

## Are We in a Recession? The ‘Anxious Index Nowcast’ Knows!

Adam Scavette\*

Federal Reserve Bank of Philadelphia

December 9, 2014

When the economy is in the midst of a recession, even a severe one, it can be quite difficult at first to tell. For example, as the Great Recession took hold in late 2007 and early 2008, uncertainty lingered as to whether the economy had merely slowed or was already contracting. Unfortunately for policymakers, investors, and consumers — all of whom might have been able to use such information to make better decisions regarding consumption, investment, and saving — the recession was not officially called until December 2008. Similarly, the four prior recessions were anywhere from five to nine months old before their onset was declared.<sup>1</sup>

Since recessions are critical events affecting the national economy, being able to “nowcast” a recession — that is, determine whether we are currently in one — would clearly be valuable. However, nowcasting recessions is not so easy. While the financial press routinely defines a recession as two consecutive quarters of a decline in the gross domestic product, the group that economists and policymakers rely on to call U.S. recessions, the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER), follows a broader definition: “a significant decline in economic activity that spreads across the economy, which can last from a few months to more than a year.”<sup>2</sup> It also examines a broader range of evidence. The NBER holds that a recession should also be visible in real income, employment, industrial production, and wholesale and retail sales. Yet, when initially released, these data are often noisy, ambiguous, incomplete, and subject to considerable subsequent revision. Furthermore, there is often a significant delay between the period being measured and the data’s release.<sup>3</sup>

One possible solution to the recession nowcasting conundrum is to use the Federal Reserve Bank of Philadelphia’s quarterly Survey of Professional Forecasters (SPF). The survey is already known for its

---

\*Adam Scavette is a research associate at the Federal Reserve Bank of Philadelphia. The views expressed in this report are those of the author and not necessarily of the Federal Reserve Bank of Philadelphia or Federal Reserve System.

<sup>1</sup> For instance, the January 1980 recession onset was announced in June 1980, and the July 1990 recession onset was announced in April 1991. See [www.nber.org/cycles/main.html](http://www.nber.org/cycles/main.html).

<sup>2</sup> See [www.nber.org/cycles/recessions.html](http://www.nber.org/cycles/recessions.html).

<sup>3</sup> This is especially the case for GDP, which is first estimated for a given quarter roughly one month after the quarter ends. It is subsequently revised on a monthly basis, which results in large cumulative adjustments.

ability to forecast an imminent recession via its “anxious index,” which is the mean of forecasters’ estimated probability that in the next quarter real GDP will contract — undoubtedly the most characteristic symptom of a recession.<sup>4</sup> This report will evaluate a similar indicator derived from the survey: the mean probability of a contraction in real GDP in the *current* quarter, which we will call the anxious index *nowcast*. For some time now, it has been recognized that averaging numerous individual forecasts offers the best possible forecast from the available data.<sup>5</sup> Using NBER recession quarters, this report will formally evaluate the anxious index nowcast’s predictive accuracy against that of the Conference Board’s composite index of coincident indicators, a popular business cycle indicator. By performing this comparison, we will be able to examine whether a completely unrevised, real-time probability assessment based on one variable can outperform a revised series based on multiple economic variables. The outcome should determine whether the public has the information it needs to nowcast recession quarters accurately in real time.

### **The Anxious Index Nowcast**

Polling the opinions of leading economic forecasters across government, academia, and the private sector, the SPF was started by the NBER and the American Statistical Association in 1968 and has been coordinated by the Philadelphia Fed since 1990. Besides collecting forecasts for various economic variables such as inflation and the unemployment rate, the SPF asks forecasters to estimate the probability that real GDP will contract in the current and following four quarters.<sup>6</sup>

The statistical history of the SPF’s anxious index nowcast, from the last quarter of 1968 to the first quarter of 2014, is plotted in Figure 1. We see that the first quarter 2014 index reading is 11.17, meaning that survey respondents on average said there was an 11.17 percent chance that the economy was then, in the first quarter of 2014, contracting from the prior quarter. The gray bars representing NBER recessions tend to coincide with peaks in the anxious index nowcast. For example, we notice a jump to 47.31 percent in the first quarter of 2008, which was the first full quarter of the 2007-09 Great Recession, eventually reaching an all-time high for the index of 94.41 one year later, in the first quarter of 2009. This suggests that the anxious index nowcast should be a very good predictor of recessions.

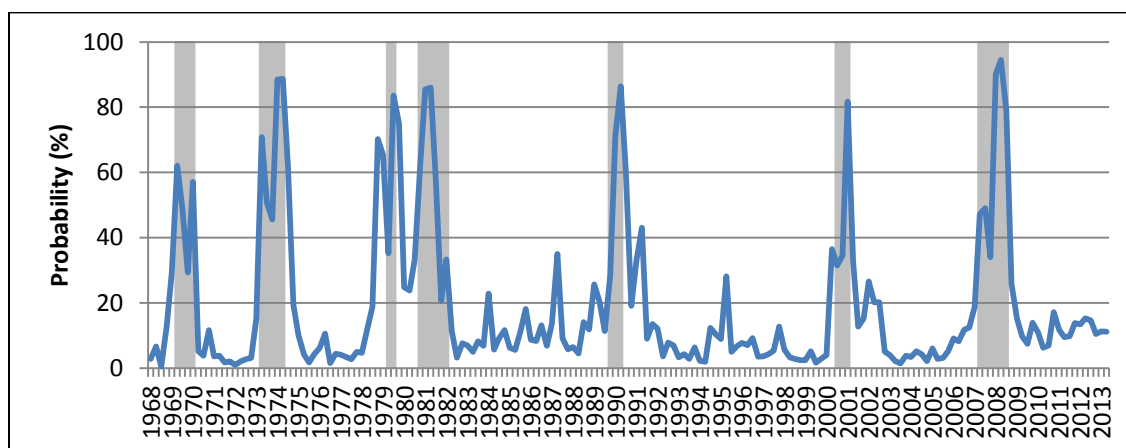
---

<sup>4</sup> The one-quarter-ahead mean was first dubbed the *anxious index* in a 2002 *New York Times* article by David Leonhardt.

<sup>5</sup> See Zarnowitz (1984).

<sup>6</sup> All five means are reported in the quarterly report under “Risk of a Negative Quarter (%)” See [www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/](http://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/).

**Figure 1: Anxious Index Nowcast, 1968 Q4–2014 Q1**



Source: Federal Reserve Bank of Philadelphia Survey of Professional Forecasters.

Table 1 describes key features of the seven most recent U.S. recessions. The mean value of the anxious index nowcast during a recession is 59.79% but is quite low, 11.82%, when the economy is not in a recession. Its overall mean is 19.46%, while the relative frequency of recessions — the percentage of quarters when the U.S. was in recession since the SPF started — is only 15.93%. This suggests that forecasters are generally more anxious than need be, in that the anxious index nowcast overstates the probability of recessions on average.

**Table 1: Recession Features Since 1970**

Onset	End	Approximate Duration (quarters)	Anxious Index Nowcast Peak
1970 Q1	1970 Q4	4	62.13%
1974 Q1	1975 Q1	5	88.72%
1980 Q1	1980 Q2	2	83.57%
1981 Q3	1982 Q4	6	86.06%
1990 Q3	1991 Q1	3	86.38%
2001 Q2	2001 Q4	3	81.76%
2008 Q1	2009 Q2	6	94.41%

Sources: National Bureau of Economic Research; Federal Reserve Bank of Philadelphia Survey of Professional Forecasters.

### Conference Board Coincident Index

As mentioned earlier, the NBER notes that a recession should be visible in a variety of economic variables once they are updated and revised. Although multiple business cycle indicators exist that combine information on the variables listed by the NBER, those conducted by the Conference Board are viewed as highly indicative of overall U.S. economic activity. Previously compiled by the Commerce

Department, this influential business cycle indicator has been released by the Conference Board since 1995. The Conference Board’s composite index of coincident indicators, henceforth referred to as the “coincident index,” combines information on payroll employment, personal income, industrial production, and manufacturing in order to track the U.S. business cycle. The Conference Board notes that the “the cyclical turning points in the coincident index have occurred at about the same time as those in aggregate economic activity.”<sup>7</sup> Therefore, the coincident index should be a good approximation of the indicators that the NBER examines in determining its recession dates.

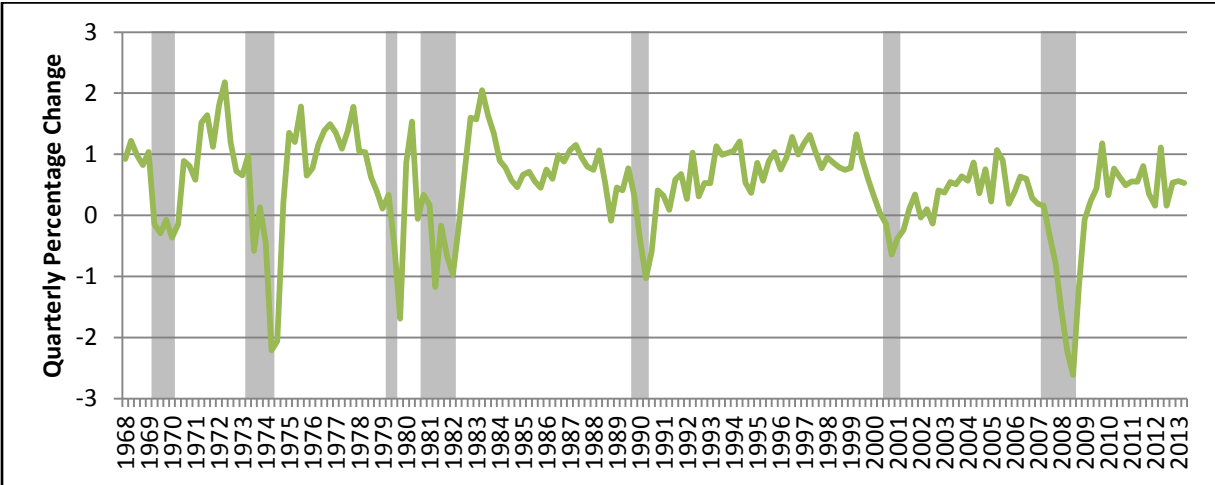
**The Timing of the Two Indexes**

Note that the coincident index is released monthly while the anxious index nowcast is released quarterly. Since we are interested in assessing recessionary activity in real time, the timing of the series’ respective release dates is important. The anxious index nowcast is released six to seven weeks into the quarter that it is nowcasting. The Conference Board releases its coincident index three weeks after the end of the month it measures. Therefore, complete information for both indexes is available only for the first month of a given quarter, making that month the basis of a fair comparison. Accordingly, to create a coincident series comparable to the anxious index nowcast, we construct the quarterly “COIN” series based on the first month of the current quarter and last two months of the previous quarter. Its quarterly percentage change is plotted in Figure 2.

$$COIN_t = COIN_{t,i} = \frac{COIN_{t-1,2} + COIN_{t-1,3} + COIN_{t,1}}{3}$$

where t = quarter and i = month within quarter t

**Figure 2: Conference Board Coincident Index in Quarterly Percentage Change, 1968 Q4–2014 Q1**



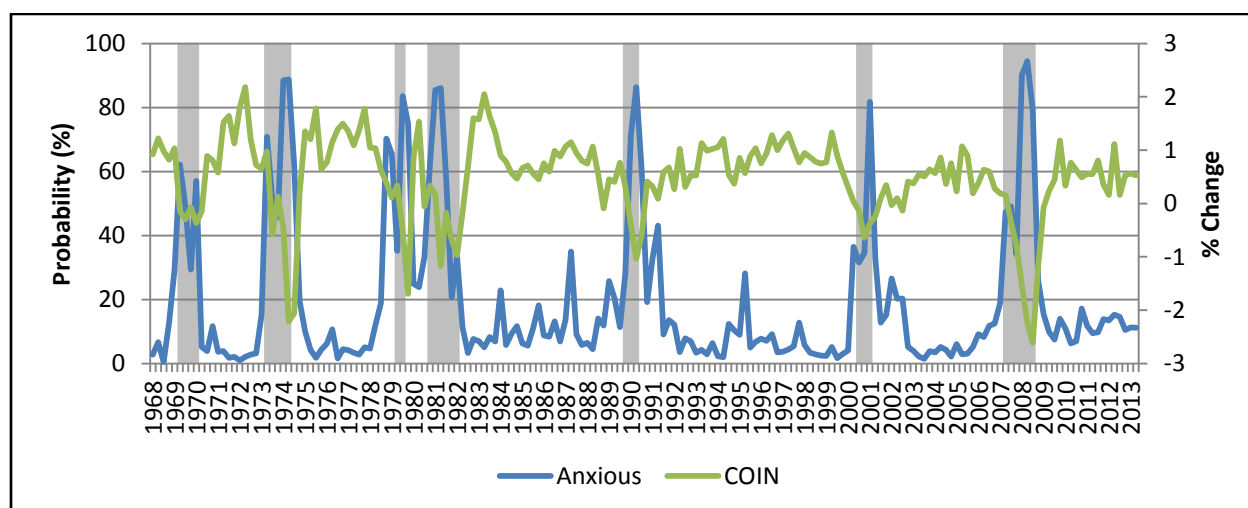
Source: The Conference Board.

<sup>7</sup> See [www.conference-board.org/data/bci/index.cfm?id=2151](http://www.conference-board.org/data/bci/index.cfm?id=2151).

### Predicting Recessions: Anxious Index Nowcast vs. Coincident Index

In the following evaluation, we compare the predictive power of the anxious index nowcast to the coincident index with regard to recessions to help clarify whether the anxious index nowcast is as good a predictor of recessions in real time as a revised business cycle indicator.<sup>8</sup> We use probit analysis, a type of binary response model designed to answer a yes or no question such as, “Are we in a recession?” The two indexes are plotted in Figure 3. The anxious index nowcast series is the raw nowcast, while the coincident index has been transformed into a quarterly series and is modeled in percentage changes. While the gray bars representing NBER recessions tend to coincide with troughs in the coincident index, they coincide with peaks in the anxious index nowcast as the probability of a negative growth rate rises. These opposite movements nevertheless signal the same direction of economic growth.

**Figure 3: Coincident Index (% Change) and Anxious Index Nowcast, 1968 Q4–2014 Q1**



Sources: The Conference Board; Federal Reserve Bank of Philadelphia Survey of Professional Forecasters.

We run three separate models. Model 1 uses only the anxious index nowcast. Model 2 uses only the coincident index. Model 3 uses both indexes as independent variables. While Models 1 and 2 capture the predictive power of each index individually, Model 3 takes both as predictors to examine which becomes less relevant in the presence of the other. The dependent variable, recession, is binary, taking the value of 0 or 1, where 0 is a nonrecession quarter and 1 is a recession quarter. For each model, the independent variables are a constant and one or both indexes.

Table 2 presents our coefficient results and McFadden r-squared values, a goodness-of-fit measure, for the three models. Model 1 appears to have a stronger fit (due to the higher r-squared value) than Model 2. Furthermore, when both are placed as independent variables in Model 3, the coincident

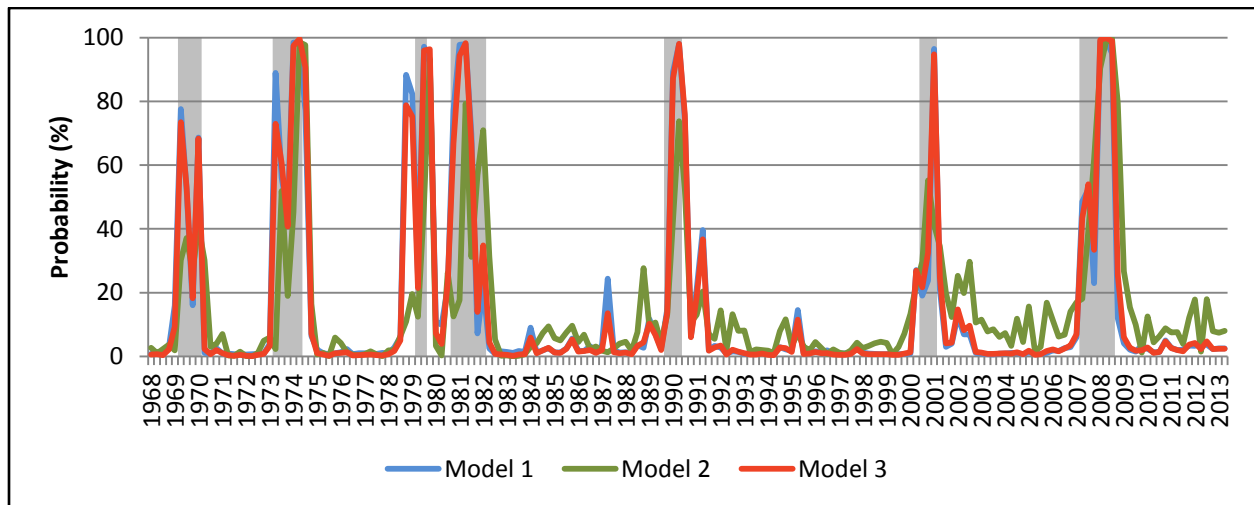
<sup>8</sup> Technically, the anxious index forecasts the likelihood of a negative GDP growth rate, and that question has been discussed in Lahiri (2013), but for most economic purposes we are more interested in recessions than in isolated quarters with negative growth rates.

index is no longer significant. This suggests that the predictive power for recessions lies primarily in the anxious index nowcast. The fitted values for all three models are plotted in Figure 4. All three models tend to peak during recessions, with Model 2 being generally the highest of the three during nonrecession quarters.

**Table 2: Probit Model Results**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Constant</b>	-2.5609	-0.71043	-2.28369
<b>P-Val</b>	0	0	0
<b>Anxious</b>	0.053393		0.045982
<b>P-Val</b>	0		0
<b>Coincident</b>		-1.30548	-0.37072
<b>P-Val</b>		0	0.1805
<b>McFadden R-Sq</b>	0.576953	0.377365	0.588387

**Figure 4: Fitted Values from Probit Models 1, 2, and 3**



The primary measure of predictive accuracy that we use in this section is a comparison of the probit fitted values against a constant 50 percent value in assessing whether we are in a recession in a given quarter. This measure is specified such that if the quarter is in fact in recession (recession=1) and the model identifies a value greater than 50 percent, then the model has correctly predicted a recession. Similarly, if the quarter is not in recession and the model identifies a value of 50 percent or less, the model has correctly predicted a nonrecession quarter.<sup>9</sup> Our results are presented in Table 3. The first row can be understood such that there are 153 nonrecession quarters in our sample, and Model 1 produced

<sup>9</sup> The cutoff point beyond which the anxious index nowcast will push Model 1 above 50 percent, and therefore into a recession, is 47.96 percent. The cutoff point below which the coincident index will push Model 2 above 50 percent is -.5951 percent..

values of less than or equal to 50 percent in 96.73 percent of them. The second row can be understood such that there are 29 recession quarters in our sample, and Model 1 produced values greater than 50 percent in 65.52 percent of them. The results in Table 3 tell us that Model 1 and Model 3 have the same predictive capabilities. Furthermore, it indicates that although Model 2 is slightly better than Model 1 or 3 at identifying nonrecession quarters, it is significantly worse at identifying recession quarters. This means that Model 2 has a downward bias during recession quarters. Furthermore, the totals in Table 3 demonstrate that Models 1 and 3 together are better at identifying both recessions and nonrecession quarters. As an alternative measure of predictive accuracy, we compute the root mean squared errors of the three series.<sup>10</sup> We find that the values for Models 1, 2, and 3 were .245, .286, and .241, respectively. These results agree with those of our prior measure of predictive accuracy in that the anxious index nowcast alone (Model 1) performs much better than the coincident index alone (Model 2).

**Table 3: Predictive Accuracy**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>% Correct (Recession=0)</b>	96.73	97.39	96.73
<b>% Correct (Recession=1)</b>	65.52	37.93	65.52
<b>Total</b>	91.76	87.91	91.76

### **How Accurately Has the Anxious Index Nowcast Assessed Recession Risk Historically?**

Now that we have shown that the anxious index nowcast has predictive power for identifying recessions with a probit model, we must now assess how the anxious index nowcast should be used on its own. If it is to be used by the public as a nowcast of current economic conditions, it would be helpful to know how it has behaved probabilistically in terms of its accuracy in evaluating recessionary risk. While the exercise in the previous section suggested that the anxious index nowcast can certainly be used to predict recessions with a statistical model, this section will examine how it has performed in assessing recessionary risk historically.

Table 4 presents the anxious index nowcast distribution ranges with sample sizes, as well as the relative frequency that quarters within these distributions were in recession. For example, the first row shows that forecasters provided anxious index nowcast values between 0 and 10 percent in 91 quarters. Out of those 91 quarters, the country was in recession 0 percent of the time. If a probabilistic forecast is to be considered accurate for our purposes in assessing recession risk, then the relative frequency of recession shown in the fourth column should lie within the index distribution range shown in the first column. Table 4 also provides the mean of all index values reported within a given range. It is easy to think about these index probabilities as precipitation forecasts by a meteorologist. If the meteorologist

---

<sup>10</sup>  $RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2}$  where  $y_i = 0$  or 1 depending on whether the quarter is in recession or not,  $\hat{y}_i$  = probit fitted values, and  $n$  = sample size.

provides a 10 percent forecast of rain in a 100-day sample, then it should rain on approximately 10 of those days. If the relative frequency of rain matches the probability of rain, then the meteorologist would be providing the public with an accurate risk of precipitation.

**Table 4: Nowcast Probabilistic Historical Accuracy**

Index Distribution Range	Sample Size	Mean Value	Relative Frequency of Recession
0.01-10%	91	5%	0%
10.01-20%	40	13%	0%
20.01-30%	14	25%	21%
30.01-40%	10	34%	50%
40.01-50%	5	47%	80%
50.01-60%	3	55%	100%
60.01-70%	5	62%	40%
70.01-80%	5	73%	60%
80.01-90%	7	86%	100%
90.01-100%	2	92%	100%

However, as we see in Table 4, the economic forecasters in the survey have an upward risk bias at the low end of the index spectrum. When they forecast recessions at values between 0 percent and 20 percent, they are overstating the possibility of there being a recession (i.e., they have been overstating the risk of a recession historically). Furthermore, anxious index nowcast values between 50 percent and 100 percent, while being highly indicative of recession, do not provide precise recession risk measures historically. For example, a recession has occurred every time the index has lain between 50.01 and 60 percent — yet, when the index has lain between 60.01 and 70 percent, a recession has occurred less than half the time. However, this variability across ranges is likely the result of small sample sizes, suggesting a lack of statistical significance.<sup>11</sup> Unlike meteorologists who make predictions daily, economists participating in the SPF provide their index results only quarterly. Furthermore, it should again be noted that the forecasters are not explicitly evaluating recession risk in the survey; they are assessing the risk of a negative GDP growth rate.

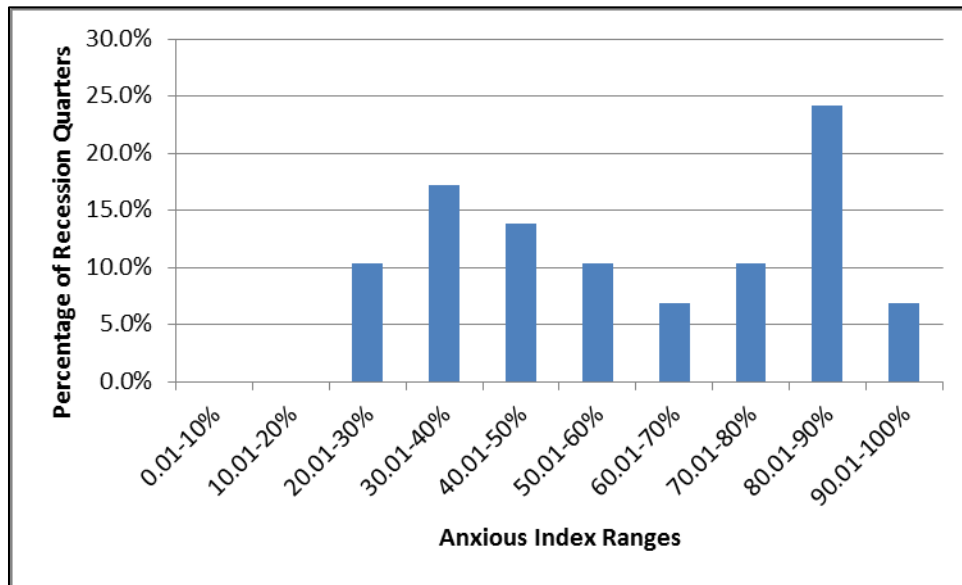
As mentioned earlier, the mean value of the anxious index nowcast during a recession is 59.79 percent, which should be a very strong signal that the country is in a recession quarter. Figure 5 provides additional information on the accuracy of the anxious index nowcast over its history. Using the same index distribution ranges as Table 4, this histogram provides the values of the anxious index nowcast

<sup>11</sup> Neither meets the standard 5 percent significance level. For the 50.01–60 percent range, assuming that the true probability of a recession is .55, the probability of having three recession quarters out of three quarters in the sample (a 100 percent relative frequency) is  $(.55)^3 = .17$ . For the 60.01–70 percent range, assuming that the true probability of a recession is .65, the probability of having two or fewer recession quarters out of five quarters in the sample (a 40 percent relative frequency) is  $\sum_{i=0}^2 \binom{5}{i} (.65)^i (.35)^{5-i} = .24$ .



during all recession quarters since the index was created. The figure demonstrates that during recession quarters the largest percentage — nearly 25 percent — of anxious index nowcast values were within the 80 percent to 90 percent range. However, the second-most frequent range reported during recessions was between 30 percent and 40 percent, a much lower risk assessment.

**Figure 5: Distribution of Anxious Index Nowcast During Recession Quarters**



Sources: Federal Reserve Bank of Philadelphia Survey of Professional Forecasters; author’s calculations.

## Conclusion

The anxious index nowcast is a helpful series for assessing whether the country is in a recession. It is visibly correlated with recessions, and it has been shown to have predictive power for dating recessions, as it was evaluated against a common business cycle indicator. However, if one is to use the index itself as a probabilistic indicator of recessions, it is important to note that the index suffers from overstating risk at the lower end of the index (0-20 percent), while offering low precision at the higher end of the spectrum. Therefore, the index should be used as more of a rule of thumb than as a true probabilistic assessment. If the index is above 50 percent, the U.S. is likely in a recession that quarter.

## References

- Lahiri, Kajal J., and George Wang. “Evaluating Probability Forecasts for GDP Declines Using Alternative Methodologies,” *International Journal of Forecasting*, 29:1 (January–March 2013), pp. 175-190.
- Leonhardt, David. “Forecast Too Sunny? Try the Anxious Index,” *New York Times*, (September 1, 2002).
- Zarnowitz, V. “The Accuracy of Individual and Group Forecasts From Business Outlook Surveys,” *Journal of Forecasting*, 3, pp. 11–26.