

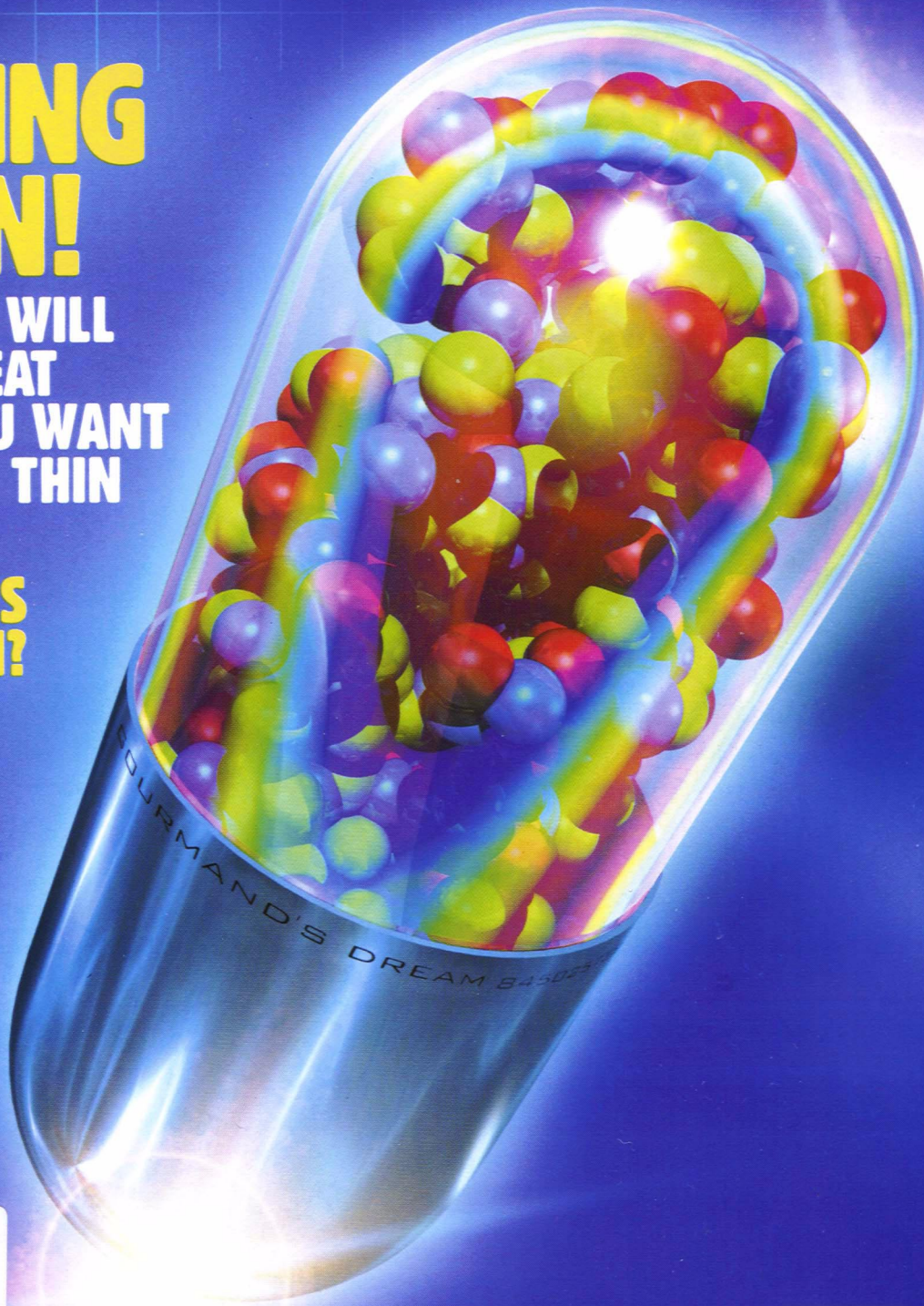
NewScientist

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NEW SCIENTIST



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ASK THE ORACLE

Who's going to win an Oscar? Is there life on other planets? Nobody knows for sure. But Robert Matthews knows how to make the best guess

RUSSELL Crowe will win an Academy Award for his portrayal of mathematician John Nash in *A Beautiful Mind*. The film's director, Ron Howard, will win the award for best director. Ian McKellen will take Best Supporting Actor. But Judi Dench can forget it.

Says who? Says a new way of predicting the future with a stunningly impressive track record. From film awards to presidential elections to scientific and technological advances, it has picked winners with uncanny reliability.

And where do these amazing insights come from? People like you. Those predictions of this year's Oscars, for example, come from thousands of ordinary punters who are interested enough in films to play a Web-based game called the Hollywood Stock Exchange (HSX). Players who reckon they know who'll win the Best Actor Oscar can buy shares in him using fake "Hollywood dollars". The higher the demand, the more they'll have to fork out. But it could be worth it: come Oscar day, players with a big investment in the winner stand to gain vast amounts of—well, nothing much, apart from kudos.

Playing for fake money on pretend stock markets might sound like a sad pastime for wannabe stock market traders (see "Playing the markets", p 43). But here's a thing: those imaginary stock prices have turned out to be eerily accurate predictors of reality. Last year, HSX's army of amateur traders correctly predicted the winners of six out of the eight main Oscar categories. The year before they nailed all eight—better even than a poll of the Academy members who actually decided

the winners. This year, too, the HSX traders seem to have lost none of their acumen: they correctly forecast 35 of the 40 Oscar nominees announced last month.

It's a success rate that has led to the game being taken very seriously by movie moguls keen to gauge market reaction before they commit millions to a film. "We get calls from agents and producers wanting their star, film title or whatever listed on the exchange," says HSX vice-president Michael O'Rourke. Some studios are even willing to pay HSX for detailed trading information.

HSX's predictive power has also prompted people a long way from Tinseltown to

trader—including the sneaky insider dealers. That's because if they want to benefit from their information, they will do so through trading which changes the share price and thus reveals the implications of what they know to everyone else. Then a second basic tenet of economic theory kicks in: "rational expectations", which says that everyone in the market responds rationally to what they know, and buys or sells accordingly. So stock markets allow communities of people to benefit from each other's insights, with share prices giving a handy summary of what that knowledge implies.

All very neat, but is it true? In 1988,

'AMATEUR TRADERS ON THE HOLLYWOOD STOCK EXCHANGE CORRECTLY PREDICTED THE WINNERS OF ALL EIGHT OSCARS'

wonder exactly what's going on in these games. Are their forecasts really as good as they seem? An international team of scientists is on the case. What they are finding casts intriguing new light on some basic tenets of economic theory. And it could have a huge impact on how businesses carry out market research—and how we consumers decide what we'll buy.

Not bad for something that started out as just a teaching aid. For years, economists have tried to find ways of convincing students that their theories bear some resemblance to reality. For example, the "efficient market hypothesis" says that share prices reflect the sum of all the knowledge available to every

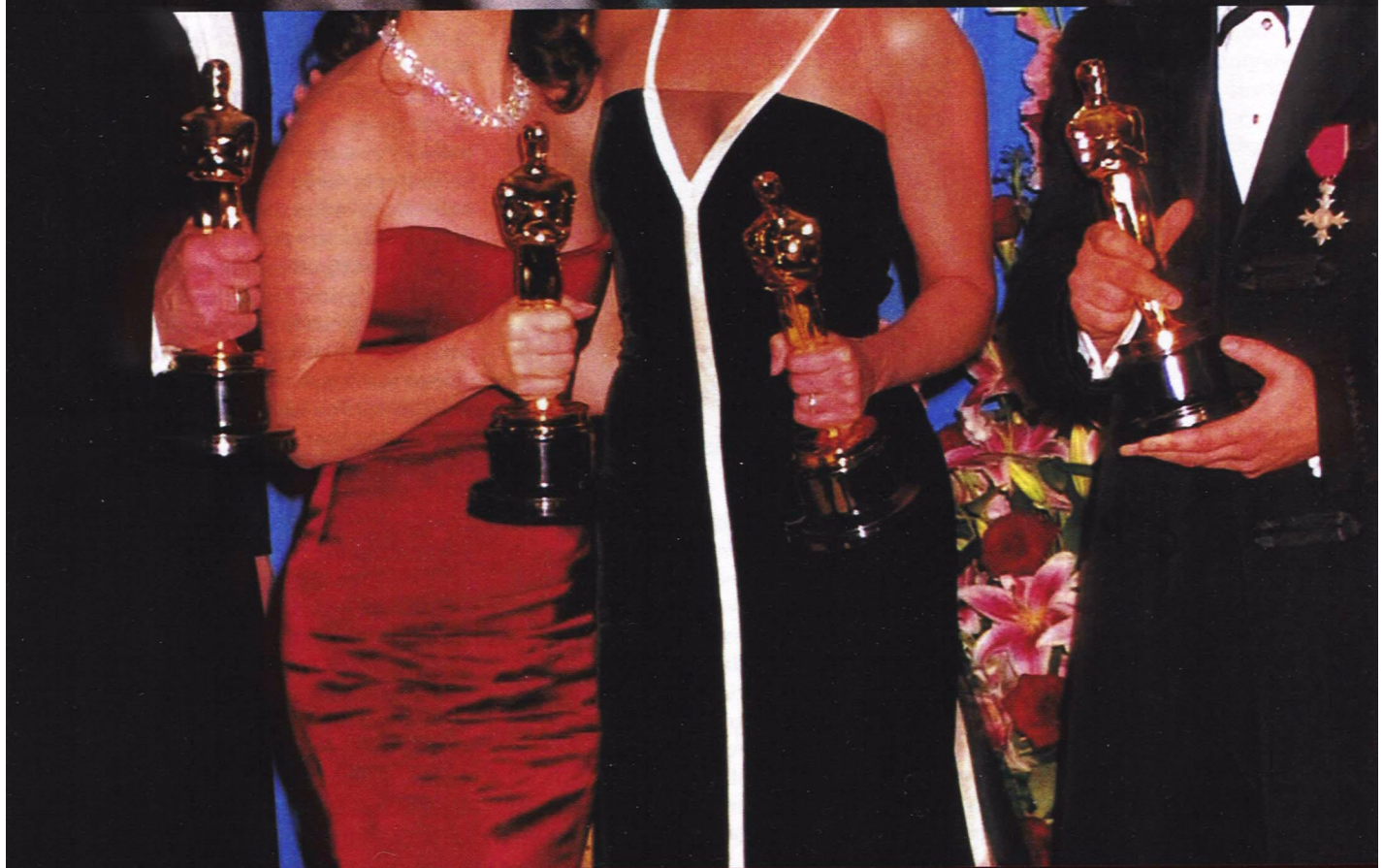
economists at the University of Iowa set up an artificial stock market to let students see the effect of some of these key ideas for themselves. The market traded securities, contracts that pay off only if an event takes place. This time they were tied to the candidates in that year's presidential election.

Each security had to be paid for with real money. Once the election was over the securities paid off according to the percentage of the final vote won by each candidate. With real money at stake, students had a big incentive to follow the intricacies of the presidential race. And, according to the efficient market hypothesis, the final prices should have reflected the total knowledge of

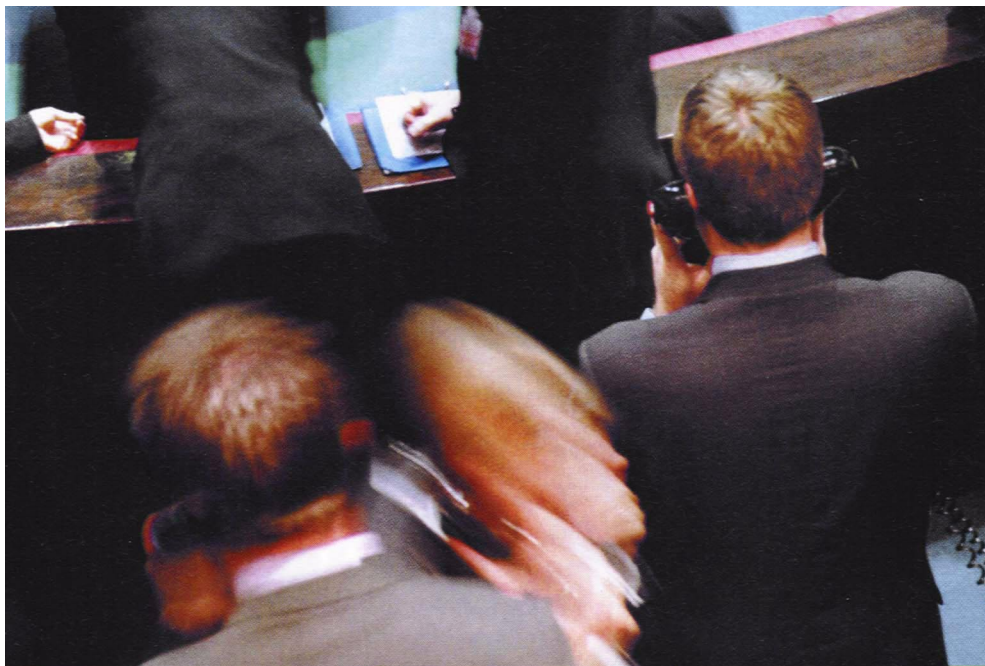
P. Lowe/Magnum

M. Towski/ReX Features

..... HUMAN ORGAN FARMS BY 2015 BID 30 ASK 31 MAJOR ACCIDENT AT FUSION RESEARCH PLANT
2050 BID 44 ASK 46 CELLPHONES BANNED IN CARS BY 2005 BID 28 ASK 35 HABITABLE PLANET
IN US BY 2010 BID 16 ASK 18 GOLDBACH CONJECTURE PROVEN BY 2020 BID 57 ASK 59 GRAVITY



41 ASK 69 UNIVERSE OLDER THAN 13 BILION YEARS BID 87 ASK88 DINOSAUR RECREATED BY
 COVERED BY 2005 BID 52 ASK 54 NEUTRINO HAS MASS BID 94 ASK 95 ABORTION ILLEGAL
 HALWAIVES DISCOVERED BY 2003 BID 52 ASK 53 CANCER CURED BY 2010 BID 13 ASK 15



P. Marlow/Magnum



Rex Features

all the players. How did they do? The market predicted George Bush's margin of victory over Michael Dukakis more accurately than any of the six national opinion polls.

Now, because of the Web, the Iowa market has opened its doors to anyone who cares to take a punt on political and financial events such as the New York mayoral elections or the financial performance of IBM. Renamed the Iowa Electronic Market, it has consistently beaten the major opinion polls in predicting the vote in presidential elections, including the dead heat in 2000.

The Iowa Market has spawned many imitators and trading is now possible on artificial markets covering a stunning range of issues. Formula One Pick Six, for example, trades in securities predicting the top six drivers in Grand Prix races, while NewsFutures trades in current affairs securities, such as the capture of Osama bin Laden by US forces. The Foresight Exchange even trades in predictions of scientific breakthroughs, from the likely date of a cure for AIDS to whether there will be a big quake on the US West Coast before 2010.

These artificial markets are played for imaginary money and usually offer little reward to successful traders apart from bragging rights. Yet they have proved hugely popular: HSX has over 400,000 accounts.

It would be all too easy to dismiss what happens in these markets as just a bit of fun, since with no real money at stake, no one's going to fret that much over trading decisions. That should diminish their reliability. After all, people can make rash trades without worrying about losing their shirts.

But it seems that economic theorists forgot that there's more to life than money. Research by a team led by Dave Pennock of the NEC Research Institute in Princeton, New Jersey, has revealed that people playing these toy markets do indeed act as if they have something to lose: self-esteem and peer-group approval. This triggers both market efficiency and rational expectations, which combine to produce knowledge pooling—with a positive effect on the games' predictive abilities. "People playing a market game are genuinely interested and care about doing well," says Pennock.

To find out exactly what was going on, Pennock and colleagues took a closer look at the movie market HSX. They found that its prices displayed a classic attribute of a rational, efficient market, called coherency. As the price of one Oscar nominee rose, those of at least one of the others dipped accordingly, keeping the sum of all the prices more or less constant.

Price coherency doesn't just imply a market is operating efficiently and rationally. It also means prices can be used as estimates of something else that always adds up to the same figure: probability. In other words, the market won't just tell you who will win, it will also tell you what their chances are.

Analysing over 100 prices quoted on the HSX, Pennock and his colleagues found that its price coherency was not quite as good as a real-money market. Its predictions remain pretty accurate, though. If Sissy Spacek's shares are worth 40 per cent more than those of Judi Dench, then Spacek has a roughly 40 per cent bigger chance of taking the Best Actress Oscar.

Pennock's team has uncovered price coherency in other artificial markets, including the Foresight Exchange, which deals in securities on all manner of future events ranging from Arnold Schwarzenegger becoming president to whether the Higgs particle

... vegetarians a majority in US BY 2030 Bid 31 Ask 33 WORLD POPULATION EXCEEDS 10 BN BY 2010 Bid 10 Ask 20 Big West Coast Quake BY 2010 Bid 39 Ask 40 SMALLPOX RETURNS BY 2010 Bid 15 Ask 17 EXTRATERRESTRIAL LIFE DISCOVERED BEFORE 2050 Bid 77 Ask 78 CRYOGENICALLY FROZEN MAN BY 2010 Bid 12 Ask 14

Playing the markets

Anyone can become a trader on the artificial markets: it's just a matter of registering, grabbing some fictional money to play with, and using it to trade with on the market.

Open a Hollywood Stock Exchange account, for example, and you'll be given two million "Hollywood dollars" (H\$) to spend and a range of ways of doing it. One of the most popular is to bet on the Oscars. As soon as the nominees are announced, HSX issues stock for each nominee, priced at H\$5, and the buying and selling starts. As traders feed in their insights—from how the nominees perform in the Golden Globes, for example—the prices diverge, with the favourites becoming the most expensive. Hot-favourite director Ron Howard, for example, is currently trading at H\$13.75, while outsider David Lynch is just H\$1.75. On Oscar day, each security you hold in a winner pays you H\$25; everything else is worthless.

But striking it rich isn't just about buying winning securities. You can also make a killing on trades. For example, you might buy up a

cheap stock, hoping for a last-minute surge in popularity. Then you can sell, sell, sell and make a tidy profit.

Other markets operate in broadly similar ways. The Foresight Exchange, for example, lets you wager fictional "FX bucks" on claims that may or may not come true by a specific date—such as "Japan has nuclear missiles by 2020". To buy stock, players issue a "bid" price. If this matches a seller's "ask" price, they make a trade (For a selection of claims and their current prices, see bottom of pages).

If a claim comes true, each security you hold pays out FX\$1. But it's not necessary, or even advisable, to wait that long. Simply buy and sell cleverly as perceptions change over time. For example, securities in the claim "Evidence of extraterrestrial life will be discovered by 2050" debuted in 1995 at FX\$0.30. By late 1996 you could sell them for FX\$0.80. The difference? In October of that year, NASA announced it had found traces of fossil bacteria in a Martian meteorite.

will be found by 2005. Again the prices could be turned into probabilities. For example, a bunch of securities consistently trading at FX\$0.80—80 per cent of the maximum price—came true around 80 per cent of the time. Similarly, claims with low prices, such as "O. J. Simpson vindicated by 2000", duly turned out to be true only very occasionally.

Not everyone's impressed. Bob Worcester, chairman of London-based opinion survey company MORI and doyen of pollsters, dismisses artificial markets as just the latest in a long, sorry list of claims to have found a way of beating opinion polls: "We must get half a dozen offers to go into business with these each week, and we always show them the door."

Worcester's big problem with artificial markets is their lack of a mathematical basis. He points out that opinion polls are underpinned by tried-and-tested statistical theory, which demands them to be as large, random and unbiased as possible. The theory also allows estimates of the likely error: around plus or minus 3 per cent for the standard 1000-person poll. There's no guarantee that an artificial market will be as rigorous, since the traders are usually self-selected and their numbers can be very small. Without this assurance, the results are beset by suspicions of bias and outright manipulation.

Yet opinion polls hardly have a glowing track record. The polls for the 1992 general election in Britain notoriously failed to get within 8 per cent of the actual result, chiefly because voters refused to give their views.

But according to Worcester, alternatives such as artificial markets are even worse. "They're voodoo polls," he says.

Pennock himself accepts that there are some key issues to be resolved—not the least being how many active traders the markets need to produce accurate predictions. "I'd guess something on the order of 20 to 30 people could be enough," he says. "But the Web can draw from a global audience, so even esoteric topics could have enough to drive forecasts."

See the future

But one person at least is ready to bet the farm on the power of artificial markets. Later this year, Canada-based entrepreneur Leonard Brody plans to launch Ipreo, the first company offering artificial market services to those who want to see the future.

According to Brody, businesses all over the world spend billions of pounds a year trying to second-guess the response of real markets to uncertain future events. He thinks he can grab a big chunk of this from market researchers and focus groups by offering them an alternative with a proven track record. His artificial market would act as a financial test bed where real-life players trade according to how they see a company succeeding in the prevailing market conditions.

For example, private companies could track the performance of imaginary shares before dipping their toes in a real stock market. It could also help investors estimate a sensible valuation for a new company offering products or services never seen before on

real markets. "The Web allows us to tap into collective knowledge as never before," says Brody. "Artificial markets capture this in a single metric—price—instead of the complex responses you get from market research."

Ipreo will initially draw its traders from business schools, offering them prizes as incentives for taking part. Brody recognises the dangers of market manipulation, and says that a raft of safeguards such as Internet address-checking will be put in place. "We know who all our traders are, unlike stock markets like NASDAQ."

But it is not just companies that stand to benefit from this new source of insight, says Pennock. Artificial markets could also transform consumers' decisions about what they buy. "Imagine if you knew that VHS would win the video wars," he says. "You'd never have let the salesman talk you into buying that Betamax machine."

You can't hear about trading on artificial markets without possible candidates springing to mind: the success of 3G mobile phones, for example, or the chances of nuclear fusion power before 2030. Oddly, no one seems to have set up the most obvious artificial market of all: shares in the success of artificial markets. No doubt it's only a matter of time, and on the evidence to date, they're a definite "buy". □

Robert Matthews is science correspondent for *The Sunday Telegraph*. Play the Hollywood Stock Exchange at www.hsx.com, or the Foresight Exchange at www.ideosphere.com

1 Bid 73 Ask 75 1 m rise in sea level by 2030 Bid 28 Ask 30 ... HIV cure by 2005
2010 Bid 30 Ask 40 Unnatural cosmetic surgery fashionable by 2010 Bid 50 Ask 51
revived by end 2002 Bid 3 Ask 6 Higgs particle discovered by 2005 Bid 69 Ask 71 ...