



Ask the MARKET

Companies are leading the way in the use of prediction markets. The public sector may soon follow

BY VANESSA SUMO

Every week, the Centers for Disease Control and Prevention (CDC) produces a five-color map, each color representing the gravity of the flu in each state, from yellow (no activity) to red (widespread activity). It's useful so far as it goes, but the information is often a week old.

There might be a way to gather timelier information. Say that a nurse in a public health clinic in North Carolina usually sees about one or two patients come in each day with flulike symptoms in the month of December. But one day that number goes up to four, and then to five the following day. Sensing that the flu was quietly spreading, the nurse places a bet that the CDC will upgrade the state's flu alert from green (sporadic activity) to purple (local activity) or even to blue (regional activity). A doctor, a lab technician, a pharmacist, a nursing student, and other traders in the flu prediction market likewise throw in their hunches, based on their own observations. Together, they come up with their best prediction of how widespread the flu will be in the coming weeks.

The University of Iowa has been running such a flu prediction market for the state of Iowa for the past four years. During the October 2006 to April 2007 flu season, it added a new market for North Carolina because of strong interest from state epidemiologists.

Here is how it works. Each participant is given 100 "flu dollars" with which to trade. This amount is equivalent to a real money educational grant of \$100, which grows or shrinks during the season depending on the accuracy of their predictions. Participants buy and sell five color-coded shares, or contracts, each one corresponding to a level of flu activity based on the CDC's surveillance system.

For instance, if the price of a red contract that expires in two weeks is 80 flu cents, then the market's collective guess is that there is an 80 percent probability that the flu will be widespread in a couple of weeks. If many traders believe likewise, then they will buy more red contracts, hence bidding up its price. Thus, the market price of each contract indicates the likelihood that the spread of the seasonal bug will reach a certain level in a particular week. If the CDC eventually reports a "red week," then those holding on to red contracts will be rewarded one flu dollar. Contracts of losing bets expire worthless. Participants get a check at the end of the season depending on how well they did.

Predictions from the Iowa flu market (where there are more data to analyze) have been remarkably accurate. About half of the time, it has been able to correctly predict the extent of flu activity one to two weeks in advance, according to a study by the managers of the flu prediction market. The record is even better if allowed some wiggle room. "Doctors say we don't have to be exactly right, they just want to know, for instance, that [the prediction] is green rather than red, and we're [correct] there 90 percent of the time," says George Neumann, an economist at the University of Iowa and one of the market's managers.

The value of such a prediction market is that one can often get a very good idea of how severe the flu season will be, even up to five weeks in advance. That's enough time for health care workers to spring into action — to mobilize resources toward vaccinating high-risk individuals and to prepare hospitals to anticipate more patients.

The principle behind prediction markets is simple. By designing contracts for which payoffs depend on some

unknown future event, markets can offer incentives for people to reveal what they know, and then pool this information to produce the best forecast. Prediction markets provide an effective way to bring together what writer James Surowiecki calls the “wisdom of crowds.” His book (which bears the same title) is a treatise on how the collective intelligence of people is often better at predicting the future, and, therefore, at making better decisions, than calling on a few experts. This claim has been shown to be true in many domains. In the case of flu prediction markets, epidemiologists are happy to tap into the wisdom of anyone from doctors to nursing students.

Political and media uproar a few years ago about a Department of Defense-funded project has somewhat frozen interest in using these markets for public policy. One of two appointed projects, the Policy Analysis Market (PAM), was accused of being a market for predicting when the next terrorist attack would occur, something that was thought to be offensive and morally wrong. PAM was promptly shut down even before it was launched.

In fact, PAM was a market that would have allowed traders to speculate, for instance, on how the country’s financial aid and military involvement would affect economic and political stability in the Middle East, and how conditions in those countries could affect the United States. “It wasn’t a market about terrorist attacks,” says Robin Hanson, an economist at George Mason University and one of the architects of PAM. But it might have demonstrated how well these markets can make forecasts in comparison with other means of gathering intelligence.

With the demise of PAM, public policymakers may have become hesitant to adopt prediction markets. “The government got shy,” says Hanson. Instead, companies are leading the way, turning to the power of these markets to peer into the future to help them make better decisions.

The Market as a Crystal Ball

Prediction markets have been used to forecast election and sports outcomes, the weather, Oscar winners, future technologies, the direction of the fed funds rate, and almost any event that people care about. It is tempting to look at these markets as just a fancy form of gambling or an entertaining pastime. But as a new book on information markets (another name for prediction markets) by the AEI-Brookings Joint Center for Regulatory Studies notes, these markets are beginning to acquire some respect. They seem to deliver forecasts that are as good as or even better than other well-known prediction mechanisms.

For instance, the Iowa Electronic Markets (IEM), a prediction market institution at the University of Iowa for almost two decades, has consistently done a better job at calling the winners of presidential elections than opinion polls. One of the contracts offered at the IEM allows traders to bet on a candidate’s share of the total votes, which makes it easy to compare the market’s prediction to the actual vote share won by each nominee. These contracts pay off a penny for each vote share earned by a candidate. For instance, if the democratic nominee gets 40 percent of all democratic and republican votes, then that contract pays 40 cents. The markets are open to all traders, except for some “classroom markets” that are limited to academic traders.

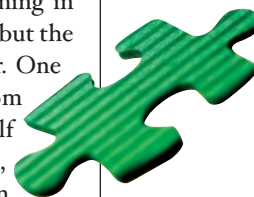
Joyce Berg and Thomas Rietz, both of the University of Iowa, have studied the performance of the IEM so far. They find that on the eve of the election, the predicted presidential vote shares missed the actual vote shares by 1.33 percent. This is smaller than the average error of 2 percent for opinion polls (for elections prior to 2004). Moreover, Berg and Rietz find that IEM prices for the 2004 presidential elections were “more stable than polls, respond less to transient events than polls, and were closer to election outcomes than the average poll when the election was more than one week away.”

The IEM is probably the best place to search for proof on the forecasting ability of these markets because it has been around for a long time. The evidence is still coming in from other corners of the field, but the results look encouraging so far. One piece of evidence comes from data for the first two and a half years of Economics Derivatives, a prediction market that bets on the future path of economic variables like nonfarm payrolls and retail sales. A recent analysis by Refet Gürkaynak of Bilkent University in Turkey and Justin Wolfers of the University of Pennsylvania shows that market-based forecasts “mildly dominate” the consensus forecasts of professional economists working in financial markets.

The power of prediction markets to successfully aggregate and summarize information relies a great deal on giving participants monetary incentives to truthfully reveal their beliefs, in making people “put their money where their mouth is.” This reward entices people to come forward and trade, to toss their bets and information in the ring. The more confident a trader is in his beliefs, the bigger his bet, thus giving more weight to what he knows. Because he will be rewarded for being correct, a trader will have the incentive to constantly watch the markets and to jump on any opportunity when prices fall out of line with their predictions. He will also be motivated to continually seek information to improve upon his bets and therefore the market’s forecasts.

The Fed, for instance, can look at various surveys of inflation expectations, something that it is keen on following because it directly affects its decision on where the fed funds rate, its monetary policy instrument, will go. However, as a San Francisco Fed *Economic Letter* points out, “survey estimates suffer a bit from the ‘talk is cheap’ problem.” A better way is to look at what the market thinks the future course of inflation will be.

One indicator is the difference between the rate of return on



conventional bonds and the rate of return on inflation-indexed bonds: a measure of the public's expectations of inflation. The prices of these financial instruments will always represent the market's best forecast. There is every incentive not to lie because there is money at stake. Consequently, the difference in yields between these two instruments has been shown to be better predictors of inflation than survey-based estimates.

But does money always matter in prediction markets? This question is especially important in the United States where gambling is mostly illegal, which makes it difficult to set up a prediction market that involves real money. The prediction market puzzle is that even markets trading in pretend dollars can make very accurate predictions, which seems to undermine the profit motive that makes these markets work so well.

For instance, the Hollywood Stock Exchange, a play money site, has been shown to have a very good record of predicting Oscar winners and box-office successes. Even when the stakes are limited such as at the IEM, which trades with real money but has an investment limit of \$500, accuracy has not suffered. (The IEM can legally operate with real money because it has been given a "no action" letter from the Commodity Futures Trading Commission, on condition that it does business in a way that it has indicated to the commission, including accepting an investment no greater than \$500 for each participant.)

Why do play money prediction markets do as well? In real money markets, the quality of the information or the skill of the trader is reflected in the amount he is willing to bet. However, the amount he is willing to put down can be determined in part by the depth of his pocket. In a play money world, however, one can make large bets only after amassing a fortune of play money, which in turn is only possible by making a series of good trades. This feature may help make up for any accuracy that could be lost by not trading with real money.

And there are other reasons that could motivate people to trade on the information that they have. In companies that run internal prediction markets, for instance, managers would probably never ask employees to put up their own money. "What we come to think of as real money is when [employees] pay out of their own pocket to participate. And inside the company, that usually doesn't happen," says Emile Servan-Schreiber, CEO and co-founder of Baltimore, Md.-based NewsFutures, a firm that sets up internal prediction markets for companies.

While businesses sometimes provide some small monetary rewards like cash or gift certificates, reputation or recognition within the group could be a stronger incentive. "Your performance in the market is going to reflect well upon you in the minds of the higher-ups, which is probably more important than the material reward," say Servan-Schreiber. Another factor is how much the employee cares about the event to be predicted in the market. (For instance, will product X be launched on time?) "If you care about the question because it's part of your job and you think you know a lot about it, then that will be its own reward," Servan-Schreiber says.

Markets vs. Meetings

A good forecast is extremely valuable for companies, one that translates into better decisions and higher profits. Google is running internal prediction markets to predict product release dates. Arcelor Mittal, the largest steelmaker in the world, has one to forecast sales and the price of steel. The pharmaceuticals industry has also been keen on prediction markets because choosing a new drug to place its money on can be very risky. "The problem of a pharmaceutical company is that it has many ideas that it could bet on, but it needs to bet on the right one early on, otherwise it could be wasting billions of dollars on the wrong course," Servan-Schreiber says.

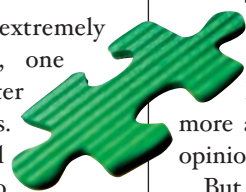
In companies, just like in any organization, there is a lot of information that managers may find helpful, and the challenge lies in how to bring the pieces of the puzzle together. Of course, probably the oldest and the most widely used method, the staff meeting, is one way to get everyone in the same room and exchange what they know, says Wolfers, but this is probably not the best way to extract what employees really believe.

Someone who is only interested in pleasing his boss might say what he believes the boss wants to hear, in which case his information is useless and even distracting. Nobody wants to be the bearer of bad news, so someone who might think that a project will not be launched on time will hold back saying so. And then there is the insufferable employee who will say his opinion about everything but in fact knows nothing. And in the corner at the back of the room there may be someone who is uncomfortable about speaking up but really knows a lot.

In this type of situation, the information that is laid out in front of the manager will be erroneously weighed according to who has the loudest voice or who wants to curry the most favor with the boss, which is surely not the best way to aggregate information. Prediction markets offer a better way by giving employees

equal opportunity to place bets on their beliefs and have what they know count more according to how strong their opinions are.

But who gets to participate in the company's internal prediction market? Should it be limited to the smartest guys in the room? The problem is that companies often do not know who the smart guys are; if they did, then they would just go up to them and ask. Prediction markets make it possible for experts to step forward and reveal themselves. "We may be surprised that the guys from the loading dock are actually the ones who know how many orders went out that week," says Wolfers. "So I wouldn't want to exclude the loading guy ever, because



he may be smart, and he's the only one who knows that."

But what happens if those who think they are experts but really are not likewise come forward? This actually makes it even more appealing for the smart guys to trade. "You can think about uniformed money as sort of the honey that attracts the bees," says Wolfers. "It's the reward for intelligence and good trading."

Similarly, manipulators, or those who would lose trades intentionally to move prices in their favor, can also be thought of as "noise" traders. For instance, if a company rewards resources to a division based on what prediction markets say, then employees may be tempted to try to manipulate prices. However, it is the nature of markets to offer rewards to those who spot these "noises" early on.

A Not-So-Scary Proposition

Besides manipulation, there are other circumstances when prediction markets might fail to yield the right forecast. Markets may be biased toward "favorites" and "long shots," or the tendency to undervalue near certainties and overvalue small probabilities. Prediction "bubbles" may also be possible if investors irrationally inflate the probabilities of certain outcomes. These anomalies are not different from those observed in

financial markets. Also, if the quality of available information is very poor, then the prediction will simply reflect the market's collective ignorance.

But no system of forecasting is error free, and so the relevant question is how the errors of this mechanism compare to the errors of other forecasting mechanisms. So far, prediction markets have done at least as well as the alternatives.

Even so, prediction markets are not meant to prematurely replace other methods of forecasting and gathering information, if at all, but can initially take on an advisory role. "We don't have to put the market directly in charge, [but] you would slowly rely on it as you came to trust its judgment more," says Hanson. Hence, it is important to continue to compare the accuracy of prediction markets with alternative institutions. That may assuage some fears of handing over an organization's decisionmaking capabilities entirely to the market, especially in the arena of public policy.

And there are many uses for public policy. Just like company managers, the problem a policymaker faces is how to find those who will truthfully reveal their beliefs about a certain policy and how to best aggregate and weigh those beliefs. One clever way is to design a set of contracts that can be traded in prediction markets to allow policymakers to compare the outcome

of competing policies, or what Hanson calls "decision markets." For instance, decision markets can be used to compare murder rates with and without capital punishment, children's test scores with and without school choice, road congestion with and without the expansion of a highway, and a host of other public-choice questions.

Will governments ever use prediction markets in this way? Perhaps, but not soon. "Many useful institutions took a long time to become adopted," says Hanson. Life insurance is one such institution, which took awhile to become accepted because people thought that life insurance was like gambling on death, and that put people off. The unlawful Internet gambling law that was passed last year may also inadvertently affect prediction markets from flourishing, insofar as these markets are seen as gambling.

In the business world, interest in prediction markets is growing fast even if the acceptance is a little slower, mostly because it takes awhile to see results. But Servan-Schreiber is optimistic about their place in corporate circles. "Prediction markets are going to become a fixture of management in the 21st century. That's pretty sure," he says. "[Prediction markets] work and there's a demand out there for the wisdom of crowds." **RF**

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