

Sentiment, Liquidity and Asset Prices

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Abstract

We study a dynamic asset market, in which asset owners (i) are privately informed about the quality of their assets and (ii) experience occasional liquidity needs that give rise to gains from asset trade. The important feature of our setting is that although asset prices are always equal to fundamentals, the fundamentals themselves depend on asset prices through their effect on how efficiently assets are allocated. When the perceived quality of assets in the market is sufficiently low, the equilibrium features a “market freeze”: only low quality assets trade at the lowest possible price. On the other hand, when the perceived quality of assets is sufficiently high, the equilibrium features “efficient trade”: high and low quality assets trade at the highest possible price. Finally, for intermediate asset quality, there is equilibrium multiplicity and asset prices are driven by “market sentiment.” There is a rich set of equilibria, in which asset prices fluctuate due to sunspots, resembling what one may refer to as “bubbles.”

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1 Introduction

In a frictionless marketplace, all gains from trade are realized. Thus, durable assets or securities are always traded in a manner which ensures that they are held by the parties that value them the most. In such an environment, asset prices reflect not only the current but also all future gains from trade. In contrast, in the presence of frictions, some trades may remain unrealized, and this can depress asset prices. In such an environment, there is a fundamental connection between market *liquidity* – the efficiency with which the assets are re-allocated, – and asset prices. Moreover, if the frictions result from information asymmetries, there is ample room for equilibrium multiplicity. For example, if traders believe that the market in the future will be liquid, they expect to more easily trade the asset in the future (if they need to sell); this will tend to mitigate the adverse selection problem and generates more trade today. Instead, if traders believe there will be less trade in the future, they expect to hold on to the assets longer. This will make the adverse selection problem more severe and reduce trade today. Therefore, asset prices will depend on traders' expectations about the efficiency with which assets are allocated in the future. which equilibrium is expected to be played in the future. Thus, market sentiment, liquidity and asset prices are tightly linked. Furthermore, sentiment can play an important role on liquidity, asset prices and their volatility.

In this paper we consider a market for durable assets whose quality, low or high, is only known to the current owners. Gains from trade arise stochastically over time since current owners are hit by a privately observed liquidity or productivity shock that depresses their value of holding the asset vis a vis other potential holders in the market. The problem is that the holders of low quality assets would want to pretend they are owners of high quality assets who happen to experience liquidity shocks. Their presence in the market reduces the willingness to pay of the buyers which might drop below the reservation price of liquidity hit owners of a high quality asset. If this is the case, then the only asset traded in equilibrium is the low quality asset. Instead, if the willingness to pay remains above the reservation price of the liquidity hit owners of high quality assets, then trade is efficient. Importantly, since buyers are long lived and anticipate that they might need to sell the asset in the future, their willingness to pay for the asset depends on their beliefs about future prices and liquidity. If they believe that there will be a liquid market in the future with high prices they will be willing to offer a higher price in the first place. We show that these concerns about the market in the future can lead to multiple equilibria. We first construct two equilibria, one with constant high prices and one with constant low prices. This provides a bound for the possible prices in the market. We then consider equilibria in which the current market sentiment (a sunspot

really) determines if current prices and liquidity are high or if they are low.

2 The Model

Time is infinite and discrete, indexed by $t \in \{0, 1, \dots\}$. There is a mass of indivisible assets, indexed by $i \in [0, 1]$, which are identical in every respect except their quality. Assets can be either high or low quality, which we denote by $\theta_i \in \{L, H\}$. A quality θ_i asset delivers a per period cash-flow of x_{θ_i} , where $x_H > x_L > 0$.

Although the fraction of good quality assets is fixed and given by $\pi \in (0, 1)$, the quality of an individual asset can change. In particular, an asset that is high quality in the current period remains high quality in the next period with probability $\phi^\theta + (1 - \phi^\theta) \cdot \pi$, whereas a low quality asset remains low quality with probability $\phi^\theta + (1 - \phi^\theta) \cdot (1 - \pi)$, where $\phi^\theta \in (0, 1)$ captures the persistence of asset quality.

There is a large mass $M \gg 1$ of identical risk-neutral agents who discount payoffs with a factor $\delta \in (0, 1)$, indexed by $j \in [0, M]$. An agent can hold at most one unit of the asset, and we refer to agents who currently hold assets as *holders* while to the rest as potential *buyers*.

We introduce gains from trade among agents as follows. We suppose that a holder j values the cash-flow of an asset of quality θ_i at $\omega_j \cdot x_{\theta_i}$, where $\omega_j \in \{\chi, 1\}$ with $\chi \in (0, 1)$ satisfying $\chi \cdot x_H \geq x_L$. All potential buyers are assumed to value the cash-flow at x_{θ_i} . This heterogeneity in valuation can be motivated by for example productivity differences or liquidity constraints. For concreteness, we refer to ω_j as agent j 's liquidity status and to an agent with $\omega_j = \chi$ as an agent who has liquidity needs. We suppose that each period a holder experiences a liquidity need with probability $\lambda \in (0, 1)$, i.e., a holder's liquidity status is assumed to be independent of her asset quality and her liquidity status in the past; we consider persistence in liquidity status in Section X.

Absent frictions, all assets would be reallocated from agents with liquidity needs to those without. As we will see, however, trade may be hindered due to the presence of private information. In particular, we assume that the quality of a holder's asset and her liquidity status are that holder's private information.

The market for assets is competitive - in each period, at least two buyers are randomly matched with a holder and compete a la Bertrand for her asset. When a holder receives offers from buyers, she decides whether and which offer to accept. If she rejects all offers, then she continues to be a holder in the next period and is rematched with a new set of buyers. Instead, if she accepts an offer, then she enters the pool of potential buyers in the next period. A buyer

whose offer was rejected continues to be a potential buyer in the next period, whereas a buyer whose offer is accepted, receives the asset and becomes a holder in the next period.

Let v_t denote the fraction of assets that trade (or volume of trade) at time t . We suppose that the information set of a buyer at time t includes the history $\{v_s\}_{s=0}^{t-1}$ but not the individual trading history of the asset for which he bids. The strategy of each buyer is a mapping from his information set to a probability distribution over offers. A holder's information set includes the quality θ of her asset, her liquidity status ω , and the buyers' information set. The strategy of each holder is a mapping from her information set to a probability of acceptance.

2.1 Equilibrium Concept

We use Perfect Bayesian Equilibrium (PBE) as our equilibrium concept. This has the following implications. First, each holder's acceptance rule must maximize her expected payoff taking as given the buyers' strategies (*Holder Optimality*). Second, any offer in the support of a buyer's strategy must maximize his expected payoff given his beliefs, the seller's and the other buyers' strategies (*Buyer Optimality*). Third, given their information set, buyers' beliefs are updated using Bayes' rule whenever possible (*Belief Consistency*).

3 Equilibrium

Definition 1 *We say that there is **efficient trade** if in equilibrium both high and low quality assets trade in the market. Otherwise, if only low quality assets trade in the market, we say that there is a **market freeze**.*

Theorem 1 (Characterization and Multiplicity) *A constant price equilibrium exists and it either features efficient trade or market freeze. There exist thresholds $0 < \bar{\pi}_{ET} < \bar{\pi}_{MF} < 1$ on the beliefs about asset quality such that:*

(i) *Efficient trade equilibrium exists if and only if $\pi \geq \bar{\pi}_{ET}$, whereas*

(ii) *Market freeze equilibrium exists if and only if $\pi < \bar{\pi}_{MF}$.*

Thus, the two equilibria coexist when $\pi \in [\bar{\pi}_{ET}, \bar{\pi}_{MF})$. The belief thresholds $\bar{\pi}_{ET}$ and $\bar{\pi}_{MF}$ are increasing in δ , ϕ^θ , χ and $\frac{x_H}{x_L}$, and are decreasing in λ .

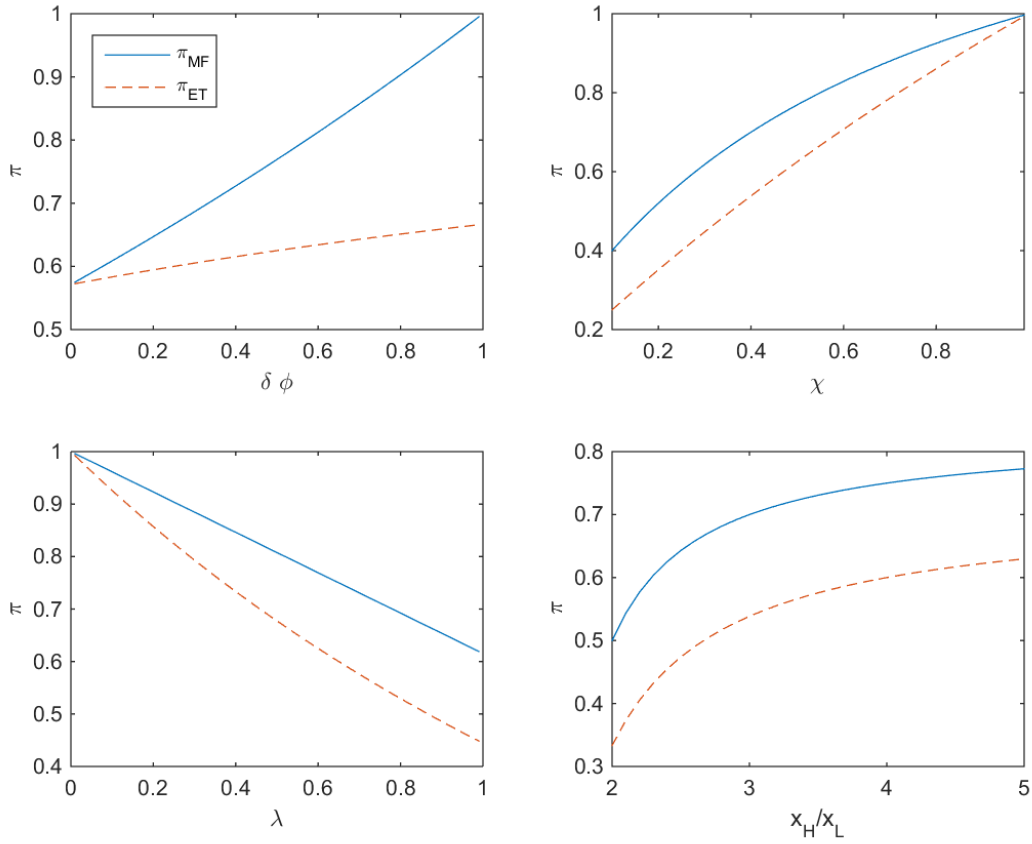


Figure 1: **Comparative Statics on Equilibrium Set.** Unless stated otherwise, the parameters used are: $\pi = 0.5$, $\delta = 0.9$, $\phi^\theta = 0.6$, $\lambda = 0.6$, $\chi = 0.5$, $x_H = 1$ and $x_L = 0.1$.

3.1 Sunspot-driven Equilibria

Let $z_t \in \{B, G\}$ denote the (sunspot) state of the economy at time t . We assume that z_t follows a Markov process with the following properties. First, the unconditional probability that the state is good is $\pi^\xi \in (0, 1)$. Second, the probability that the state is good in the next period given that it is good this period is $\phi^\xi + (1 - \phi^\xi) \cdot \pi^\xi$. Finally, the probability that the state is bad in the next period given that it is bad this period is $\phi^\xi + (1 - \phi^\xi) \cdot (1 - \pi^\xi)$. Thus, $\phi^\xi \in [0, 1]$ captures the persistence of market sentiment.

The market observes and, if feasible, coordinates its equilibrium play on the realization of the random variable z_t . In particular, we will suppose that the market plays the market freeze equilibrium in the bad state and the efficient trade equilibrium in the good state.

The following proposition shows that indeed sunspot-driven equilibria exist, but that not all such equilibria are feasible.

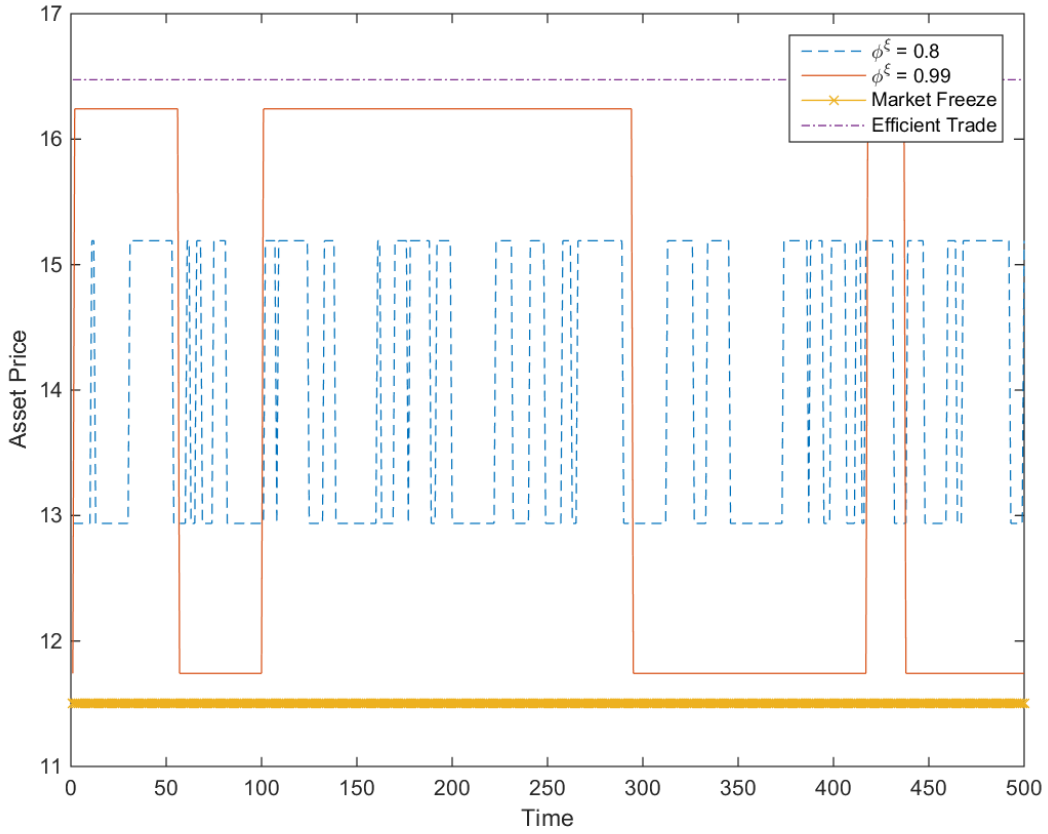


Figure 2: **Sunspot Fluctuations.** The parameters used are: $\pi = 0.5$, $\delta = 0.9$, $\phi = 0.6$, $\lambda = 0.6$, $\chi = 0.5$, $x_H = 1$ and $x_L = 0.1$.

Proposition 1 (Sunspot Equilibrium) *Suppose that $\pi \in (\bar{\pi}_{ET}, \bar{\pi}_{MF})$, where $\bar{\pi}_j$'s are as in Theorem 1. Then there exists a threshold $\bar{\phi}^\xi < 1$, such that a stochastic equilibrium with sunspot z_t exists if and only if $\phi^\xi > \bar{\phi}^\xi$. In such an equilibrium, the difference in asset prices between the two states increases in ϕ^ξ .*

4 Persistent Gains from Trade

To be written ...

5 Concluding Remarks

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