

# Forecasts and Forecasting

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Yesterday I was called to participate in a survey of economists. As these surveys go, it was very well done and took almost twenty minutes. They were very explicit about their time horizons and very precise in their question wording. To summarize my responses, I stated that I expect little change in interest rates over the next year and a small increase over the next three years, with the 1 year Treasury rate of about 0.6 by the end of 2010 and about 2.0 by the end of 2012. I expect GDP growth to be a bit over 3 percent in the next year and a bit higher, perhaps 3.5 percent, over the next three. And I expect inflation to be roughly 1 percent in the next year and also a bit higher over the next three, but less than 2 percent.

My expectation is that they will take my response and that of forty or so other economists and present results like “the 1 year Treasury rate on average is expected to be 1.2 percent at the end of 2010 and 2.1 percent at the end of 2012.” They may go further and state “95 percent of the Treasury rate forecasts for the end of 2010 fell in the range of 0.4 to 2.0 percent.” I do not know what the actual responses will be and my numbers are really only guesses at the likely survey results. They indicate the standard method for gathering a sample of forecasts and packaging the results in an easy-to-digest format.

While this process is standard, it is deeply flawed and can potentially lead to misleading implications. There are two major potential problems: what are the assumptions underlying any individual forecast and what are the appropriate confidence intervals?

## Assumptions? What Assumptions?

Why do the underlying assumptions matter? As an example, consider forecasts of the 1 year Treasury rate and my forecast of that rate at 0.6 percent by year end. I could have reached that conclusion from very different perspectives. In fact, my logic was that the recovery is likely to be agonizingly slow and that monetary policy will need to continue to be accommodative and that the unprecedented amounts of excess reserves in the banking system will not change dramatically over the next year. One alternative perspective would have been to assume that the foreclosures will increase and the housing sector will deteriorate further and, despite an increase in exports, the Fed will need to pursue even more aggressively expansionary monetary policy to avoid a complete meltdown in housing. Another alternate perspective would have been to assume that China will finally break free from a dollar peg and the ensuing financial chaos will lead the Fed to decrease interest rates late in the year after allowing them to increase over much of the year. Each of those sets of assumptions will get you a 0.6 percent 1 year Treasury rate by the end of 2010.

Why do the assumptions matter? This is because my forecast is only as good as the underlying assumptions. If you believe my assumptions are appropriate, then my forecast potentially has value, assuming that I am working with a good model. However, if you believe my assumptions are inappropriate, even if you like or agree with my model, my forecast really should have little or no value. If my forecast is based on the assumption that China will no longer peg to the dollar, which is decidedly not my belief, and you think that assumption is incorrect, then the correct action is to ignore my forecast even if you find it plausible.

Why is this a problem for surveys of forecasters? The user of the survey has no ready method for relating the assumptions underlying a forecast to the forecast itself. In addition, to the extent that different forecasters have different assumptions, any notion of survey “average” is

problematic. If I'm counting oranges and another survey respondent is counting apples, any average of what we're counting is fruit salad. The meaning of the average is virtually impossible to ascertain.

This problem is mitigated in part by the behavior of forecasters themselves. Forecasters typically have a very good perspective on what other forecasters believe and what they are likely to forecast - and even on the assumptions underlying their forecasts. Thus, forecasters generally tend to shade forecasts toward the expected mean forecast. That holds not just for economic forecasters but for forecasters in general. While that behavior reduces the impact of the problem of different assumptions underlying forecasts, it contributes to the second problem.

### **Confidence Intervals**

The best surveys report not only the mean survey results (or median); they also report the range of responses and even the range over which, say, 90 percent of the responses fall. With a survey of 40 economists, the 90 percent confidence interval would include 36 of the 40. The surveyor would eliminate the two highest and two lowest forecasts, the outliers, and present the range of the remaining 36 forecasts. That would be viewed as the 90 percent confidence interval. Alternatively, the survey could calculate the standard deviation from all 40 and then use that value to calculate the 90 percent confidence interval (which would be the mean forecast +/- 1.65 times the standard deviation). Unfortunately, neither approach tells the forecast user what they should want to know.

Let me guess that the survey forecast for the 1 year Treasury rate at the end of 2010 will be 1.2 percent and that the standard deviation will be about 0.5 percent. You could argue that you want to be conservative and thus construct a 95 percent confidence interval for what is likely to happen to the Treasury rate. You would multiply the standard deviation by 2, then add and subtract from the mean, yielding an interval running from 0.2 to 2.2 percent. Isn't that the 95 percent confidence interval?

Sadly, it is not. Or it is at least not the confidence interval that should be of interest to forecast users. That confidence interval implies that if you asked another economic forecaster what the 1 year Treasury rate would be in a year's time, there would be a 95 percent probability that the forecast would fall in that interval. That statement is very different than saying that economic forecasters believe that there is a 95 percent probability of the 1 year Treasury rate being in that interval. The former statement, correctly made, is about economic forecasts while the latter statement, incorrectly made, is about the 1 year Treasury rate.

### **How We Make the Sausage**

Let me return to my forecast to illustrate the difference between these two interpretations. Presumably, my forecast would be included in the initial 40 and would be included in the calculation of the confidence interval above. However, my forecast of a 0.6 percent 1 year Treasury rate by the end of 2010 says nothing about my confidence interval about that value or how sure I am that the 1 year Treasury rate will be close to 0.6 percent. Presumably, each of the 40 individual forecasters gives their best estimate of their forecast but do not give their confidence interval. Personally, I think the value is most likely to be 0.6 percent. However, I also think that it is extremely unlikely that it will be exactly 0.6 percent. I wasn't asked - but wish that I was asked - what was my 95 percent confidence interval for the 1 year rate. That is, name two interest rates such that I was 95 percent confident that the 1 year Treasury rate would fall in the interval defined by those two values. Were I asked that question, my response would have been 0.2 to 4.0 percent. That is, I believe that there is only a 5 percent chance that the 1 year Treasury rate will move out of that range. Going a step further, I believe that there is only a 2.5

percent chance that the rate will fall below 0.2 percent and only a 2.5 percent chance that the rate will move above 4.0 percent.

What should a forecast user want to know? Obviously, the most likely value is a critical component of any forecast. But that is only the first step. The second is how dramatically can things move from that value? That is the confidence interval. One might think of having a “green zone” of forecasts which is highly likely, a “yellow zone” indicating that you are toward the outer limits of your forecasting interval, and a “red zone” indicating that those values are highly unlikely or outside your confidence interval. The third item is what are the assumptions underlying the forecast and its associated confidence interval(s). For example, will the Fed be able to successfully manage the money supply if or when the economy recovers? Will the dollar maintain its role as the reserve currency? Will excess reserves change dramatically? Will the prior stimulus package get the economy through to the point where other sectors can pick up the slack?

Finally, there is an item not included in forecasts and really cannot be readily included: a perspective on what is in the tails, or what is not included in the confidence interval. I can tell you my forecast; I can tell you the confidence intervals associated with my forecast; I can tell you the assumptions I’ve made in putting together my forecasts. That tells you what I expect and what I think is most likely and the logic that got me to those conclusions. But you still don’t know what are in the tails of the distribution, say, of the 1 year Treasury rate. In the best of worlds - or the worst of worlds - what could happen? Statistical analysis alone cannot answer that question, whether it is confidence intervals, value-at-risk, or regression analysis. Statistics requires data and so-called “black swan” events don’t occur often enough by definition to generate data amenable to statistical analysis.

Let me illustrate this point with my 95 percent confidence interval. I believe that there is only a slight chance that the 1 year Treasury rate will drop below 0.2 percent by the end of the year. What could cause that fall? The most likely events are negative; a surge in foreclosures or a default of a country like Greece could send the world economy into a double-dip recession at a time when traditional fiscal and monetary policy responses would be constrained given our current debt and low rates. Such a trigger could force the Fed to attempt even more expansionary policy, driving rates down even further. Alternatively, I believe that there is only a slight chance that the 1 year Treasury rate will rise above 4.0 percent by the end of the year. What could cause such a rise? The stimulus package could have a larger than expected impact or consumer confidence could increase dramatically, prompting substantially higher consumption and GDP growth. This allows the Fed to switch focus and drain the system of some of the large increase in reserves, which increases interest rates. My expectation is that none of those events are particularly likely, but all are possible. They are the black swan types of events that would make most current economic forecasts - even the very best - look very, very bad.

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