Risk premium

5 June, 2024 by David Pannell

A risk premium is the psychological cost of putting up with risk, expressed in monetary terms. Or, equivalently, it's the psychological benefit of avoiding risk, expressed in monetary terms.

In PD409 I talked about risk aversion and how it can be measured in units of "relative risk aversion". There is also another way to measure it called "absolute risk aversion". The problem with both of these measures is that nobody apart from a specialist knows what they mean.

An alternative more intuitive way of talking about risk is to express the psychological cost of risk in monetary terms.

To illustrate how this works, suppose I offer you the chance to participate in a risky game based on a single roll of two dice. I will pay you $1,000 for each dot that comes up. For example, if you roll a three and a five, I will pay you $8,000. Figure 1 shows the probability distribution of results for this risky prospect. The expected value (weighted average) of this distribution is $7,000, but the result could be a payout of anything from $2,000 to $12,000. If I asked you to make a payment to participate in this game, what payment level would leave you indifferent between participating and not participating?

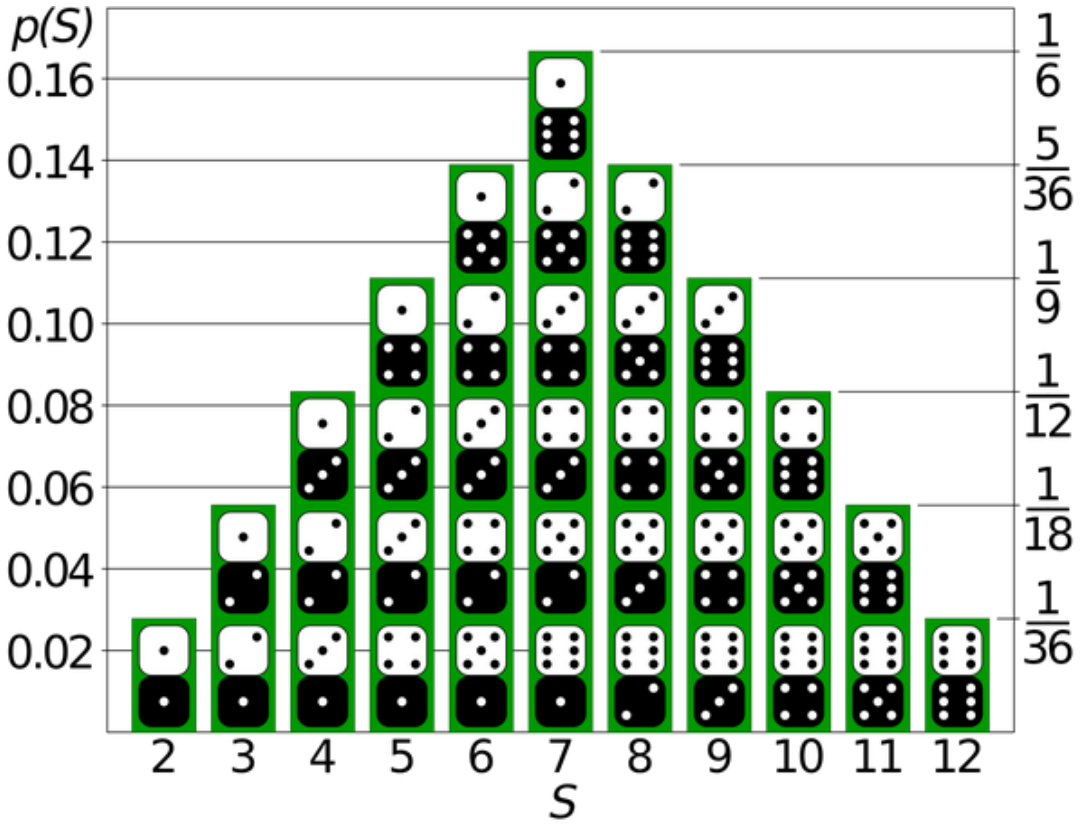

Figure 1

If you are risk-neutral, your answer would be $7,000. By definition, a risk-neutral person is unaffected by the riskiness of the game and only cares about the expected value of the payout.

If you are risk-averse, your answer would be less than $7,000. You would deduct something from the expected value of the payout to allow for the fact that you don't like the fact that it's risky – you won't get $7,000 for sure; you'll get some amount between $2,000 and $12,000 with the probabilities shown in Figure 1. Let's suppose your answer is $6,500.

The payment level that leaves you indifferent between participating and not participating ($6,500 in this example) is called the "certainty-equivalent value". It's called that because the risky prospect with an expected value of $7,000 is equivalent to getting $6,500 for certain (for a particular person, for this probability distribution).

The difference between the expected value ($7,000) and the certainty-equivalent value ($6,500) is the "risk premium": $500 in this case.

Of course, the certainty-equivalent value will be different for different people. The more risk-averse you are, the lower will be your certainty-equivalent value for a particular risky prospect, and therefore the higher will be your risk premium for that risky prospect.

It should also be obvious that the risk premium doesn't only depend on a person's risk aversion. It also depends on the riskiness of the risky prospect. The higher the riskiness (i.e., the larger the standard deviation of the probability distribution), the higher the risk premium for a risk-averse person.

We can apply this concept to the various examples we've seen in my recent posts about risk. In PD412, the risk premium is almost the same for each fertiliser rate in Figure 1. It increases only very slightly as the fertiliser rate is increased. Diversification of income sources (PD413) reduces the risk premium attached to a farmer's overall net income because the various risks faced by a diversified farm business partly cancel each other out.

In PD418, the buyer in a forward contract or futures contract offers less than their expected value for the price, and difference is their risk premium. From a farmer's perspective, their risk premium is relatively high in the absence of hedging, as profit is fully affected by the riskiness of price, but it is reduced as a result of hedging, which reduces price risk. However, as we saw, there are other costs and risks associated with hedging that could potentially outweigh the reduction in risk premium.

Further reading

This is #12 in my RiskWi$e series. Read about RiskWi$e here or here.

The RiskWi$e series:

405. Risk in Australian grain farming
406. Risk means probability distributions
408. Farmers' risk perceptions
409. Farmers' risk preferences
410. Strategic decisions, tactical decisions and risk
412. Risk aversion and fertiliser decisions
413. Diversification to reduce risk
414. Intuitive versus analytical thinking about risk
415. Learning about the riskiness of a new farming practice
416. Neglecting the risks of a project
418. Hedging to reduce crop price risk
419. Risk premium (this post)
420. Systematic decision making under risk
421. Risk versus uncertainty
422. Risky farm decision making as a social process
423. Risk aversion versus loss aversion, part 1
424. Risk aversion versus loss aversion, part 2