RESEARCH RAP Special Report

December 2008

What Does the Philadelphia Fed's *Business Outlook Survey* Say About Local Activity?*

Leonard Nakamura and Michael Trebing

Every month, the Federal Reserve Bank of Philadelphia publishes the *Business Outlook Survey*, which solicits the views of local manufacturers about conditions at their companies. This survey, which has been conducted continuously since May 1968, provides a unique early view of U.S. economic activity each month. Consequently, economists, the media, and investors carefully watch the survey, and the survey is widely believed to have an influential impact on the stock market.

The value of the survey as a signal is due to its unusual longevity and to the fact that manufacturing remains quite sensitive to – and central to — shifts in overall economic activity. As a result, even though the survey seeks the views of manufacturers only in the local area, it is useful in estimating how manufacturers and other businesses throughout the U.S. economy are performing. The survey asks several questions that have been shown to be useful in estimating quantitatively how the entire U.S. economy is doing along a variety of dimensions. These studies have been reported in the Philadelphia Fed's *Business Review*, in the September/October 1998 issue and again in the Fourth Quarter 2003 issue.

The *Business Outlook Survey* (BOS) receives nationwide attention because it is viewed as both a national and regional indicator. Oddly enough, it is easier to show that the BOS performs well in terms of predictive value at the national level than it is to show the same result at the local level. This is because many economic statistics are not available regionally, but they are available nationally; for example, industrial production indexes are reported for the nation, but not for states.

One source of local information is the Philadelphia Fed's state coincident indexes. In this *Research Rap Special Report*, we will show that questions from the BOS about general activity and shipments provide

* The views expressed here are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. Leonard Nakamura is assistant vice president and economist and Michael Trebing is a senior economic analyst in the Research Department of the Philadelphia Fed.

early information on both the Pennsylvania and the New Jersey coincident indicators, as well as coincident indicators of other large industrial states.

State Coincident Indicators and the BOS

Following the successful construction of coincident indexes of the national economy that track official business cycles, the Philadelphia Fed began publishing state coincident indicators of the region's economy in 1994. Subsequently, we began publishing indexes for each of the 50 states in 2006.[1] The indexes are released a few days after the Bureau of Labor Statistics (BLS) releases the employment data for the states. For example, a coincident index for each state for September 2008 was published on October 23, 2008. The coincident index is based on four state-level variables: nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements deflated by the consumer price index (U.S. city average). Moreover, the trend for each state's index is set to the trend of its gross domestic product (GDP), so long-term growth in the state's index matches long-term growth in its GDP. A dynamic single-factor model, based on original work by James Stock and Mark Watson, is used to create the state indexes. The model and the input variables are consistent across the 50 states, so the state indexes are comparable to one another.

The original purpose of these coincident indicators was to glean information in the short run about the health of regional economies when little data were available. The state coincident indicators published by the Philadelphia Fed are available with a lag of about one month and use the existing consistent monthly data for nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements.

Monthly responses for the BOS are tabulated and published as diffusion indexes intended to measure the direction of change in overall business activity, shipments, new orders, inventories, delivery times, prices paid and prices received, and employment. We focus here on two of the survey's broadest indicators: the indexes for general activity and shipments. The general activity index is based on a question about firms' appraisal of changes in general business conditions each month. The shipments index is based on a more specific question about changes in the firms' shipments from the previous month. We first evaluate the relationship between the BOS general activity and shipments indexes and the coincident index using the Pennsylvania index, since that state has the largest manufacturing presence among the three states in the Third District (Pennsylvania, New Jersey, and Delaware). A cursory review of the two data series reveals similar patterns, with declines in the coincident index typically associated with declines in both BOS diffusion indexes, especially during recessions. (Figure 1 displays the comparison for the general activity index.) The availability of the BOS diffusion index well ahead of the release of the coincident index suggests

[1] Detailed information on coincident indicators for the 50 states is available in Crone (2006). Current data are available on the Philadelphia Fed's website: http://philadelphiafed.org/research-and-data/regional-economy/indexes/coincident/.

that a test of its usefulness in forecasting is possible.[2] Using data from 1979 to 2008, we estimate a simple linear regression model. The dependent variable is the monthly percent change in the Pennsylvania coincident index, and the explanatory variable is simply the same month's BOS diffusion index for current activity. The results (Table 1) demonstrate that, by itself, the BOS general activity diffusion index can "explain" 39 percent of the month-to-month variation in the monthly change in the coincident index. Moreover, the estimated coefficient for the constant (intercept) term is insignificant and near zero, suggesting that the diffusion index model is valid: that is, positive diffusion values are associated with growth, and negative values of the index are associated with declines. The same model, using the current shipments index, shows a significant relationship to the monthly change in the coincident index, but the fit was somewhat inferior compared with using the activity index as the independent variable.[3] If we look at the model in a different light, Figure 2 displays the in-sample forecasts since 1990 for the simple linear model (using the current activity index) compared to the actual monthly percent change in the PA coincident index.

Although the simple models demonstrate an ability to forecast changes in the coincident index, a test that meets a higher forecasting standard could be conducted to see if the BOS provides information independent of that already available in the history of the coincident index itself. To test this statistically, we employ an autoregressive model of the form:

$$\dot{V}_t = \beta_0 + \sum_{i=1}^{12} \beta_i (\dot{V}_{t-i}) + \delta BOSC_t + \varepsilon_t$$

where $\dot{V}$ is the percentage change in Pennsylvania's state coincident indicator and BOSC is the current general activity index. Included in the regressions are 12 lags of the dependent variables, allowing us to test if the independent variable provides additional useful and timely information, controlling for the information provided by the coincident indicator by itself.[4] In other words, the test determines whether the BOS provides useful information on the health of the state economy, much like the published results for the national economy, and well ahead of the published indicator itself.

Regression results are shown in Table 2 for the full-sample period (1979–present). The same regression model is also estimated using the BOS shipments index. The analysis shows that the diffusion indexes for general activity and shipments are statistically significant, even when accounting for the past realizations of the coincident index. These findings are consistent with the previously published findings that

[2] In fact, two months of data for the BOS are available ahead of the coincident indicator. The BOS for the current month is always released on the third Thursday of the same calendar month; therefore, by the time the coincident index is released for a given month, the BOS has been published for that subject month plus the subsequent month.

[3] One possible explanation for the better fit is that the general activity index captures more information because it is based on a more general question about overall business conditions.

[4] Previous work used essentially the same autoregressive model for estimation, where the one-month changes in various **national** measurements (industrial production, manufacturing shipments, employment, etc.) were regressed on

the BOS diffusion indexes have predictive power in explaining monthly changes in manufacturing measures at the national level.

In the next stage we conduct an analysis of the coincident indexes for our three Federal Reserve District states. Additionally, we apply a similar analysis to coincident indexes for the largest states, which are more likely to have a relationship to income associated with the manufacturing sector. Table 3 presents the results from the model using the BOS index and the coincident indicators for each state. That is,

$$\dot{V}_{jt} = \beta_0 + \sum_{i=1}^{12} \beta_i (\dot{V}_{jt-i}) + \delta GAC_{jt}$$

where $\dot{V}_{jt}$ is the percentage change in **state j's coincident index** at time **t**.

Presented along with our three District states are the largest states as measured by total population and those that are most likely to have a relationship to income associated with the manufacturing sector. For the full sample period (1979 to present), two of our three District states display a statistically significant relationship to the respective state coincident indicator (Pennsylvania and New Jersey). Twelve of 14 state indexes show a statistically significant relationship with the BOS general activity index (only Delaware in the Third District and Texas do not).[5]

We therefore find that our BOS manufacturing indexes have significant predictive power in forecasting changes in the coincident indicators of the states in our region. Moreover, and perhaps more interestingly, the same predictive power is found with most states that have a large manufacturing footprint. These findings are consistent with the previously published findings that the BOS manufacturing indexes have predictive power in explaining monthly changes in manufacturing measures at the national level.

References

Crone, Theodore M. "A New Look at Economic Indexes for the States in the Third District," *Business Review*, Federal Reserve Bank of Philadelphia (November/December 2000).

Crone, Theodore M. "What a New Set of Indexes Tells Us About State and National Business Cycles," *Business Review*, Federal Reserve Bank of Philadelphia (First Quarter 2006).

Stock, James H., and Mark W. Watson. "New Indexes of Coincident and Leading Economic Indicators," *NBER Macroeconomics Annual* (1989), pp. 351-94.

---

12 lags of changes in the respective dependent variable and 12 lags of various counterpart diffusion indexes for each variable. See Schiller and Trebing.

[5] For the shorter period (1989-present), the results are amplified, with 13 out of 14 states exhibiting a statistically significant relationship. Similar results hold when regressions are run for the BOS shipments index.

Schiller, Tim, and Michael Trebing. “Taking the Measure of Manufacturing,” *Business Review*, Federal Reserve Bank of Philadelphia (Fourth Quarter 2003).

Trebing, Michael E. “What's Happening in Manufacturing: ’Survey Says…’,” *Business Review*, Federal Reserve Bank of Philadelphia (September/October 1998).

Figure 1

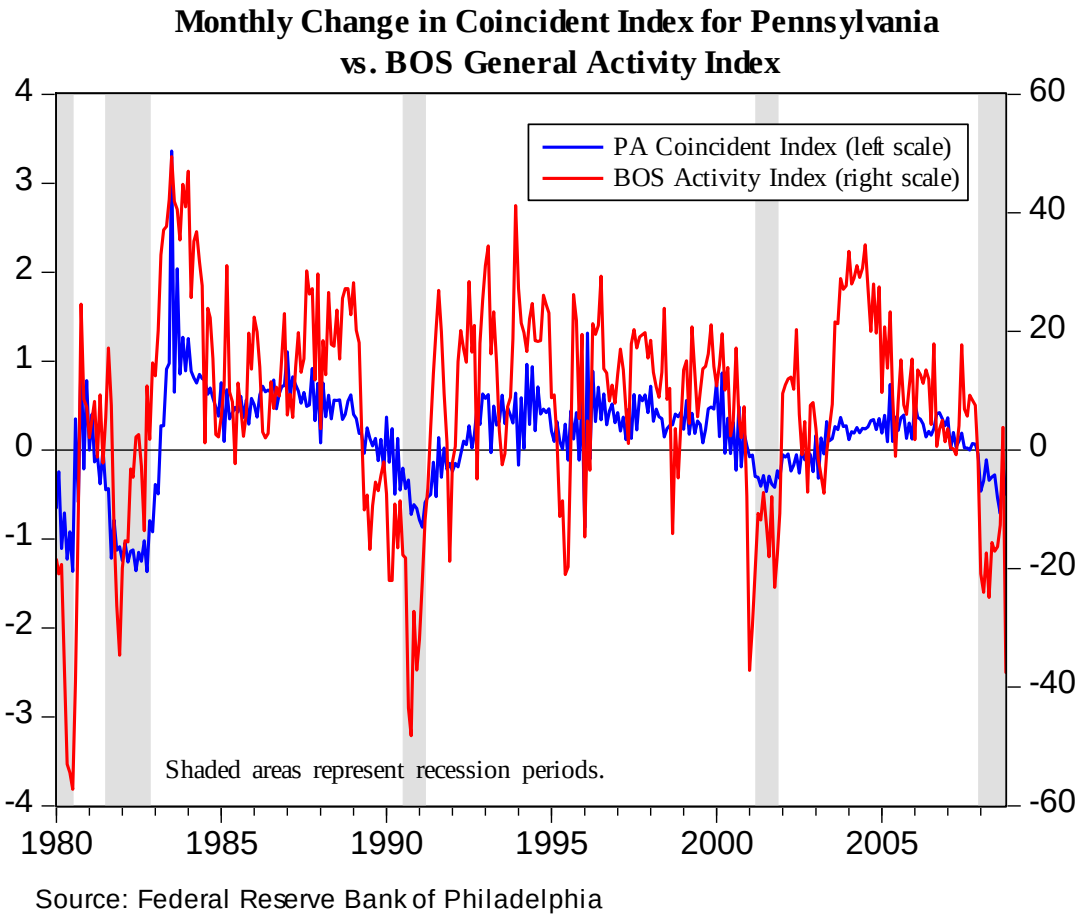

Monthly Change in Coincident Index for Pennsylvania
vs. BOS General Activity Index
PA Coincident Index (left scale)
BOS Activity Index (right scale)
Shaded areas represent recession periods.
4
3
2
1
0
-1
-2
-3
-4
60
40
20
0
-20
-40
-60
1980
1985
1990
1995
2000
2005
Source: Federal Reserve Bank of Philadelphia

Table 1a

Testing the Relationship Between the BOS Manufacturing Indexes (General Activity and Shipments) and Pennsylvania Coincident Index— Simple Linear Regression Results

Dependent Variable: Percent Change in Pennsylvania Coincident Index
Method: Least Squares

Sample (adjusted): 1979 - 2008
Included observations: 356 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.023479	0.023060	1.018144	0.3093
General Activity Index	0.018725	0.001207	15.51939	0.0000

R-squared	0.404894	Mean dependent var	0.156542
Adjusted R-squared	0.403212	S.D. dependent var	0.522845
S.E. of regression	0.403909	Akaike info criterion	1.030346

Table 1b

Dependent Variable: Percent Change in Pennsylvania Coincident Index
Method: Least Squares

Sample (adjusted): 1979 - 2008
Included observations: 356 after adjustments

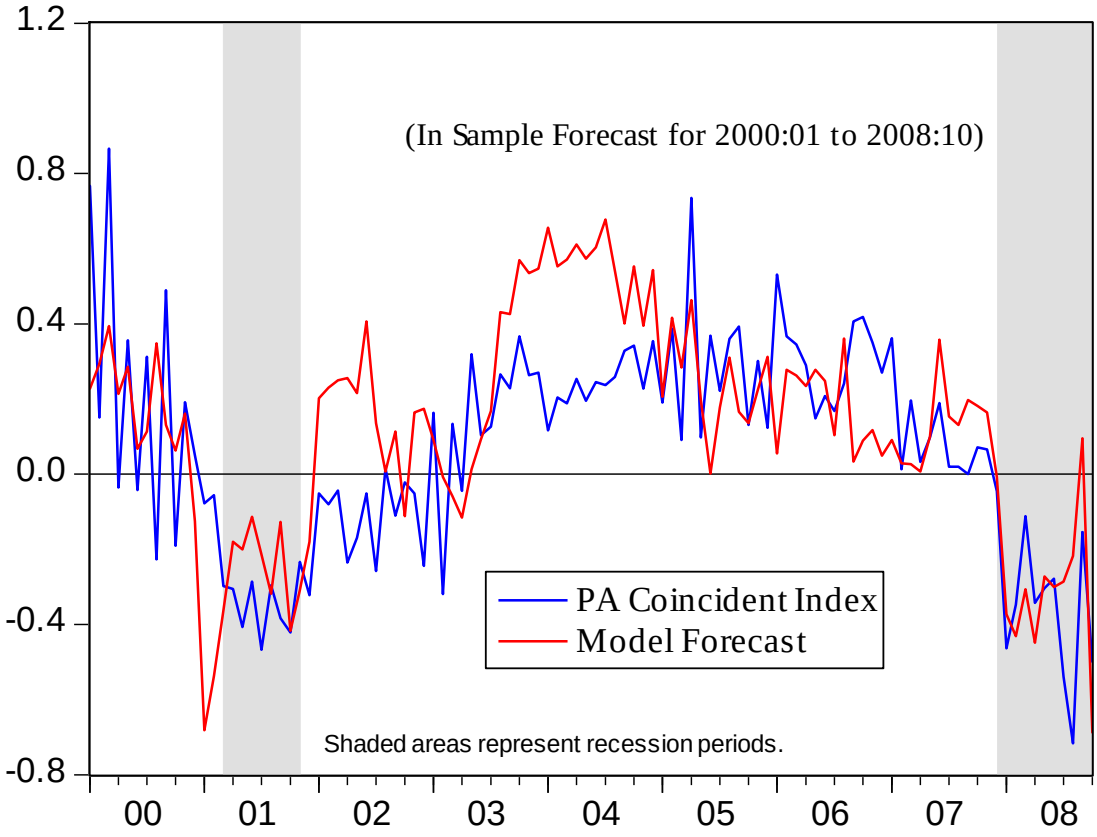
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.147889	0.029639	-4.989725	0.0000
Shipments Index	0.023976	0.001593	15.05391	0.0000

R-squared	0.390307	Mean dependent var	0.156542
Adjusted R-squared	0.388585	S.D. dependent var	0.522845
S.E. of regression	0.408829	Akaike info criterion	1.054561

Source: Federal Reserve Bank of Philadelphia

Figure 2

Simple Linear Model Forecast and Actual Monthly Change in Pennsylvania Coincident Index



Source: Federal Reserve Bank of Philadelphia

Table 2

Testing for Additional Information from BOS General Activity and Shipments Index

Using an Autoregressive Model and Pennsylvania Coincident Index

$$\dot{V}_t = \beta_0 + \sum_{i=1}^{12} \beta_i (\dot{V}_{t-i}) + \delta BOSC_t + \varepsilon_t$$

where $\dot{V}$ is the percentage change in the Pennsylvania coincident indicator and BOS is the current general activity index or shipments index.

	GAC Coeff (δ)	GAC T-stat	Constant (β_0)	Constant t-stat	Sum of Lagged Coeff $\sum_{i=1}^{12} \beta_i$	R-squared
General Activity						
Sample Period: 1979 to Present	*0.0053*	*4.7395*	0.0044	0.2601	0.7652	0.7397
1987 to Present	*0.0060*	*5.4619*	0.0013	0.0803	0.7085	0.6821
Shipments						
Sample Period: 1979 to Present	*0.0052*	*3.7291*	-0.0200	-0.9360	0.7594	0.7335
1987 to Present	*0.0057*	*4.3221*	-0.0262	-1.3078	0.7176	0.6695

Source: Federal Reserve Bank of Philadelphia

Table 3

Testing the Relationship Between the BOS General Activity Index And Individual State Coincident Indexes--Results of Autoregressive Model For Large States and Tri-State Area

General Activity (1979-Aug. 2008)

$$\dot{V}_{jt} = \beta_0 + \sum_{i=1}^{12} \beta_i (\dot{V}_{jt-i}) + \delta GAC_{jt}$$

(where $\dot{V}_{jt}$ is the percentage change in **state j's coincident index** at time **t**)

	GAC Coeff (δ)	GAC t-stat	Constant	Constant t-stat	Sum of Lagged Coeff $\sum_{i=1}^{12} \beta_i$	R-squared
US	0.0010	4.0651	0.0233	4.2631	0.8718	0.9141
California	0.0016	4.4722	0.0145	1.7255	0.9008	0.8607
Delaware	-0.0001	-0.5989	0.0132	2.7390	0.9626	0.9530
Florida	0.0010	3.4378	0.0210	2.7884	0.9075	0.9135
Georgia	0.0015	3.0205	0.0331	2.9500	0.8691	0.8242
Illinois	0.0023	4.9384	0.0047	0.6187	0.8839	0.8850
Massachusetts	0.0013	3.7616	0.0153	2.1978	0.8973	0.8948
Michigan	0.0052	4.5691	0.0086	0.5305	0.7328	0.7726
New Jersey	0.0016	3.9644	0.0229	2.9141	0.8526	0.8523
New York	0.0011	4.8309	0.0119	2.3891	0.9094	0.9206
North Carolina	0.0045	5.9446	0.0634	3.9247	0.6756	0.6481
Ohio	0.0066	7.3746	0.0122	0.9129	0.6448	0.7559
Pennsylvania	0.0053	4.7395	0.0044	0.2601	0.7652	0.7397
Texas	0.0002	1.1402	0.0074	1.7264	0.9649	0.9772
Virginia	0.0011	3.2331	0.0234	3.0762	0.8805	0.8695

Shaded areas are for states in the Third Federal Reserve District (Delaware, New Jersey, and Pennsylvania).

Source: Federal Reserve Bank of Philadelphia