

FYI

Tracking Manufacturing: An Update on the Survey of Southeastern Manufacturing Conditions

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At the end of 1991, the Federal Reserve Bank of Atlanta began a survey of manufacturers in Sixth Federal Reserve District states.¹ This Survey of Southeastern Manufacturing Conditions has been valuable in helping gauge the strength of the southeastern economy over the past four years of recovery and expansion. In March 1995 the implementation of seasonal adjustment procedures substantially improved the survey by making the data easier to interpret. The seasonally adjusted data make time series comparisons much easier than they were when only unadjusted data were available. As a result, the data provide a clearer picture of the past four years as well as current conditions and manufacturers' expectations.

Why does the Federal Reserve Bank of Atlanta conduct this survey? Like the eleven other Reserve Banks across the nation, the Atlanta Fed monitors economic conditions in its region. Its most important reason for doing so is to contribute to the Federal Reserve System's task of setting appropriate monetary policy. The Atlanta Fed also releases the information in the survey (at aggregate levels only) to the public so that interested citizens can have additional current information on the region's economy. In the Southeast, one of the most important influences on the economy's performance is manufacturing activity. It is more variable than most other sectors and is generally a higher-wage sector.

Consequently, to augment its analysis of economic conditions in the region, the Atlanta Fed's research department in late 1991 launched the first

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comprehensive survey to focus solely on changes in indicators of manufacturing activity in the Southeast. Because turnaround is rapid—less than three weeks for gathering, compiling, and reporting the data—the survey provides recent information on the southeastern economy, information not available from other sources.

What's in the Survey?

The Atlanta Fed's manufacturing survey covers manufacturing plants in all or parts of the six states in the Sixth Federal Reserve District. This monthly mail-in survey is distributed to about 230 selected firms with plants located in these states. The survey's panel of manufacturers is patterned on the distribution of industries according to the two-digit standard industrial classification (SIC) for shipment values from the Census Bureau's quinquennial Census of Manufactures in 1992. Table 1 shows the current distribution of survey respondents according to the two-digit SIC classification; the table also gives 1992 Census of Manufactures shipment values for Sixth District states and the United States. Tabulated responses are not weighted by firm size, nor are adjustments made for variances in response rates by industry from an "ideal" distribution.

For the most part, the survey design and operation is little changed from when reports were first released to the public in November 1992.² The survey asks for information about a broad range of activities: production, shipments, new orders, order backlogs, materials inventories, inventories of finished goods, number of employees, average employee workweek, prices received for finished products, prices paid for inputs (nonlabor), capital expenditures, new orders for exports, and supplier delivery time. Responses to the survey are qualitative—not for specific levels such as dollar amounts. For each question respondents are asked to report activity as being an "increase" or a "decrease" or as showing "no change" (a) from the previous month, (b) from the same month a year ago, and (c) in terms of expected levels of activity six months from the current month. In addition to the questions specific to the manufacturer's own plant, each respondent is asked for an evaluation of the firm's industry activity at the national level.

Data for each question are aggregated into percentages reporting each of the three responses—increase, decrease, and no change.³ A diffusion index is also calculated for each question. This index is merely the dif-

ference between the positive response share (the percentage reporting increases) and the negative response share (the percentage reporting decreases). Numerical values of the diffusion indexes range from minus 100 to positive 100. At the zero value, the percentage reporting increases equals the percentage reporting decreases. While the diffusion indexes are not calculated from specific dollar levels of activity for each respondent, there is a statistical relationship that higher index values are associated with higher growth rates.

Survey questionnaires are mailed out on or near the twenty-fourth of each month. The timing of the mailing allows respondents to provide data that reflect known activity for the reference month, for the most part, rather than estimates based largely on data from the previous month. For the initial release of data for a given reference month, the sample size averages between 115 and 125 respondents; the data received late boost the subsequent month's tally to between 125 and 140 replies. Summary data are released to the public on the second business day after the tenth of the month after the reference month.

Why Seasonally Adjust the Data?

For the past four years, the Survey of Southeastern Manufacturing Conditions has provided useful information and has played a role in the bank's consideration of the proper monetary policy. However, during the first two years of the survey, it became apparent that the data about current activity and expectations have some significant seasonal movements that, at times, overwhelm cyclical movement and add uncertainty to interpretation. For example, each July the share of respondents reporting decreased production output jumps sharply—apparently because of vacation shutdowns and slowdowns. Similarly, output numbers are weakest around December as Christmas production is completed for the most part and there are vacation-related cutbacks in hours of production. Related to the pre-Christmas boost in production and the December slump, data about manufacturers' expectations are generally strongest in December and weakest in June. June expectations data reflect the anticipation of production cutbacks in December (six months after June). See Chart 1 comparing seasonally adjusted and not seasonally adjusted production diffusion indexes.

With these volatile monthly patterns in the data, cyclical movement was often overwhelmed. The question then became, After taking into account these

Table 1
States' Value-Added Manufactures by Industry
As a Percentage of States' Total Value Added by Manufactures

SIC Code	Description	AL	FL	GA	LA	MS	TN	DIST.	U.S.	Survey Distribution By Units ¹
20	Food and kindred products	7.3	14.4	15.7	7.9	11.5	14.0	12.3	11.2	8.51
22	Textile mill products	7.4	D ²	D	D	D	2.5	1.6	2.1	2.84
23	Apparel and other textile products	7.1	3.5	6.4	0.6	8.0	5.2	4.9	2.6	4.12
24	Lumber and wood products	4.3	2.5	3.2	2.3	8.3	1.5	3.1	2.4	3.09
25	Furniture and fixtures	2.5	1.4	1.5	—	8.1	2.9	2.2	1.6	2.06
26	Paper and allied products	13.3	4.2	11.6	7.9	9.5	5.5	8.3	4.3	8.76
27	Printing and publishing	3.5	11.6	5.8	2.0	D	6.4	5.7	8.1	4.90
28	Chemicals and allied products	11.8	9.3	10.3	40.5	8.9	16.5	16.1	11.8	13.14
29	Petroleum and coal products	D	0.4	D	18.2	D	D	2.8	1.7	—
30	Rubber and misc. plastic products	6.1	3.2	3.9	0.9	5.6	5.8	4.2	4.2	4.12
31	Leather and leather products	D	D	D	D	D	1.0	0.2	0.3	—
32	Stone, clay, and glass products	2.2	3.3	3.5	1.1	2.6	2.3	2.6	2.5	4.64
33	Primary metal industries	7.3	0.7	2.9	0.9	2.7	4.4	3.1	3.7	3.09
34	Fabricated metal products	6.3	4.8	3.5	3.5	5.9	5.8	4.9	6.0	10.57
35	Machinery, except electrical	6.8	4.7	4.9	2.7	7.4	7.3	5.5	9.4	6.70
36	Electric and electronic equipment	5.7	15.7	8.1	1.9	10.4	5.7	8.0	8.7	9.02
37	Transportation equipment	5.6	8.3	14.9	8.8	10.3	8.9	9.7	11.5	9.79
38	Instruments and related products	1.4	10.7	2.6	0.4	0.8	2.4	3.5	6.4	2.58
39	Miscellaneous manufacturing	1.4	1.3	1.1	0.3	D	2.0	1.2	1.6	2.06
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹ Average for October-December 1995

² "D" indicates that census disclosure rules prevent the release of data when there are too few firms in a geographic location for a particular industry.

Source: U.S. Department of Commerce, Census of Manufactures, 1992

normal seasonal fluctuations, is southeastern manufacturing improving or not? Seasonal adjustment procedures indeed do a relatively good, although not perfect, job of taking these seasonal fluctuations into account. Statistical programs adjust the data for seasonally weak months by raising the data for these months by a typical difference between the unadjusted months' value and an average yearly value such as a thirteen-month centered average.⁴ Similarly, data for seasonally strong months are lowered by the typical difference between it and a broader average. As a result, a user can discount normal seasonal influences on the data and focus more closely on data that may suggest changes in underlying economic strength.

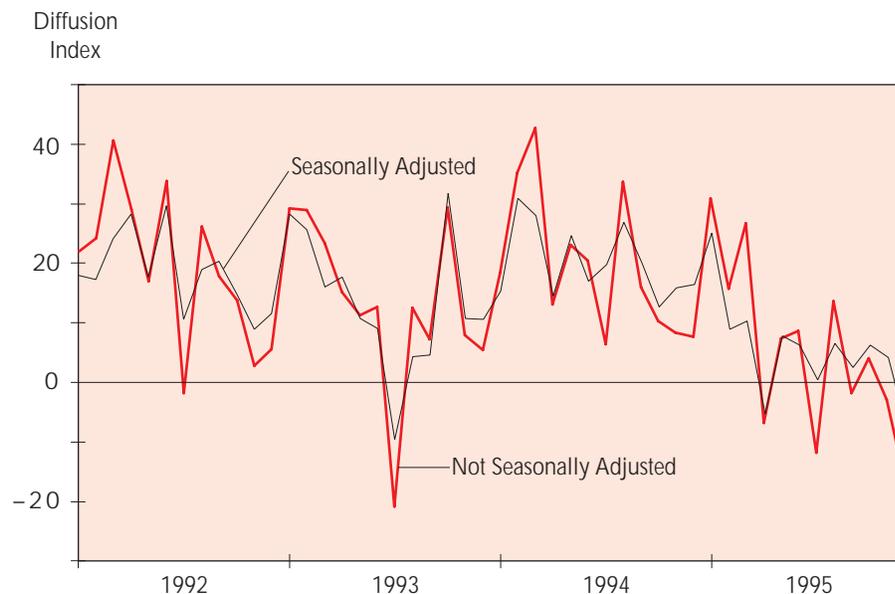
The Seasonal Adjustment Process

To seasonally adjust the data, the Atlanta Fed used a standard seasonal adjustment program—the Census Bureau's X11 program. However, before seasonally

adjusting the data, standard procedures were implemented to determine whether seasonal adjustment was appropriate. In the preliminary stage of the seasonal adjustment process, the X11 program conducts a statistical test (an F-test) to determine whether the seasonality is “stable”—that is, whether the movement in a data series has a regular intrayear pattern.

Data can be processed through seasonal adjustment programs regardless of whether seasonality is stable. However, doing so for data that do not show a stable seasonal pattern does not improve the user's ability to discern true cyclical movements and may instead distort cyclical patterns. Seasonal adjustment programs compare unadjusted monthly numbers to a yearly moving average and then apply seasonal factors to unadjusted data. If the pattern of the differences from the moving average is not regular (that is, stable), then the seasonal factors that are calculated are simply “averages” of random movements. Under these circumstances seasonally adjusted data merely reflect the addition of random factors (the seasonal factors based on unstable data) to unadjusted data. In short, data series that reveal no sea-

Chart 1
Survey of Southeastern Manufacturing Conditions
Production Diffusion Indexes, Seasonally and Not Seasonally Adjusted



Source: Federal Reserve Bank of Atlanta

sonal patterns should not be run through a seasonal adjustment procedure. Some examples of national data series without clear seasonality are from the U.S. consumer price index report, including the price series for household insurance, household maintenance and repairs, and public transportation costs.

Seasonality Tests. For the Atlanta Fed survey, unstable series are monitored on an ongoing basis so that, if they do begin to exhibit a more stable seasonal pattern, they may be seasonally adjusted in the future. Beginning with the initial release of January 1996 data, only three series are not being reported in seasonally adjusted form: (1) prices received for the current month versus the previous month, (2) supplier delivery time for the current month versus the previous month, and (3) new orders for exports for six months from November. These series did not pass a statistical test for stable seasonality.⁵ A list of the F-test results for seasonal stability can be found in Table 2 with the top panel indicating the test results for responses in the “this month versus last month” category and the bottom one providing test results for responses in the “six months from now” category.

After F-test results determined which series should be seasonally adjusted, data for each question in the survey were seasonally adjusted by components—that is, the response categories “decrease,” “no change,” and “increase.” A seasonally adjusted diffusion index was created using the seasonally adjusted components.⁶

After the data have been seasonally adjusted but before the survey is published, one final process is necessary. For each month the seasonally adjusted components (decrease, no change, increase) for a given question do not always sum exactly to 100 because of the nature of the seasonal adjustment statistical procedure. The unadjusted responses’ percentage shares of course sum to 100. So that the sum of the parts equals the whole, seasonally adjusted components are statistically constrained to sum to 100. As a result, the seasonal factors implied by the difference of published (constrained) adjusted and unadjusted data for a given component are not the same as the factors generated by the unconstrained data. The published seasonally adjusted diffusion indexes are the difference of these constrained seasonally adjusted components.

It is important to note that only four years of data are used to derive the seasonal factors and that revisions could be significant with the inclusion of more data. This past year, seasonal factors were revised from those based on only three years of data, and modest changes were seen in the factors as well as in the test statistics for seasonal stability.

Southeastern Manufacturing: Trends, Current Conditions, and Expectations

Several trends in the southeastern manufacturing data have emerged during the past four years from the responses given by participating manufacturers. Trends have become evident in the proportions reporting increases, decreases, or no change for the various survey questions—such as for production, shipments, and new orders. Changes over the business cycle can also be seen by looking at the diffusion index for a given survey question. While in many situations as the proportion of respondents reporting increases moves up, the share with decreases declines, and vice versa, there are instances when both shares move together with the impact showing up in the no-change category. In these instances, the diffusion index is particularly useful because it reveals the difference between the proportion reporting higher levels of activity and the share reporting lower levels of activity.

During the last four years, the various survey series have shown a manufacturing sector largely in a post-recovery phase of economic expansion. Reports have reflected varying magnitudes of strength for manufacturing output with corroborating data in other series, such as orders and employment. Similarly, price data have followed the strength in output.

The diffusion index for output portrays an almost continually expanding southeastern manufacturing sector from early 1992 until the end of 1995. There were mild softenings in mid-1993 and early 1995. A moderate weakening in output, possibly related to a temporary inventory adjustment, began in December 1995. By early 1995 somewhat more firms than not reported higher inventories for finished goods while series for new orders and backlogs remained soft. In May 1995, for the first time, more plants reported decreases in output than reported increases, beginning an extended period of softness that continued into early 1996.

The survey’s employment data suggest that management has been cautious in adding to the manufacturing work force in the Southeast. By February 1992 more manufacturers were adding to the work force than were laying off workers, but the net positive hiring trend took a brief detour in mid-1993, as indicated by the employment diffusion index, which turned negative from May 1993 through August 1993. Thereafter, manufacturers were more inclined to add to their labor force until April 1995, when the employment index again turned negative. Despite mostly favorable hiring trends over the first three years of the survey, the underlying

Table 2
Test for Stable Seasonality

This Month versus Last Month Series

Series	Decrease	No Change	Increase	Diffusion Index
Production	7.114	3.136	8.497	9.645
Shipments	5.701	2.818	5.917	6.346
New orders	2.853	0.547*	3.719	3.308
Backlog of orders	2.978	0.689*	5.562	4.698
Materials inventories	3.156	1.756*	2.835	4.267
Finished goods inventories	3.534	1.120*	4.203	4.674
Number of employees	2.856	5.050	5.027	2.096
Employee workweek	3.187	2.680	5.138	5.899
Prices received	1.972*	3.189	2.399	1.711*
Prices paid for raw materials	0.606*	3.739	3.160	2.026
New orders for exports	0.601*	2.793	3.597	2.358
Supplier delivery time	1.143*	1.718*	1.552*	1.049*
Industry activity nationwide	2.745	1.568*	3.737	2.751

Six Months from Now Series

Series	Decrease	No Change	Increase	Diffusion Index
Production	11.099	2.504	7.891	9.198
Shipments	10.113	2.709	8.064	9.509
New orders	9.175	2.112	8.318	8.986
Backlog of orders	6.962	1.626*	7.633	10.691
Materials inventories	2.877	0.605*	2.037	3.608
Finished goods inventories	3.752	1.374*	2.936	4.810
Number of employees	7.242	1.002*	5.558	7.769
Employee workweek	8.419	0.593*	6.871	14.525
Prices received	4.449	7.202	8.446	6.331
Prices paid for raw materials	0.767*	6.474	5.708	3.434
Capital expenditures	1.556*	1.951	2.910	2.388
New orders for exports	0.687*	1.995	1.869	1.355*
Supplier delivery time	1.563*	1.104*	1.915	2.075
Industry activity nationwide	11.160	3.563	6.544	9.247

Note: The table shows the values of the X-11 F-test for stable seasonality. Seasonal adjustment is done using RATS386-EZ-X11 with graduated extremes. Critical value for the 99 percent level is 2.36. Critical value for the 95 percent level is 1.83. An * indicates those series for which seasonality is not significant at the 95 percent level. The tested series consist of data spanning the period January 1992–December 1995, except for supplier delivery time, which is tested over the March 1992–December 1995 period.

caution of manufacturers should not be overlooked. The percentage of plants reporting no change in their number of employees remained high—never dropping below 55 percent—throughout this period.

The data for the average workweek show a pattern similar to that for the number of employees. Workweek figures have been positive on balance for the 1992-94 period, with the exception of a mildly negative five-month period in mid-1993. Since February 1995 the trend clearly has been for the index to remain mildly negative. Comments from manufacturers give several possible explanations for the fact that only a small portion of plants have boosted either employment or average work hours during the current expansion. These explanations include management's expectation that output gains would be only moderately healthy rather than robust during the expansion, firms' cost of labor being driven up by benefit costs, and foreign and domestic competition's forcing manufacturers to boost productivity and reduce labor costs.

As the string of positive reports on production, shipments, and orders continued into the third year of this expansion, the issue of price pressures became increasingly important. In both 1992 and 1993 the share of respondents reporting an increase in prices for raw materials remained at a relatively constant 20 percent each month. However, by the end of 1994 this figure had surged to over 50 percent, peaking at 59 percent in January 1995. Such figures raised concern that inflation pressure might be building at the manufacturing level and could be passed on to consumers. The share of respondents reporting raising prices for their finished product also rose, although much more slowly. The share reporting increases rose from the 10 percent to the 15 percent range in 1993 to a peak of 34 percent in January 1995. The share reporting increases for either series eased in early 1995 and remained soft into early 1996.

In analyzing the relationship of these numbers, particularly for input prices, to overall inflation trends, several points should be considered. First, the figures do not indicate the size of price increases, merely the proportion of firms reporting those increases. Second, for most firms the number of different raw materials used in their production process exceeds the number of finished products. Hence, reports typically show input prices increasing more often than do finished product prices. Finally, raw materials may be only a small portion of total costs, and manufacturers may temporarily absorb that cost. To some degree, all these factors likely have played a role in constraining reported increases in output prices in 1994 despite the fact

that figures for the raw materials price series have been higher.

The Outlook Data

The data respondents report on outlook are difficult to interpret for the Southeast because the survey has not yet been in existence for even a full business cycle. Yet thus far the outlook responses for a number of activities have been consistent with current-month data, but only in a broad cyclical sense. The six-months-out data tend to miss some of the more volatile oscillations in the current-month figures. For example, the outlook data for production peaked early during this expansion, in December 1992, when two-thirds of the respondents anticipated future output gains. This peak was consistent with the later maturing manufacturing sector in the Southeast when output grew more slowly. On the other hand, the noticeable deceleration in mid-1993 was not foreseen by southeastern manufacturers.

In the prices-received and prices-paid series, the six-months anticipation data appear to have been more accurate for peaks and troughs for two or three months ahead than for six months. Also, for the first two years of the survey, manufacturers were significantly more optimistic in terms of expectations of prices received than later data bore out. Only in the spring of 1995 did expectations data for prices, both received and paid, approach the current-month diffusion index levels. During the past four years, only a small percentage of southeastern manufacturers were able to report increases in prices for their own finished products despite significant percentages of respondents indicating higher input prices over the first three years of the survey, especially in 1994.

Summary

In March 1995 the Federal Reserve Bank of Atlanta began publishing data for the Survey of Southeastern Manufacturing Conditions in seasonally adjusted form, thereby significantly improving the data's usefulness in portraying the current status of southeastern manufacturing. Seasonally adjusted data are now available historically back through 1992 for most month-ago and six-months-ahead expectations series. Historical data are available through the Commerce Department's Economic Bulletin Board, on the Internet at

<http://www.frbatlanta.org>, or through the Atlanta Fed's public affairs department.

The new, seasonally adjusted data portrayed a robust manufacturing sector in the Southeast from 1992 through 1994 with gradually rising price pressures peaking at the first of 1995. The fourth year of the survey, 1995, showed southeastern manufacturing activity

rebounding with modest growth following a mild inventory adjustment in the spring of the year. Output in early 1996 weakened after an extended period of declines in backlogs. At the end of 1995, price indexes for prices paid and for prices received were soft compared with 1994.

Notes

1. The Sixth Federal Reserve District encompasses Alabama, Florida, Georgia, and parts of Louisiana, Mississippi, and Tennessee.
2. See R. Mark Rogers, "Tracking Manufacturing: The Survey of Southeastern Manufacturing Conditions," Federal Reserve Bank of Atlanta *Economic Review* 77 (September/October 1992): 26-33.
3. For supplier delivery time the question format was changed in March 1992. The choice of responses was changed from "decrease," "no change," and "increase" to "faster," "no change," and "slower" to clarify intended responses. There had been some doubt as to how respondents were interpreting these questions when the survey first began. For supplier deliveries, "slower" is a positive response because slower deliveries generally indicate a strong economy with increasing shortages of supplies. The diffusion index for supplier delivery time is the percentage of "slower" responses minus the percentage of "faster" responses.
4. Using thirteen months to determine an average gives an equal number of months before and after the "center" of the average.
5. If the results of the F-test do not indicate stable seasonality at the 95 percent confidence level or higher, that particular series is not seasonally adjusted. The 95 percent figure is a typical, high standard for acceptance of the hypothesis (that stable seasonality is present). For a number of types of activity (that is, production, new orders, and so on), one or more of the components of the diffusion indexes did not pass the 95 percent hurdle for stable seasonality. For example, for material goods inventories, the "no change" response has an F-statistic that is well below the 95 percent critical value even though the "decrease" and "increase" components had F-statistics exceeding this value. In these cases, all of the components are seasonally adjusted if one component passed (including, for this test purpose, "no change" as well as the diffusion index [in a test directly on the unadjusted index]).

The seasonally adjusted diffusion index is still calculated indirectly from these seasonally adjusted components. For the category "prices received this month versus last month, only the "no change" component series is stable, likely reflecting the fact that most responses fell in that category. The "increase" and "decrease" categories had a high ratio of noise (monthly volatility) to any seasonal movement and did not pass the test for stable seasonality.

When the survey data were first released in seasonally adjusted form in March 1995, the list of series not available in seasonally adjusted form differed slightly. At that time the series available only in unadjusted form were "prices received for this month versus last month" and "supplier delivery time" (for both time frames). For both the "supplier delivery time" series there were an insufficient number of observations for seasonal adjustment because the format for these series changed in March 1992 (see note 3). A minimum of three years of data is required for the X11 procedure.

6. Direct seasonal adjustment of the diffusion index was also considered. The directly adjusted diffusion indexes were practically identical to those computed using seasonally adjusted components. The directly adjusted indexes usually had marginally less monthly volatility than the indirectly adjusted indexes. The deciding factor in using an indirect seasonal adjustment process for the diffusion indexes was that the seasonally adjusted components are consistent with the indirectly adjusted indexes. In other words, indirectly adjusted diffusion indexes exactly (except for rounding) equal the difference between percentages for positive and negative seasonally adjusted component responses. Directly adjusted indexes do not always equal the difference between positive and negative response shares. Another concern was that with directly adjusted indexes using additive factors it is possible for some seasonally adjusted monthly indexes to take on values greater than 100 or less than -100—possibilities that are not aesthetically or theoretically pleasing.