Stag hunt

Game theory is an important sub-field of decision theory. In the game theory we take decisions by evaluating our opponent’s next move. If they are smart enough, they can foresee what you are likely to do, and then adjust their strategies accordingly. An example, originally discussed by Jean-Jacques Rousseau, is the stag hunt: a game which describes a conflict between safety and social cooperation. Other names for it or its variants include "trust dilemma".

The stag hunt game: Two hunters can either cooperate to hunt a stag (which is big animal that cannot be caught by a single hunter) or individually hunt for hares. A hare is of course smaller and can easily be caught by a single hunter. If the hunters cooperate and hunt stag each of them will get 25kg of meat; this is the best payoff for the two hunters. The worst outcome for each hunter is to hunt stag when the other is hunting hare, because then he will get nothing. If the hunter decides to hunt hare he can expect to get a hare of 5kg. In the Table, the numbers in each box refer to the amount of meat caught by the first and second hunter, respectively.

<table>
<thead>
<tr>
<th>1. Hunter</th>
<th>2. Hunter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stag</td>
<td>25, 25</td>
</tr>
<tr>
<td>Hare</td>
<td>5, 0</td>
</tr>
</tbody>
</table>

A stag hunt is a game with two pure strategy Nash equilibria - one that is risk dominant another that is payoff dominant. The strategy pair (Stag, Stag) is payoff dominant since payoffs are higher for both players compared to the other pure Nash Equilibrium, (Hare, Hare). On the other hand, (Hare, Hare) risk dominates (Stag, Stag) strategy since if uncertainty exists about the other player's action, gathering will provide a higher expected payoff. The more uncertainty players have about the actions of the other player(s), the more likely they will choose the strategy corresponding to it.

In order to better and more deeply analyze the game, we have to imagine we are one of the two hunters: let’s imagine that we are Hunter 1. Whether it would be better to hunt a stag or a hare depends on what we believe the other hunter will do. However we have to bear in mind that this holds true also for the other hunter. Whether it would be better for him to hunt a stag or a hare depends on what he thinks we are going to do. If we and the other hunter were fully confident that the other would cooperate, then we both would benefit from hunting a stag. However, if only one hunter chooses to hunt a stag and the other does not cooperate, one of the two will end up with nothing. If we choose to hunt a hare, then we would not have to worry about this risk. The payoff of hunting hare does not depend on what the other hunter decides to hunt. It is the same for our opponent. If he suspects that we may not be willing to cooperate, it is safer to hunt a hare. Rational hunters, for this reason, have to make a balance between two conflicting aims, that
is the mutual benefit and the risk minimization. So, as specified above, the hunters are more prone to hunt stags because they consider the mutual benefit, and towards hare hunting by considerations of risk minimization.

If the players are both rational, what should we expect from them? Many phenomena in society have a similar structure to this stag hunting game. In most cases, we are all better off if we cooperate and help each other, but this cooperation can only occur if we trust our fellow citizens.

So in depends on the level of trust we have in the fellow. The thing that makes stag hunt very peculiar is that it shouldn’t be a dilemma at all. You should certainly cooperate. If both do so, both will get the best possible payoff. What makes things less clear is the possibility that the friend won’t be so rational. If the friend cheats on you, you want to cheat on him/her either.

Unfortunately, in our modern society, sometimes people have little or no reason to trust the others. In these cases, it is likely that we will end up with outcomes that are bad for everyone.

References:

Peterson M., An Introduction to Decision Theory, 2009


http://www.heretical.com/pound/staghunt.html