Dynamic trading with developing adverse selection ☆

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Abstract

We study a dynamic trading game in which the information asymmetry between the agents develops over time. A seller and potential buyers start out symmetrically uninformed about the quality of a good, but the seller becomes informed after the game begins. We show that this developing adverse selection gives rise to novel trading dynamics. In particular, if the seller's learning speed is high, the equilibrium features "collapse-and-recovery" behavior: Both the equilibrium price and the trade probability first drop and then increase over time. While the trade surplus monotonically decreases as the learning speed increases, the seller's surplus may change non-monotonically.
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1. Introduction

A typical model of adverse selection begins by taking information asymmetry as given. In many economic environments, however, it is not the case that one side is initially endowed with superior information than the other side. Rather, one side gradually obtains information about the underlying object, while the other does not, which gives rise to information asymmetry between the two. In other words, adverse selection often *develops* over time.[1] Consider an entrepreneur who wants to sell his start-up firm. At an early stage, neither the potential buyers nor the entrepreneur himself know the true prospects of the firm. However, as the entrepreneur gradually learns about the firm's viability, the information asymmetry between the entrepreneur and the potential buyers grows over time. Similar phenomena could also occur in the trading of securitized assets: A sudden shock to fundamentals could create symmetric uncertainty over the underlying asset value, then the asset holder subsequently gains an informational advantage over the potential buyers as he learns the asset value over time.[2] The goal of this paper is to study the effects of such developing adverse selection on trading dynamics and market efficiency.

We consider a stylized model of dynamic trading under adverse selection. There is a single seller who holds an indivisible good, the quality of which is either high or low. She meets a sequence of randomly arriving buyers, each of whom observes the seller's time-on-the-market (how long it has been since the seller has obtained the good) and makes a take-it-or-leave-it offer to the seller. In contrast to existing models, all agents are initially uninformed about the quality of the good and have a common prior belief about its quality. Over time, the seller exogenously learns the quality of the good by receiving a signal. The signal is perfectly informative about quality, but the timing of its arrival is random. The buyers remain uninformed about the quality of the good; they also do not know whether the seller is informed about the quality of the good.[3]

The equilibrium dynamics in this paper contrast with those in standard models with exogenously given adverse selection in several significant ways. The existing literature repeatedly identifies equilibrium dynamics with a monotonically increasing price pattern. The buyers initially offer a low price, knowing that they are subject to the adverse selection problem. Only a seller with a lemon accepts such offers, and thus, rejecting the offer signals that the seller is more likely to have a high-quality good.[4] In response, the offer price increases over time, and eventually the seller with a high-quality good accepts and the game ends. However, such monotonic dynamics do not seem to fully capture the phenomena observed in various markets; several markets with information asymmetry exhibit non-monotonic trading patterns, such as those in which the trading price decreases at some point and then recovers.[5]

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[1] Even in Akerlof's classic 1970 example of the market for "lemons," information asymmetry can develop over time: A seller of a used car could obtain additional information about his car's value (e.g., hidden deficiencies) while it is still on the market. See Biglaiser et al. (2017) for a recent empirical result on developing adverse selection in the used car market.

[2] Some securitized assets, such as Collateralized Debt Obligations (CDOs) and CDOs squared, have overwhelmingly complex structures. For example, the financial stability office of the Bank of England has estimated that the documents underlying a typical CDO squared amount to over 1.1 billion pages (Haldane, 2013).

[3] Specifically, while the buyers are aware that there is a possibility that the seller is informed about the good's quality, they do not know whether this is the case.

[4] In the literature, this equilibrium behavior is called the "skimming property" (Fudenberg et al., 1985).

[5] In a recent paper, Waters and Mirkin (2017) provide evidence that in the venture financing and construction equipment markets, the trading dynamics exhibit a "U-shaped" pattern. They also build a model of competitive market in which information asymmetry increases over time and show that the equilibrium exhibits non-monotonic, U-shaped dy-