

TRUST AND IMPLICIT INFORMATION ASYMMETRY IN REPEATED GAMES

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Abstract:

This article aims at presenting the way how a suitably long time perspective together with the learning process contributes to generating trust in mutual relation between various entities and how it is possibly to abuse this trust through the application and recognition of characteristics leading to the emergence of trust based on the learning process and implicit information asymmetry. Thanks to the analysis conducted it was possible to notice how much the model changes when we introduce an information asymmetry into it, particularly when the asymmetry in question involves the extent of time perspective. To achieve this, we applied measures used in the game theory that allowed us to construct a distinct, characteristic for a particular case game model based on results obtained in experimental studies.

Keywords: repeated games, implicit information asymmetry, trust

1. INTRODUCTION

The organisation and management theory commonly uses three paradigmatic organisation metaphors that affect the development of model concepts or theories of organisation as well as on concepts of organisation management. This includes: analogy presenting an organisation as a machine, biological organism (human being) and game. The consequence of the machine analogy is the mechanistic model of organisation that is a machine used to implementation of objectives, which consists of reliably interacting elements. In the case of analogy to a biological organism the organisation is described as an open social and technical system built of subsystems capable of self-regulation. Subsystems of such organisation remain in multilateral relations with each other as well as with the environment providing therefore sustainable organisational balance. However, the game analogy emphasises a role of an individual participant and coalitions that may be concluded with other members of an organisation. One of the basic categories in this approach (model) is a conflict and rules of game. Divergence of objectives and different interests are treated as a natural property of organisation (all types of complex systems).

The purpose of this article is presentation how a suitably long time perspective together with the learning process contributes to generating trust in mutual relation between various entities and how it is possibly to abuse this trust through the application and recognition of characteristics leading to the emergence of trust based on the learning process and implicit information asymmetry. For this purpose we carried out an analysis of popularity of certain investment vehicles. To achieve the purpose assumed, we applied measures used in the game theory that allowed us to construct a distinct, characteristic for a particular case game model based on results obtained in experimental studies. During studies we put a hypothesis that, unlike in the traditional approach, in some situations **the implicit information asymmetry may be used to establish trust while at the same time striving to break the principle of cooperation.**

2. CONCEPT OF ORGANISATION AS A GAME

The game theory is a concept applied in many areas of sciences (economics, management, political sciences, sociology, psychology, biology, and informatics). It describes situations participated by entities that consciously make decisions in order to change their position in a hierarchy or the organisation structure, however in a close conjunction to decisions taken by all other participants of this particular game. Therefore the conflict shall be understood as a natural property of the organisation defined in this way and can be destructive or can become an important element of development and progress. The game theory studies also situations, when interests of particular entities or individuals are not conflicted, these interests may be compatible, however communication difficulties make it impossible to establish a common course of action.

Concepts based on assumptions accepted within the game theory, organisations are treated as social systems, in which we can observe a constant struggle (game) for authority and resources. An important element of this game is a set of rules in accordance with which the game is played. They are associated with the division of organisational roles based on which an access to various resources (material, financial, information and authority) is determined.

One of first approaches that assumed the autonomy of individuals and social groups in social systems was the proposal formulated by R.M. Cyert and J.G. March, who presented a concept of an organisation as a political coalition (March 1962). The authors present an organisation as a system consisted of individuals and groups (coalitions), which expectations are mutually competitive. Limited resources mean that these expectations cannot be met simultaneously. Therefore these resources are stakes in in a game. A joint decision making is therefore possible only thanks to concluded agreements (coalitions) and mutual compensations (equalising benefits) (Cyert, March 1965). Therefore one of the main tasks of top management is concluding and maintaining a coalition that shall affect formulation of objectives, politics and allocation of restricted resources. Therefore the concept presented by R.M. Cyert and J.G. March became a basis for studies on mechanisms of formulating organisational objectives and allocation of resources.

Another interesting approach is the proposal of M. Crozier and E. Friedberg described as a concept of organisational social games. The concept has been presented in a book of M. Crozier and E. Friedberg: *Actors and Systems. The Politics of Collective Action* published in 1982. The basic

elements of this approach are the following concepts:

- organisation,
- uncertainty,
- game,
- authority,
- actor (player).

The organisation is treated as a structured system with precisely determined objectives, awareness of the existence of these objectives among all members of an organisation and responsibility for regulatory processes. Assuming that the purpose of such understood system (organisation) is to ensure a sustainable operation in a longer horizon the management shall establish procedures, regulations, organisational structure and course of processes, which are elements allowing for implementation of the objective mentioned. An important role is played by the degree of formalisation of organisation operation through a system of procedures and regulations. Within this the organisational structure and behaviour standards for members of an organisation are shaped. It creates a possibility to control particular resources by individuals and teams. This diversity is a condition of conducting social games by particular actors (members of an organisation). Each member of an organisation retains some margin of flexibility within the position obtained. This scope affects the degree of predictability of the behaviour of particular members of organisation. Therefore, in each organisation there is a specific social game played, which is consisted of a structure and rules. The scope of this game is defined by problems present in particular organisations. The management shaping (standardising) activities of particular individuals and groups affects the shape of game. An important role is played here by the flow of information, personnel policy, career advancement system, principles of remuneration and bonuses for employees.

This approach treats the uncertainty in a specific way. It arises from the complexity of problems with which particular organisations struggle and the dynamics of changes in the environment. The uncertainty is also shaped by particular individuals or groups in order to increase their control over other game participants. Sources of uncertainty are treated as specific type of resources that are the subject of game.

While the proposal of M. Crozier and E. Friedberg remains within the so called sociology of organisation, the proposal of Polish authors A.K. Koźmiński and A.M. Zawiślak is considered as the so called sociology of management. The essence of this proposal is to treat the process of management as a complex system of social games (Koźmiński 2004). A game can take place in the space of particular functions that are implemented within the management process (in the classic approach these are planning, organizing, leading and controlling), but also within the understanding of management as the information and decision making process. A game is restricted to manipulation of information in order to reduce or increase the uncertainty of particular decision-makers (participants of the game). A specific way in which the information is transferred serves to induce emotion and feelings of recipients favourable for a person (persons) transmitting the information. Describing the management as the social game arises, among others, from the lack of objective criteria of selection of objectives and directions of actions, as well as criteria for evaluation of the degree of implementation of mission and strategic objectives of an organisation. The management as a game is characterised by the following features (Koźmiński 2004):

- is a non-zero sum game,
- if one wants to derive additional benefits one has to be a player (participates in the game),
- players must recognize the possibility to obtain extraordinary benefits to prone to involve additional resources;
- management is a system of controlled game;
- management is a hierarchical game.

The basis of the game (starting point) is a formal structure of an organisation, powers and responsibilities are established. Within this formal structure informal relationships develop.

3. REPEATED GAMES AS A TOOL TO CREATE A REPUTATION

Thanks to the assumption that in repeated games it is possible to gather information and learn, such games may be applied to form desired behaviour among all participants of a particular situation. This means that the participation in a game, even if the repetition applies to only one party of the game,

may be used to establish and maintain a reputation, and therefore to control forming of expectations concerning the future among all other participants of the game (Samuelson 2012: 424). It seems that the most favourable strategy that could be adopted by a player in such game is to play fair (Binmore 1998, Samuelson 2012: 424), however, when the information asymmetry concerning the length of game (number of rounds) is introduced, a tendency to increase the reputation with a view to breach a principle of cooperation at the appropriate time, known only to one of players, emerges. If a player has sufficient basis to believe that the game in such given moment t is finished – and in this case the player can make decision to finish the game – then the cooperation must break down, despite the fact that the previously the game was conducted in a way supporting both creating the trust and the cooperation.

In order to avoid this situation it might necessary to apply the limited trust principle, even though external conditions suggest that seemingly the game is symmetric in terms of information (Samuelson 2012: 426). In this particular case the information asymmetry is of implicit character, which means that not only the asymmetry occurs but also that the fact of its occurrence is an element of asymmetry – only one party is aware of it and therefore can improve its position in a particular game. The implicit information asymmetry in this context is one of elements of uncertainty in a particular game and serves, in accordance with assumptions presented above, to establish advantage of one of players, as well as to conceal the fact of possessing such advantage.

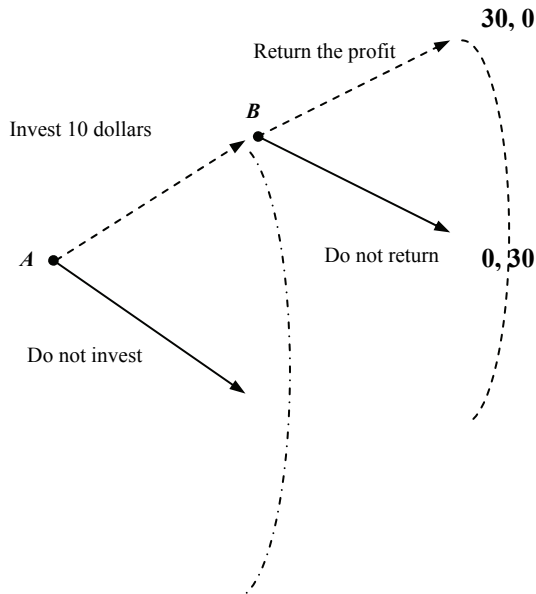
3.1. Shadow of the future

In finite repeated games necessarily appears the problem of the last move (Axelrod 1984, Camerer, Loewenstein 2003: 27) that is why the shadow of the future, that is lack of knowledge of course of a particular multi-stage game in subsequent trials, is so important. It must be sufficiently vast to minimise the temptation to betray, which occurs naturally in case of games with determined and known number of repetitions. The temptation to betray naturally appears in the last move. Therefore, using the backward induction (Binmore et al 2002, Binmore 1996) chances for emergence of cooperation in any form may be completely excluded. At the beginning the “shadow of the future” is sufficiently large to support the cooperation, however the closer the end of the game is, the lower is its importance and the more the tendency to act non-cooperatively is emphasised. And then such non-cooperative action may in a short perspective bring significant benefits or, in a case of bad faith of other players, secure against losses.

3.2. Investment game

The game in which the “shadow of the past” is important is the game analysed by Camerer (Camerer, Loewenstein 2003, p. 27) exploiting some variant of extended ultimatum game, involving 10 rounds in each game. At the beginning of each of ten rounds a player that also could be called an investor receives a given amount (10 dollars) that he/she may invest transferring them to another player – the bank. The contact between players is virtual one only, they do not see each other, but they also know nothing about each other. Therefore, these conditions do not support the emergence of trust. Despite this, the game in some sense is based on the trust, because after receiving the money, the investor may invest any part of the amount (but does not have to) however the incentive to invest is significant – each invested dollar will be tripled by the bank. Then, the bank may return any part of the multiplied amount to the investor, but also may keep everything for himself/herself). The awareness that the game includes nine more rounds, in which the bank may earn on investments of the investor, induces the bank to return at least one dollar more than the investor transferred at the beginning of the round. Therefore, if the investor decided to invest 5 dollars for example, then after multiplying of this amount by the bank there would be 15 dollars to share. If the game had only one round, then none of the parties would be willing to manifest the trust and investments would not be possible (see Figure 1 below, the first value indicates the pay-off of the investor and the second – the bank). [Notice: *In order to present sequential problems it is better to apply the extensive form of game. This allows for presentation of course of particular moves in the game in a single tree.*]

Figure 1: Analysis of a single-shot investment game



Source: Own study

In this game the investor can make an investment decision (transfer 1 – 10 dollars), while the bank can decide, whether to return some part or the entire multiplied amount or to keep everything. Because the game has no continuation, the player indicated as *B* should make a rational decision not to return any of the dollars invested, regardless the amount of the money invested. Therefore, solving the game with the backward induction, the bank shall ignore the strategy “return the profit” – marked on the figure as a dotted line. It means that when the player *B* makes his decision he has only one non-dominated strategy – “do not return” the money. Analysing the game in the same way, the player *A* shall come to the same conclusions, and therefore he shall not invest his money at all. Of course only on the assumption that there are no such external guaranties that might protect the capital invested.

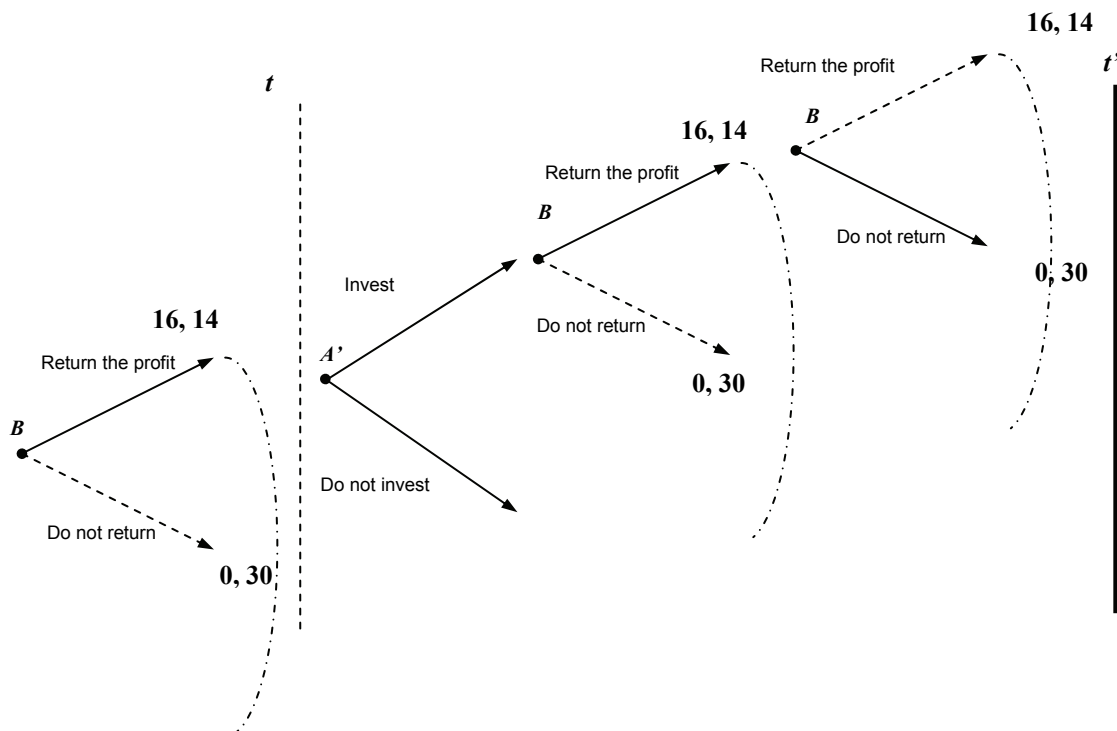
3.3. Repeated investment game

However, if the game is repeated, then the player *B* knows that if in the first round he does not return some part of the investment, then in another he will not receive the contribution. Let us now consider an optimal variant: the player *A* invests 10 dollars in each round and the bank triples this amount, returning always half of the profit, which means that players divide between them 15 dollars each. After 10 rounds each of them is enriched by 150 dollars, while applying the dominant strategy the investor would have 100 dollar after ten rounds and the bank – nothing. Therefore, each of them, thanks to the trust can improve, even significantly, own results (pay-offs). According to results obtained by Camerer (Camerer, Loewenstein 2003: 27) the player *B*, after investing 10 dollars, returns 16 dollars on average, which means that in the end the investor shall have 160 dollars and the bank – 140 dollars from the maximum total pool of 300 dollars.

But, since it is known that the game is finite and includes only 10 rounds, then the final round shall look exactly as the one-shot game presented above in the Figure 1. Therefore, there emerges the temptation to betray in the last move. If so, then the player *A* in the final round shall not invest and keep all of 10 dollars for himself. Unfortunately, developing this reasoning, it turns out that it can go back to the first round and therefore the player *A* shall refrain from investing earning 100 dollars after 10 rounds. Assuming, all the time, that there are no other instruments guaranteeing that it does not pay to cheat. Therefore, depending on the degree of trust, and as it turns out also on the fact whether players are man or women (Camerer, Loewenstein 2003: 28) the game goes without any obstacles until the eight, sometimes nine round, and then the cooperation collapses. This means that when players demonstrate the same knowledge and equal (or similar) degree of rationality, the investment will be ceased and until the end of the game, the player *A* will only collect the standard amount of 10 dollars in each remaining round.

Let us, however, consider what would happen when both players had a different level of information and therefore, if the game was characterised by a particular information asymmetry. Let us then suppose that the game has been played already for some time and many players participate in it (see Figure 2). The game for an external observer seems to be unrestricted, and therefore observing good outcomes of all its participants, he decides to join it, because the observed pay-offs of other players allow him to trust the payer *B*. Therefore, in some moment *t*, market in the Figure 2 with a dotted line, the player *A'*, observing the history of behaviour of the player *B*, decides to join the game and invest own 10 dollars. However, this player (similarly as other investors) does not know that the game includes some additional point *t'*, marked with a bold line, when the game will be ended. Therefore this is an element of the information asymmetry – the information is held by the player *B*, but none of the *A*-type player can learn it. This implies that in some round *k* the player *B*, due to the informational advantage will have a significant tendency to act non-cooperatively, or in other words, to betray. The player *A'* confirmed in his trust thanks to at least one cooperative pay-off, shows an inclination to continue investments, however in the moment *t'* it appears that the entire amount invested by him is kept by the bank and he remains with nothing. Until the time *t'* the player *B* has no reason to consider the choice of “do not return” strategy, so in the case of repeated games, this strategy may be ignore until a particular given moment.

Figure 2: Analysis of repeated investment game with the information asymmetry

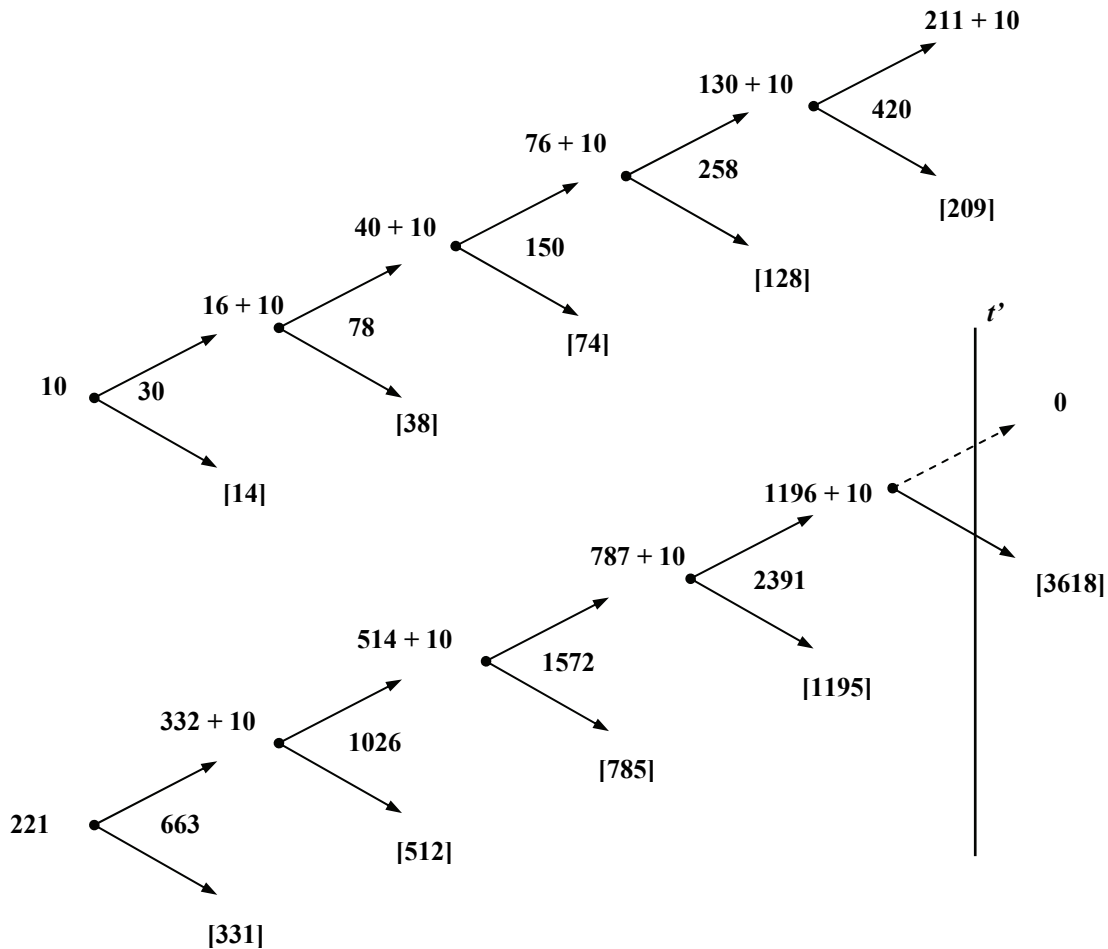


Source: Own study

3.4. Investment game with implicit information asymmetry

The game resembles the game played with institutions known as the shadow banking system – SBB (in Poland for example Amber Gold or Finroyal), which at the beginning adopt the cooperative strategy and therefore create the trust among potential (*A'*) and actual (*A*) customers. Establishing their position effectively, they do not reveal the information that significantly contribute to the asymmetric game structure that ultimately gives an advantage for the player *B*, who therefore has in the entire game a dominant position. Assuming however that the game is more realistic, we can ignore the investment limit, which means that in each round a player may invest not only current incomes (10 dollars) but also profits from previous rounds. Then in the final, ten round there would be 3618 dollars to split, of which about 51% (that is 1810 dollars should be returned to the investor). However, if the player *B* proves to fraudulent, then he may keep the entire amount including all previous profits, which would give him 6904 dollars in total (see Figure 3 below). Of course, creating the information asymmetry and exploiting to the detriment of other players in real conditions is not only morally reprehensible, but also punished by law.

Figure 3: Analysis of ten-round investment game allowing for investing profits from previous rounds and with the information asymmetry



Source: Own study

The figure above presents, how from an initially small amount it is possible to obtain a large amount at the end, assuming that investments are tripled in each round. However, if the information asymmetry includes the information about the end of game, then all profits may accrue to one of the players – the one, who has the informational advantage. The Figure, in square brackets, indicates pay-offs of the player *B* after each round that are cumulated through all rounds. The top arrows indicate values of pay-offs in subsequent rounds for the player *A*, which before each round are increased by 10 dollars and invested in total, in accordance with assumptions adopted for the investment game. Therefore, the player *A*, in this case, does not draw any profits aiming at maximising return on the investment. Therefore in the *k* round falling in the time *t'* (in this case in the 10 round) the player invest the entire available amount and after the game he remains with nothing.

4. SUMMARY

The analysis allows seeing, how much the information asymmetry changes, when it includes the time perspective. The case studied here is special, because the information asymmetry is implicit and only one of parties knows that it occurs. Such situation may be used for creating the trust – reputation – as well expectations concerning the future cooperation. Unlike in the traditional approach the trust, due to the information asymmetry, will be abused in a suitably distant round of the game. Therefore, the trust built in this way may be used to break the rule of cooperation and to transform the game from seemingly cooperative into the game of conflict. However, it has to be noted that the results presented here are necessarily fragmentary and it is necessary to perform further, more advanced studies to

establish, how such phenomena contribute to the general limitation of trust in the wider perspective of games with similar structure.

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