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Strategic behavior in acquiring and revealing costly private information

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ABSTRACT

When an agent has the opportunity to access public information, whether or not to acquire costly private information is a strategic decision. In this case, to study the informativeness of the revealed information, it is essential to consider the processes of both information acquisition and revelation together. Using a model in which two agents sequentially forecast the true state of a forthcoming period, this paper studies an agent's strategic behavior in acquiring and revealing costly private information in the presence of the payoff externality due to their competition. If the penalty for an incorrect forecast is greater than the reward for being right, the forecast cannot be informative because there is no investment in private information. Otherwise, costly private information is acquired as long as the information quality is moderate. Hence, the payoff structure under which the reward is greater than the penalty is a necessary condition for the investment in costly private information. Moreover, the acquired information is always revealed truthfully without herding or anti-herding. That is, the introduction of endogenous costly information raises the issue of "*free-riding*" rather than the issue of "*herding* or *anti-herding*".

1. Introduction

Professional forecasters are paid for providing information regarding future market situations. The information those agents provide is assumed to be difficult to obtain, either because access to it is relatively limited or specialized knowledge is required for interpretation. Therefore, the market usually relies on their forecasts while remaining unaware of the detailed processes involved, providing an opportunity for agents to act strategically for their own benefit. For this reason, whether or not the forecasts agents provide are informative has been a key concern. (See Figs. 1 and 2.)

The information agents provide is costly to acquire even for themselves. If agents must choose to sacrifice a large amount of money, time or effort to acquire meaningful information, while they have costless access to existing public information, then it would be rational for them to avoid the costly acquisition of private information and use public information instead. That is, costly information may induce agents to act strategically, especially during the information acquisition process. This strategic behavior can be relatively common as it is somewhat difficult to detect. It appears, then, that studying the informativeness of forecasts requires us to look at both information acquisition and revelation at the same time.

Thus, this paper studies the topic of the informativeness of an agent's forecast when her informative private signal is costly to acquire. We discuss this issue considering the case in which a payoff externality is present due to the agents'

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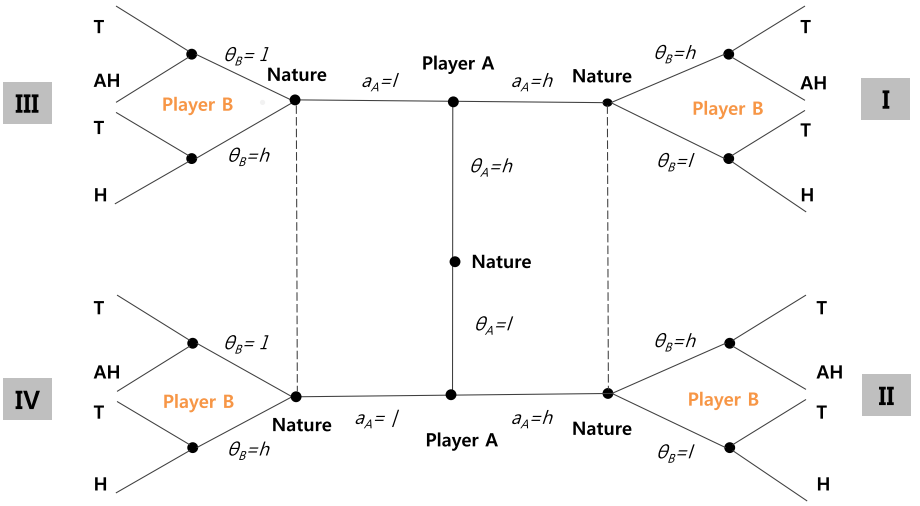

Fig. 1. Game tree of exogenous information case.

competition.[1] We consider a simple sequential model in which two players compete with each other in forecasting the true state of the forthcoming period. The leader always observes the informative private signal. On the other hand, it is costly for the follower to acquire her informative private signal. Before announcing her own forecast, the follower can observe the leader's forecast. As the follower can use it without acquiring her own costly signal, the investment in a costly private signal is her endogenous decision. After both players sequentially issue forecasts, the true state is revealed. Then according to the accuracy of their forecasts, each player earns a reward or a penalty. We assume that both players observe the signals with the same precision, in order to explore the payoff effects without appealing to a difference in the ability of players. If both players are of the same ability, no one's (potential) information should be ignored. Addressing the question of under what condition the follower invests in costly information to obtain an informative forecast is well worth considering, especially when players have equal precision.

The main results of our model can be summarized as follows. As the leader's signal is private information, she can strategically decide whether to follow her signal or not in announcing forecast. As to this leader's strategic behavior, we restrict our attention only to the separating equilibrium. This restriction can be justified by the argument that we are mainly interested in the case where there is *credible* public information the follower can free ride on. In our setting, this denotes the case where the follower can infer the leader's private signal perfectly. We show that there exists a unique separating equilibrium where the leader always reveals her signal truthfully. The follower, therefore, can infer the leader's private signal and it can be used as truthful public information in this separating equilibrium. Thus, the follower makes a strategic decision on whether to make use of the leader's announced forecast or to acquire a costly private signal. She should also consider whether or not to be truthful in revealing the private signal if she intends to acquire it.

The follower's equilibrium strategy varies according to the payoff structure and the information quality. If the penalty is greater than the reward, the follower always imitates the leader's forecast without acquiring a costly private signal. Hence, her forecast is not informative at all. Even if the reward is greater than the penalty and the information cost is relatively low, the acquisition of a private signal is not guaranteed. A sufficiently high or low information quality strongly signals the accuracy or inaccuracy of public information. Thus, the follower makes use of public information by imitating or deviating from it, without costly investment in a private signal. If the information quality is not extreme, on the other hand, the follower acquires the costly private signal. Moreover, if she does so, she always reveals it truthfully without herding or anti-herding: As the signal is costly to acquire, the follower compares the expected gain from observing the costly private signal and the gain from making use of existing public information. The follower acquires the costly signal only if the former is greater than the latter. Hence, if a costly signal is acquired, there is no incentive for her to ignore it. If the follower had any incentive to ignore the acquired private signal, she would have avoided paying a cost to observe it.

To sum up, although the public information can be used for free, there exists an equilibrium in which a costly private signal is acquired and revealed truthfully without herding or anti-herding. The acquisition of a costly signal is not monotone with respect to the information quality: it happens as long as the public information is moderately accurate. The payoff structure under which the reward is greater than the penalty is a necessary condition for the existence of this equilibrium.

[1] There is no doubt that forecasting agents compete with each other and are evaluated frequently. These evaluations consider not only the individual agent's own performance, but also her performance relative to her competitors' performances. Aggarwal and Samwick (1999), Antle and Smith (1986), Gibbons and Murphy (1990), Janakiraman, Lambert, and Larcker (1992) provide empirical findings which support that the relative evaluation is widely used in the market. In particular, according to Mikhail, Walther, and Willis (1999), the analysts who are inferior relative to their peers are more likely to be fired. However, the absolute accuracy of the forecast has little effect on the probability of layoff. Given that the relative evaluation is used, if an agent is successful but her peers are also successful, her reward may not be greater than if she alone were successful. On the other hand, if an agent fails but her competitors also fail, the blame can be shared, resulting in a less negative evaluation than if she alone were unsuccessful. It would be natural then to raise the question of how the payoff structures affect the informativeness of the agents' forecasts.