

Lab: Expected Value

Rarely do you know exactly what will happen in the future. In some cases (called uncertainty), you can identify possible outcomes and assign probabilities to each one. For instance, you might have three forecasts: good, same, and bad with associated revenue:

Good (p=0.3)	Same (p=0.5)	Bad (p=0.2)
100,000	75,000	50,000

Basic probability and statistics theory provide tools to deal with uncertainty. One of the most important concepts is expected value (EV).

$$EV = \sum p_i V_i$$

In the example, the expected value is: $0.3 \cdot 100,000 + 0.5 \cdot 75,000 + 0.2 \cdot 50,000 = 77,500$. Notice that the EV is not equal to any of the three outcomes. It is not the value that can be obtained in a single outcome. Instead, it is the average of the outcomes that you can expect to reach if the situation is repeated many, many times.

Now consider what happens if you are given another choice: Someone offers to pay you \$77,000 immediately, or you can play the “game” with the three outcomes and their associated probabilities. What should you do?

In economics, a risk-neutral person is indifferent between outcomes that have the same expected value. The expected values in this example are close, but there is a slight advantage (\$500) to playing the game. But, are you a risk-neutral person? If you are even slightly risk-averse, you would choose the certain \$77,000 because there is only a small potential loss. On the other hand, if you are risk loving (or aggressive), you would choose the game because there is a potential win of \$100,000 (net gain of \$23,000) in any one play of the game.

Question

If there is time, watch at least part of an episode of a game show such as “Deal or No Deal.” Evaluate the game’s structure and the player’s choices.

For example, in “Deal or No Deal,” the player has two choices: (a) Accept an immediate offer to quit the game, or (b) continue to play, which means selecting one more box. Each box contains an unknown amount of money. The selected box and its money are removed from the game. If the game is played to the end, the player is awarded the amount of money in the last box. At various points in the game, a new offer is made to the player to continue or accept a newly-calculated amount of money. In this case, the player has the following amounts of money remaining in unknown boxes, and an offer of \$25,000.

5	50,000
100	200,000
2,000	

Do you continue to play the game or accept the offer? What does your answer reveal about risk aversion? In the actual show, most people accept an offer instead of playing to the end of the game, and almost all offers are substantially less than the expected value. Why might the decision to accept an offer make sense to so many people?