Insurance and Gambling

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Gambling works as follows. You pay some money to the "house". Then a random event is observed; it may be the roll of some dice, the draw of some cards, or the drop of some balls. Or it may not be a completely random event: it could be a horse race or a ball game; the important thing is that neither you nor the house controls or influences the outcome. Before the event, you and the house have agreed that if the event turns out one way, the house keeps the money you paid, and if the event turns out the other way, the house pays you according to an agreed formula.

Now suppose the "house" is an insurance company. The money you pay is called a "premium". The event which neither you nor the insurance company controls is the passage of a year, and the two possible outcomes are that a fire will damage your home during that year, or there's no fire. If there's no fire, the insurance company keeps your premium. If there is a fire, the insurance company pays you the amount of the damage. This fits the gambling scenario exactly. Buying insurance is a form of gambling.

Insurance companies have worked long and hard and very successfully to convince us of the opposite. They say that if you *don't* have insurance, you're gambling. They talk about protecting us against fire. But fire is beyond their control; they cannot protect against fire. Perhaps they talk about protecting us from loss due to fire. But they can't stop the fire from burning your photos, nor can they limit the damage caused by the fire in any way. The only thing they can do is pay you money when a fire occurs. You have made a bet with them; you bet that fire will occur and they bet that it will not. If it does not occur, you lose the bet, and the premium is your loss; if it does occur, you win the bet, and they pay you. Perhaps the amount they pay you is the amount you lost in the fire; that way it feels like they are paying you back. But the amount they pay you doesn't have to be the same as the amount you lost in the fire (and if you read the fine print, you see that it often isn't); you get whatever you and the insurance company have agreed to. Of course, an insurance company would never call it "making a bet". They would say that they want to insure you against loss, but as you will see, they do a good job of ensuring that you lose.

A mutual funds advisor is required by law to assess your openness or aversion to risk before selling you a mutual funds portfolio. So the advisor asks you whether you gamble; if you do, that is taken as evidence for openness to risk, and if you don't, as evidence for aversion. The advisor also asks if you have lots of insurance; if you do, that is taken as evidence for aversion to risk, and if you don't, as evidence for openness. In my experience, mutual funds advisors cannot see their inconsistency. We even have legislation requiring us to buy insurance in various circumstances, "just to be safe".

So far, I have not yet said whether gambling is a good or bad idea, nor whether buying insurance is a good or bad idea; I have just said that buying insurance is a form of gambling. There are two very different ways to decide whether to gamble or not, and whether to buy insurance or not; one is arithmetic, and the other is psychology. I'll discuss the arithmetic first, and the psychology after. Sometimes the two methods give different answers.

Arithmetic

To decide whether to gamble using arithmetic, compare the amount you might win times the probability of winning against the amount you might lose times the probability of losing. (A probability is a number in the range from 0 to 1, and the two probabilities (winning and losing) add up to 1.) If the amount you might win times the probability of winning exceeds the amount you might lose times the probability of losing, then (assuming that winning is the goal) you should go ahead and gamble. And if the amount you might win times the probability of winning is less than the amount you might lose times the probability of losing, then you should not gamble. If the two are equal, then arithmetic does not tell you whether to gamble or not.

If you have a choice of how much to bet, the amount you choose may depend both on the probability of winning, and the amount you have available for betting. As the probability of winning varies from 50% to 100%, the fraction of your available funds that you are willing to bet should vary from 0% to 100%. If the amount of the bet is fixed and not a choice, then bet only if this fixed amount is less than or equal to the amount you would choose if you had a choice.

In a very simple game, we can assign probabilities easily enough. Suppose the game is rolling a die, and you win if it lands showing 6. If all you know about the die is that it has 6 sides, then the probability of winning is 1/6, and the probability of losing is 5/6. If you stand to gain \$3 or lose \$1, then you should not agree to play, because $3 \times 1/6$ is less than $1 \times 5/6$. But if you stand to gain \$9 or lose \$1, then you should play, because $9 \times 1/6$ is more than $1 \times 5/6$. If your opponent makes the same calculation using the same probabilities, one of you will refuse to play unless the two products are equal.

Probability depends on what you know. If you know that the die is weighted asymmetrically, being light on the 6 side and heavy on the side opposite 6, you will assign more than 1/6 probability to side 6, and less to the others. Let's say side 6 gets probability 1/2, and the other sides together get probability 1/2. If your opponent doesn't know this, but knows instead that the edges of the 6 face are a bit rounded and the other edges are sharp, your opponent will assign less than 1/6 probability to side 6, and more to the others. Let's say side 6 gets probability 1/10, and the others together get probability 9/10. If you stand to gain \$2 or lose \$1, you compare $2 \times 1/2$ to $1 \times 1/2$ and decide to play. Your opponent compares $1 \times 9/10$ to $2 \times 1/10$ and also decides to play. Both you and your opponent are making a sensible decision to play, given what you each know. There is an ethical question about whether to tell your opponent what you know, and likewise whether your opponent should tell you what they know. If you have the same knowledge, you make the same calculation, and you agree to play only when the two products are equal. That way the game is fair, and depends only on the luck of the roll. Or maybe the game is intended to be partly a game of knowledge, and you are each entitled to keep your secrets.

Should you buy a lottery ticket? You know what the ticket costs and you know what you might win and you can calculate the probabilities by knowing the criterion for winning. But there's an easier way. The lottery company has already done all the calculations, and they have chosen the ticket price to make sure that it's a good deal for them. Just the fact that they make a profit tells you that it's not a good deal for you — unless you know something they don't. So lottery companies choose winners by a method, such as balls dropping from a drum, that makes it impossible for you to know any more than they do about what the outcome will be. So that settles it: buying a lottery ticket is never a good idea, arithmetically speaking, if winning is the only goal.

Should you gamble at a casino? Some of the games at a casino, for example the slot machines, are like a lottery in the sense that they are just luck; you cannot predict the outcome any better than the casino does. Since the casino makes money on those games, those games must always be avoided. Some of the games, for example card games, are partly luck and partly

skill. The casino has set the price so that it's a good deal for the casino when playing against a customer of average skill. But the casino doesn't know what your particular skill level is. If you know that you are good enough to win, then play. If you are only average, or only a little above average, the fact that the casino makes a profit tells you that you should not play, arithmetically speaking, if winning is the only goal.

Should you buy insurance? The question applies to all kinds of insurance, including theft insurance, fire insurance, so-called "life" insurance (which really is death insurance), and so on. Calculating the probabilities is difficult, but the insurance company has already done all the calculations, and they have chosen the premium price to make sure that it's a good deal for them. Just the fact that they make a profit tells you that it's not a good deal for you — unless you know something they don't. If you know that your house has faulty wiring and they don't know that, then fire insurance is worth getting. If you know that you live in a high theft area and they don't know that, then get theft insurance. If you know that you have a bad heart and they don't know that, then get life insurance (unless there's a clause that says they pay nothing if they can prove that you knew). If they know what you know, they will set the premium so that insurance is not a good deal for you, arithmetically speaking. If you live an average length of life, the life insurance premiums you pay, plus interest, add up to more than your estate gets when you die.

In the case of disaster (earthquake, flood, tornado) insurance, there is a further unfairness that makes it even worse: sometimes the government steps in and helps those who have no insurance. I am not suggesting that government assistance to those in need is wrong. I am saying that government assistance is unfair to those who bought disaster insurance, making it even more a waste of money.

A very common reaction to all of this is the question "What if the bad thing happens?". What if there's a fire? What if you are robbed? What if you die unexpectedly young? Obviously, if the bad thing happens, it's better to have insurance. The effect of the question is to say: forget about the fact that the bad thing has a low probability. Or the reaction may take this form: If you have insurance and the bad thing doesn't happen, the premium is only a small loss; but if you don't have insurance and the bad thing does happen, you'll really wish you had the insurance. Once again, the effect is to push aside the probabilities, and simply compare the loss (the premium) with the gain (the payout). That comparison corresponds to assigning equal probabilities, half and half, to the two possibilities, treating not-happening and happening as equally likely. With those probabilities, you should definitely buy the insurance. The same reaction for lotteries goes like this: think of a number; now if you buy a lottery ticket and play that number and lose, it's a small loss; but if you don't buy a lottery ticket and that number wins, you'll really wish you had bought a ticket. If that argument convinces you, it should equally well convince you to buy a ticket for every number, and in every lottery. But it's not reasonable to treat things with very different probabilities as if they were equally likely. It's like avoiding the direct route to work each day because a meteor might fall there. If it doesn't fall there, well, the other route takes only a little longer. But if it does fall there, you'll really wish you had taken the other route. It's exactly the same reasoning. Apparently there are many people whose mathematical knowledge includes comparison but does not include probability.

As I sit here writing this essay, the Italian lottery has not been won for 7 months, and the jackpot is nearly €140,000,000. A ticket costs only €1. Italians are buying tickets like crazy. People are flying to Italy just to buy tickets. All of these people are making the comparison (jackpot to ticket price) and ignoring the probability. The probability of picking the right six-number combination is well publicized; it is about $1 / 622{,}000{,}000$. But they don't know what to do with the probability, so they just compare winning with losing. That would be the right calculation if winning and losing each had probability a half, but that's insanely wrong. The correct comparison is $(140{,}000{,}000 - 1) \times 1/622{,}000{,}000$ (which is about 0.225) against $1 \times 621{,}999{,}999/622{,}000{,}000$ (which is about 1). It may seem that if the jackpot grows to

about €622,000,000 it will become a good deal; the ticket price doesn't change, and the probability of picking the right combination of numbers doesn't change. But there's one more ingredient: the jackpot is divided among all those who chose the right combination of numbers. Right now, about 25,000,000 tickets are bought for each drawing, and that number goes up as the jackpot goes up. The Italian lottery, just like every other lottery, is never going to be a good deal.

The experts are predicting that in the coming winter there will be a swine flu epidemic. I have just bought a one-week winter vacation, and I am wondering whether to buy cancellation insurance in case of illness. It occurs to me that the insurance companies have not put up their rates in anticipation of the epidemic. I guess they have decided that they will raise their rates when they find they are not making as much profit as they would like; the insurance company is just as happy if their payouts to those who bought insurance during the epidemic are paid for by those who buy insurance after the epidemic. I don't have knowledge that they don't have; rather, I am using knowledge that they are not using; so maybe the insurance is worthwhile. To find out, I need to know three numbers: the price of the trip, the price of the insurance, and the probability that I will be ill at vacation time. I know the first number; I have already paid for the trip. The second number is available from my travel agent. The last number is harder to get, but public health officials have gathered data and done calculations and come up with a probability, as it is their job to do so. I phoned my travel agent to find out how much the insurance costs, and while I was calculating whether the insurance is worthwhile, I learned something amazing: the agent already knew the answer. She told me that she personally knows of someone who fell and broke their arm just before a trip, so she says the insurance is definitely worthwhile. No numbers needed; for her, all arithmetic is apparently irrelevant.

Arithmetically, gambling against a for-profit company or group is almost always a bad deal. The form of gambling known as for-profit insurance is always a bad deal unless you have knowledge that the insurance company doesn't have or isn't using. When gambling or insurance is not-for-profit, the conclusion is different. Some gambling raises money for charity. You might well decide that you want to support the charity, in which case winning is not your only goal. In effect, part of the price of the ticket is a charitable donation, and the rest is fair gambling. Gambling among friends is typically not-for-profit (there's no “house”), and therefore fair, and arithmetic does not tell you whether to gamble or not. Government-run health insurance is not-for-profit; it is arithmetically fair and morally right.

Even when the gambling and insurance are for-profit, arithmetic is not the only thing to consider. There are psychological considerations too.

Psychology

When you buy a lottery ticket, what you are buying is a dream. Some people enjoy dreaming about being rich, thinking what they would do with all their money. One could dream about being rich without buying a lottery ticket, but many people find it easier to dream if they are holding a ticket in their hand. Maybe a dream-aid is worth the price of a lottery ticket. Some people have a lot of fun gambling in casinos, and perhaps for them the fun is worth the monetary loss. For other people, gambling is an addiction without fun; those people lose twice: their money and their time. The psychological value of gambling varies from person to person, so no single answer fits all.

We buy insurance against bad events, like fire and theft and death. Arithmetically, it makes just as much sense to tie the insurance payout to a good event as to a bad event. You could buy insurance against having a fire-free year. An insurance company has all the numbers and expertise to know what premium it should charge so that it makes a profit on this kind of insurance. Perhaps a fire-free year is a poor example because it is more probable than a year with a fire, making the premium more than the payout. So let's say you buy insurance against

winning a Nobel prize; the premium for that would be quite small. Then, if you win the Nobel Prize, you also get a lot of insurance money. Joy on top of joy! But psychologically, people prefer to balance a loss (due to fire, or theft, or the death of a family member) with a gain (due to winning a bet with an insurance company). Insurance companies also prefer to tie the payout to a loss so they can say they are helping you in your time of need, rather than admit that they are paying you a gambling debt.

There is another reason why it makes sense to many people to insure against loss due to fire or theft. With insurance, you know exactly how much money you will lose every year: you will lose the amount of the insurance premium. If there's no fire or theft, the only loss is the premium. If there is a fire or theft, that loss is matched by an insurance gain, leaving the premium as the net loss. For many people, the certainty of knowing the loss in advance is "peace of mind", worth the loss, even though it's an arithmetically bad deal. For many people, many small losses (the premiums) are not as traumatic as one big loss, even if the small losses add up to more than the big loss.

A psychological advantage of life insurance is as a discipline of saving. Arithmetically, you would do better to use the amount of your premium to buy government bonds, rather than to give it to an insurance company. But people lack the self-discipline to buy bonds annually. Life insurance motivates you to save by a simple fact: if you stop paying the premiums, you lose all that you have already paid. Perhaps that motivation is worth the lower return.

One difference between death and fire is that the probability of your death increases each year, but the probability of a fire in your home stays pretty much the same each year. Your decision whether to buy fire insurance can be made each year, independent of your decision other years. But your decision to buy life insurance cannot. The premium you pay depends on your age when you start paying for life insurance, going up as your starting age increases. But once you start, your premium remains the same each year. That means that your payments are front-loaded; you pay way too much in the early years so that you won't have to pay a higher premium in later years. The idea is that once you start, you are hooked; you have already paid ahead, and it would be foolish to stop.

Suppose you have bought all the life insurance that you want. How can an insurance company sell you more? Simple: call it something else. A good example is "mortgage insurance", which pays off your mortgage when you die. Since the payout is triggered by your death, it is life insurance. The difference is that ordinary life insurance can be used for any purpose, including paying off your mortgage, whereas mortgage insurance can be used only for paying off your mortgage. Similarly, credit card insurance is just special purpose life insurance. There is no advantage to you in buying life insurance with a restriction on how it can be used. The advantage to the insurance company is to sell you something you don't want by dishonestly telling you that it's something else.

I'm not fond of insurance companies. And I haven't even talked about the fine print and the dirty tricks they use to get out of paying what they owe. In fairness though, I should also talk about the dirty tricks their customers play to get insurance companies to pay what they don't owe.

In the end, you have to decide for yourself, based both on arithmetic and on your personal psychology, whether to gamble, and in particular, whether to buy insurance. My main point is that buying insurance is a form of gambling. That's not an opinion; it's gambling because it fits the definition of gambling.

other essays

Addendum 2016-8-26

I want to clarify some confusing terminology. To a probabilist, an "event" is something like the roll of the dice, and an "outcome" is something like 7 showing up. For fire insurance, the event (according to a probabilist) is the passage of a year, and the two possible outcomes are that your house burns during that year or it doesn't burn during that year. I began this essay using that terminology, but switched in the section titled "Psychology" to the common use of words, in which your house burning down is an "event", and an event either does or does not happen. In this use of words, rolling the dice is not an event, but rolling a 7 is an event. In this Addendum I'll stick with the common usage.

I wrote this essay and put it on my website in 2009. In the years since then several other essays and blogs on the same subject have appeared. One by http://gellmannamnesia.blogspot.ca/2013/08/insurance-its-just-gambling-essentially.html in 2013 makes all the same points I make, and adds some really good examples. In 2016, the Patriot Medical Insurance Company's newsletter http://www.news.com.au/finance/money/wealth/insurance-why-jason-murphy-says-its-more-like-gambling/news-story/5240f81b40c75e885d22988924918ac4 also says that insurance is gambling.

Wikipedia https://en.wikipedia.org/wiki/Gambling says the following:

> Because contracts of insurance have many features in common with wagers, insurance contracts are often distinguished under law as agreements in which either party has an interest in the "bet-upon" outcome *beyond* the specific financial terms. *E.g.*: a "bet" with an insurer on whether one's house will burn down is not gambling, but rather *insurance* — as the homeowner has an obvious interest in the continued existence of his/her home *independent of* the purely financial aspects of the "bet" (*i.e.*, the insurance policy). Nonetheless, both insurance and gambling contracts are typically considered aleatory contracts under most legal systems, though they are subject to different types of regulation.

So, according to this Wikipedia article, if I own a racehorse, and I bet with someone that my racehorse will lose the race, that's not gambling, it's insurance. If my son is running in the Olympic 100m race and I bet against him, that's not gambling, it's insurance. If I buy fire insurance on a building I don't care about, that's not insurance, it's gambling. I don't think this legal distinction (Do you care about the outcome independent of the bet?) would stand up in court if challenged.

The webpage http://www.insuranceinthelight.com/?p=10 says gambling and insurance differ because gambling introduces risk where none exists, and insurance mitigates risk where risk exists. The examples offered are rolling dice and dying. There's no risk in rolling dice until you decide to bet on the outcome, so that's gambling. The risk of dying is there whether or not you buy life insurance, so that's insurance. The Quora blog https://www.quora.com/Is-Insurance-a-form-of-Gambling makes exactly the same point. The Institute of Islamic Banking and Insurance has a strong interest in saying that insurance and gambling are different, since gambling is prohibited by Islam, so in http://www.islamic-banking.com/gambling_and_insurance.aspx they make the same distinction. The webpage https://www.megainsights.com/why-insurance-is-not-gambling/ in 2011 begins by arguing really well why gambling and insurance are the same, including this interesting snippet:

> The first life insurance law which was enacted in Great Britain in 1774 was aptly titled Gambling Act 1774. It illegalized gambling with people's life.

But it ends by concluding that gambling and insurance differ for the same reason as the others:

> A gambler pays to take an unnecessary risk. He creates a risk for himself and he knows full well that he would either win (and make profit) or lose (and bear the risk of losing his money). On the other hand, someone who buys insurance is actually paying the insurance company to avoid the consequences of risks that are necessary.

All these papers confuse the intrinsic risk that an event will happen or not happen with the risk one takes when one gambles or buys insurance on whether that event will happen. The lottery balls will fall, and your favorite number may turn up, whether or not you buy a lottery ticket. My house will burn or not burn this year whether or not I have fire insurance. Rolling dice fits their point better than a lottery because if you don't bet, there's no point in rolling the dice; but you could roll the dice anyway and just watch whether your number turns up without betting. The bet does not create the risk that the event will occur.

One reason for the confusion is that an insurance payout often matches the loss due to the event. But that's a decision. House insurance may have a deductible or other exclusions so that the payout is not equal to the loss. Does life insurance match the loss of a life? How much is a life worth? You just decide how much insurance you want, and the insurance company calculates a premium. Both gambling and insurance decide upon an event, and on your loss or gain depending on whether the event occurs. Whether the event is created for the purpose or would happen anyway is irrelevant.

There are other webpages saying that insurance and gambling differ, quoting the insurance advertising line: if you don't buy insurance you are gambling that the bad thing won't happen. But by the definitions of both gambling and insurance, if you buy insurance, you are betting that the bad thing will happen, and that's gambling, even though you are hoping that the bad thing won't happen.