WANT TO PREDICT THE FUTURE? ASK THE MARKET!

Markets may be better than experts at predicting the future, **Glenn Boyle** and **Steen Videbeck** explain

In 1988 the US Commodity Futures Trading Commission gave permission for the University of Iowa to begin operating the Iowa Electronic Market (the IEM). This ushered in the world's first prediction market (sometimes called an information market). Similar markets have subsequently appeared at the University of British Columbia and Vienna University of Technology. Outside the education sector, firms such as Trade Exchange Network (tradesports.com) and a joint venture between Goldman Sachs and Deutsche Bank (economicderivatives.com) have set up public information markets, while other firms such as Hewlett-Packard, Lilly, and Siemens have used information markets for internal purposes.

Prediction markets are similar to standard derivatives markets in that they provide a mechanism for trading financial claims to future contingencies. But they differ in that, first, they are more accessible to small investors and, second, they offer markets on a wider range of events—including politics, sports, weather, business, and entertainment.

Prediction markets have several purposes. Initially, they were designed to serve as teaching and research tools: they provided university students and staff with the opportunity to study a trading environment that is more realistic than the typical laboratory setting but without the scale, complexity, and noise of real-world markets. More recently, given the proven ability of markets to gather and assimilate dispersed information, interest has focused on the potential forecasting power of prediction markets.

Prediction markets aggregate information in much the same way as any other financial market. They give investors the opportunity to make

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money based on their ability to correctly provide and analyse information (both public and private). If the market price of a security is different from an individual's valuation, they will buy or sell that security in order to benefit from the price changes that they expect to eventuate when the market 'catches up'. By doing so, they alter the balance of demand and supply in the market and help to move prices. For example, if investors believe the market price is too low, they will buy the asset—the increased demand will push the price upwards. If an investor's information turns out to be correct, they will be rewarded—as they will have bought at a low price and be able to sell at a higher price. Similarly, investors that contribute incorrect information will be punished by the market. This continual process of investors buying and selling securities to exploit perceived mispricing ensures that prices never move far away from the value that reflects all publicly available information. That is, prices are 'informationally efficient'.

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Trading in prediction markets

Like standard derivatives markets, prediction markets provide a mechanism for trading financial claims to future contingencies. The most common contract traded on prediction markets is one that yields a fixed payoff if and only if a certain event occurs. For example, suppose there is a market on who the Australian prime minister will be on 31 December 2007. Three contracts are on offer: John Howard, Kim Beazley and Other, each of which pays $1 if the corresponding individual becomes prime minister and zero otherwise. In this case, the price of each contract represents the market's estimate of the probability of each being prime minister on that date. For example, if the Howard contract is trading at $0.61, then the market believes he has a 61% chance of remaining in power.

Contracts that offer a variable payout provide different information. For example, suppose there is a contract that pays $0.01 for every percentage point of House of Representatives seats won by the Labor Party in the next general election, that is, $0.20 if they win 20% of the seats, $0.50 if they win 50%, and so on. In this case, the contract price reveals the outcome expected by the market. That is, if the price is $0.55, then the market expects Labor to win 55% of the seats.

Contracts can even be used to discover an entire probability distribution. For example, the price of a contract that pays $1 if the National Party wins at least ten seats in the House of Representatives tells us the market's estimate of the probability of that party winning at least ten seats. A similar contract with a threshold of at least 20 seats reveals the market's estimate of the probability of the party winning at least 20 seats. By offering many such contacts we can learn the market's beliefs about the entire distribution.

An example of a prediction market: TradeSports.com

TradeSports is an Irish commercial entity that offers a wide range of contracts on events related to economics, entertainment, politics, current events, sports, and the weather via its website www.tradesports.com. A very small sample of the contracts it currently offers include: who will be the 2008 Republican Presidential nominee, whether Osama Bin Laden will be captured by certain dates, who will be the next American Idol, and how many inches of snow will fall in New York's Central Park in a particular month. In 2004, it also offered a contract on whether Yasser Arafat would cease residing in Palestine, which expired when Arafat died as at that point he no longer lived there.

How accurate are prediction markets?

Many studies have focused on the predictive power of prediction markets, particularly in comparison with more traditional approaches like opinion polls and expert analysis. Overall, these suggest that prediction markets provide predictions of future events that are at least as accurate as the more traditional methods.

For example, Joyce Berg and her colleagues examined the accuracy of prices in the IEM political markets and found that the market outperformed polls in 9 out of 15 national elections. Across all

elections, the average poll error was 1.91% while the average market error was 1.49%.[1] Thus, relative to polls, information markets seemed to be superior at predicting election results. Similarly, a journal article by Robert Forsythe and others discussed the results of the 1988 US presidential election, the first event on which the IEM offered a market. Even with a relatively small number of traders (192) in a non-traditional field, the market predictions proved superior to six polls taken around election time.[2] This suggests that the well-known advantages of markets can eventuate even when traders know little about the environment or other traders.

Justin Wolfers and Eric Zitzewitz considered the accuracy of prediction markets across a wider range of events, and concluded that these markets generally performed better than opinion polls and did at least as well as expert opinions and other standard barometers.[3] They also found that, despite the presence of some behavioural biases, information markets have thus far offered little in the way of arbitrage opportunities and have been largely immune to manipulation.

A local example of the accuracy of prediction markets is given by Justin Wolfers and Andrew Leigh who examined the accuracy of tracked election betting from Centrebet in predicting Australian federal election results. They concluded that 'the betting market not only correctly forecast the election outcome, but also provided very precise estimates of outcomes in a host of individual electorates.'[4]

It is important to note that while the research into the predictive ability of prediction markets has been encouraging, prediction markets can of course be wrong and are also not necessarily suitable for every type of event. For example, the prediction markets can experience 'information mirages', the equivalent of stock market bubbles (where overenthusiastic investors create overvalued stock prices). There is also some scepticism surrounding their ability to accurately predict events where information is very closely held by a very small number of people.

Prediction markets as a policy instrument

The success of information markets in predicting future outcomes has focused attention on their potential value as a policy tool.

Private sector firms have already begun to utilise these opportunities via the establishment of internal information markets. For example, Siemens recently found that such a market predicted it would be unable to complete a software project by a particular date, while standard processes suggested the opposite. In this case, the market prediction turned out to be the correct one. At Hewlett-Packard, an internal prediction market proved to be a better forecaster of future sales than more traditional methods. Another example, this time in the public arena, is provided by Tradesports.com, which is currently offering contracts on whether Sony will release their Play Station 3 games console in the US by certain dates. It is easy to see how such information would be valuable to both Sony (for example, for securing component suppliers, planning advertising campaigns, etc) and also Sony's competitors (for example, to determine the optimal date to release their rival product). More such applications seem likely in the future—prediction markets could play a significant role in gauging customer interest, determining organisational challenges, forecasting earnings, and exploiting potential markets.

In the government sector, Robert Hahn pointed out that the prices provided by prediction markets could be used to inform public policy across a range of issues, particularly in aiding assessment of initiatives that have high costs and uncertain benefits.[5] For example, the potential uptake of a subsidised vaccination programme could be estimated using a prediction market. An innovative, and ultimately controversial, use of prediction markets for public policy purposes surfaced in 2003 when the US Defense Advanced Research Projects Agency suggested the creation of a market specialising in various geopolitical contracts, with the aim of predicting the likelihood of a terrorist attack. However, the perceived potential for investors to profit from US citizens dying raised a furore and the proposal was dropped.

Another topical example is provided by Tradesports, which is currently offering contracts on whether the first case of bird flu will be confirmed in the US by certain dates. Such information is vital to authorities who must make important decision surrounding the surveillance plan of birds, distribution of supplies of anti-virals, public service

announcements regarding disease containment and research into new vaccines. Improved decision making has the potential to help save lives and minimise the economic damage of an outbreak. A similar market for healthcare professionals was successfully piloted to help predict influenza outbreaks in Iowa.[6]

It is also interesting to note that the contracts a prediction market provides could allow private firms to better hedge the risks they face from the unwanted event occurring. For example, a poultry farm owner could buy bird flu futures contracts which would payout if bird flu was detected in their country. This payoff would then help to offset the loss they would suffer from the outbreak.

Conclusion: Australasian prediction markets?

The establishment of prediction markets that focus on New Zealand and Australian events has obvious benefits for policymakers, who would obtain the advantages of market-based predictions about uncertain future events. Furthermore, such a market in the region could also raise awareness of the potential benefits of prediction markets in the Australasian business community—which in turn could lead to the increased use of internal markets in Australasian organisations, a development that has the potential for improved decision-making and increased productivity.

However, establishing and running such a market is costly: it requires the creation and ongoing maintenance of a new trading platform. And, in a small market, there is only limited capacity to recoup many of these costs from participants. Corporate, educational or government support is likely to be essential.

Endnotes

1 Joyce Berg, Robert Forsythe, Forrest Nelson and Thomas Rietz, 'Results from a Dozen Years of Election Futures Markets Research', Working draft for the *Handbook of Experimental Economics Results*, 2003.

2 Robert Forsythe, Forrest Nelson, George R Neumann and Jack Wright, 'Anatomy of an Experimental Political Stock Market', *American Economic Review* 82:5 (1992), 1142–1161.

3 Justin Wolfers and Eric Zitzewitz, 'Prediction Markets', *Journal of Economic Perspectives*, 18:2 (Spring 2004), 107–126.

4 Justin Wolfers and Andrew Leigh, 'Three Tools for Forecasting Federal Elections: Lessons from 2001', *Australian Journal of Political Science*, 37:2 (2002), 223–240.

5 Robert Hahn, 'Using Information Markets to Improve Policy', AEI-Brookings Joint Center for Regulatory Studies, Working Paper 04-18 (2004).

6 Philip Polgreen, Daniel Diekema, Loreen Herwaldt, Forrest Nelson and George Neumann, 'Proposal for the Use of Prediction Markets to Forecast Influenza Activity', University of Iowa Working Paper (2004).