

A Scientific Coin Flip Experiment

How a coin flip can come silver spoon up

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Abstract

When flipping a fair well-balanced coin it is normally assumed a 50% probability of it coming heads up and 50% probability of it coming tails up. Well there is also the very small probability that the coin lands on its edge. What about even more unlikely tail-events? Have you heard of quantum physics and quantum probability? And have you heard of Schrödinger's cat?

In the quantum world the strangest and most unexpected things can happen. Can such things also happen in the macroscopic world of everyday objects? If so, do we need to adjust our thinking around probability calculus? The probability for some very strange phenomena are very low indeed, but they can happen. Two professors recently met for lunch, one with background in quantum physics and quantum probabilities and another one from economics.

Quantum Professor: What is the probability of getting heads up on a coin flip bet?

Economics Professor: 50% on a fair coin, at least if we exclude the very small probability of ending on the edge.

Quantum Professor: What about silver spoon?

Economics Professor: What on earth are you talking about?

Quantum Professor: I am asking you what is the probability that a fair coin flipped will turn into a silver spoon? Have you heard of quantum probabilities? And what about the Schrödinger's cat? And energy is related to matter, matter can change form, sometimes almost spontaneously. The reason you not have observed it is just that the probability is very low.

Economics Professor: You must have been studying way too much quantum physics. I am willing to bet my annual salary against that if we are flipping a fair coin that it not can turn into a silver spoon.

Quantum Professor: Well, why don't we do a coin flip bet. I pay you \$20 if the coin shows up head or tail and you pay me your annual salary if the coin turns into a silver spoon? The probability for it to turn into a silver spoon is naturally extremely small and therefore I win much more if this extremely small tail probability shows up, but based on quantum physics it can happen.

Economics Professor: Done!

Quantum Professor: I look at this as a scientific experiment so we need to be very precise in defining the coin flip bet. As you know quantum probabilities are on the finest scale and need very precise measurements.

Economics Professor: Okay you write down the details.

Quantum Professor: I have written down the detail of our scientific coin flip bet. There are 11 points that we must follow. Let me read them for you before you sign on this scientific coin flip bet:

1. The coin that is flipped is an uncirculated 2009 US Mint Silver Eagle 1 oz .999 Walking Liberty.
2. That weight of the coin is one troy ounce, that is 31.10 grams.
3. The weight of coin will be measured on an atomic scale 5 minutes before the coin flip toss. The time will be measured with an atomic clock. If the weight of the coin diverge more than 1% from 31.10 grams the bet will not be valid.
4. The person flipping the coin must carefully wash his hand with soap and let his hands dry before tossing the coin.
5. The clock used to measure the time frame must be a high precision atomic clock.
6. The flipping of the coin will take place in Silver Street number 3, at the first floor.
7. The start of the tossing of the coin will be exactly 12 am at the address above.
8. The coin will be tossed by Economic Professor in his hands for 10 minutes.
9. As close as possible to 12:10 am as measured by the atomic clock you the Economy Professor will drop the coin to the top of the table placed in the room at the first floor of silver street 3. The table is a normal fair table with a flat surface.
10. After the coin falls on the table neither of us are allowed to touch it before the final scientific reading have taken place.
11. The exact time of the reading of the coin will be...

Economics Professor: (interrupting): I have heard enough lets just do it. Where should I sign the bet.

Quantum Professor: Sign here at the bottom of the coin flip bet contract.

The two professors went to Silver Street number 3. The economic professor tossed the one ounce silver dollar coin in his hands for 10 minutes. Then 12:10 am he let it drop to the top of the table in the room.

Economics Professor: See it is tails up, ha ha ha ... your quantum probabilities failed, give me \$20, and stop reading so much quantum nonsense.

Quantum Professor: Please check the scientific coin flip bet you signed, in particular point 11.

Point 11: The exact time of the reading of the tossed coin will be exactly 1 week after we tossed the coin as measured by the atomic clock.

Economic Professor: Waiting one week? What is this for nonsense?

Quantum Professor: Well we had to have an exact time frame of when to measure the outcome of our experiment, if not it would not be scientific. I put it to exactly 1 week. One week is just as good as 3 seconds or 5 minutes. And remember according to point 10, non of us are allowed to touch the coin. So there is no need to worry.

Economic Professor: Fair enough, lets get back in one week.

One week later, the two professors are returning to Silver Street 3. A beautiful woman opens the door. The two professors walks in.

Economics Professor: Where is the coin? We left a silver coin on this table one week ago.

Woman: So it was you that left the one ounce silver coin one week ago. A Quantum Professor called me last week and told me he would leave a one ounce silver coin on the table so I could make a silver spoon out of it. I was not here so I left my door open. Here is the silver spoon. As on your request I have engraved it with "Probabilities are always conditional on the time frame".

Well there was no need for quantum probabilities or Schrödinger's cat to explain how a coin flip can turn into a silver spoon. My point is simply that all probabilities are conditional on time, second it is important to take into account the probability of asymmetric information. See also Haug (2005).

References

HAUG, E. G. (2005): "Hidden Conditions and Coin Flip Blow Ups," *Wimott Magazine Mar/Apr*.