



Why do people play the Lottery Make up your mind!

Professor Michael Mainelli

25 September 2006

Good evening Ladies and Gentlemen. I'm delighted to see so many of you choose to take a chance on this evening's lecture. Tonight we're going to explore rationally how we make irrational choices. We're also going to explore how you might make some money out of irrationality.

It wouldn't be a Commerce lecture without a commercial, so I'm pleased to announce that the next Commerce lecture will continue our theme of better choice and explore an often over-looked approach for reconciling free markets with societal risk aversion. That lecture is "Standards Markets: The Free Market Response To Regulation?" here on Monday, 16 October 2006, at 18:00. Well, as we say in Commerce – "To Business".

Tax on Stupidity?

It has often been said that any lottery is a mug's game. Clearly, lottery players are guaranteed, overall and over time, to lose. A more pointed comment on lotteries is that "they are a tax on stupidity". You must be stupid to play, and smart people never participate. Henry Fielding supplied a song for his farce, *The Lottery*, which was first performed on New Year's Day January 1732 at the Drury Lane Theatre, London. Nearly three centuries on, the lyrics ring true:

*"A lottery is a taxation,
Upon all the fools of Creation;
And Heav'n be prais'd,
It is easily rais'd,
Credulity's always in fashion;
For, folly's a fund,
Will never lose ground,
While fools are so rife in the Nation."*

In the last century, Albert Einstein remarked, "Only two things are certain: the universe and human stupidity; and I'm not certain about the universe."

Well, it's fun to carp, but the fact remains that people do play lotteries, in abundance. Ancient lotteries existed in China, Japan and India. While the Bible mentions casting 'lots' at least 23 times, government lotteries were probably first introduced in China during the 2nd century BC, in a form called Keno. Keno tickets had 120 characters where players selected ten using an ink brush. Carrier pigeons communicated the results. Keno is distinctively advantageous to the house. Most casino games give the house between 1% and 5%, while Keno frequently delivers over 50%.

Chinese lotteries helped finance the raising of armies and major governmental infrastructure projects like the Great Wall of China. The first public English lottery was in 1566 for public works projects. Up till the 17th century England had private lotteries, but private lotteries became such a scandal that parliament outlawed them in 1699. In 1753 the British Museum was funded by the proceeds of a scandal-ridden lottery sanctioned by Parliament, where £300,000 or more was raised and the Museum got less than £100,000. Nevertheless, UK mandarins were determined to emulate the Chinese and 2,200 years later the UK government on 21 October 1993 established the National Lottery by an Act of Parliament. On 14 November 1994, National Lottery tickets went on sale in 10,000 retail outlets - the world's biggest on-line lottery launch. On 19 November 1994, 22 million viewers tuned in to the BBC to watch the first National Lottery draw.

This is a timely lecture as two days ago, on 23 September, we had National Lottery Day (yes, there is such a day) designed to tell us just how good lotteries are for us. The UK National Lottery is a £5 billion industry. Since 1994, new products have included Lottery Instant, Lotto HotPicks, Thunderball and Dream Number. Today over 25,000 retail outlets offer lottery tickets as well as online, phone and mobile services. During the past 13 years the lottery spent over £19 billion on 240,000 good causes around the UK and created around 2,000 millionaires.

Lotteries are often run by governments and are sometimes described as a regressive tax, as those most likely to buy tickets are presumed to be less affluent members of society. This 'tax' charge is somewhat unfair, as lotteries are voluntary. Nevertheless, in the UK tax is important, after the 50% paid back to winners, 12% is a direct government tax take. Further, much political credit is taken for the 28% to "good causes" that is very much steered by the government through quangos directing the expenditure to the selection of causes, e.g. arts, heritage or supporting the London Olympics 2012 bid. So 50% goes to motivating people to play and 40% is controlled by government. Of the remaining 10%, 5% goes to retailers, 4.5% is spent running the lottery and 0.5% goes as profit to the operator, a consortium called Camelot. Interestingly, the UK format of having a private sector contractor run the system seems to mean that overheads are about half of those of most other state-run lotteries.

This is not to ignore newer lotteries, such as Playmonday.com which promised to give even more money to charity, but has since had to scale back its ambitions. Nor can we avoid comparing lotteries with the questionable use of television channel and other phone-in lines where people are kept waiting and paying supposedly to answer "skill questions" for reward; such as, "Question: for £50 find the anagram in CRO COD ELI, Answer: crocodile". Nor can we miss seeing the ubiquitous explosion of gambling. Technology allows us to choose among global games of chance, lotteries around the world, unless we live in the USA. Gambling may seem frivolous, but so are many other activities. Is gambling just glamorous entertainment, a social night out in a casino with friends or sitting at home alone on a computer? Is gambling just a mental and emotional amusement park, a thrilling roller-coaster of highs and lows? Is gambling hard-wired escapism or an addiction similar to tobacco? But for tonight let's stick to what we might learn from traditional state-run lotteries.

There are a number of well-honed objections to lotteries at both a moral and mathematical level, moving from their silly odds to their preying on the weak and defenceless, to problem-gambling, to underage-gambling, to money-laundering, to monopolistic abuse by many governments, or to problems of discerning "additional good cause" expenditure from a supplementary government budget. Professor Mark Griffiths, Professor of Gambling Studies at Nottingham Trent University, points out that gambling also has direct public health impacts. Extensive evidence shows that lotteries are regressive; the poor spend more as a percentage of income and sometimes in absolute terms as well. It is no surprise that governments market lotteries heavily to low-income groups, yet odds do not seem that important to players. Nietzsche noted that people feel better about success that they have 'willed' over success based on 'chance'.

"He who wills believes with a tolerable degree of certainty that will and action are somehow one – he attributes the success, the carrying out of the willing, to the will itself, and thereby enjoys an increase of that sensation of power which all success brings with it." [Nietzsche, page 49]

So it should come as no surprise that giving players some control over the numbers they choose seems to increase the popularity of lotteries; although in a well-designed lottery the selection of numbers should have no effect. In some respects lotteries highlight our desire to control the chaotic world we inhabit. If we win effortlessly, we wind up feeling guilty about not actually contributing to the win – hence every gambler's desire to have a "system", regardless of whether it can be objectively proved whether it works or not. This desire for a "system" is not confined to gamblers. Technical analysis, or "chartism", such as a reliance on

Fibonacci numbers or momentum oscillators, has a huge following in the City's financial district for bonds and equities. Yet empirical studies, such as one covered in *The Economist* this week ["Buttonwood: Technical Failure", 23 September 2006, page 89], repeatedly show that technical analysis doesn't work.

Where state-run lotteries are popular, reasons for popularity are availability, virtually no skill required to play, little fear of corruption and the ability to wager small amounts. But surely we should feel uneasy at a government programme directed at taking proportionately more money from the poorest, however it is wrapped up in 'good cause' rhetoric? One of tonight's key points is that even if the lottery's odds are awful, they are better than zero for some people.

To highlight an interesting example, "In 1986, the Illinois Lottery placed a billboard in a poor Chicago neighbourhood that read, 'From Washington Street to Easy Street.' Even though similar billboards were placed around the city with different street names, angry Chicagoans boycotted the lottery, alleging it was taking advantage of the poor. Some even claim the billboard read, 'Your Ticket out of Here,' although the Illinois Lottery denies that. Regardless of the exact wording, there was widespread sentiment that the lottery was taking advantage of the state's most vulnerable citizens ... Should the government be in the business of selling, marketing and profiting from an item on which the poor spend - albeit voluntarily - a higher percentage of their income?" [Hansen, 2005]

Consistently Irrational

And economists are troubled by lotteries, but not for the reasons you might think. What troubles economists is why people so reliably make such obviously poor choices when playing lotteries. The fact that lotteries are popular leads to contradictions with economic rationality. Economic irrationality among so many people is a huge challenge to economics. Naturally, economists long ago decided to ignore the irrationality of people. As John Kenneth Galbraith pointed out, "In the choice between changing one's mind and proving there's no need to do so, most people get busy on the proof". Unfortunately irrationality is so widespread that it was actually psychologists who finally forced economists to take real people's irrationality seriously in the 1960's and 1970's. Now examining the differences between actual decisions and ideal decisions is one of the hottest areas in economics.

We need to begin trying to understand economic rationality in order to understand how irrational the idea of economic rationality is. Rational choice is distinguished by three key criteria: it is based on the decision maker's current assets; it is based on the possible consequences of the choice; and when these consequences are uncertain, their likelihood is evaluated without violating the basic rules of probability theory [Dawes, 1988, page 8]. Rational decision-making is a model which assumes decision-makers define the problem; identify and weigh criteria according to their preferences; know and assess all relevant alternatives; and accurately calculate and choose the alternative with the highest perceived value. While many problem-solving systems eschew the notion of a best solution, decision theorists can be dogmatic about the definition of a rational choice. "By the logical law of contradiction, reasoning processes based on the same evidence that reach contradictory conclusions are irrational" [Dawes, 1988, page 9]. For example, scenario planning exercises may use the same evidence to reach contradictory conclusions, so it is unlikely that strategic planning systems would qualify as rational under a strict application of the definition of rational choice.

Standard economic teaching promotes rationality – people make decisions based on their expected utility and with all information to hand. To quote from 1992 Nobel prize-winner Professor Gary Becker's 1976 book, *The Economic Approach to Human Behavior*, "[A]ll human behavior can be viewed as involving participants who maximize their utility from a stable set of preferences and accumulate an optimal amount of information and other inputs in a variety of markets." This premise can be easily challenged – are people really stable about what they want?, how do we know what is an optimal amount of information?, in how many markets can people actually participate?

Another Nobel laureate, Herbert Simon, moved most economists towards 'bounded rationality'. Bounded rationality takes into account the limitations of both knowledge and cognitive capacity. Bounded rationality forces us to look at actual decision-making and relax one or more assumptions of standard expected utility theory. Economists, and other social scientists with an interest in decision-making, have found that the difference between the rational model (how decisions ought to be made) and the real world (what decisions are made) is so significant that their rational models can be of little use. Increasingly, economists are trying to take into account empirical work on decision-making in the real world.

Prospect Theory

Daniel Kahneman and the late Amos Tversky undertook seminal work in the 1960's looking at the relationships between psychology and economics. Kahneman was awarded the 2002 Nobel Prize in economic sciences "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty." Sadly, Nobel prizes are not awarded posthumously; Tversky had the bad luck to go too early to that lottery in the sky. Their Prospect Theory attempts to describe why individuals make decisions which deviate from rational decision-making. Tversky and Kahneman developed Prospect Theory around the concept of 'framing' to explain why people would, on average, prefer risk when they feel 'behind' and prefer safety when they feel 'ahead'. Prospect Theory shows how individuals frame decisions and deviate predictably in large numbers from the third criteria of rational choice, i.e. they violate probability theory [Tversky and Kahneman, 1974; Kahneman and Tversky, 1979].

According to The Economist ["Irrationality: Rethinking Thinking", 16 December 1999]:

"The psychological idea that has so far had the greatest impact on economics is 'prospect theory'. This was developed by Daniel Kahneman of Princeton University and the late Amos Tversky of Stanford University. It brings together several aspects of psychological research and differs in crucial respects from expected-utility theory - although, equally crucially, it shares its advantage of being able to be modelled mathematically. It is based on the results of hundreds of experiments in which people have been asked to choose between pairs of gambles."

Starting from some simple but cunning questions, and not shying away from uncomfortable empirical evidence, Prospect Theory provides a descriptive framework of how individuals actually evaluate losses and gains. Ironically for us here this evening, in the original formulation the term 'prospect' referred to a 'lottery'. Let's undertake some empirical work tonight.

You are looking at one of Tversky and Kahneman's classic experimental questions:

Imagine that you face the following pair of concurrent decisions. First examine both decisions, and then choose the options you prefer.

Decision 1 - Choose between:

A - a sure gain of £240

B - a 25 percent chance to gain £1,000, and a 75 percent chance to gain nothing

Decision 2 - Choose between:

Y - a sure loss of £750

Z - a 75 percent chance to lose £1,000, and a 25 percent chance to lose nothing

In Tversky and Kahneman's experiments, for Decision 1, 84% of subjects chose A, while 16% chose B. Given that the expected value of A is £240, while the expected value of B is £250, this is, strictly speaking, irrational. For Decision 2, 13% chose Y, while 87% chose Z. Given that the expected value of Y and Z are identical, we might expect the result to be 50:50. Instead what we get is 50 of one and half a dozen of the other!

This simple test shows that we tend to be risk-averse concerning gains and positively framed questions, such as that in Decision 1. We also tend to be risk-seeking concerning losses and negatively framed questions as in Decision 2. As economic machines we should value B more than A and be indifferent to Y and Z, but we're not. As humans, we value the certainty of A's sure gain of £240 over B's possible, uncertain gain of £1,000. As humans, we hate Y's sure loss of £750 much more than Z's possible loss of £1,000 with a chance of losing nothing.

Now Tversky and Kahneman tried many other permutations of questions. They varied the questions from neutral choices to highly biased expected values. They tried very small sums and very large sums. What they produced was one of the most influential behavioural curves of the century.

Prospect Theory proposes that:

people evaluate rewards and losses relative to a neutral reference point (i.e. get them to change the frame of the reference point and their decisions will change);

people adopt risk-averse behaviour concerning gains (i.e. they will value initial gains more than subsequent gains);

people adopt risk-seeking behaviour over losses (i.e. they will forego higher degrees of certainty over loss to seek choices which reduce the loss more markedly);

people's response to loss is greater than their response to gain (i.e. the pain associated with losing £100 is greater than the pleasure of winning £100);

people tend to give too much emphasis to low probability events (i.e. they overweight low probability events while underweighting medium and high probability events).

Prospect Theory is frequently summarised in a diagram similar to the one here. In this diagram, the X or horizontal axis represents the units gained (to the right) or lost (to the left) in objective, rational terms (i.e. the genuine probability of winning or losing money). The Y or vertical axis represents the units of utility associated with varying levels of gain (above the line) or loss (below the line). Over 30 years of research has indicated that the S-curve best represents the function associated with most human choices. As you can see, the top right quadrant shows that people would rather take a sure gain today than a probable one tomorrow. A gain of £100 may only have value units of £50. The bottom left quadrant shows that people would rather gamble to avoid a loss. Decreasing a loss by £50 may have £100 of value.

Prospect Theory emphasises the importance of framing the problem. The way in which a problem is presented, either starting from a position of gain or from a position of loss, is crucial to the position of the neutral reference point. The difference between Prospect Theory and economic theories of diminishing marginal utility is that marginal utility assumes that people only consider their choices in terms of the final outcome, not from where they start. At first glance, framing seems either hard or non-sensical, however framing is everything. Prospect Theory highlights contradictions such that in some problems 250 lives saved is more than 25% as valuable as 1,000 lives saved. Many insurance offers rely on Prospect Theory. Consider paying £350 for a year's £1,000 worth of insurance when you have a 1/4 chance in a year of losing £1,000. Clearly that is not a good bet; it's £100 more than your likely loss of £250. Yet contrast that with losing £1,000 1/4 of the time and gaining nothing 3/4's of the time. While that's equivalent to paying £250 per year, it sounds worse.

I quote from Bernstein, "Richard Thaler has described an experiment that uses starting wealth to illustrate Tversky's warning ["our preferences ... can be manipulated by changes in the reference points]. Thaler proposed to a class of students that they had just won \$30 and were now offered the following choice: a coin flip where the individual wins \$9 on heads and loses \$9 on tails versus no coin flip. Seventy percent of the subjects selected the coin flip. Thaler offered his next class the following options: starting wealth of zero and then a coin flip where the individual wins \$39 on heads and wins \$21 on tails versus \$30 for certain. Only 43 percent selected the coin flip." [Bernstein, 1996, pages 274-275]

Clearly both games are identical in terms of expected outcomes, but what we see here is that the reference point for the game when people took the gamble was that the \$30 was behind them; they had nothing to lose. On the contrary, by taking a gamble in the second game they might lose a sure \$30.

Further, do note that the far top right shows that when you're well ahead of the game in your own mind, perhaps a billionaire at the village church raffle, you take risky decisions. Also take note of the bottom left where when you are well and truly behind, perhaps down to your last meal, you take safe decisions. Framing affects many decisions. Let's try this one:

A large charity has recently been hit with a number of fundraising setbacks and should cut back drastically. The finance director has developed two alternative rescue plans:

Plan A: Saves one office and 200 staff

Plan B: Has a 1/3 probability of saving all three offices and all 600 jobs, but a 2/3 probability of saving no offices and no jobs

Choose A or B!

A large charity has recently been hit with a number of fundraising setbacks but may be able to rescue things. The finance director has developed two alternative rescue plans:

Plan Y: Loses two offices and sheds 400 staff

Plan Z: Has a 2/3 probability of losing all three offices and all 600 jobs, but a 1/3 probability of losing no offices and no jobs

Choose Y or Z!

As many of you will have realised, both decisions are equal in terms of expected value. Tonight you may differ from the norm, but I've taken a chance by hard-wiring this slide in advance based on Tversky and Kahneman's overall results.

Most people would (about 80%) choose A and Z, i.e. people are risk-avoiding when ahead, risk-seeking when behind. A & B and Y & Z are identical in expected value, but people tend to favour one depending on the wording. The wording difference is "save" or "lose". Changing the description of the outcome from "saved" to "lost" is sufficient to make people favour certainty or take a gamble on uncertainty.

All four options are equivalent in economic terms, but if you're the finance director, it may not feel that way. You might be willing to take that 1/3 chance just to have the opportunity to avoid making anyone redundant. You might want to say that you exhausted every avenue. Of course, you might also like to say that you were conservative and chose to cut back prudently. The reason that people are biased is that in the first case the wording focuses on "saving" and in the second on "losing". In the first case, most people feel that the decision is framed on keeping what they have. In the second case, most people feel that they are already down, so they might as well take a chance.

If you want to drive decision-makers towards a riskier decision, convince them that they are already losing. If you want to drive decision-makers towards a risk-averse decision, convince them that they are ahead and stand to lose quite a bit. "You have to speculate to accumulate" drives decision-makers towards riskier choices, whilst "let's not throw good money after bad" drives them away from risk-seeking choices. Both phrases take advantage of framing to move decision-makers' perspectives. To speculate implies they are already behind. To throw good money implies they are in a position where they stand to lose more.

As Mark Twain noted, "There are two times in a man's life when he should not speculate: when he can't afford it, and when he can". [Samuel Clemens, Following the Equator]

Prospecting for Bubbles

So, let's look at what Prospect Theory might indicate about the dot.com bubble. The key to this discussion is an assumption that valuations of dot.com companies were in excess of their 'objective' value. If we assume dot.com valuations were excessive, then investors were risk-seeking, i.e. we should place their decisions in the lower left quadrant. Prospect Theory implies that investors are deliberately seeking risk because they believe that from their neutral decision making point, they are already losing.

Was the dot.com mania born of panic at losses, not at excitement from potential gains? Clearly, for some of the large institutional funds, competitively measured each year against their peers, failing to have made significant dot.com gains already meant that they were losing and needed to seek more risk. For individual investors this explanation is a bit less likely. The rising market might have made them feel that they were already winners and thus, according to Prospect Theory, they should become risk averse, getting out of or staying away from dot.com's. On the other hand, individual investors may have been looking at their peers who made large gains (at least on paper). If individual investors feel that they are losing out against their peers, they become more risk-seeking.

Realistically, investors may have several different tranches of investment. There might be a base level of investment which they do not wish to put at significant risk, e.g. pension, but there may also be a tranche of investment, their 'gingerbread' layer, where they are prepared to take large risks for large gains. The only difficulty with using the gingerbread layer to explain high dot.com valuations is that it appears to have risen in volume many-fold in a short space of time. A lot of people suddenly had more gingerbread and a greater desire to seek risk with their gingerbread investment tranche. There are numerous additional explanations, e.g. increased portfolio diversification for a new portfolio area or the increased vulnerability of old economy shares leading to re-weightings.

If it is herd behaviour that drove us towards dot.com's, perhaps it was the behaviour of a herd in panic, not euphoria. Do worry and fear drive people towards the next big thing? Is the next big thing a mania born from panic at relative losses, not from excitement at potential gains? And the surest way to help the herd to have avoided the dot.bomb bubble? According to Prospect Theory, tell people, "as you have already gained so much, now look at what you stand to lose!"

So there are two interesting hypotheses one might propose. The first is that investors seek the next big thing out of 'fear of missing out'. 'Fear of missing out' leads us to act in a herd-like manner, all moving to implement whatever the crowd tells us is the next big thing, whatever fad is popular, leading to investment bubbles. The second hypothesis is that this irrational behaviour nevertheless offers a rational investment approach. By investing early and heavily in the next big thing, an investor inflates the bubble further, but is on to a sure market return regardless of whether the next big thing fulfils its promise, as long as he or she knows when to leave the market. To the savvy investor, the technological next big thing is no such thing, just a recurring, somewhat predictable, bubble to ride. "The next big thing is dead; long live the next big thing."

It's All About People

Decision theory (and much of economics) relies upon models of people. Decision theory begins from the premise of a rational person. As Peters notes, "To justify our methods, we have even built a model human called the rational investor, even though this person does not resemble anyone we know. We have ignored historical evidence that groups of people are prone to fashions and fads, saying instead that, in the aggregate, investors are rational even if they are not rational individually." [Peters, E., 1991, page 203] The contrast between the application of decision theory and the way in which decisions are taken in practice may differ markedly. Cognitive barriers that impede rational decisions have been recognised since at least the time of Bacon – individual peculiarities, limits of language, pre-existing beliefs and inherited foibles of human thought – these were Bacon's "idols" [Schermer, 2004]. The place of emotion in decision theory has always been contentious. "Accepting responsibility for our lives involves continually facing difficult choices and decisions, and bearing the consequences of them when they are wrong, and this is burdensome, not to say alarming." [Magee, 1973, page 87].

Much of the current literature on decision theory introduces elements of irrationality to the strict definition and contrasts the results with experiment. An increasingly popular research area these days is Behavioral Economics, trying to analyse other systematic biases in human decisions. To enumerate a few of these other systematic, partially predictable, biases in human decision-making: overconfidence in our own abilities, over-optimism about the future, relying overly much on our own experiences, anchoring decisions around suggested solutions, sunk-cost effects, herd instincts, counterproductive regret and spending too much time on small decisions rather than larger ones. How people behave creates risks and opportunities. Some basic examples include tribalism & the herd mentality; "keeping face" & trust; turf & ownership; greed & fear; the corruption of power [Howitt, Mainelli & Taylor, 2004].

A related, more fundamental, research area is Evolutionary Psychology. Evolutionary Psychology notes that the human brain consists of a collection of functionally specialised computational devices that evolved to solve the adaptive problems regularly encountered by primates. As humans share an evolved architecture, individuals are likely to develop a distinctively human set of preferences, motives, shared conceptual frameworks and reasoning procedures with many characteristics in common. Moreover, it appears that Prospect Theory may be hard-wired into our behaviour. Experiments on monkeys show that they too follow the predictions of Prospect Theory, avoiding uncertainty for less beneficial but more certain gains. Professor Kendrick gave a fascinating lecture here earlier this year on the evolutionary basis behind risk-taking, "Why Do We Gamble and Take Needless Risks?" It is anticipated that over time research into systematic behavioural biases, underpinned by theories from Evolutionary Psychology, will help explain why human decisions are rarely risk/reward-neutral or rational.

Prospect Theory, Behavioral Economics and Evolutionary Psychology are fascinating and some of their theoretical frameworks are being applied both to improve decision-making and to identify opportunities. Ideally understanding Prospect Theory should improve decision-making by imposing procedures that attempt to correct for known biases and bring decisions more into line with "rational" behaviour, i.e. what a risk-neutral entity would choose. Professor Richard Thaler has been examining the Swedish pension privatisation experience using Prospect Theory in order to help shape US pensions policy. Prospect Theory has also been applied to trying to find opportunities in enduring mis-valuations such as the equity

premium puzzle (why are equities overvalued), intertemporal consumption and the endowment effect.

“Alan Greenspan, the chairman of the Federal Reserve, compared owning shares with buying a lottery ticket. Each share had a small chance of securing a great reward, but a high probability of failure. ‘What lottery managers have known for centuries is that you could get somebody to pay for a one-in-a-million shot more than the value of that chance,’ observed Mr Greenspan. Hence, the more volatile the business outlook, the more likely ‘you will get a lottery premium in the stock’”. [The Economist, 24 September 2005, page 88].

Even Alan Greenspan’s views are very much in accord with Prospect Theory, so let’s go back to the lottery. Rationally, you ought to see long queues outside lottery retail outlets in the closing minutes. There would be a good reason for this.

Discount Me Out

As the odds of the winning lottery are 1:13,983,816

based 10.2 deaths per thousand people per year for adults

odds of dying per year $0.0102 = 1:98$

odds of dying per day = 1:35,784

odds of dying per hour = 1:858,824

odds of dying per minute = 1:51,529,412

and the odds of dying per second are 1:3,091,764,706, people should be laying bets only within 5 seconds of the close of lottery ticket purchases.

But there are no queues. Lotteries almost single-handedly prove that people are not rational. But do lotteries prove Prospect Theory? On a limited budget, we can only have a quick look. A colleague at Z/Yen, Jez Horne, dug out some figures on misery, happiness, GDP and lotteries. Jez was able to dig out reasonably comparable figures for 14 countries. I won’t go into the data problems, but if anyone wishes to research this further they really need to take into account how to estimate overall lottery sales, how to evaluate the overall gambling sector, how unemployment and disability are measured, how to estimate the black market, how to rationalize GDP and PPP as well as how to measure happiness. Despite some interesting results to follow in a moment, Jez and I looked at a number of happiness indicators where our results are definitely weaker. Anyone interested in taking the following ideas further is welcome to talk with us. Caveats aside, let’s look at three slides that appear to affirm Prospect Theory. We would expect people to participate more in lotteries when they have framed their position as behind, as if they feel they’re losing. We would also suspect that people who feel good about their position in life would be less inclined to play lotteries.

This first slide shows the correlation between overall lottery sales by country and misery. The misery index we’ve taken is an economic indicator created by Chicago economist Robert Barro in the 1970’s. It is the unemployment rate added to the inflation rate. As you can see, increasing lottery sales per person rises with increasing misery. The fit, with an R^2 of 0.35, is ok, but not particularly strong.

We also looked at correlations for countries with a high or low GINI coefficient. For those of you who don’t toss these terms around on a daily basis, the GINI coefficient is a measure of a country’s economic equality. It was developed in 1912 by the Italian statistician Corrado Gini who calculated an inequality index as a number between 0 and 1, where 0 corresponds to perfect equality (i.e. everyone has the same income) and 1 corresponds to perfect inequality (i.e. one person has all the income, while everyone else has zero income). Our presumption was that high GINI coefficients would create a larger proportion of people who felt they were behind compared with more egalitarian countries where we felt that people would be indifferent to lottery participation.

You see before you the correlation for the seven lowest GINI countries. This correlation is poor. When people feel there is economic equality, perhaps they don’t need a lottery.

Now here is the graph of the seven highest GINI countries. This correlation is strong enough to be interesting, though I hasten to add that proper analysis would need significant work. Nevertheless, at a first glance, when people feel that things are iniquitous, perhaps they are more inclined to take a chance at

improving their lot.

Of course, the paradox to savour is that while lotteries are played more in countries with a high GINI coefficient, lotteries also increase the GINI coefficient, thus raising the propensity of people to play the lottery, and so on. There's an old joke that "you've no idea how stupid the average person is, and half of them are stupider than that." A GINI or lottery paraphrase might be "you've no idea how far behind the average person feels, and half of them feel that they're further behind than that".

A National Success?

A recent article on Nollywood, the Nigerian Hollywood or Bollywood, stated: "Many Nigerian films involve witchcraft, or "juju", because marketers have found that it sells especially well. Plots often use black magic as a way to explain why a man has gone from being poor to a millionaire overnight, says Onookome Okome, associate professor of African literature and cinema at the University of Alberta. Such a theme resonates in a society with great inequality of wealth. [The Economist, "Nigeria's Film Industry: Nollywood Dreams", 29 July 2006, page 63]

Well I'm not so sure that we don't have a similar problem in the UK. You will have noticed from the slides that the UK is well-correlated with lottery sales and misery. Yet we have political statements such as the Culture Secretary Tessa Jowell telling us that widespread lottery participation is something of which to be proud.

What's All This Got To Do With The Price Of Fish?

So what might you take away from tonight that's of some practical use? Well, first and foremost, make sure that your decisions aren't poorly framed. Are you upset when friends drop by unexpectedly because you'd framed the evening as a night in? Do you worry too much about sunk costs? Why do you overvalue your possessions?

Second, if you're trying to sell something that has poor odds for the buyer, try to package it as insurance.

Third, if you want to drive a decision your way remember framing. For example, if you want the company board to invest in a risky new computer system make them feel behind. Emphasise how much their competitors are ahead. "Ladies and Gentlemen, over the past five years each of our terrifying competitors has invested over 25% more than us in new information technology." If you want the company board to reject a new computer proposal, make them feel safe. "Ladies and Gentlemen, do you expect us to throw away the past five years of investment in computers, training and staff knowledge just because we're having a few technical problems?"

Fourth, the best investment strategy is likely to be the contrarian strategy. People are not risk/reward neutral and bubbles start when people believe, through framing, that they are ahead or behind. Nevertheless, everything will, over time, revert to the mean. If you can wait long enough, buying undervalued assets or shorting overvalued assets always wins. There are some investment and hedge funds already established that claim to be following behavioral economic principles, but I sometimes wonder if that's just marketing gloss for contrarianism.

Finally, when you're feeling down buy a lottery ticket, otherwise don't bother. Leo Longanesi quipped, "Due stupidi sono due stupidi. Diecimila stupidi sono una forza storica." ("Two idiots are two idiots. Ten thousand idiots are an historic force.") But economics is about real people in real markets. People aren't the problem; people are the most important components in economics. If economists can't build models that take account of the way people actually make decisions, then they will build impractical models on topics as diverse as pensions savings, employment incentives, operational risks, fraud and misinformation.

A lifetime in business has taught me that people are reluctant to admit that their original opinions might be in error – of that I'm sure. But economists are changing theirs. Prospect Theory, Behavioral Economics and possibly Evolutionary Psychology hold out the hope that we can integrate theoretical economics with observation and experimentation of actual decision-making so that we can have better markets, better decisions and better societies. Heads I win, tails you lose. So why do people play the lottery? It's all in the way you make up your own mind!

Thank you.

Further Discussion

Is lottery popularity confirmation of popular disillusion?

How does our framing of global risks, e.g. climate change, affect our actions?

Further Reading

BAZERMAN, Max, Judgment in Managerial Decision Making, John Wiley & Sons, 1986 (1998 edition).

BERNSTEIN, Peter L, Against the Gods: The Remarkable Story of Risk, John Wiley & Sons, 1996.

DAWES, Robyn M, Rational Choice in an Uncertain World, Harcourt Brace Jovanovich, 1988.

FIELDING, Henry, The Lottery (London: J. Watts, 1732), Scene 1, quoted in Charles T. Clotfelter and Philip J Cook, Selling Hope: State Lotteries in America (Harvard University Press, 1989), page 215.

HOWITT, Jonathan, Mainelli, Michael and Taylor, Charles, "Marionettes, or Masters of the Universe? The Human Factor in Operational Risk" , Operational Risk (A Special Edition of The RMA Journal), pages 52-57, The Risk Management Association (May 2004), <http://www.zyen.com/Knowledge/Articles/marionettes.pdf>.

KAHNEMAN, Daniel and Tversky, Amos, "Prospect Theory: An Analysis of Decision Under Risk", Econometrica, Vol. 47, No. 2, March 1979, pp. 263-291.

KAHNEMAN, Daniel, Slovic, Paul and Tversky, Amos (eds), Judgment Under Uncertainty: Heuristics and Biases, Cambridge University Press, 1982.

KINDLEBERGER, Charles P, Manias, Panics and Crashes, John Wiley & Sons, 1978.

MAGEE, Bryan, Popper, Fontana Press, 1973 (1985 ed).

MAINELLI, Michael and Harris, Ian, "How I Learned to Start Worrying & Love the dot.bomb", Strategy, pages 6-7, The Strategic Planning Society (May 2000), http://www.zyen.com/Knowledge/Articles/dot_bomb.htm.

MAINELLI, Michael, "Beyond the Technology Frontier" (debate "After the Internet, What Will Be the Next Big Thing?"), European Business Forum, Issue 16, pages 31-32, Community of European Management Schools and PricewaterhouseCoopers (Winter 2003/2004), www.zyen.com

NIETZSCHE, Friedrich, Beyond Good and Evil, Penguin Books, 1973 (1990 edition).

PETERS, Edgar E., Chaos and Order in the Capital Markets: A New View of Cycles, Prices, and Market Volatility, John Wiley & Sons, 1991.

SCHERMER, Michael, "The Enchanted Glass", Scientific American, page 27, May 2004.

TVERSKY, A. and Kahneman, D. "Judgment under Uncertainty: Heuristics and Biases", Science, 185, 1974, pp. 1124-1131.

Further Surfing

Keith Kendrick's lecture, "Why Do We Gamble and Take Needless Risks?", 2 March 2006 - <http://www.gresham.ac.uk/event.asp?PageId=4&EventId=371>.

Cumulative Prospect Theory - http://en.wikipedia.org/wiki/Cumulative_prospect_theory

Dunstan, Roger, "Gambling In California", California Research Bureau, January 1997, <http://www.library.ca.gov/CRB/97/03/crb97003.html#toc>.

Hansen, Alicia, "State Run Lotteries As A Form Of Taxation", 8 October 2005, http://www.taxfoundation.org/research/show/1126.html#_edn1.

History of Lotto - http://www.14g.com/lotto/knowledge/history_of_lotto/.

On Lotteries - <http://en.wikipedia.org/wiki/Lottery>

Papadopoulos, Dr Linda, "The Nation's Attitude to Luck – The First Ever Regional Barometer of Luck across the UK", ICM Research, August 2006, <http://www.camelotgroup.co.uk/TheNationalLotteryLuckStudy.pdf>.

Prospect Theory - http://en.wikipedia.org/wiki/Prospect_theory

Ramos, Fernando, "An Empirical Analysis of Gambling Consumption: National Lottery in Spain, 1850-2000" [very preliminary version], XIV International Economic History Congress, Helsinki 2006, Session 24, <http://www.helsinki.fi/iehc2006/papers1/Ramos.pdf#search=%22uk%20national%20lottery%20sales%20by%20region%22>.

Simple Biases in Lottery Perceptions - <http://faculty.clintoncc.suny.edu/faculty/June.Foley/lottery.htm>

Thaler and Sweden's Pension Fund – "Can Behavioral Economics Save Us From Ourselves?", University of Chicago Magazine, Volume 97, Issue 3, February 2005, <http://magazine.uchicago.edu/0502/features/economics.shtml>

UK Mortality Statistics - www.statistics.gov.uk

My thanks for thoughts behind this lecture go to Ian Harris for much joint work on theory versus behavioural reality, to David Hurst for pushing me to get lottery & happiness figures and to Jez Horne for actually doing the lottery & happiness figures work. I would also like to thank Elisabeth, Xenia and Maxine Mainelli for reminding me that lotteries take many forms.

© Professor Michael Mainelli, 2006