# Games with incomplete information

## Author: John C. Harsanyi

Source: The American Economic Review , Jun., 1995, Vol. 85, No. 3 (Jun., 1995), pp. 291-303 [https://www.jstor.org/stable/2118175](https://www.jstor.org/stable/2118175?Search=yes&resultItemClick=true&searchText=apply+incomplete+information+game+theory&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Dapply%2Bincomplete%2Binformation%2Bgame%2Btheory%2B&ab_segments=0%2Fbasic_search_gsv2%2Fcontrol&refreqid=fastly-default%3Ad3235b1f72dfdf9697024383c091c351&seq=1#metadata_info_tab_contents)

We follow the approach of Harsanyi (1995) in applying a game theoretic model of incomplete information, where players have less than full information about each other’s payoff functions. Based on the Bayesian methodology, the two players have expectations in the form of subjective probability distributions. We use a lottery to assign types to players, before any moves are made in the game (this justifies how we are choosing types – we can also change the probability distributions). The two players then try to estimate the probability of each others’ types, subject to the information that is commonly available. In order to solve the model, the game of incomplete information will be reinterpreted as a game with complete and imperfect information, by transforming the basic mathematical structure. (This is just substantiating why we are drawing the game the way we are).

# Too cool for school? Signalling and countersignalling

## Authors: Nick Feltovich, Richmond Harbaugh and Ted To

Source: RAND Journal of Economics Vol. 33, No. 4, Winter 2002 pp. 630–649

It could be interesting to structure the payoffs in such a way that an organized student doesn’t need to signal she is organized, because she is organized. Feltovich, Harbaugh and To show that it can be beneficial to not send a signal of a “good” type (to differentiate them from the “bad” type). It can be beneficial to save the cost of signaling if there is a high chance the high types will be separated in any case. In our case, say the lecturer has access to test scores and assumes a student with a high test score is more organized.

# Refinement Criteria

* Rationalization in Signaling Games: Theory and Applications - Pierpaolo Battigalli
* Equilibrium Selection in Signaling Games - Jeffrey S. Banks and Joel Sobel

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A student receives an assignment, which is due by a certain date set by the lecturer. While the student

is working on the assignment, she undergoes a crisis and therefore spends less time on the assignment.

She has two options: she can hand in the assignment on time or she can hand in late. If she hands in

on time, she will get a payoff of a − c, where a is the potential mark she would have received, and c

is the negative impact the crisis has on her mark. However, if she submits her project late, she has

some time to recover after the crisis and reduce its academic impact. Her payoff is a − βc − m if the

lecturer gives her a penalty, where m is the size of the penalty. She gets a payoff of a − βc if there

is no penalty. β represents the type of the student, where a high β suggests a low resiliency to crises

and a low β suggests a high resiliency and a better academic recovery. The student observes her own

type but does not know the lecturer’s type.

On the other hand, the lecturer is faced with the decision either to give a penalty (m) if a student

submits late or not to give a penalty. If the lecturer gives a penalty, he feels bad since the student

has gone through a crisis. The size of his disutility depends on the size of the penalty (m) and how

empathetic the lecturer is, where the level of empathy describes the lecturer’s type (δ). The more

empathetic the lecturer is, the higher δ is. The lecturer observes his own type but not that of the

student. The lecturer’s and student’s types are both continuous types, which are independently and

randomly chosen by nature at the start of the game from a uniform distribution 1 : δ ∼ Uniform(0,1)

and β ∼ Uniform(0,1). If the lecturer decides not to impose a penalty, he feels good that he did

not impose on a student experiencing a crisis, and gets a positive payoff of δc. However, the lecturer

knows that by waving the penalty, he may be encouraging this student, and other students to hand in

late in the future. The lecturer would rather deter late hand-ins, and receives a negative payoff −d for

not deterring late hand-ins. This deterrent parameter relates to the literature on games of repeated

interaction and reputations.

The parameters a, c, m&d are all common knowledge. This is a game of incomplete information

because the players’ types are not common knowledge. The type spaces are continuous and the action

spaces are discrete. Each player needs to choose his/her action based on his/her own type, what

each believes the other player’s type is, and the values of a, c, m&d. Figure 3.1 shows the game in

extensive form 2 . And a summary of the game’s parameters and restrictions are given in figure 3.1