

Answer on Question #48587 – Math – Other

You are a property insurer and your client, Patricia, whose current wealth is 1.4million dollars wants to insure her \$730000 house. The chances of the house burning down is 1.5 in a thousand, renata's utility function is $u(w) = \sqrt{w}$. Will she buy insurance policy if you offer it to her for \$1164?

Solution:

According to the condition of the task we know that an agent has the following utility function:

$$u(w) = \sqrt{w}$$

We consider a case where the client of agent, Patricia owns a house that is worth \$730 000. There is a possibility that the house may burn down in which case, the client loses everything and is left with \$0. The probability of the event of a fire is 0.0015.

Then we will consider two scenarios: one in which the agent does not insure client house against the fire and the other in which the client, Patricia buys insurance policy for a premium of \$1164.

Thus we can note the case with no insurance; the client will faces the following lottery:

Event	Payoffs	Probability
No Fire	\$730 000	0.9985
Fire	\$0	0.0015

The represented table is just summarizing the information provided to us in the problem. The clients expected payoff from this lottery is:

$$0.9985 \cdot \$730\,000 + 0.0015 \cdot 0 = 728905$$

The clients expected utility from this lottery is:

$$0.9985 \cdot u(730\,000) + 0.0015 \cdot u(0) = 0.9985\sqrt{730000} + 0.0015\sqrt{0} = 853.119$$

When we consider case with insurance, the clients gets compensated for the full amount of her losses so that if there is a fire the insurance company pays her \$730 000. As specified in the problem, the client pays a premium of \$1164 for this insurance.

Event	Payoffs	Probability
No Fire	$\$730\,000 - \$1164 = \$728\,836$	0.9985
Fire	$\$730\,000 - \$1164 = \$728\,836$	0.0015

The clients expected payoff from this lottery is:
 $0.9985 \cdot \$728\,836 + 0.0015 \cdot \$728\,836 = \$728\,836$

The clients expected utility from this lottery is:
 $0.9985 \cdot u(728\,836) + 0.0015 \cdot u(728\,836) = 0.9985\sqrt{728\,836} + 0.0015\sqrt{728\,836}$

We can simplify our equation.

$$0.9985\sqrt{728\,836} + 0.0015\sqrt{728\,836} = 853.719$$

In order to see which lottery the client will prefer (the first one which is with no insurance verse the second one which is with insurance) we need to compare the client's expected utilities for the two cases:

Expected utility with no insurance = 853.119

Expected utility with insurance = 853.719

Since the expected utility that the client gets if she buys insurance is larger, she will choose to get the insurance. In other words, the risk averse home owner prefers to buy insurance, since both lotteries give her the same expected payoff, but with the insurance she faces lower variance in her payoffs. The client willingness to pay for the insurance also depends on the premium she needs to pay. This problem is constructed so that the client is willing to pay the amount \$1164 to avoid risk.