Methodology Behind the NAM Manufacturing Outlook Index: How to Explain What the Index Tells Us

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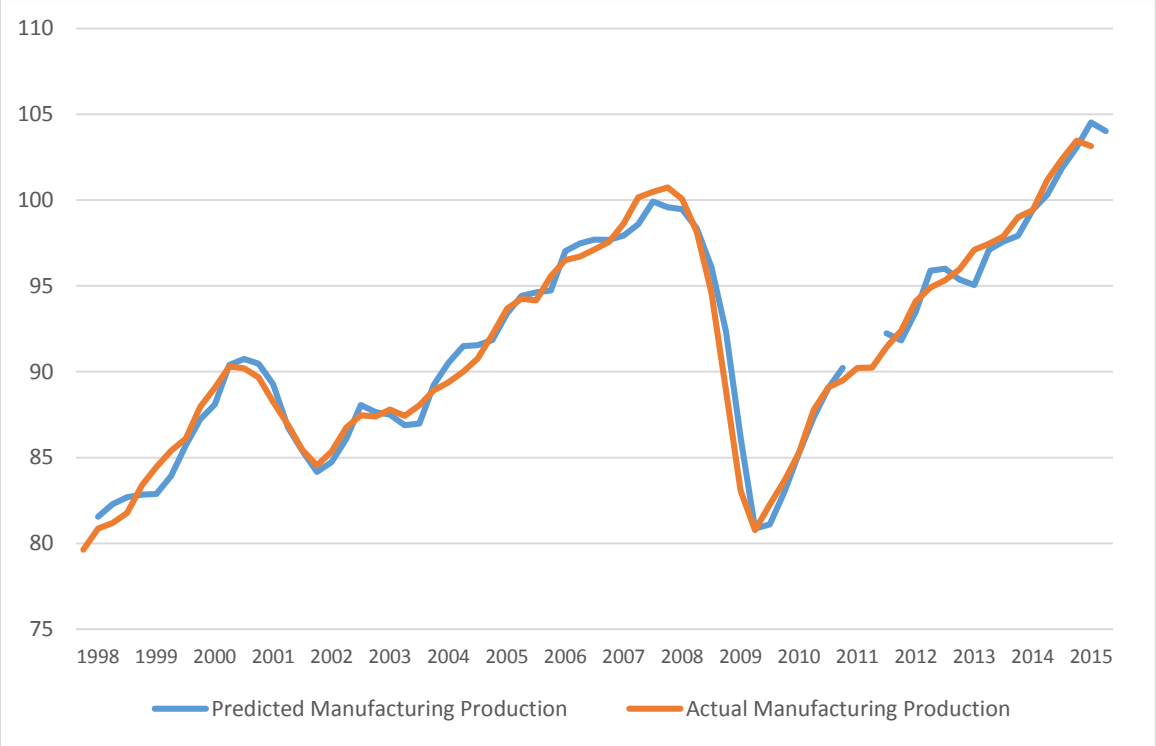
Background

The National Association of Manufacturers (NAM) has conducted an outlook survey of its members since the fourth quarter of 1997 in one form or another. This survey asks respondents about their own company's outlook and their expected levels for sales, capital spending, employment, wages, benefits, product prices, inventories and exports over the next 12 months. Some questions have shorter time frames, as they were added more recently to the mix. In addition, manufacturing leaders assess their biggest challenges facing their businesses, and there are often a number of special questions to complete. Historic data appear in Table 1.

Figure 1: Predicted Versus Actual Manufacturing Production
(Manufacturing NAICS, 2007=100)



Source: National Association of Manufacturers, Federal Reserve Board

Using the Survey as a Predictive Tool

These survey findings provide an interesting snapshot of what manufacturers are thinking at any one time. In looking at the more than 17 years of data, you can sense swings in the business cycle, even without sophisticated statistical analysis. Yet, when I joined the NAM in 2011, I wanted to know if the

survey results provided any clues about where the manufacturing sector was headed. In other words, if the survey said that 88.5 percent of manufacturers are either somewhat or very positive about their company's outlook—as they were in the first quarter of this year—what does that mean exactly? Is it a good number or a bad number? And, can you use the data to help to predict manufacturing activity moving forward?

For a few years now, I have tried to forecast production using a regression model. Starting with the second quarter of 2015, I will introduce an updated version. (See Table 2.) To determine what manufacturing production might be in the next quarter, we use survey data on the business outlook and expectations for both sales and investment. Other variables in the regression include current manufacturing output and real consumption. This model predicts 97.5 percent of the variation in manufacturing production over the course of this survey, which is illustrated in Figure 1. Using this analysis, we would predict the manufacturing production index (NAICS) from the Federal Reserve to reach 104.0 in the second quarter of 2015, up from an average of 103.1 in the first quarter (the actual number).

We could then apply this analysis in future surveys. For instance, in the second quarter 2015 survey, we should be able to predict manufacturing production in the third quarter and so on.

Creating the NAM Manufacturing Outlook Index

Many economic indicators report an easy-to-understand headline index that helps to summarize the overall findings of the respective analysis. For instance, many entities release a purchasing managers' index (PMI) for manufacturing, which is based on a series of diffusion indices on new orders, output, employment, inventories and other questions posed to respondents. Moreover, others track activity over time, such as the before-mentioned manufacturing production data, fixing a certain time period as 100 percent. Data that follow that time point reflect growth since then.

There were some challenges in creating an index using the NAM survey. First, while the survey has been administered since 1997, the underlying data for sales, investment, employment and other expectations are limited to more recent time horizons. The summary data are readily available, as can be seen in Table 1, but without more detail, it would be difficult to analyze a larger set of diffusion indices on each of these variables. Second, the overarching summary variable is on a company's business outlook, wherein we report the percentage that is either somewhat or very positive for each quarter. Note that, unlike other diffusion indices, there is no neutral option. This also differentiates the NAM survey with other surveys that provide this option, where net positives suggest expansion, or vice versa.

Therefore, the NAM Manufacturing Outlook Index has a slightly different methodology. The first step was to take the mean of all business outlook responses over the history of the survey. Currently, the mean is 73.8 percent. Thus, when more than 73.8 percent of manufacturers suggest that they are either somewhat or very positive in their company's outlook, we could say that the outlook is above average. Percentages below that threshold would suggest the opposite.

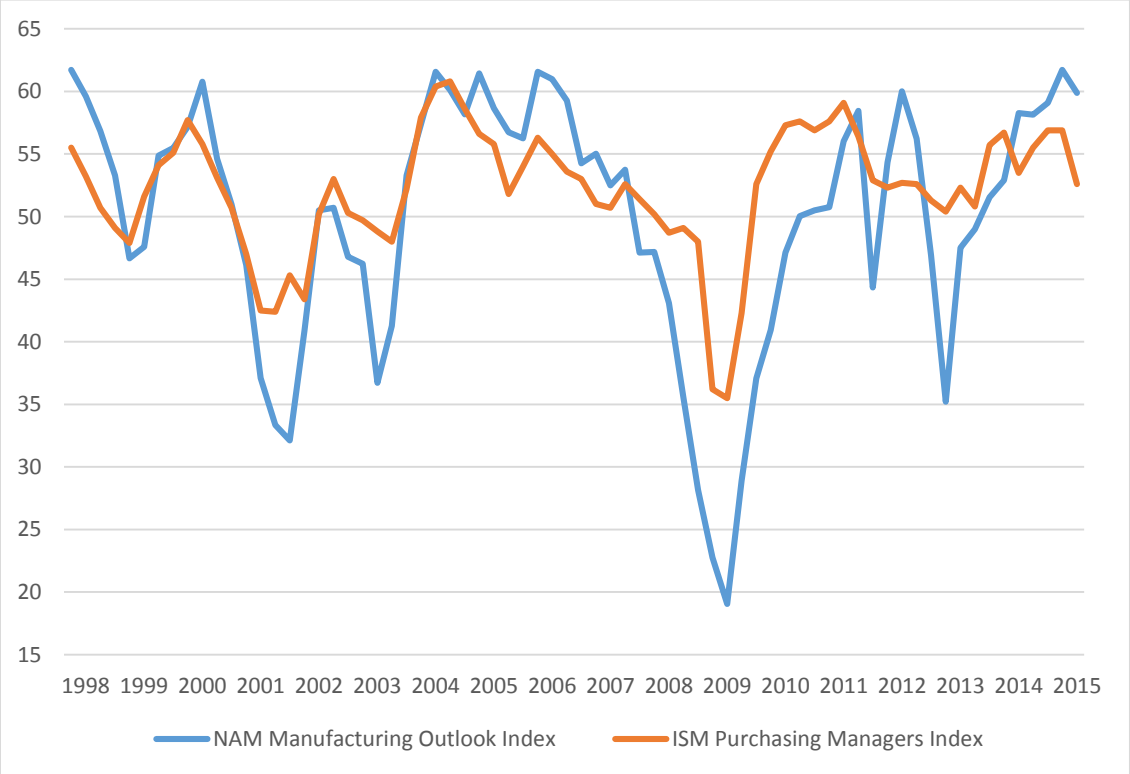
To help standardize this into an index measure, we set the mean to equal 50. Moreover, one standard deviation from the mean would be 60 in the positive direction or 40 in the negative direction. Currently, the standard deviation is 14.9 percent. In essence, an outlook reading of 88.7 percent would

yield an NAM Manufacturing Outlook Index of 60. This would be consistent with a strong manufacturing sector that was expanding at healthy levels, with respondents very optimistic in their outlook. For historical values of this index, see Table 3.

Just for comparison, Figure 2 charts the NAM Manufacturing Outlook Index against the Institute for Supply Management's (ISM) Manufacturing PMI, which is seen as a bellwether for the sector in terms of current activity and sentiment within the sector. Note that these two time series track fairly closely, with a correlation coefficient of 0.804. Beyond the ISM survey, the NAM Manufacturing Outlook Index has also had a fairly strong relationship with manufacturing production since the recession, with a correlation coefficient of 0.69 since 2008. It also did a fairly decent job of explaining the 2002–2006 time period, with a coefficient of 0.58.

Overall, the NAM Manufacturing Outlook Index measures enthusiasm in the activity from quarter to quarter. Similar to other sentiment surveys, these data points often move on external factors. As a result, the index is clearly more volatile than some other indicators, such as manufacturing production, reflecting the ebbs and flows that you would expect from such gauges. Survey takers have often responded to geopolitical events, economic headwinds and political challenges. For instance, as an example of the latter, the index plummeted to 35.2 in the fourth quarter of 2012 (with just 51.8 percent of respondents being positive in their outlook) on the eve of the fiscal cliff debate. It then recovered.

Figure 2: NAM Manufacturing Outlook Index Versus Institute for Supply Management's Manufacturing PMI



Source: National Association of Manufacturers, Institute for Supply Management

Table 1: Historic Data from the NAM Manufacturers' Outlook Survey, 1997–2015

	Business Outlook (% Either Somewhat or Very Positive)	Expected Growth Rates Over the Next 12 Months							
		Sales	Prices	Investment	Inventory	Employment	Wages	Exports	Benefits
1997:4	91.21%	5.93%	1.24%	3.65%	0.57%	2.47%	3.09%		
1998:1	88.07%	5.64%	0.84%	3.65%	-0.38%	2.24%	2.77%		
1998:2	83.95%	4.83%	0.87%	2.45%	1.30%	2.43%	2.98%		
1998:3	78.68%	4.44%	0.63%	2.21%	-0.27%	1.55%	2.93%		
1998:4	68.83%	2.92%	0.41%	2.00%	-0.96%	1.39%	2.66%		
1999:1	70.20%	3.51%	0.73%	2.49%	-0.71%	1.38%	2.48%		
1999:2	81.05%	3.82%	0.81%	2.49%	0.08%	1.91%	2.85%		
1999:3	81.96%	4.62%	1.24%	2.01%	0.25%	2.20%	3.05%		
1999:4	84.45%	3.28%	1.11%	2.27%	0.43%	2.23%	3.07%		
2000:1	89.81%	5.17%	1.50%	2.53%	0.03%	2.25%	3.10%		
2000:2	80.67%	4.49%	1.27%	2.11%	-0.04%	1.72%	3.26%		
2000:3	75.26%	4.46%	1.36%	1.95%	0.05%	1.65%	3.10%		
2000:4	68.03%	3.02%	1.11%	1.15%	-0.55%	1.07%	2.82%		
2001:1	54.62%	1.99%	0.96%	0.91%	-1.09%	0.48%	2.66%		
2001:2	49.04%	1.65%	0.68%	0.47%	-1.04%	0.47%	2.50%		
2001:3	47.19%	1.23%	0.44%	-0.10%	-1.70%	0.06%	2.10%		
2001:4	60.23%	2.13%	0.48%	0.13%	-1.31%	0.34%	1.92%		
2002:1	74.51%	2.47%	0.75%	0.90%	-0.81%	0.43%	2.00%		
2002:2	74.82%	3.30%	1.03%	0.52%	-0.56%	1.35%	2.15%		
2002:3	69.01%	2.90%	0.90%	1.15%	-0.71%	0.67%	1.93%		
2002:4	68.17%	3.19%	0.86%	1.50%	0.06%	0.95%	1.96%		
2003:1	54.03%	2.14%	0.57%	0.64%	-1.01%	0.24%	1.78%		
2003:2	60.81%	2.64%	0.24%	1.24%	-1.15%	0.73%	1.78%		
2003:3	78.67%	3.44%	0.41%	1.27%	-0.51%	1.02%	1.69%		
2003:4	84.75%	4.08%	1.04%	1.68%	0.00%	1.42%	1.94%		
2004:1	91.00%	4.72%	1.66%	2.08%	0.50%	1.83%	2.18%		
2004:2	88.84%	5.13%	1.98%	2.96%	0.22%	2.20%	2.35%		
2004:3	85.93%	4.64%	1.90%	2.86%	0.42%	1.62%	2.06%		
2004:4	90.79%	4.76%	1.77%	3.00%	-0.18%	1.52%	2.16%		
2005:1	86.65%	4.87%	1.64%	3.13%	-0.79%	1.42%	2.25%		
2005:2	83.82%	4.03%	1.96%	2.65%	-0.13%	1.16%	2.21%		
2005:3	83.07%	4.42%	2.39%	2.70%	-0.09%	1.00%	2.11%		
2005:4	91.00%	4.86%	2.38%	2.30%	-0.23%	1.58%	2.34%		
2006:1	90.10%	5.11%	2.14%	3.03%	-0.06%	1.65%	2.30%		
2006:2	87.58%	4.60%	2.30%	2.33%	-0.17%	1.54%	2.35%		
2006:3	80.12%	4.06%	2.12%	1.69%	-0.51%	1.25%	2.28%		
2006:4	81.24%	3.94%	1.82%	1.98%	-0.37%	1.81%	2.23%		
2007:1	77.50%	4.23%	1.55%	2.31%	-0.61%	1.21%	2.00%		
2007:2	79.36%	3.93%	1.94%	2.21%	-0.70%	1.53%	2.22%		
2007:3	69.50%	3.02%	1.77%	1.40%	-0.84%	1.07%	2.11%		
2007:4	69.59%	2.84%	1.98%	1.74%	-0.67%	0.98%	2.06%		
2008:1	63.51%	2.67%	2.59%	1.78%	-0.90%	0.71%	2.05%		
2008:2	52.32%	2.25%	3.30%	1.29%	-0.67%	0.62%	2.23%		
2008:3	41.32%	1.21%	2.16%	0.27%	-1.38%	0.09%	1.79%		
2008:4	33.28%	-3.14%	-0.17%	-2.24%	-3.47%	-2.47%	0.63%		
2009:1	27.78%	-5.22%	-0.88%	-4.14%	-4.80%	-3.59%	-0.28%		
2009:2	42.39%	-0.63%	0.02%	-2.01%	-2.88%	-0.82%	0.40%		
2009:3	54.59%	1.58%	0.44%	0.19%	-1.50%	0.09%	0.79%		
2009:4	60.32%	1.64%	0.65%	-0.76%	-1.35%	-0.19%	0.79%		
2010:1	69.51%	3.05%	1.22%	0.33%	-0.25%	0.36%	1.00%		
2010:2	73.86%	3.33%	1.36%	1.68%	-0.10%	1.33%	1.42%		
2010:3	74.52%	3.49%	1.25%	1.85%	-0.20%	1.06%	1.27%		

2010:4	74.90%								
2011:1	82.76%								
2011:2	86.36%	5.48%	3.40%	3.42%	0.66%	2.36%	1.76%	1.06%	
2011:3	65.38%	3.19%	2.20%	1.50%	-0.03%	1.41%	1.08%	0.36%	
2011:4	80.22%	4.36%	2.02%	2.78%	0.29%	1.78%	1.42%	1.34%	
2012:1	88.68%	4.73%	2.15%	2.57%	0.55%	1.99%	1.85%	1.32%	
2012:2	83.06%	4.32%	1.51%	2.52%	0.11%	1.88%	1.79%	1.40%	
2012:3	69.20%	2.55%	1.40%	1.17%	-0.59%	0.71%	1.54%	0.96%	
2012:4	51.80%	0.97%	1.48%	-0.60%	-1.53%	-0.44%	1.14%	0.68%	
2013:1	70.10%	2.34%	1.50%	0.87%	-0.14%	0.70%	1.47%	0.89%	
2013:2	72.30%	2.68%	1.08%	1.16%	-0.33%	0.62%	1.59%	1.22%	
2013:3	76.10%	3.30%	1.11%	2.14%	-0.03%	1.06%	1.71%	1.37%	
2013:4	78.10%	3.03%	1.19%	1.40%	-0.16%	0.89%	1.58%	1.17%	
2014:1	86.10%	3.62%	1.52%	1.93%	0.07%	1.28%	1.58%	1.28%	
2014:2	85.90%	4.10%	1.59%	2.29%	0.50%	1.73%	1.58%	1.58%	
2014:3	87.30%	4.40%	1.97%	2.51%	0.76%	1.85%	2.03%	1.34%	6.35%
2014:4	91.20%	4.54%	1.50%	2.34%	1.05%	2.05%	1.97%	1.18%	6.34%
2015:1	88.50%	4.34%	1.22%	2.30%	0.41%	1.91%	1.91%	0.87%	5.27%

Source: National Association of Manufacturers

Note: There was no survey conducted in the fourth quarter of 2010 or the first quarter of 2011. A predictive model was used to impute the business outlook percentage in those quarters.

Table 2: Predictive Regression Analysis for Manufacturing Production

(Dependent Variable: Manufacturing Production)

Variable	Coefficient	Standard Error	t-Statistic	Probability
Constant	2.196454	2.258704	0.972440	0.3347
NAM Business Outlook *(Lagged One Quarter)*	**6.763818***	2.128942	3.177080	0.0023
Survey Sales Expectations *(Lagged One Quarter)*	**0.572434****	0.264436	2.164735	0.0343
Survey Investment Expectations *(Lagged One Quarter)*	**-0.672002****	0.310846	-2.161851	0.0346
Manufacturing Production *(Lagged One Quarter)*	**0.845869***	0.037229	22.72054	0.0000
Real Consumption Expenditures *(Lagged One Quarter)*	**0.000685***	0.000213	3.221301	0.0020
Regression Statistics:				
# of observations	67			
R-squared	0.975010			
Adjusted R-squared	0.972962			
F-statistic	475.9929			

Source: National Association of Manufacturers

* Significant at the 99% confidence level

** Significant at the 95% confidence level

Table 3: NAM Outlook Index

(Mean=50)

	NAM Outlook Index
1997:4	61.72
1998:1	59.60
1998:2	56.83
1998:3	53.29
1998:4	46.66
1999:1	47.58
1999:2	54.88
1999:3	55.49
1999:4	57.17
2000:1	60.77
2000:2	54.62
2000:3	50.98
2000:4	46.13
2001:1	37.11
2001:2	33.35
2001:3	32.10
2001:4	40.88
2002:1	50.48
2002:2	50.69
2002:3	46.79
2002:4	46.22
2003:1	36.71
2003:2	41.27
2003:3	53.28
2003:4	57.37
2004:1	61.57
2004:2	60.12
2004:3	58.17
2004:4	61.43
2005:1	58.65
2005:2	56.75
2005:3	56.24
2005:4	61.57
2006:1	60.97
2006:2	59.27
2006:3	54.26
2006:4	55.01
2007:1	52.49
2007:2	53.74
2007:3	47.11
2007:4	47.18
2008:1	43.08
2008:2	35.56
2008:3	28.16
2008:4	22.75
2009:1	19.05
2009:2	28.88
2009:3	37.09
2009:4	40.94
2010:1	47.12
2010:2	50.04
2010:3	50.49
2010:4	50.74
2011:1	56.03
2011:2	58.46
2011:3	44.35
2011:4	54.33
2012:1	60.01
2012:2	56.23
2012:3	46.91
2012:4	35.21
2013:1	47.52
2013:2	49.00
2013:3	51.55
2013:4	52.90
2014:1	58.28
2014:2	58.14
2014:3	59.09
2014:4	61.71
2015:1	59.89

Source: National Association of Manufacturers