the USDA revised 2005 numbers, causing minor revisions to the AFPI values for January 2005 through December 2005.[1]

The third update needed was the recalculation of each series' standardization factor. These factors, computed as the inverse of the standard deviation of the changes in the series normalized across all series to sum to one, attempt to equalize the volatility of each component in the index. As noted above, accounting for changes observed over the 12 months between July 2006 and June 2007 lead to volatility increases for some series and decreases for others (see Table 1). The increase in volatility for average manufacturing hours pulled its standardization factor down by 0.015, reducing the overall range of factors by 0.014. This will even out the contributions of the series somewhat although the

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[1] 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 corn and hogs and rose for soybeans 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.

ranking of series by volatility remained unchanged. Thus it is not surprising that the new standardization factors have no discernible impact on the ILII historical and current values.

Conclusions

The Iowa Leading Indicators Index is a work in progress. The limited historical period over which the index can be calculated restricts the analysis of its effectiveness at predicting changes in economic activity. The initial results suggest that the ILII can provide some guidance in predicting the direction of Iowa non-farm employment. It is encouraging that an additional year of data and close observations of the eight component series did not suggest major changes were needed. The minor updates to the Iowa stock market index should improve the strength of that component going forward without changing its contribution in history. Consideration of additional indicators that may have improved the ability of the ILII to predict movements in the economy did not reveal any strong contenders at this point, although the Department will continue to study data series with this in mind. With only minor modifications from the FY 2007 ILII, the Department will continue to release the ILII monthly reports with the hope they will 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: Jan. 1999-June 2007

Index (1999=100)

Non-Farm Employment Index

ILII

July 2004

January 2007

May 2005

July 2000

August 2001

Month and Year
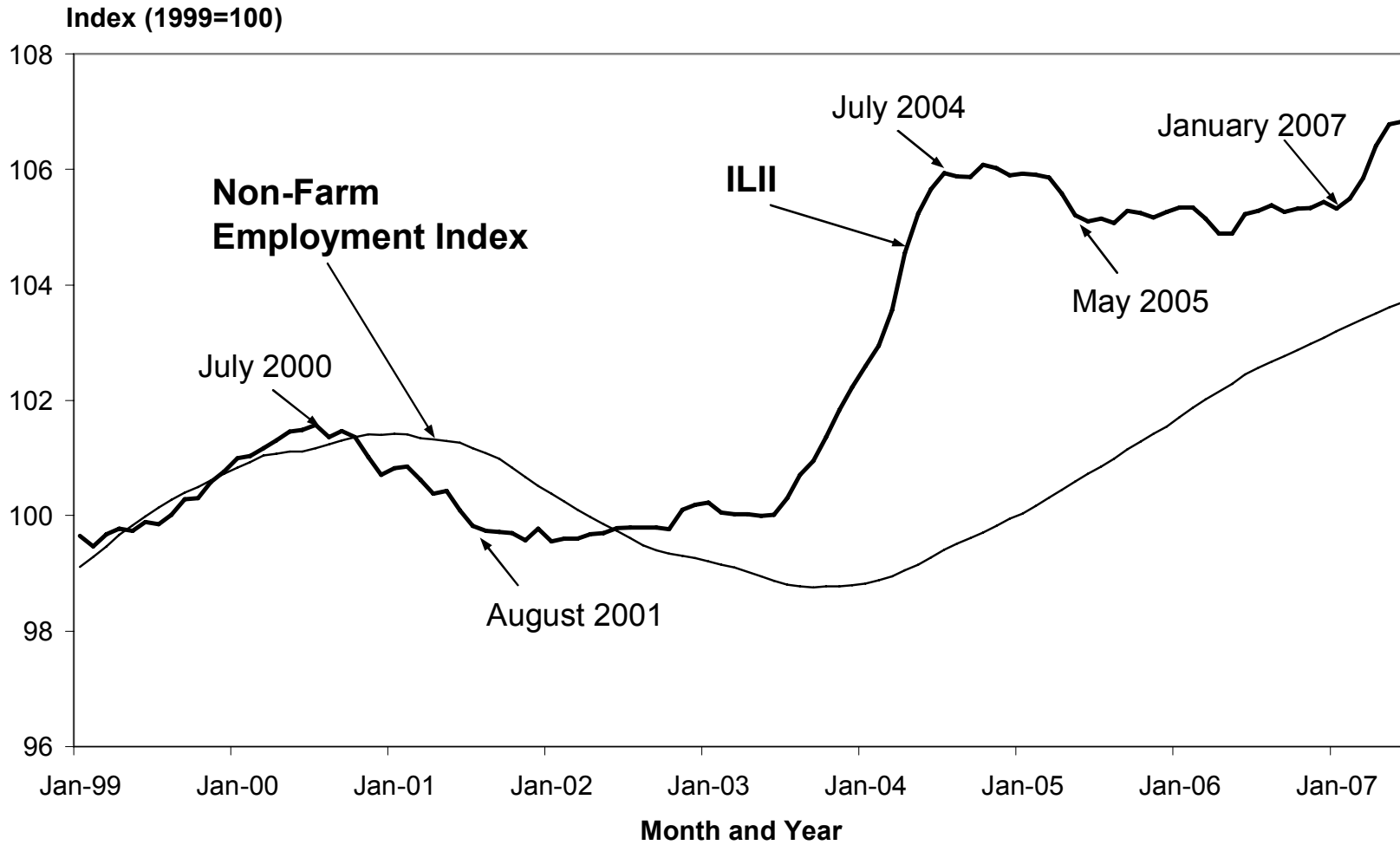
Figure 2. Iowa Leading Indicators Index, Non-Farm Employment Coincident Index, and Gross Domestic Product

Index (1999=100)

Billions $1999

GDP of Iowa (left scale)

ILII (right scale)

Non-Farm Employment Index (right scale)

Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07

Month and Year
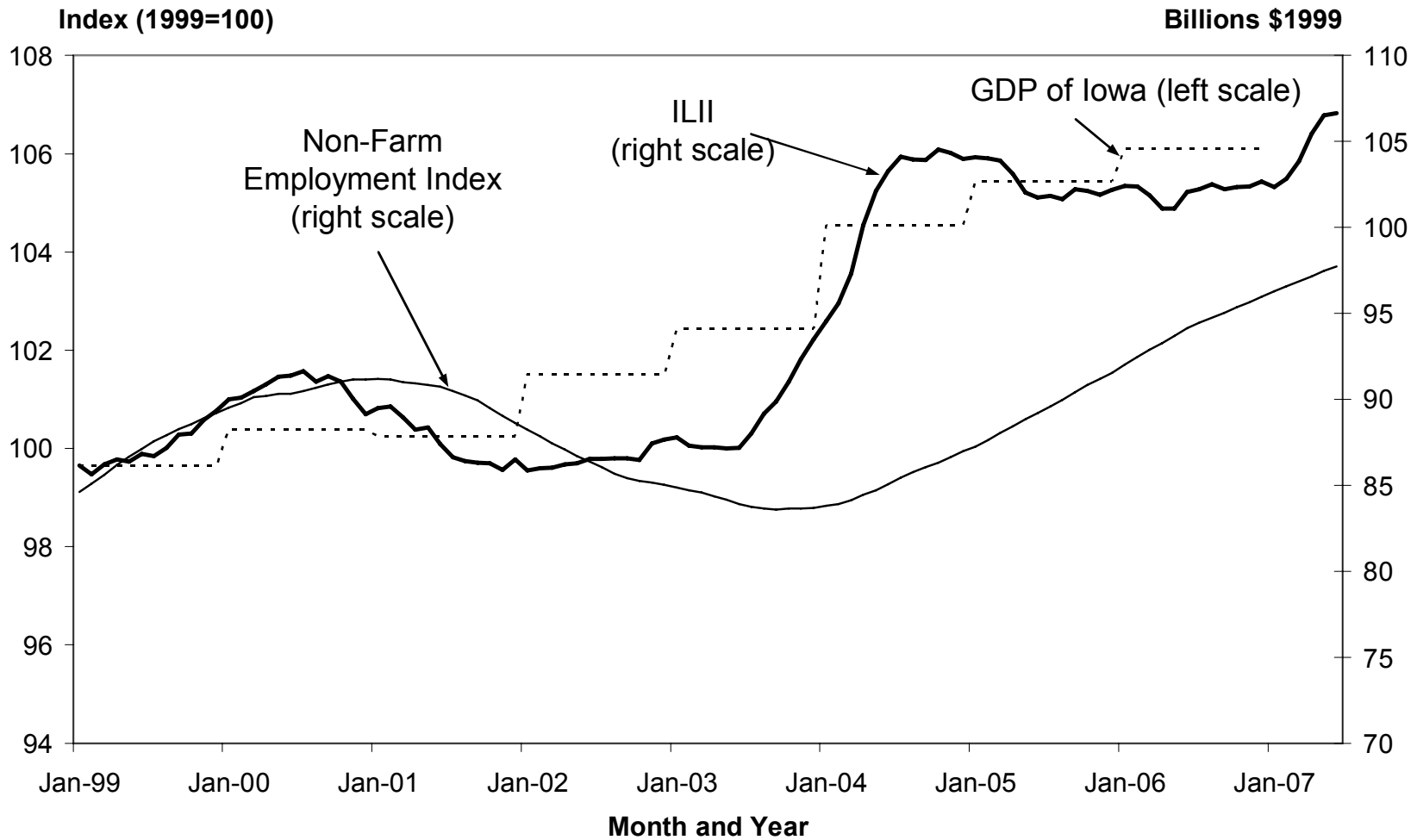
Figure 3. Iowa Leading Indicators Index, Non-Farm Employment Coincident Index, and Total Tax Revenues

Index (1999=100)

Millions (1999$)

12-Month Moving Average of Total Tax Revenues (right scale)

ILII (left scale)

Non-Farm Employment Index (left scale)
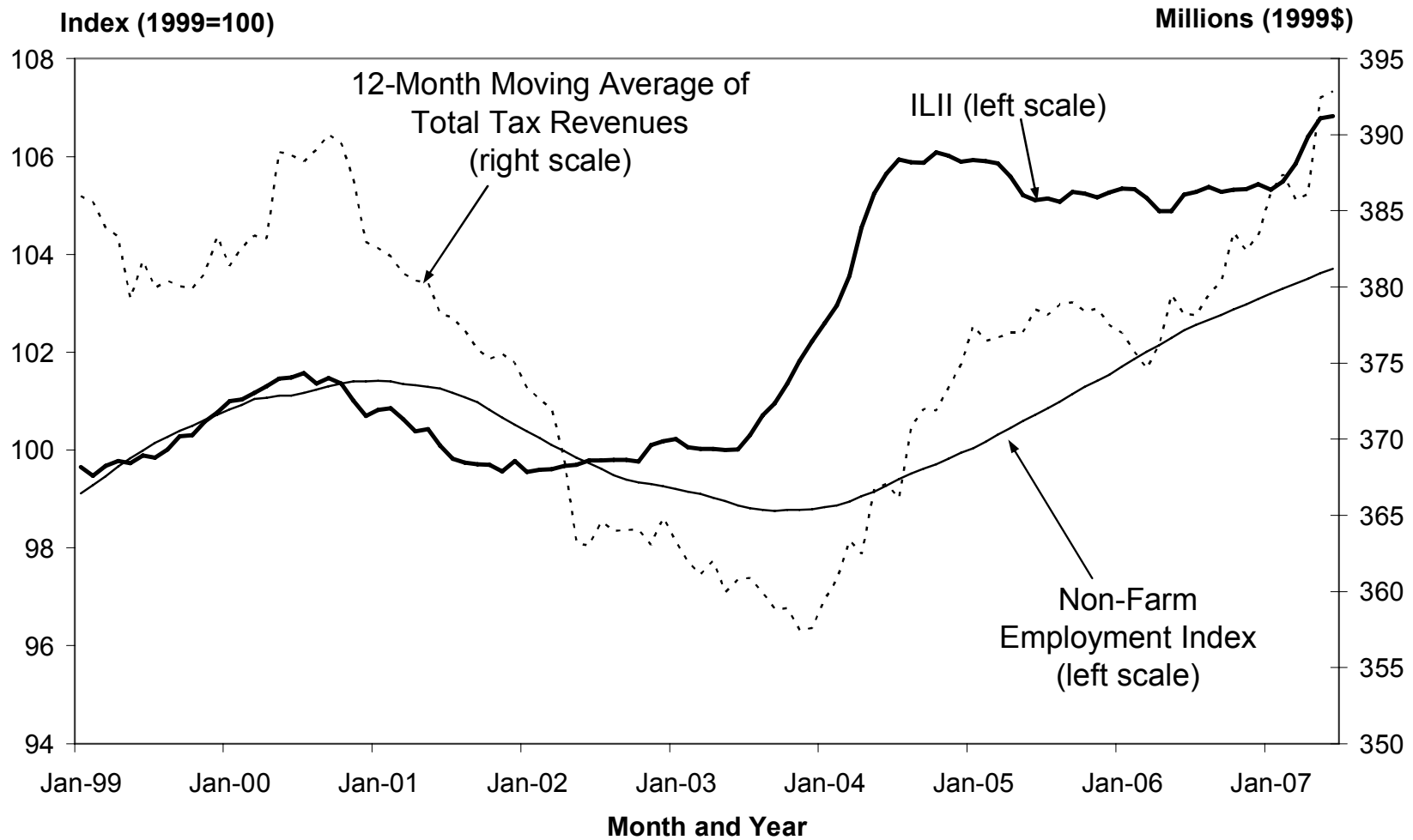
Month and Year

Table 1. Changes in ILII Standardization Factors Accounting for FY 2007 Data

Leading Indicator	Jul-2006 Standard Deviation	Jul-2007 Standard Deviation	Percent Change in Standard Deviation	Jul-2006 Standardization Factor	Rank	Jul-2007 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Price Index	0.479	0.520	8.6%	0.132	4	0.124	4	-6.2%
Iowa Stock Market Index	1.124	1.111	-1.1%	0.056	5	0.058	5	3.1%
Yield Spread	0.269	0.261	-2.9%	0.235	2	0.247	2	5.0%
Building Permits	2.123	2.230	5.1%	0.030	8	0.029	8	-3.0%
Unemployment Claims	1.982	1.918	-3.2%	0.032	7	0.034	7	5.3%
Average Manufacturing Hours	0.210	0.223	6.5%	0.302	1	0.289	1	-4.3%
New Orders Index	1.206	1.164	-3.4%	0.052	6	0.055	6	5.5%
Diesel Fuel Consumption	0.394	0.392	-0.4%	0.161	3	0.164	3	2.4%

Each data series considers month-to-month changes over January 1999 to June 2006 for July 2006 values and January 1999 to June 2007 for July 2007 values. For all series except for the yield spread, which is the only national series, the changes are based on 12-month moving averages. The yield spread and new orders index changes are simple arithmetic changes, the rest are computed as symmetric percentage changes.

Figure 4. Iowa Leading Indicators Index: Sensitivity to Excluding Individual Componer
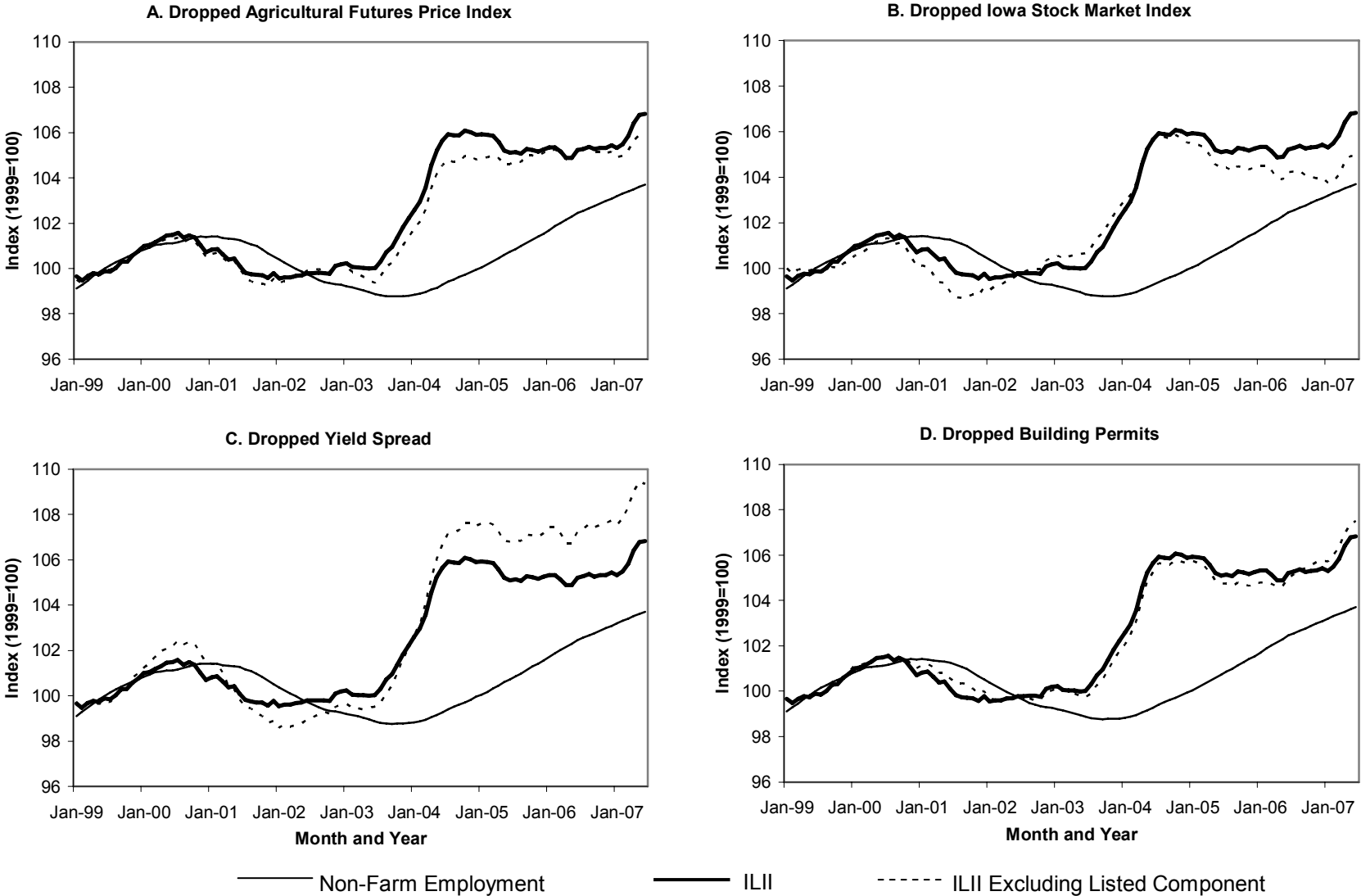
A. Dropped Agricultural Futures Price Index

B. Dropped Iowa Stock Market Index

C. Dropped Yield Spread

D. Dropped Building Permits

Non-Farm Employment   ILII   ILII Excluding Listed Component

Figure 4b. Iowa Leading Indicators Index: Sensitivity to Excluding Individual Compone

E. Dropped Unemployment Claims

F. Dropped Manufacturing Hours

G. Dropped New Orders Index

H. Dropped Diesel Fuel

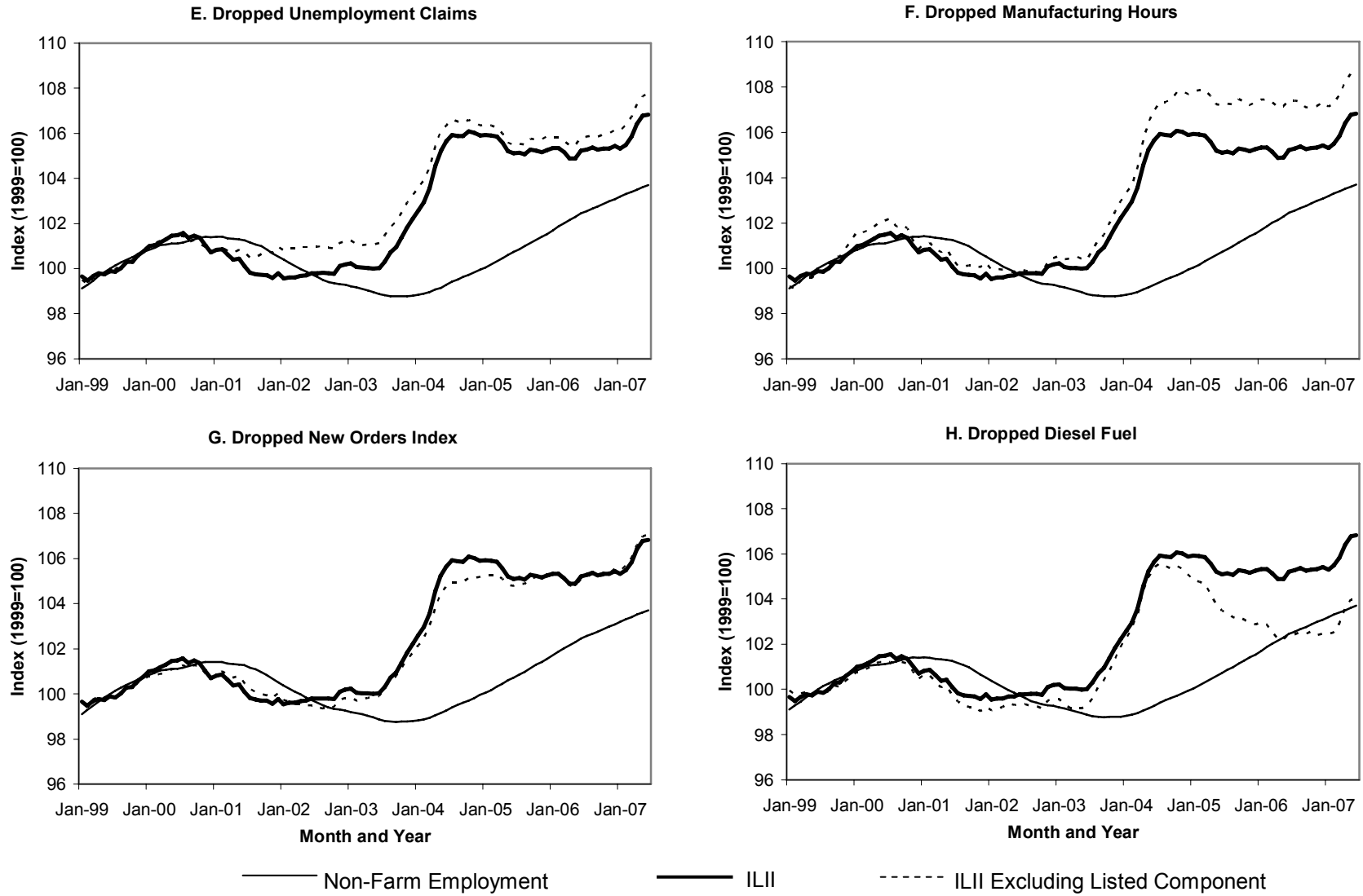Non-Farm Employment ——— ILII — — — — ILII Excluding Listed Component

Table 2. Iowa Leading Indicators Index Component Sensitivity

Six-Month Values	July to January	Aug to February	Sept to March	Oct to April	Nov to May	Dec to June
ILII						
Percentage Change (Annualized)	0.1%	0.2%	1.1%	2.1%	2.7%	2.6%
Diffusion Index	50.0	50.0	50.0	56.3	62.5	62.5
ILII without AFPI						
Percentage Change (Annualized)	-0.7%	-0.7%	0.1%	1.0%	1.6%	1.4%
Diffusion Index	42.9	42.9	42.9	50.0	57.1	57.1
ILII without Iowa Stock Market						
Percentage Change (Annualized)	-0.9%	-0.9%	0.1%	1.2%	1.9%	1.8%
Diffusion Index	42.9	42.9	42.9	50.0	57.1	57.1
ILII without Average Manufacturing Hours						
Percentage Change (Annualized)	-0.5%	-0.1%	1.0%	2.0%	2.6%	2.9%
Diffusion Index	42.9	42.9	42.9	50.0	57.1	57.1
ILII without Yield Spread						
Percentage Change (Annualized)	0.3%	0.4%	1.7%	2.8%	3.4%	3.0%
Diffusion Index	57.1	57.1	57.1	57.1	57.1	57.1
ILII without Diesel Fuel						
Percentage Change (Annualized)	0.0%	0.0%	1.0%	2.0%	3.1%	3.0%
Diffusion Index	42.9	42.9	42.9	50.0	57.1	57.1
ILII without New Orders Index						
Percentage Change (Annualized)	0.6%	0.7%	1.5%	2.6%	3.1%	2.8%
Diffusion Index	57.1	57.1	57.1	64.3	71.4	71.4
ILII without Unemployment Claims						
Percentage Change (Annualized)	0.5%	0.8%	1.6%	2.5%	3.1%	3.1%
Diffusion Index	57.1	57.1	57.1	64.3	71.4	71.4
ILII without Building Permits						
Percentage Change (Annualized)	1.1%	1.2%	1.8%	2.6%	3.2%	3.3%
Diffusion Index	57.1	57.1	57.1	64.3	71.4	71.4

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 28, 2007 using updated standardization factors through June 2007.

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 annual rate) and a majority of the individual components also decline over those six months (six-month diffusion index less than 50.0).

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 1 for the standardization weights 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 the index's value is multiplied by the following monthly change:

   $ILII_0 = 100$

   $ILII_1 = ILII_0*(200 + \text{month 1 ILII change})/(200 - \text{month 1 ILII change})$

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 variation, before calculating month-to-month changes all series except the yield spread, the only national series, are smoothed by taking 12-month moving averages.

The standardization factors will be recalculated annually and any revisions to historical data (beyond the previous two months) will be 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 2007

One-Month Diffusion Index

Six-Month Diffusion Index

Month and Year