Is Playing the Lottery Irrational?
Or Reasonable? Or Both?

Moshe Alamaro
alamaro@mit.edu

I buy a $2 lottery ticket each week, which is irrational from both classic economics and cost-benefit analysis points of view. Until a year ago, I felt ashamed as if I were downtrodden, expecting to win millions of dollars just like that. Then, I developed the insight I will present here, so now I feel better about myself.

I once saw a neighbor of mine, an upscale woman, buy a lottery ticket in a convenience store. She seemed embarrassed when she saw me, as if she is declassed or becomes *hoi polloi* by buying the lottery. When she saw that I also bought a lottery ticket, she seemed relieved. Most likely she said to herself: I am not the only lunatic one in this town.

Playing the lottery is often thought to be for the poor and the uneducated since the expected value of a lottery ticket is negative. Lotteries return to the winners about 60% of the selling revenues. It would mean that, on average, each dollar invested in a lottery provides 60 cents. Therefore, the expected value for a $1 lottery ticket is negative 40 cents, or the value of a ticket is less than its cost. The 40% of revenues left with the state lottery authorities is used to pay for education and other civil purposes. This is the
reason it is said that the lottery is an immoral and regressive tax on the poor.

From a classical economics point of view, playing the lottery is an irrational decision since it provides negative expected value. I will show now that it could be reasonable for most people considering behavioral economics or their decision-making even if they know nothing about behavioral economics or decision-making.

My insight is why spending two dollars per week on the big national lotteries while expecting, even remotely, to win a large prize of say tens or even hundreds of millions of dollars is reasonable for me and most likely for most of you. For sure, I am not promoting gambling!

Behavioral economics is a field that tries to explain the irrational decision-making that defies classical economics. It has been popularized for example, by the book *Freakonomics* and the writings of Malcolm Gladwell. Daniel Kahneman, a psychologist, extended this field to business and politics and won the Nobel Prize in economics. These writers provide extreme counterintuitive cases of utility preference cases.

Utility theory is the study of human preference when making economic decisions. A simple example is the following: An individual is asked if she prefers receiving now a gift of 100 dollars or receiving instead $300 gift with 50% probability a year later. The expected value of the 300 dollars with 50% probability is $150. Forfeiting now $100 for an expected value of $150 provides a year later an interest gain of 50%, a high return that would be attractive for rational investors.
However, different people might decide differently. One might say: I don’t care about the $300 later, my children are hungry and I need the money now. Others might say they want the probability to be raised to say 75%, and only then will they wait a year. Others might say they are willing to wait only if the probable payment a year later is $400.

In fact, we are making negative expected value bets all the time when, for example, we buy home insurance. Insurance companies return to all the damaged insured customers less than their total premiums revenues paid by the insured. The reason people buy insurance is that they are more averse to the remote possibility of losing their home by fire than they are averse to paying annual premiums of a few thousand dollars.

It is unlikely that the insured make such analyses or considerations when they buy insurance. Most likely such and other negative expected value decisions are done instinctively. To be sure, the insurance companies make such an analysis to assure their profits. There are numerous such smaller bets with negative expected value that we implicitly frequently make.

So, making a bet on a lottery ticket that provides a negative expected value is not rational. What would happen if the lotteries returned to the winners more than 100% of total sales revenues? Would most people play the lottery? My girlfriend says that she will not buy a positive expected value lottery ticket. She reasons that the chances of buying a winning ticket are still very low out of millions.

Actually, there was a case where a lottery returned to the winners more than 100% of the revenues, so the value of a lottery ticket was then more
than its cost. It happened in the Massachusetts state lottery in the early 2000s. Then, the winning jackpot was only a few millions, unlike the large national lotteries that provide jackpots of tens or even hundreds of millions.

In the Massachusetts case, the odds were sometimes so high that winning a jackpot was rare, discouraging people from buying. Revenues accumulated from one lottery cycle to another, but fewer and fewer people were buying. To stimulate the public to buy more, the Massachusetts lottery decided to pay more than 100% of the revenues to the winners in some cycles. But even then, the chances of winning by a single ticket out of millions were very low.

So as the legend goes, an MIT nerdy math student by the name of James Harvey came up with ingenious scheme. He would buy all or a large number or most of the lottery tickets. Doing so, he will increase his chances of winning more than his spending.

But how could he draw half a million dollars from a bank in small bills? Try to ask your bank to give you half a million dollars in small bills if you have the money. James did not have the money. And could he buy hundreds of thousand tickets in a few days’ lottery cycle when a lottery dispensing machine is so slow? And would he be able to sort hundreds of thousand tickets to find the winning tickets? The logistics of his scheme seemed to be daunting.

So, this MIT scoundrel went to his classmates and convinced them to provide a few thousands dollar each. That way he formed an investor syndicate. He dispersed the nerdy squad across Greater Boston to buy a few thousand tickets each using their own money. At least one geeky
professor joined the fray. With all the excitement, it is not clear how they found the time for their studies. They won the lottery several times over the next few months.

The Massachusetts Office of the Inspector General investigated and found no illegal or wrongdoing. The Inspector General estimated their profit to be $3.5 million after tax. Two other such investor syndicates were formed. In some of the lottery cycles, the three syndicates bought 80% of all the issued lottery tickets!

The crescendo of my talk is the following. Assume a case where a large national lottery provides 60% of its revenues to the winners where total accumulated revenues in that cycle is $100 million. The lotteries pay in total 60% or $60 million to the winners, $10 million of which goes to the small winners. The sum of $50 million is left for the large winning jackpot. Should I buy a $2 ticket from this negative expected value lottery in hope to win $50 million? From a classic economics point of view, you might say it would be irrational.

Assume now another hypothetical case where the lottery returns to the winners more than 100% of their revenues. Now the jackpot is, say, $100 million and the value of a lottery ticket is more than its cost. Should I buy such a ticket? You might also say that buying a ticket in this hypothetical case is rational.

But from a utility preference point of view, there is no difference, at least for me, if I win $50 million or $100 million. With $50 million I will be as happy and content as having won $100 million. I will eat the same number of expensive caviar and lobster meals. I will buy the same number of
expensive gifts to my expensive girlfriend; the same number of trips worldwide; donate to the same charities; and be able to pay for college for all my grandchildren many times over.

So, negative and positive expected value of a lottery are the same for me. A 60% payment by the lottery for the winners is the same as if the lottery returns more than 100% (which is unlikely). So, buying a $2 lottery ticket for me personally is irrational from the classic economics point of view but also reasonable from my personal behavioral economics point of view. Most likely it is also reasonable for some or most of you as it is for me.

It is hard to believe that buyers of lottery tickets are doing such an analysis to justify their lottery bets except for James Harvey, who cornered the Massachusetts lottery. It is more plausible that the lottery buying decision has evolved somehow spontaneously. As scientists say when they seek funding, such a possibility requires more research.