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The US recession of 2007-2009 clearly was very different from the other post World War business cycles. It was more severe and posed more threats to the stability of the US economy than did any of the other cycles because it was accompanied by a financial crisis. Did economists recognize the severity of this recession and crisis in real time? We can gain some insights into this issue by examining their forecasts and asking when they predicted or recognized the seriousness of this crisis. The profession has considerable knowledge about the characteristics of macroeconomic forecasts. However, this information was derived from analyses of the predictions of the previous cycles. It is of considerable interest to determine whether the characteristics of forecasts made in 2007-2009 were similar to (or different from) the stylized facts that were derived from predictions of previous periods.

Fildes and Stekler (2002) provided a comprehensive survey about the characteristics of US macroeconomic forecasts. Their findings provide some of the stylized facts about these predictions. They concluded that most forecasters failed to predict recessions in advance. They sometimes even did not recognize them in real time. Given the severity of this recession, we not only wish to determine whether it was predicted in advance but also how the forecasters responded to new information in the vicinity of the turning point. The earlier studies indicated that forecasters made systematic errors by underestimating growth during periods of growth and overestimating growth when the economy was declining. We will also examine whether this result was observed again.

In discussing the size of the errors, Fildes and Stekler used the findings of the Zarnowitz and Braun (1992) study of the ASA/NBER forecasts. Zarnowitz and Braun had found that the

median mean absolute error of the quarterly change predictions was about 3%. Surprisingly, there was only a small improvement in accuracy as the forecast horizon declined. (Also see Isiklar and Lahiri, 2007). Despite the large errors, most forecasts are superior to predictions from naïve or simple time series models.

Finally, there is a literature that examines the disagreement among forecasters at each horizon. Lahiri and Sheng (2010) found that the disagreement diminished with a decrease in the forecast horizon. Several studies explicitly determine whether the level of disagreement is related to the state of the business cycle, especially in the immediate vicinity of large economic shocks. Dopke and Fritsche (2006) find that disagreement among German forecasters is significantly higher prior to and during a recession than in other periods. Doornik et al. (2009) showed that disagreement, as measured by the cross-sectional interquartile range, in the G-7 countries rose during recessions.

In this paper we analyze the characteristics of some forecasts that were made prior to and during the Great Recession. The next section discusses the data. This is followed by a discussion of when the economists predicted and recognized the recession. We then examine both the quantitative and systematic errors that were made and the other characteristics of these forecasts. Then we analyze the disagreement among the forecasters and present our conclusions.

1. Data

For the past few years, *The Wall Street Journal* has published monthly surveys of 50-60 business economists' forecasts. These include projections of the rate of growth of real GDP, the rate of inflation, the level of unemployment, various interest rates, housing starts and housing prices, oil prices, and the number of employees on nonagricultural payrolls. Given the sharp decline in the economy in this recession, we are particularly interested in, and thus only evaluate,

the real GDP predictions made in the period October 2007- September 2010.¹ The GDP growth forecasts are always made for the current and the next two quarters but sometimes also for the third quarter ahead. Because we want to have the same number of forecasts for each quarter, we limit our analysis to the forecasts for the current and the subsequent two quarters. The economists are surveyed in the beginning of each month and, therefore, the forecasts involve horizons of one to nine months. Horizons one through three refer to the current quarter; four to six are forecasts made with a one quarter lead; etc. The actual data that are used to evaluate these forecasts were the real time numbers available 90 days after the end of the quarter to which they refer.² In every case, our analysis is based on the average of all the forecasts of the particular survey. This is considered to be the consensus forecast.

2. Forecasting and Recognizing the Recession

According to the National Bureau of Economic Research, the Great Recession began in December 2007 and ended in June 2009. Although the Great Recession began in December 2007, the first decline in real GDP, *as measured by the real time data*, only occurred in the third quarter of 2008, following the collapse of Lehman Brothers. Then real GDP declined at annual rates of 6.3% and 5.5% in the fourth quarter of 2008 and the first of 2009, respectively.

The conventional way of determining whether a recession was forecast in advance is to see whether and when the growth rate of real GDP was predicted to become negative.

Because the real-time data did not show negative rates of growth at the beginning of the

¹ Previous studies have examined forecasts published in the Wall Street Journal, but these have primarily analyzed interest rate or exchange rate predictions. (See Cho, 1996; Kolb and Stekler, 1996; Greer, 1999 and 2003; Eisenbeis et al., 2002; Mitchell and Pearce, 2005).

² The numbers now available are substantially different from the data that were available in real-time. (See Appendix Table A1.) The forecasts correspond more closely to the real-time data than they do to the historical numbers now available.

recession, it would be inappropriate to use this method for determining whether the recession was predicted in advance. There is, however, an alternative measure that may be used. In every survey, along with their quantitative forecasts of GDP growth, individuals also provided their subjective probability that a recession would occur in the next 12 months. While the average subjective probability of a recession was less than 50% until March 2008, the reported odds of a recession did increase substantially between the November 2007 and March 2008 surveys. (Table 1). The participants in the March survey had some February real time data, and recognized the likelihood of a recession within two months after it actually began.

On the other hand, the average of the quantitative forecasts that were issued during this period did not show that the growth rate of real GDP would be negative in any quarter of 2008.³ (Table 2A). These forecasts indicated that paltry growth in the first half of 2008 would be followed by somewhat higher growth in the second half of the year. This evidence suggests that these economists were not expecting that 2008 would be a recessionary year. On the other hand, in the March-May 2008 period, forty to fifty percent of the participating economists predicted negative growth in either the first or second quarters of 2008.⁴ Thus our analysis yields results that are contradictory or ambiguous at best about the economists' record in forecasting and/or recognizing the *beginning* of the Great Recession.

The next question is whether the sharp declines that occurred in late 2008 and early 2009 were predicted in advance. Table 2B shows that the September forecasts made before the collapse of Lehman Brothers suggested that there would be very slow growth in the remainder of 2008 and the first half of 2009. The Lehman collapse had already occurred

³ Although the numbers are slightly different, the mean and median forecasts have the same patterns.

⁴ A much smaller percentage of the economists made negative growth forecasts in June through September 2008. (See Appendix Table A2).

when the October forecasts were prepared. In October nearly all survey participants predicted a recession that would last at least through the first quarter of 2009. While recognizing this recession, the economists initially grossly underestimated the impact of this shock. Later forecasts did recognize the severity of the economic decline.

On the basis of all this evidence, we conclude that the economists recognized the possibility that a recession would occur, did not actually predict it in advance, BUT were quick to identify it once the economy declined sharply. They, however, underestimated the impact of the crisis.

We wanted to determine whether these results were unique to private sector forecasters. The Board of Governors of the Federal Reserve has a large staff of economists who prepare forecasts that are inputs to the decision making process of the Federal Open Market Committee (FOMC). These forecasts are published in the Fed's Greenbook, but this publication is not available to the general public for five years after it has been prepared. Nevertheless, the minutes of the proceedings⁵ of the FOMC contain qualitative summaries of these forecasts. In reading these transcripts, we discovered that the Greenbook forecasts were similar to those that we are reviewing here.

For example, at the January 29-30 meetings the staff projected that growth for the first half of 2008 would be lower than previously expected but that the second half of the year would be stronger. At the March 18 meeting, it was noted the second half of 2008 would display slow growth after a decline in the first half and that growth in 2009 would be above potential. It was not until the October 28-29 meeting that the recession was recognized with GDP expected to decline through the middle of 2009.

⁵ The minutes of the FOMC meetings are published 21 days after the end of each meeting. The web site is www.federalreserve.gov/monetarypolicy/fomcminutes.

These results for both the private and Fed forecasts are consistent with the findings (stylized facts) of Fildes and Stekler (2002) that forecasters are successful in distinguishing periods of rapid growth from slowdowns and declines, but don't predict turning points. Thus, these forecasts, made during the Great Recession, are no different from those made in prior periods. However, given the major imbalances in the US economy in the US economy and all of the institutional failures, it is necessary to speculate why it took so long to recognize their impacts. We undertake such an effort in the concluding section.

3. Quantitative and Systematic Errors

In addition to analyzing the cyclical characteristics of the forecasts, we are also interested in the magnitude of the errors. The mean absolute errors (MAE) and the root mean squared errors (RMSE) were calculated for the forecasts made for all nine horizons. The results show (Table 3) that both error metrics decline as the forecast horizon becomes smaller. The most substantial reductions occurred during the current quarter when some actual data became available. This result is consistent with the findings obtained from previous studies. However, even at the one month horizon the MAE is still nearly 50% of the mean absolute change (2.83%), reflecting the large errors made in failing to predict the magnitudes of the very large declines that occurred in the midst of the crisis.⁶

There are systematic errors that are consistent with previous findings. The rate of growth of GDP was substantially overestimated while the economy was declining. After the trough, growth was underestimated in the third and fourth quarters of 2009. These systematic errors may also be

⁶ The MAE of forecasts made a quarter in advance is about 75% of the mean absolute change. It is over 80% for the two quarter-ahead forecasts. The ratio of MAE to the mean absolute change is a comparison of the accuracy of the forecasters relative to the predictions of the no-change naïve model. This model predicts that the path of the economy will not change. The large one and two quarter-ahead forecast errors relative to the naïve model may indicate a lack of understanding by the economists of the basic underlying dynamic trends in the economy.

indicative of the forecasters' failure to *foresee* the strength of the underlying recovery forces within the economy.

4. Other Characteristics of the Forecasts

Our analysis has been based on the *average* of the forecasts of each survey on the assumption that it represented the "consensus". But did a consensus exist in each of those surveys? Kolb and Stekler (1996) developed a methodology to determine whether the mean prediction of a survey had the characteristic of a consensus. It is possible that the mean did not reflect the presence of general agreement which may be said to constitute a consensus. Their methodology consisted of a series of tests concerning the distribution of each survey's predictions.

There is no consensus if there is wide disagreement in the cross-section of forecasts. There would be no consensus if the distribution were bimodal because that would indicate two distinct set of views. Thus unimodality is a necessary but not sufficient condition. Kolb and Stekler then argued that the distribution must be symmetric and relatively peaked. If the forecasts were distributed normally, a consensus would exist. Similarly if the distribution is more peaked than the normal, it is leptokurtic and the forecasts are even more tightly clustered and thus would certainly constitute a consensus. If the forecasts were skewed or yielded a flat or platykurtic distribution, there is no consensus.

We conducted these tests for all of the surveys and found that in most cases there was no consensus because the distributions of the forecasts were skewed. For example, each of the distributions of one month horizon forecasts in the surveys from October 2008 through July 2009 was significantly positively skewed. From August 2009 through December 2009, the distributions were negatively (but not always significantly) skewed.

These results led us to examine the accuracy of the median forecast to determine whether our results are robust. Table 3 presents the MAE and the RMSE of the median forecaster in each survey. The results for the median forecaster are similar to those of the mean forecast and thus confirm our findings.

5. Disagreement among Forecasters

Because the distributions were skewed, the forecasts were not tightly distributed about the mean and there was substantial disagreement among the economists. We use the standard deviation of each forecast horizon (current quarter, one quarter ahead, etc.) contained in a particular survey as the measure of disagreement. The previous studies have measured disagreement as it (1) pertains to fixed events or (2) how it has varied with the length of the forecast horizon averaged over all events. Our analysis presents results for both of these approaches.⁷

A. Fixed Event Disagreement

Table 4 presents the standard deviations of the forecasts made at different horizons for each quarter between 2007.4 and 2010.3. We note that the standard deviations for most quarters decline with a reduction in the forecast horizon. A very interesting result is the time pattern of these standard deviations that seems to perfectly mirror the Great Recession. At all of the short horizons, the standard deviations increase at the turning point, increase throughout the recession, and then decline as the trough is reached. (See the first six rows of Table 4). This result confirms

⁷ There is a third possible concept: the disagreement among forecasters for all forecast horizons in a particular survey. This measure is obtained by averaging the standard deviations over all the horizons for which predictions were made. As an illustration, suppose that a particular survey contains predictions for the current quarter and one and two quarters ahead. In that case, we calculate the standard deviation of the forecasts made for each of those three horizons and then use the average of the three standard deviations as the measure of disagreement among economists *at that time*. One can view this as a measure of the disagreement about the direction of the economy over a period of time. The results for this measure of disagreement are similar to those for fixed events that we present below.

the findings of Doovern et al. (2009) who had found a similar relationship for recessions prior to the Great Recession. *This raises an obvious question for future research: Can a time series that measures disagreement become a useful forecasting indicator?*

B. Fixed Horizon Disagreement

The last column of Table 4 shows how average disagreement varies with the length of the forecast horizon. The standard deviation remains relatively constant when the lead time is greater than three months. It then declines, but only slightly, with a decrease in the length of the forecast horizon. This result is not surprising because data referring to economic activity in the current quarter first become available at the three month horizon. When these data become available, the forecasts for the current quarter are revised. Because these data are available to all of the economists, presumably they are interpreted similarly, and therefore, the forecasts should converge. These results differ somewhat from those of Lahiri and Sheng (2010) who found that the decline was more substantial as the horizon decreased. However, their time period was substantially longer and they measured average disagreement in a different manner.⁸

6. Conclusion and Discussion

We found that these forecasts exhibited the same types of errors that had been previously observed in other business cycles. The downturn was not predicted in advance; the consensus did not recognize a recession until Lehman collapsed; and the magnitude of the decline was underestimated. Given the severity of this recession, one can ask why the performance was not better.

The leading as well as the coincident indicators had been continuously declining since December 2007; the collapse of the housing market was continuing; the strains and stresses in

⁸ Lahiri and Sheng measure between-agent variation as the difference between an agent's mean forecast over time and the overall mean forecasts over time and across agents.

the financial system were obvious; etc. Yet until Lehman failed, the consensus did not predict that real GDP would decline. One cause may have been the accuracy of the real-time economic statistics that differ from the ones available today.⁹

On the other hand, there are other possible explanations that are less favorable to the forecasting profession. A majority of the economists may have believed that this would be a traditional recession no more severe than the one caused by the dot-com collapse in 2001. Or that there would be no recession at all similar to 1987 when the stock market decline did not lead to a downturn. The economists may also have felt that the traditional monetary and fiscal policies that had been undertaken would avoid or at least mitigate the downturn. In this case, they would have constructed their forecasts by using analogies or interpretations based on analogies.¹⁰

If these are the explanations, they would indicate that the economists did not understand that banking and financial crises are more severe and do not behave like the traditional recession. They would have ignored all of the existing information about the effects of the financial crises that have occurred in emerging countries, Japan's experience, and the Great Depression.

Alternatively, forecasters may simply be reluctant to predict a recession until it is clearly obvious. They may have asymmetric loss functions relative to predicting a recession that does not occur and one that is not predicted.¹¹ In any event, if forecasting accuracy is to improve it is necessary to undertake a more comprehensive analysis of the failures.¹²

⁹ See Appendix Table A1; the positive growth in 2008.2 was probably due to the temporary tax rebate that was provided early in that year.

¹⁰ Economists do make forecasts based on analogies. (See Goldfarb et al. 2005).

¹¹ On this subject see Schnader and Stekler (1998).

¹² Examples of such analyses are: Enzler and Stekler (1971), Fintzen and Stekler (1999), and Heilemann (2002).

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Table 1
*Forecasters' Estimates of the Probability
 That a Recession will occur Within the Next 12 Months;*

Date ¹³	Probability
Feb 07	22.9
Mar 07	22.9
Apr 07	24.6
May 07	26.1
Jun 07	25.9
Jul 07	23.1
Aug 07	28.2
Sep 07	36.3
Oct 07	33.7
Nov 07	33.5
Dec 07	38.0
Jan 08	42.1
Feb 08	48.9
Mar 08	64.5
Apr 08	70.9
May 08	62.7
Jun 08	60.8
Jul 08	63.0
Aug 08	62.7
Sep 08	60.2
Oct 08	89.3
Nov 08	96.4

¹³ This date is when the estimate was published.

Table 2A

Mean Forecasts (and Actuals) of Real GDP Growth Rate for 2007.4-2008.4
 Made in November 2007 to March 2008

Date of Forecast	Target Date				
	2007.4	2008.1	2008.2	2008.3	2008.4
November 07	1.6	1.9	2.4	2.7	2.8
December 07	0.9	1.5	2.1	2.5	2.7
January 08	---	1.2	1.8	2.3	2.5
February 08	---	0.6	1.2	2.2	2.4
March 08	---	0.1	0.4	2.1	2.0
Actual (90 day number)	0.6	1.0	2.8	-0.5	-6.4

Table 2B

Mean Forecasts of Real GDP Growth Rate for 2008.3-2009.2
 Made in September 2008 to December 2008

Date of Forecast	Target Date				
	2008.3	2008.4	2009.1	2009.2	2009.3
September 08	1.2	0.6	1.2	1.9	---
October 08	---	-1.2	-0.1	1.1	---
November 08	---	-3.0	-1.5	0.3	1.6
December 08	---	-4.3	-2.5	-0.5	1.3
Actual (90 day number)	-0.5	-6.3	-5.5	-0.7	2.2

Table 3

Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE)
of Forecasts by Horizon

Horizon (months)	Mean Forecast		Median Forecast	
	MAE	RMSE	MAE	RMSE
1	1.24	1.47	1.08	1.33
2	1.29	1.64	1.42	1.85
3	1.70	2.18	2.00	2.35
4	2.08	2.76	2.07	2.58
5	2.14	2.86	2.22	2.83
6	2.32	3.10	2.42	3.09
7	2.50	3.58	2.69	3.86
8	2.58	3.65	2.84	3.92
9	2.68	3.77	2.80	3.85

Table 4

Standard Deviation of Forecasts at Various Horizons
2007Q4 – 2010Q3

Date for Which Forecasts were Made

Horizon (months)	2007.4	2008.1	2008.2	2008.3	2008.4	2009.1	2009.2	2009.3	2009.4	2010.1	2010.2	2010.3
1	0.45	0.87	0.89	0.82	1.45	1.56	1.20	0.72	0.79	0.66	0.69	0.59
2	0.58	0.91	1.22	0.93	1.38	1.67	1.62	0.79	0.88	0.71	0.80	0.70
3	0.74	0.94	1.32	1.06	1.04	1.52	1.53	1.36	1.13	0.82	0.81	0.73
4	-	1.06	1.50	1.24	1.13	1.52	1.47	1.33	0.99	0.84	0.79	0.78
5	-	0.78	1.28	1.47	1.20	1.41	1.61	1.50	1.12	1.08	0.77	0.78
6	-	0.90	0.99	1.38	1.24	1.11	1.39	1.48	1.11	1.04	0.73	0.82
7	-	-	1.01	1.47	1.25	1.00	1.40	1.45	1.16	0.91	0.76	0.83
8	-	-	0.71	1.16	1.16	1.18	1.19	1.47	1.22	1.01	1.00	0.80
9	-	-	0.78	0.81	1.14	1.18	1.06	1.29	0.23	1.14	0.97	0.82
10	-	-	-	0.65	1.01	1.14	0.94	1.27	1.33	1.05	0.88	0.70
11	-	-	-	0.52	0.93	1.17	0.98	1.19	1.42	1.06	1.10	0.88

Appendix Table A1

Real-Time (90 Day) and Currently Available Estimates of Real GDP Growth, Percent
2007.4 – 2010.3

Estimates	2007.4	2008.1	2008.2	2008.3	2008.4	2009.1	2009.2	2009.3	2009.4	2010.1	2010.2	2010.3
Historical	2.9	-0.7	0.6	-4.0	-6.8	-4.9	-0.7	1.6	5.0	3.7	1.7	2.6
Real Time	0.6	1.0	2.8	-0.5	-6.3	-5.5	-0.4	2.2	5.6	2.7	1.7	2.6

Appendix Table A2

Number of Economists Predicting Negative Growth in Each Month
for Quarters t, t+1, and t+2

Forecasts Made in		Forecasts for Q		
Q	Month	t	t+1	t+2
2007.4	Oct	2	1	
	Nov	0	0	
	Dec	3	0	
2008.1	Jan	4	2	
	Feb	12	7	
	Mar	28	23	2
2008.2	Apr	30	3	3
	May	24	4	4
	June	15	5	9
2008.3	July	5	16	6
	Aug	4	16	8
	Sept	3	14	6
2008.4	Oct	46	30	7
	Nov	All but 3	All but 1	20
	Dec	All but 1	All but 2	34
2009.1	Jan	All but 2	42	9
	Feb	All but 2	41	16
	Mar	All but 1	All but 4	20
2009.2	April	All but 6	22	
	May	All but 8	17	
	June	All but 4	13	