

## How to solve prisoners' dilemma?

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### Abstract

Prisoners' dilemma is a key problem in oligopoly. When the two sides are facing the prisoners' dilemma, they will both pick the worse situation due to Nash equilibrium. Thus, how to solve prisoners' dilemma is important in business as well as many aspects during our choices in daily life. Here, I will propose several methods to solve prisoners' dilemma. 1. Final strong award 2. Final strong punishment 3. Strong coherence 4. Friendly 5. Repeated games. By using these strategies, we will be able to solve the prisoners' dilemma.

### Main text

If the two sides are falling in prisoners' dilemma, they will pick the worse situation due to Nash equilibrium. If there is one group versus a man, the group or the man won't pick the best situation: Both of them won't speak out anything or don't take any action. However, when considering game theory, they will both pick the situation which is most harmful for both of them. Thus, both of them will be severely punished like going to jail or losing life. Thus, it is very important to solve the prisoners' dilemma. I propose several methods to solve this dilemma.

1. Final strong award: If the two sides want to avoid the punishment: going to jail or severe defamation which is the solution of Nash equilibrium. If both can get the final strong award such as a great deal of money or Nobel price etc, then both will pick don't speak out truth or don't take any action. Thus, this strategy can help to the two sides to avoid the worst situation. This solution is called final strong award.

2. Final strong punishment: There is another possibility for the two sides to avoid the Nash equilibrium: Final strong punishment. If there is more severe punishment than defamation or going to jail, then the both side will pick don't speak out truth or don't take any action. For example, both of them will lose lives if they pick Nash equilibrium. If the Nash equilibrium itself is losing lives, then stronger punishment is

still needed to help to two sides to avoid Nash equilibrium. Stronger punishment like a curse or spell should be applied. A curse saying that not only the persons but also his/her family member's lives will lose might be able to provide the stronger punishment. Combining the above award, I will call this "Nobel-IgNobel spell." To combine both strong award and punishment just only to break the prisoners' dilemma. A curse needs a more supra-natural power. However, it may not be illogical. Because some spells really works such as Indian spell: Tecumseh curse or Kennedy family curse or superman curse.

3&4. Friendship or strong coherence: The both sides need to cooperate via friendship and strong coherence. Then, the both side won't betray each other and pick against Nash equilibrium. Then, this will also solve prisoners' dilemma.

5. Repeated game. If this game is played repeatedly, the both side will figure out the best strategy and pick against Nash equilibrium to avoid prisoners' dilemma. Thus, repeated games will also help. A wrong solution is an eye for an eye strategy. This strategy will let the situation worse, and both of the two sides will fall in prisoners' dilemma again.

## Conclusion

The five strategies will be good solutions to solve prisoners' dilemma. Thus, instead of Nash equilibrium, good results for both sides will be chosen to avoid the worse situation of prisoners' dilemma.