Social Learning in the Laboratory - Research Proposal

Abstract

Moscarini et. al (1996) have developed an interesting social learning model hitherto unexplored in an experimental setting. If the state of the world is changing stochastically over time during the learning process, only temporary informational cascades — situations where socially valuable information is wasted— can arise. Furthermore, no cascade ever arises when the environment changes in a succinctly unpredictable way. In a microeconomic setting, where one could interpret the action as a purchase decision by a consumer who observes the decisions made by other consumers, the change in the environment could be endogenized by allowing producers to innovate on their products. It would be interesting to experimentally test for such a model of "alternating cascades".

Introduction

In many social and economic situations, individuals are influenced by the decisions of others. The commonest examples occur in everyday life, as in choosing a fashionable restaurant or a popular movie. But it has also been suggested that similar influences affect technology adoption and asset market decisions. For rational choice theory, however, the important question is why rational maximizing individuals should behave in this way.

In recent years, a great deal of attention has been paid to the social learning literature introduced by Banerjee (1992), and Bikhchandani, Hirshleifer, and Welch (1992) (BHW), describing situations in which individuals learn by observing the behavior of others. This literature analyzes an economy where a sequence of Bayesian individuals make a once-in-a-lifetime decisions under incomplete and asymmetric information. The typical conclusion is that, despite the asymmetry of information, eventually every individual imitates her predecessor, even though she would have chosen differently if she had acted on her own information alone. In this sense, individuals rationally ignore their own information and follow the herd.

In an interesting extension Moscarini et. al (1996) consider a modifed but natural model where it is common knowledge that the state of the world changes stochastically over time. A invariant underlying state of the world is not realistic and therefore this paper provides a natural extension which enriches the existing literature. This model naturally encompasses many interesting economic situations, like decision making in organizations and consumer choice, where social learning induces inertia in the behavior given a discrete action space.

In this paper the authors consider a modified but natural model where it is common knowledge that the state of the world changes stochastically over time. The authors then ask how robust are the above findings to such an evolving environment. They find that because of the resulting information depreciation, only temporary informational cascades can arise. BHW discuss at length the fragility of cascades to the release of small amount of public information. Here, they note that any cascade will eventually come to an end without new informational input, but instead simply because of the fading relevance of old information. Cascades on a single action arise only if the state of the world is sufficiently persistent. When state changes are sufficiently unpredictable no cascade ever arises, because past information depreciates so fast that the belief can never be too extreme. Finally, for completeness more than for economic relevance, cascades on alternating actions arise when the state of the world is changing frequently enough, because here too information depreciates slowly. They conclude that temporary cascades on single actions arise when the environment changes slowly. In this sense, herding survives as a temporary phenomenon only.

Some Applications

Social learning has a wide range of applications in the real world and there is a strong set of literature exploring the same. For examples see, Finance: Scharfstein and Stein (1990); Welch (1992); Avery and Zemsky (1998); Welch (2000). Auctions: Neeman and Orosel (1999). Political Economy: Morton and Williams (1999). Industrial Organization: Kennedy (2002).

Experimental Methodology

We propose to test the theory using the binary signal and action ball-and-urn observational paradigm of Anderson and Holt (1997). In a seminal paper, Anderson and Holt (1997) investigate social learning experimentally. Their design is based on the binary-signal-binary-action model of Bikhchandani, Hirshleifer and Welch (1992). In their setup there are two decision-relevant events, say A and B, equally likely to occur ex ante and two corresponding signals a and b. Signals are informative in the sense that there is a probability higher than 1/2 that a signal matches the label of the realized event.

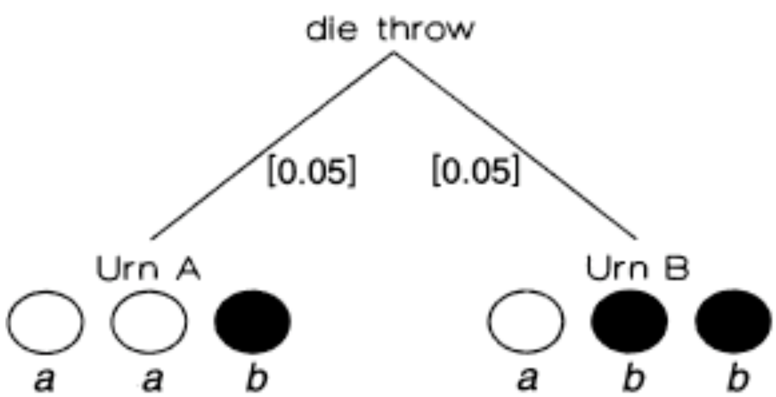

FIGURE 1. THE PHYSICAL SETUP

Now it is important to note the following -

State of the World - Urn A or Urn B
Private Signals - a or b

Chronology of events

1. As a first step, a coin toss decides which Urn will be used.
2. The first subject is asked to come and draw a ball (signal) from the chosen urn. Based on his/her private signal, the subject makes a public

announcement about the State of the World (i.e. - in his belief which Urn did his ball come from).

3. Subsequently, subject 2 is also asked to draw a separate private signal. Based upon the public announcement in 2) above plus subject 2's own private signal, he/she makes the second public announcement regarding the State of the World.
4. Subject 3 is asked to do the same and so on…

IMPORTANT NOTES

- All balls (signals) are drawn with replacement.
- Subjects do not observe their predecessor's private signals. However, they do observe the history of all the public announcement of their predecessors.
- After subject 1, there is a ε chance (probability) that the state of the world (Urn) switches. (i.e. If based on the coin toss, Urn A was chosen for subject 1, there is an ε chance that it will shift to Urn B for subject 2 and so on.)
- ε is assumed to be Markovian and independent of the current state of the world.
- All subjects are fully aware of the entire structure of the game and the probabilistic distributions.

The Choice of ε

We are proposing three basic treatments as points of comparison -

I. Base Case (ε = 0)

This reverts to Anderson and Holt (1997) where the state of the world is fixed (once the coin toss decides the state in step 1). This would prove to be a good base point.

Experimental Requirements

1. 2 sessions, with 10 subjects per session, with 10 rounds per session.
2. Each round is no different from the other, apart from the fact that the ordering of the subjects would change randomly between rounds.
3. Payment - £20 per subject.

II. Second Case

This case refers to a non-zero value of ε, where the theory would still predict some cascade possibility. The following proposition from Moscarini et. al (1996) would prove to be helpful.

Proposition 2 (cascades on a single action). *For any $q^1 \in (1-\alpha, \alpha)$, with probability one, a cascade on some action arises in finite time if and only if $\varepsilon < \underline{\varepsilon}(\alpha) \equiv \alpha(1-\alpha)$.*

It is important to note here that α refers to the proportion of a signals in Urn A (or symmetrically the proportion of b signals in Urn B). Case II would serve as an interesting intermediate case, where cascade is still a theoretical possibility.

Experimental Requirements

1. 2 sessions, with 10 subjects per session, with 10 rounds per session.
2. Each round is no different from the other, apart from the fact that the ordering of the subjects would change randomly between rounds.
3. Payment - £20 per subject.

III. Third Case

This case refers to a range of non-zero values of ε, where the theory would predict no cascade possibility. The following Corollary from Moscarini et. al (1996) would prove to be helpful.

Corollary 2. *No cascade ever arises for $\varepsilon \in [1/4, 3/4]$.*

The third and final case would be an interesting treatment where the underlying state of the world is too uncertain for any cascade formation.

Experimental Requirements

1. 2 sessions, with 10 subjects per session, with 10 rounds per session.
2. Each round is no different from the other, apart from the fact that the ordering of the subjects would change randomly between rounds.
3. Payment - £20 per subject.

DATA ANALYSIS

1. An obvious data analysis required would be too see how often do subjects rationally cascade and how often they do not.
2. However, another interesting analysis would be how often do people completely ignore public information and follow only their own private signal. Now this could be interpreted as irrational only if we assume common knowledge of rationality. In other words, if subjects do not believe other subjects to be rational then it may not be rational to simply follow your own private signal. In this regard, subjects would be asked to fill out a post-experiment survey to better gauge their belief structure.

Conclusion

Social learning decouples the behavior of the agents from the economy's fundamentals. During an informational cascade on a single action, the same action persists predictably while the environment changes with positive probability. Then the action eventually switches and learning resumes. This simple model of observational learning can explain why common practice can persist more than it should; agents stick to the practice even if they have contrary private information, without possibly knowing in an informational cascade whether others have similar contrary information.

This model is amenable to applications across the economics spectrum, where an invariant state of nature does not ring true. For a salient microeconomics example, suppose that actions are the sequential and observable consumer purchase decisions. Then a changing environment might correspond to the stochastic but unobserved quality innovations of the products purchased.

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