

When **Markets** Beat

KEY CONCEPTS

- In 1988 the University of Iowa launched an experiment to test whether a market using securities for presidential candidates could predict the outcome of the election.
- In presidential elections from 1988 to 2004, the Iowa Electronic Markets have predicted final results better than the polls three times out of four.
- Despite the track record of the Iowa market, a fundamental understanding of how prediction markets work remains elusive, and economists are still trying to develop a body of theory to provide definitive answers.

—The Editors

In late March 1988 three economists from the University of Iowa were nursing beers at a local hangout in Iowa City, when conversation turned to the news of the day. Jesse Jackson had captured 55 percent of the votes in the Michigan Democratic caucuses, an outcome that the polls had failed to intimate. The ensuing grumbling about the unreliability of polls sparked the germ of an idea. At the time, experimental economics—in which economic theory is tested by observing the behavior of groups, usually in a classroom setting—had just come into vogue, which prompted the three drinking partners to deliberate about whether a market might do better than the polls.

A market in political candidates would serve as a novel way to test an economic theory asserting that all information about a security is reflected in its price. For a stock or other financial security, the price summarizes, among other things, what traders know about the factors influencing whether a company will achieve its profit goals in the coming quarter or whether sales may plummet. Instead of recruiting students to imitate “buyers” or “sellers” of goods and services, as in other economics experiments,

participants in this election market would trade contracts that would provide payoffs depending on what percentage of the vote George H. W. Bush, Michael Dukakis or other candidates received.

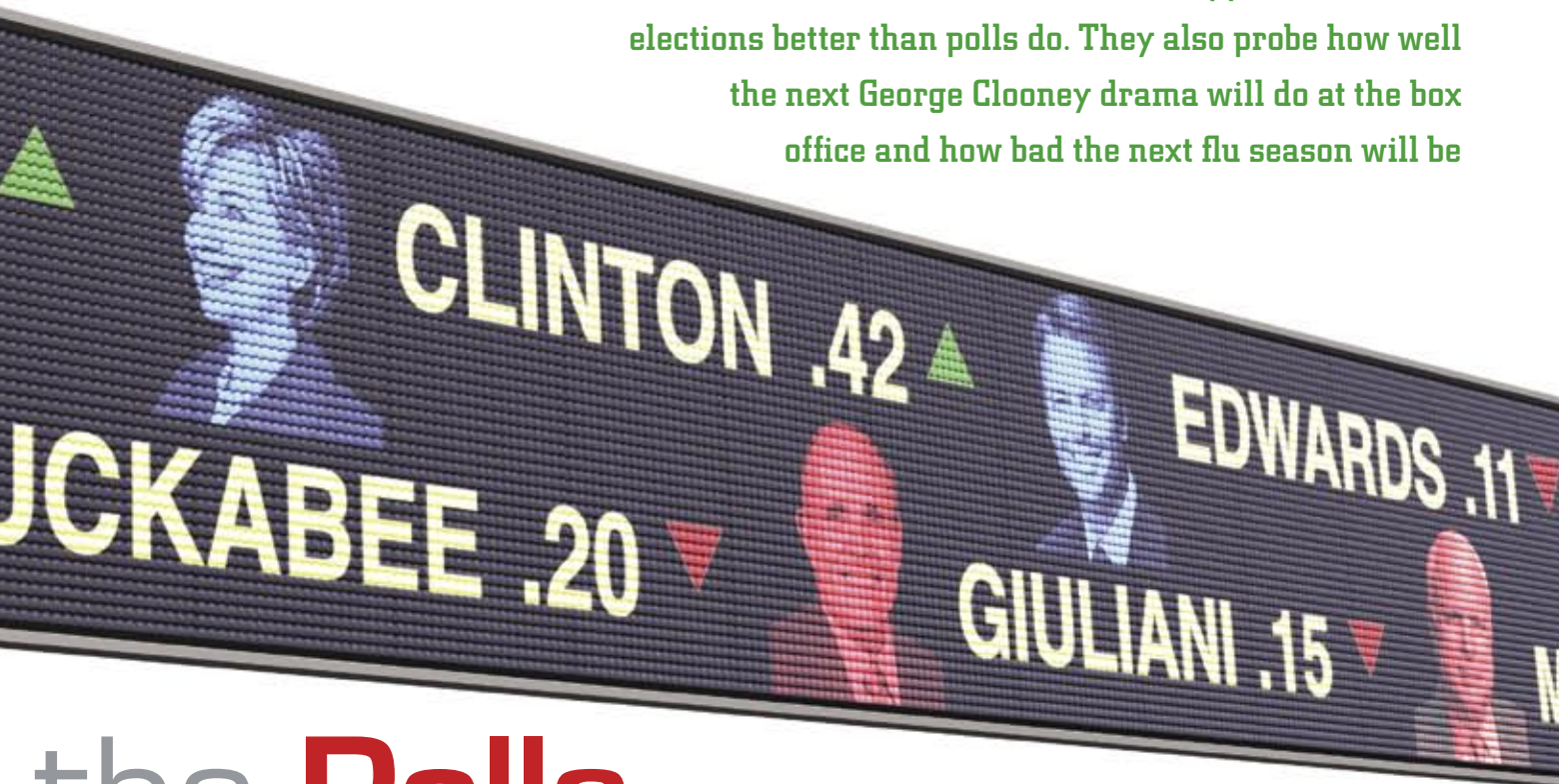
If the efficient-market hypothesis, as the theory relating to securities is known, applied to contracts on political candidates as well as shares of General Electric, it might serve as a tool for discerning who was leading or trailing during a political campaign. Maybe an election market could have foretold Jackson’s win. Those beer-fueled musings appear to have produced one of the most notable successes in experimental economics—and have blossomed into a subdiscipline devoted to studying prediction markets that allow investing or betting (pick the term you like best) not just on elections but on the future of climate change, movie box-office receipts and the next U.S. military incursion.

Make Your Best Bet

When the three academics—George R. Neumann, Robert Forsythe and Forrest Nelson—sought support from the university, the dean of its business college, a free-market advocate,

PHOTOILLUSTRATION BY GEORGE RETSECK; RICHARD PHIBBS (Clinton)

Internet-based financial markets appear to forecast elections better than polls do. They also probe how well the next George Clooney drama will do at the box office and how bad the next flu season will be



the Polls

By Gary Stix

could not contain his enthusiasm. On the other hand, the dean of the college of arts and sciences, a political scientist, characterized the proposal as “the stupidest thing he had ever heard of,” Neumann recalls. “At best, it would be a shadow of the polls,” he was told.

With the business school dean onboard, the three pressed forward. They wanted to use real money as an incentive for participants to take the exercise seriously. But they needed permission to allow students and faculty to gamble legally on campus. The university’s general counsel resisted, but Iowa’s state attorney general let the real-money market go ahead under a state law that permits office-betting pools.

The World Wide Web was still a glint in the eye of Tim Berners-Lee when the Iowa Political Stock Market opened on June 1, 1988. Nearly 200 students and faculty members began buying contracts on George H. W. Bush, Dukakis and others using the relatively primitive tools of the pre-Web Internet. A Bush or Dukakis contract was bought or sold in a futures market, the same type in which Iowa hog farmers trade pork bellies. Instead of pigs, however, the investors in the Iowa Political Stock Market were

trading contracts on the share of the vote that a candidate would receive on Election Day.

Up until the morning of the election, traders carried out their transactions, although a rule stipulated that no one could invest more than \$500. Taking a simplified example, a Bush contract in the vote-share market paid \$0.53, corresponding to Bush’s 53 percent of the vote, and a Dukakis contract paid \$0.45, tied to the Democrat’s popular vote percentage. If you had bought a Bush security at \$0.50 before the market closed the morning of the election, you would have made a gain of \$0.03 [see box on next two pages].

To the three economists, finding out who won or lost money—or the election—was less important than whether this exercise answered the question posed in the barroom: Would the expected share of the votes represented by the market’s closing prices on Election Day match the actual share the candidates obtained more closely than the polls would? The experiment worked. The final market price corresponded to Bush’s and Dukakis’s market shares better than Gallup, Harris, CBS/*New York Times* and three other major polls.

In 1992 the Iowa Political Stock Market was

HOW TO TRADE FOR PRESIDENT

The Iowa Electronic Markets allow anyone with an Internet connection and \$5, even a trader in Dhaka or Novosibirsk, to buy and sell securities in

elections. The example below depicts, in simplified form, how a market run during the 2004 presidential election operated. A trader initially purchases



MARKET OPENS

Trading has just begun on the Iowa Electronic Markets with futures contracts that will provide payoffs based on a percentage of the vote a candidate receives.



BUYING A PORTFOLIO

IEM sells an individual portfolio for \$1 each, which consists of one contract for both candidates. Joe Citizen decides to buy a portfolio.



JOE'S REASONING

Joe looks at the prices on the IEM and decides that they are out of line with what they should be. Kerry's chances of winning mean that his contract should be priced higher than Bush's.

redubbed the Iowa Electronic Markets (IEM), and trading was opened to anyone from Dubuque to Beijing who could come up with the requisite minimum of \$5. The Commodity Futures Trading Commission (CFTC) had granted the University of Iowa an exemption from regulation because the IEM is mainly run for research purposes (only minor sums are transacted).

The election exchange has continued to beat the polls consistently for presidential elections and at times has prevailed in congressional and international races. A paper being prepared for publication by several Iowa professors compares the performance of the IEM as a predictor of presidential elections from 1988 to 2004 with 964 polls over that same period and shows that the market was closer to the outcome of an election 74 percent of the time. The market, moreover, does better than the polls at predicting the outcome not just around Election Day but as long as 100 days before [see box on page 42].

The IEM will never be the New York Stock Exchange. But even with the CFTC trading restrictions, it has flourished. The number of contracts traded expanded from 15,286 in 1988 (a dollar volume of \$8,123) to 339,222 (\$46,237) in the 2004 elections. And another IEM market that furnishes a payoff only to those who picked the winner of an election had even more activity in 2004 (1,106,722 contracts totaling \$327,385). Television commentators have recognized this

new barometer of voter sentiment by sometimes mentioning market prices in the months running up to an election. The IEM's status has risen among those who contribute to the incessant blog-based chatter that has become a cornerstone of contemporary political discourse. And after a spike in trading during the 2004 election, the IEM office received e-mails charging that über-financier George Soros was trying to manipulate the market to create a bandwagon effect for Democratic presidential candidate John Kerry, an assertion for which there was never any proof.

The How and Why

The IEM continues to serve not only as a forecasting tool but as an energizing environment for students to learn about markets and, perhaps most important, as a testing ground for experimental economists to probe theories of how and why markets appear to make accurate predictions. Its track record provides arguably the best empirical evidence to date to justify the case for prediction markets. But when researchers have tried to backtrack, looking for theories of why markets serve as effective means of forecasting, straightforward answers have not been forthcoming. Some of these analyses have even called into question the basic assumption that a market does a good job of foretelling what lies ahead.

At first, the idea that a market can prophesize the outcome of an election does not seem partic-

HOW YOU CAN PLAY



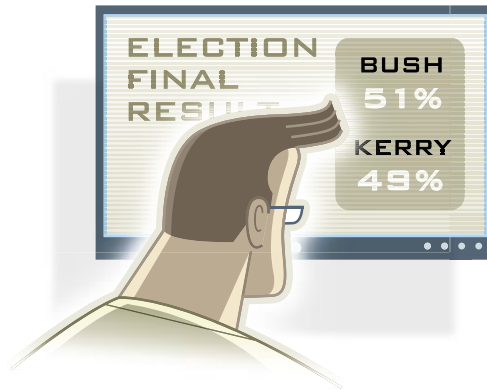
Anyone with \$5 to invest can trade on the Iowa Electronic Markets. Don't call your broker, though. Trades can only be placed by going to the IEM Web site (www.biz.uiowa.edu/iem), where detailed instructions can be found about how to buy a futures contract for Hillary Clinton or John McCain.

a portfolio for \$1, thus obtaining one contract for Bush and one for Kerry. After the election, the payout is based on the share of the vote each candi-

date receives. Despite the small sums transacted, market prices before an election have proved to be surprisingly good at predicting a race's outcome.



CONSOLIDATING HIS POSITION
Joe chooses immediately to sell the Bush contract that he thinks is priced too high and buy an additional Kerry, which he considers undervalued.



THE BIG MOMENT
If Kerry did get the expected 60 percent, Joe's holding would be worth \$1.20 ($\0.60×2), netting him \$0.20 above the \$1 he spent. But tallies (rounded off) show Bush wins.



THE PAYOUT
IEM pays \$0.98 for Joe's two Kerry contracts ($\$0.49 \times 2$). Joe loses money. After subtracting the net cost of \$1 from the payout, Joe has a net loss of \$0.02.

ularly startling. After all, the chairman of the Federal Reserve or the chief economist at Goldman Sachs will routinely look at the price of stocks or commodities as a guide to making forecasts about the economy, and the futures market for orange juice concentrate predicts Florida weather better than the National Weather Service does.

Developers of the IEM and other prediction markets contrast a poll with a market by saying that the latter takes a reading not of whom people are going to vote for but of whom they think will win—and cash wagered indicates the strength of those beliefs. You might have voted for Kerry in the 2004 election because you opposed the Iraq War, but after watching news shows and talking to neighbors, you may have decided that George W. Bush was going to win. When putting money down, you might have picked Bush.

The question, though, of how one individual's belief—that IBM's stock will rise or that a Bush will be elected—gets combined with those of every other trader and then translated into a price that is an accurate predictor continues to provoke heated debates in the research community. Economic theoreticians have yet to understand precisely why this novel means of forecasting elections should work better than well-tested social science methods.

On close inspection, the characteristics of IEM traders would drive a statistician batty. Ear-

ly on it became clear that the traders are by no means a representative sampling of the population at large, the prerequisite for any poll. And a survey of them in the 2004 presidential election market underscored the point: most were found to be well educated, affluent, white, male Republicans who tended to have a high opinion of their own political insight into the face-off between Bush and Kerry, a grouping that does not fit the definition of a well-designed sample. In about



FOUNDING FATHERS of the Iowa Electronic Markets—George R. Neumann, Forrest Nelson and Robert Forsythe—came up with the idea for trading on elections in a bar in Iowa City after Democratic candidate Jesse Jackson's unexpected victory in the 1988 Michigan caucuses, which the polls failed to predict.

DOUG BENTON/Flickr

MARKETS VS. POLLS

The Iowa Electronic Markets have usually been more accurate than the polls in predicting candidates' share of the vote in presidential elections. The table shows whether the poll or market was most accurate for each of the polls taken for U.S. presidential races beginning in 1988. In 2004, for instance, the polls were more accurate overall in 110 instances and the market trumped the polls 258 times.

All days from the beginning of the market

MOST ACCURATE	1988	1992	1996	2000	2004	All
Poll	25	43	21	56	110	255
Market	34	108	136	173	258	709
Market percentage	58%	72%	87%	76%	70%	74%

More than 100 days before election

Poll	1	20	3	2	66	92
Market	13	49	30	47	129	268
Market percentage	93%	71%	91%	96%	66%	74%

Last 5 days before election

Poll	0	1	4	8	12	25
Market	6	5	7	17	18	53
Market percentage	100%	83%	64%	68%	60%	68%

one in five transactions, traders had no personal opinions or beliefs at all about the Swift Boat smear campaign or prisoners being held in Guantánamo. Rather those buying or selling were “robots”—automated trading programs that buy and sell when the software perceives that a security is too high or low. Automated programs routinely execute trades on Wall Street. And IEM election market researchers are still plumbing what a machine's trading patterns add to the market's ability to deduce the outcome of an election.

As early as the aftermath of the 1988 presidential race, the Iowa team began to probe deeply into why the IEM seems to predict election outcomes with such precision. Discounting pure luck and the possibility that traders somehow constitute a representative sample of the population, the team analyzed trading patterns and found a select group of “marginal traders” who would buy and sell actively when the share price was not valued properly. This group might have bought, say, Bush securities if the price was way under what the members thought was the likely percentage of votes the Republican would attract.

These traders were the Warren Buffetts of the 1988 race, investing an average of \$56, twice the level of less active participants who might have simply bought and held contracts for the candidate they liked best, without making a careful judgment about that candidate's prospects. The wallflowers would typically make nothing from their trades, whereas marginal traders took

home 9.6 percent returns (a whopping \$5.38; the reason such small sums act as an incentive to traders—or the use of play money in other markets—is also closely studied).

The identification of marginal traders, described in a 1992 paper in the *American Economic Review*, has sometimes elicited phone calls from Wall Street types interested in new insight into the perennial question of the traits of a person who can beat the market. Other than noting that most of those investing are male, the Iowa researchers have not succeeded in identifying more specific qualities of this special class of trader.

One possibility is that they do not exist. James Surowiecki, a *New Yorker* columnist who wrote *The Wisdom of Crowds*, a book first published in 2004 that brought attention to prediction markets and other novel means of group decision making, thinks that the marginal trader is a myth. No individual or subgroup in a market has the financial wherewithal to sway prices in the way the marginal-trader hypothesis suggests—an opinion that is echoed by some economists.

Just a Word Argument

Perhaps the most incisive critique of prediction markets has come from Charles F. Manski, an econometrician at Northwestern University whose academic research focuses on how people assign probabilities to future events, such as the possibility that they might lose their job. Manski started wondering a few years ago about the theoretical basis for statements made repeatedly in the popular press that markets can predict an election better than polls and experts can.

Advocates of prediction markets often invoke Austrian-born economist Friedrich Hayek, who argued in 1945 that prices aggregate information held by a group—“dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess.” That knowledge is combined into a price that expresses the relative desirability of a commodity or public sentiment at a given moment, whether it be a pork belly or a candidate for the U.S. presidency. Manski went back to Hayek's original work to examine the quantitative underpinnings of his ideas. No hard numbers supported the notion of the collective wisdom of crowds. “It's a very loose argument,” he says. “There's no theory in the modern sense of the word. It's just a word argument.”

So Manski set out to explore whether he could build a mathematical model that would confirm Hayek's notion of the market as an information

DIFFERENCES BETWEEN A POLL AND A MARKET

POLL

- Takes a representative sample
- Indicates a margin of error
- Expresses voter preferences for a particular candidate on the day of the poll

MARKET

- Accepts anyone who wants to trade
- Relies only on the fluctuation of prices
- Uses prices to represent the probability of a candidate winning or receiving a given percentage of the vote on Election Day
- Provides, unlike a poll, a monetary incentive to make the best choice

aggregation mechanism and, secondarily, bolster the empirical findings taken from the IEM. Manski created a model of a diverse group of traders using the IEM's winner-take-all market in which a trader buys a contract for a candidate that pays \$1 for a victory and nothing for a loss. If the market worked in accordance with the way that proponents of prediction markets have interpreted Hayek, the price would represent the average, or mean, value of traders' belief that a particular candidate would win. A Kerry contract selling for \$0.49 would mean that there would be a 49 percent probability that Kerry would win.

But Manski's model did not confirm this conjecture. In many instances, the mean did not necessarily coincide with the price and could even diverge sharply, a finding suggesting that the market would not serve as a particularly accurate prediction tool. If, for instance, the price was \$0.50, the mean of traders' beliefs could be anything from a 25 to 75 percent chance that Kerry would win. Manski remarks that even if the price and the mean were the same, it would not be certain that the mean would correspond to a reasonable probability of a candidate's chances.

Manski is a respected economist, and his finding caused a minor furor because it appeared to contradict an emerging consensus about the value of these markets for making predictions about anything from elections to public policy. But two subsequent papers offered a way to reconcile the dispute. They also compared prices with the mean but factored in a variable called risk aversion—which measures how traders react to uncertainty in the market. In the revised model, said by the authors to offer a more realistic scenario, the price and the mean were about the same, which seemed to confirm that a price is, indeed, a good measure of a probability.

But the debate has never been resolved, and exactly how the markets achieve success remains unclear. Manski, for his part, suspects that his critics' models do not account for all the actual ways prediction markets operate in the real world. "There isn't going to be a simple interpretation of that market price that always works as a prediction," he observes. "It really depends on the beliefs and the attitudes toward risk of those trading." Manski also remains unsatisfied with the IEM's proponents' reliance on its record of consistently besting the polls. "Comparison to the polls is not the best comparison," he says. "Everyone knows there are all kinds of problems with the polls, and they're just one piece of information." In fact, Manski notes,

IEM traders may be taking the polls into account as one of many factors in making decisions about when to buy or sell.

Oft-cited statistics about election markets beating the polls have come under scrutiny from other quarters. A 2005 analysis by political scientists Robert S. Erikson of Columbia University and Christopher Wlezien of Temple University insisted that polls and election markets do not serve the same functions and so do not merit direct comparison. The authors contended that the polls identify vote preferences on the day each poll is taken, whereas the IEM market prices forecast what is to happen on the day of the election. In their analysis, they made a series of mathematical adjustments to the polls, which they then found to be more accurate in projecting Election Day outcomes than both the IEM's vote-share and winner-take-all markets.

Analyses by some economists have contradicted the emerging consensus about the value of markets for making predictions for anything from elections to public policy.



Controversy again ensued. One dissenter, Justin Wolfers, an economist at the Wharton School of the University of Pennsylvania who has done extensive analyses of prediction markets, criticized Erikson and Wlezien's results, saying that their study only compared a few elections and polls. Wolfers also objects because the 2005 analysis "adjusts polls but doesn't make a corresponding adjustment of prediction markets."

The Triumph of the Market

It will take years to put these debates to rest. In spite of persistent wrangling, the IEM has inspired formation of other prediction markets, many of them outside an academic setting. On

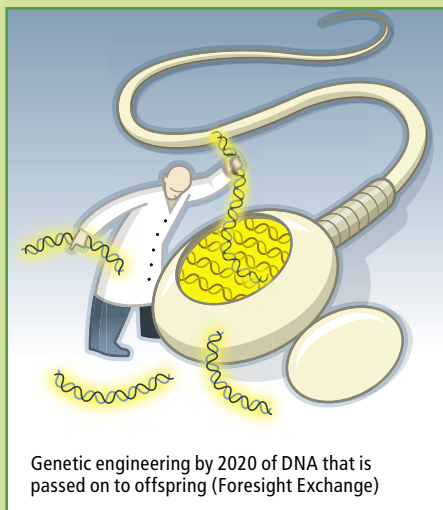
BETTING on elections was ubiquitous in the early part of the 20th century on informal exchanges and among individuals. Instead of paying off a losing bet with cash, the losers—consider these unfortunates who bet on John W. Davis instead of Calvin Coolidge in 1924—had to sometimes perform stunts. In this instance, Davis supporters had to pull Muriel Gordon, the winner of the bet, in a hansom cab down Fifth Avenue.

PICK YOUR MARKET

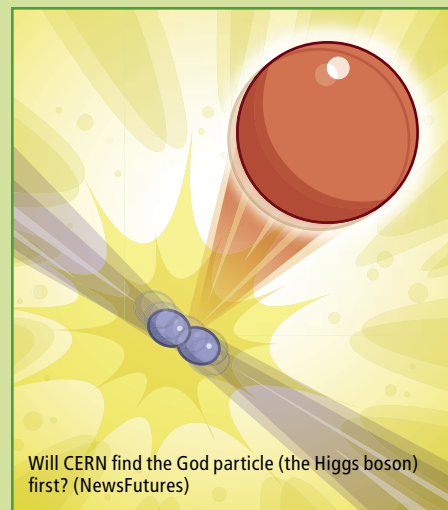
The Iowa Electronic Markets have inspired the establishment of other prediction markets that do not



Chinese moon landing by 2020
(Foresight Exchange)



Genetic engineering by 2020 of DNA that is passed on to offspring
(Foresight Exchange)



Will CERN find the God particle (the Higgs boson) first?
(NewsFutures)

the Hollywood Stock Exchange, traders speculate on box-office sales for new movies. NewsFutures trades in current events. Some markets allow traders to buy and sell securities on the prospects for new ideas or technologies. Without the CFTC exemption accorded to the IEM, other U.S. markets use virtual play money on the Internet. In Ireland, which lacks similar restrictions, TradeSports and Intrade, both part of the same company, accept real cash for trading on sports, elections or other events. Intrade, for instance, provides a contract that will furnish a payoff if the U.S. or Israel executes an air strike against Iran by March 31. Another contract will provide recompense if the U.S. economy goes into recession during 2008.

The place accorded markets in U.S. society, along with the revolution in new forms of information sharing afforded by the World Wide Web, has meant that prediction markets are now being increasingly adopted as innovative decision-making tools in both government and private institutions. The ardor for market-based answers can at times border on the hyperbolic. Robin Hanson, a professor of economics at George Mason University, has advocated that if trading patterns on prediction markets suggest that implementation of a particular policy will cause the economy to grow and unemployment to shrink, then policy officials should, by fiat, adopt that policy—an interest rate cut or a public works project, perhaps. Hanson reasons that the collective information held by traders is superior to the analyses that can be marshaled by a panel of economists or other experts. Hanson has even proposed a form of government called futarchy, based on policy-making markets.

Such utopian leanings have sometimes led advocates to push too far too fast. Several years ago the Defense Advanced Research Projects Agency (DARPA) began planning for a project called the Policy Analysis Market, which would have allowed investors to trade on geopolitical events, not unlike the Intrade Iran contract, including assassinations, wars and the next al-Qaeda attack. If the market—for which Hanson was an adviser—bid up a contract that would pay off if a terrorist attack occurred, the Department of Homeland Security might then decide to raise the threat condition status from yellow to red.

Or so went the rationale. The idea of a “terrorist futures market” repulsed many in Washington, and the market died quickly, even forcing the resignation of DARPA head John Poindexter (but not before TradeSports launched a market to speculate on the prospects of his ouster). Senator Barbara Boxer of California fumed when she learned about the Policy Analysis Market: “There is something very sick about it.”

But not everyone experienced the same distaste. Some argued that a prediction market able to serve as an efficient intelligence-gathering mechanism just might avert a pending crisis. Writing in the *Washington Post*, Wolfers and his colleague Eric Zitzewitz speculated that a contract on whether Niger had made a sale of uranium to Saddam Hussein would have been trading at low levels in early 2003, reflecting the actual intelligence consensus that the transaction never occurred and thereby undercutting one of the Bush administration’s rationales for going to war in Iraq.

The attacks on the Policy Analysis Market ultimately doomed the project, although the hoop-

The idea of a “terrorist futures market” proved repulsive, but new markets that assist in corporate or government decision making continue to emerge.

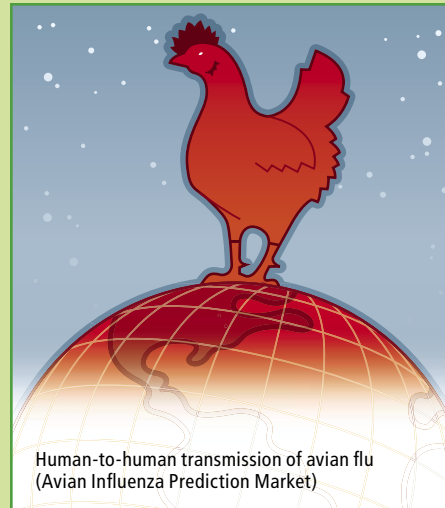
trade on elections but rather on virtually any conceivable event, from the bombing of Iran to whether a network anchor is about to be fired.



Katie Couric departs from CBS News (Intrade)



Central Park's seasonal snowfall to be more than 60 inches (Intrade)



Human-to-human transmission of avian flu (Avian Influenza Prediction Market)

la managed to boost public awareness of prediction markets. DARPA's project became an informal tutorial that broadened public awareness of prediction markets. "It actually took the DARPA thing to get people's attention," comments Joyce Berg, a professor of accounting and IEM's interim director.

New types of markets intended to assist in formulating government or internal corporate decision making have continued to emerge. Here again the University of Iowa has been a leader. Its markets for predicting influenza outbreaks serve as an example. In one, which ran for seven months, beginning in mid-September 2004, an IEM spinoff sold influenza futures contracts to a set of 62 health care professionals in Iowa to predict influenza activity for each week of the flu season. If a contract for the third week of January accurately forecast flu prevalence—gauged by a Centers for Disease Control and Prevention scale (ranked as no activity, sporadic, local, regional or widespread)—it would pay \$1. The market accurately predicted the beginning, the peak and the end of the influenza season two to four weeks ahead of the CDC reports on influenza activity.

"Prediction markets will never replace traditional surveillance systems, but they may provide an efficient and relatively inexpensive source of information to supplement existing disease surveillance systems," says Philip M. Polgreen, a physician and professor at the University of Iowa's Carver College of Medicine, who helped to run the market. The university has more recently begun a market, in collaboration with Pro-MED mail, an electronic disease-reporting system, that is intended to predict events related to the H5N1 "bird flu" virus.

Attracted by the markets' apparent soothsaying powers, companies such as Hewlett-Packard (HP), Google and Microsoft have established internal markets that allow employees to trade on the prospect of meeting a quarterly sales goal or a deadline for release of a new software product. As in other types of prediction markets, traders frequently seem to do better than the internal forecasts do.

HP has refined the running of prediction markets to make them effective for groups that might be too small to make accurate predictions. Before a market is launched, HP gauges the expertise level of participants and their attitude toward risk—factors that are then used to mathematically adjust the predictions made when participants place their bets on some future outcome. "Our mechanism basically distills the wisdom of the crowd from a very small group," says Bernardo Huberman, director of the social computing laboratory at HP. This filtering process achieves better results than does a market alone or the predictions of the most knowledgeable members of the group.

The burgeoning interest in prediction markets evokes the prepoll era of the early 20th century, when betting on election results was ubiquitous. Newspapers would routinely run stories on the odds for a particular candidate, reports that often proved to be surprisingly prescient. In that sense, prediction markets may truly hark back to the future. "My long-run prediction is that newspapers in 2020 will look like newspapers in 1920," Wharton School's Wolfers says. If that happens, the wisdom of crowds will have arrived at a juncture that truly rivals the musings of the most seasoned pundits. ■

➔ MORE TO EXPLORE

The Wisdom of Crowds. James Surowiecki. Anchor Books, 2005.

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Infotopia: How Many Minds Produce Knowledge. Cass R. Sunstein. Oxford University Press, 2006.