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Price, trade size, and information revelation in multi-period securities markets ☆

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Abstract

We study price formation in securities markets, using the sequential trade framework of Glosten and Milgrom (1985). This paper makes one basic methodological advance over previous research on sequential securities trading: we allow traders to choose from n trade sizes in a multi-period market, where n can be arbitrarily large. We examine how trade size multiplicity affects the intertemporal dynamics of trading strategies, bid–ask spreads, and information revelation. We show that price impact, as a function of trade size, is increasing and exhibits (discrete) concavity.

JEL classification: D82; G12

Keywords: Market microstructure; Glosten–Milgrom; Price formation; Sequential trade; Asymmetric information; Trade size; Bid–ask spreads

Market microstructure studies the price formation process, and how this process is affected by the organization of the market. The main objective of this paper is to understand how trade sizes affect the price formation process dynamically within an environment where traders can choose from multiple trade sizes.

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There are two standard reference frameworks in the market microstructure theory. One is the continuous auction framework, first developed by Kyle (1985). The other is the sequential trade framework, introduced by Copeland and Galai (1983) and Glosten and Milgrom (1985). In the Kyle framework, the asset orders are submitted first then the asset prices are set and made public, whereas in the sequential trade framework the prices are announced before the orders are submitted. Both frameworks are sufficiently simple and well-behaved and they easily lend themselves to analysis of policy issues and empirical tests.[1] Although most markets are organized as in the sequential trade models, these models tend to be less tractable than the Kyle model, as Back and Baruch (2004) point out.[2]

In this paper, we adopt the sequential trade framework to study the relationship between price, trade size, and information. Sequential trade models consider markets where a risky asset is traded between a market-maker, strategic traders, and liquidity traders. First, the market-maker, who is not informed of the risky asset payoff, quotes the bid and ask price. Then either a strategic trader or a liquidity trader arrives at the market in a random manner. The liquidity trader's trading motive is not related to the risky asset payoff at all. Whereas the strategic trader has information on the risky asset payoff, hence her trades reveal information. In the model of Copeland and Galai (1983), the risky asset payoff becomes public information after each trade. In the Glosten and Milgrom (1985) model, trading goes on for many rounds before the risky asset payoff is made public. Therefore, the latter allows us to see how price compounds information over time. Glosten and Milgrom also show that the bid–ask spread declines in expectation, and that the spread eventually vanishes almost surely as the number of trading rounds tends to infinity.

One of the simplified assumptions in Glosten and Milgrom (1985) is that traders can only trade one share at any given period. Easley and O'Hara (1987) extend the Glosten–Milgrom model by allowing for two trade sizes: one small and one large. By doing so, they theoretically justify the empirically observed phenomenon that block trades are made at "worse" prices than small trades. However, Easley and O'Hara (1987) mostly focus on the static characterization of equilibrium prices and spreads.[3]

Our analysis extends the analyses by Glosten and Milgrom (1985) and Easley and O'Hara (1987) in two directions: time and trade size. We extend Glosten and Milgrom's model by allowing for multiple trade sizes for traders to choose from. Also, in comparison to Easley and O'Hara, we are not confined in our analysis to two trade sizes, thus we focus more on the intertemporal equilibrium dynamics. In our model, both trade sizes and trading rounds can vary.

Our model generates several results related to how trade size affects the intertemporal dynamics of informed trading strategies, bid–ask spreads, and information revelation. First, consistent with empirical research (e.g., Hasbrouck, 1988, 1991; Algert, 1990; Madhavan and Smidt, 1991; Easley et al., 1997), informed traders are more likely to submit large orders. In each period there is a positive cut-off trade size for the informed

[1] See Madhavan (2000) and Biais et al. (2005) for extensive surveys of the literature.

[2] In a continuous time setup, Back and Baruch (2004) show that the equilibrium of the Glosten–Milgrom model is approximately the same as the equilibrium of the Kyle model, when the trade size is small and uninformed trades arrive frequently.

[3] Easley and O'Hara (1997) employ a model with a richer information structure (compared to the Glosten–Milgrom model and ours), which makes the analysis of intertemporal equilibrium dynamics more difficult.