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# thin markets

Marzena Rostek and Marek Weretka
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## Abstract

A thin market is a market with few buying or selling offers. The concept of market thinness, while general, is typically used in the context of financial markets. When the number of buying or selling offers is small, investors' trading positions are large relative to market size. Trading then requires price concessions and thus exerts an impact on prices. A thin market is characterized by low trading volume, high volatility and high bid–ask spreads. This article discusses the modelling of thin markets, some typical phenomena of such markets, and their implications for market design.
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## Keywords

asset pricing; blockage discount; inventory models; liquidity; market efficiency; market power; market structure; oligopoly; overshooting; predatory trading; thin markets

## Article

A *thin market* is a market with few buying or selling offers. It is also known as a narrow market. The signature characteristic of a thin market is traders' price impact. When the number of buying or selling offers is small, investors' trading positions are large relative to market size. Trading then requires price concessions and thus exerts an impact on prices. A thin market is characterized by low trading volume, high volatility, and high bid–ask spreads. The concept of market thinness, while general, is typically used in the context of financial markets.

Market thinness is a particular source of market illiquidity. Liquidity is broadly defined as the ease of trading a security. Apart from market power, lack of liquidity can result from asymmetric information, transaction costs, search and bargaining frictions, imperfect financing ability, limited commitment and spatial considerations.

### Price impact in financial markets

Since transaction-level data became available in the early 1990s, it has been well understood that institutional investors (such as mutual funds, hedge funds, pension funds and investment banks), whose trade on the New York Stock Exchange (NYSE) accounts for more than 70 per cent of daily trading volume, exert a significant impact on prices and take this into account in their trading strategies. The seminal empirical studies include Chan and Lakonishok (1993, 1995), and Keim and Madhavan (1995, 1996, 1998). To mitigate the adverse effects of price impact, large traders do not place their orders at once; rather, they break them up into smaller blocks, which are then placed sequentially. For instance, at the NYSE, only about 20 per cent of the total trading value of all institutional purchases and sales is completed within a single trading day, while more than 50 per cent takes at least four days for execution. If traded at once, a typical institutional package would represent more than 60 per cent of the total trading volume. In financial slang, institutional investors are referred to as elephant traders and institutional trading blocks as iceberg orders. In fact, the trading costs associated with such price impact dominate the explicit costs of trade, such as commission, order processing and brokerage fees. Consequently, extensive resources are devoted to estimating price impact and designing best execution. Such techniques are available to institutional as well as retail investors in the form of software called market impact models.

**Modelling thin markets**

On the theory side, the presence of market power poses challenges to modelling. In particular, the competitive approach is not suitable for modelling thin markets since it assumes that no individual trader can affect the market price by their buying or selling orders.

A large body of literature has emerged to explain how price impact affects individual portfolio choices of investors and the equilibrium in financial markets. The theoretical mechanisms underlying these models can be grouped into three categories: asymmetric information, inventory effects and nonequilibrium mechanisms. Traditionally, the leading class of models with price impacts is based on asymmetric or private information (e.g. Glosten and Milgrom, 1985; Kyle, 1985, 1989; Easley and O'Hara, 1987; Back, 1992; Foster and Viswanathan, 1996; Holden and Subrahmanyam, 1996). In such models, price impact arises because high sales by an informed trader are interpreted by remaining traders as a signal of low asset value, and hence reduce the asset price.

For many market events that involve anticipated demand or supply shocks, such as preannounced inclusions of new stock into the S&P, the price impact component that derives from asymmetric information can only partially explain the observed magnitudes of price changes. Therefore, an alternative strand of the literature based on inventory effects has emerged. There, because of diversification concerns, risk-averse traders are willing to absorb large, risky orders only at price concessions (Ho and Stoll, 1981; Grossman and Miller, 1988; Vayanos, 2001; Attari, Mello and Ruckes, 2005; Brunnermeier and Pedersen, 2005; Pritsker, 2005; DeMarzo and Urošević, 2006 extended by Urošević, 2005). These papers capture price impact by building Cournot-type models with one or several large investors and a continuum of (infinitesimally) small price-taking traders.

Under Cournot market structure, large investors trade only with small competitive traders. In practice, large investors trade effectively with one another in the sense that an order placed by a large investor is primarily absorbed by (a possibly small group of) other large traders. Essentially, this is a market structure of bilateral oligopoly, except that all traders can buy and sell. The seminal papers embedding these features are Kyle (1989) and Vayanos (1999). Rostek and Weretka (2008) develop a dynamic equilibrium model of asset pricing in which all traders

correctly recognize their price impact. Relaxing price taking as an assumption in trader optimization is the sole departure from the competitive framework. The model has a dual game-theoretic and general-equilibrium representation, which allows a direct comparison of the non-competitive, Nash equilibrium with the standard competitive, non-strategic model.
Finally to study such markets, several nonequilibrium models with price impact have been proposed (e.g. Bertsimas and Lo, 1998; Almgren and Chriss, 2000; Subramanian and Jarrow, 2001; Dubil, 2002; Almgren, 2003; Huberman and Stanzl, 2004; Almgren et al., 2005; Engle and Ferstenberg, 2007). These models assume motivated empirically functional forms of price impact functions, one for every trader, which are then used to analyse market dynamics.

## Thin market phenomena

Handling large orders through order break-up is but one difference between thin and competitive markets. Market thinness leads to a number of other empirical phenomena that are hard to reconcile with competitive equilibrium asset pricing models, such as CAPM of C-CAPM.

### Pareto inefficiency

Because of the reduction of buying and selling orders in response to market power, traders do not fully diversify the idiosyncratic risk of their holdings. As a result, allocations are not efficient. This is optimal, since the benefits from diversification need to be balanced against the extra (with respect to the competitive, price-taking, setting) cost of price impact.

### Response to liquidity shocks

A large body of research has emerged to explain price behavior that is broadly interpreted as temporary departures of prices from their fundamental values. Such price behavior is a common reaction of prices to exogenous shocks to supply or demand. Among the shocks examined are forced liquidations, issuance of new debt, selling Initial Public Offerings (IPOs), inclusions of new stocks into S&P 500 and other stock market indices, and index weight changes. A typical price behavior following a shock exhibits a significant price change followed by a partial reversal of the change in subsequent periods. Thus, apart from permanent effect, the price dynamics features a temporary component. The two effects have been documented by numerous studies for various securities (as "permanent and transitory," "long-run and short-run," "slow moving capital," "mispricing" or "asset price overshooting"). Estimation software used in the financial industry routinely distinguishes between "permanent" and "temporary" price-impact effects of trades. Notably, even when the shock is publicly pre-announced, the temporary price drop below the long-run level still occurs and, moreover, takes place on the actual event date and not on the date of the announcement. Price attains the long-run level only in subsequent periods. From a theoretical point of view, the price behavior is striking: Trade announcements and trade-induced price effects are separated in time and anticipated price changes are observed. In the standard competitive model, these features of price behavior are ruled out by no-arbitrage: Presence of price-taking traders who are ready to respond to price differentials at any time ties the equilibrium price to the fundamental value. Rostek and Weretka (2008) show that temporary departures of equilibrium prices from the fundamental values are the equilibrium reaction of thin markets to shocks. Any exogenous demand or supply shock in thin markets has two effects on prices -- *fundamental* and *liquidity effects* -- which differ in their origin, timing of occurrence, persistence and dynamics. The fundamental effect, which is permanent, reflects the change in the average market holdings (aggregate risk) and is present also in markets with price-taking traders. The fundamental effect is amplified by a temporary liquidity effect, which results from traders' price impact. While the permanent effect occurs upon the announcement of the shock, the temporary effect attains its maximum at the moment of trade, irrespective of whether the shock is anticipated. An alternative explanation of overshooting involves predatory trading (Brunnermeier and Pedersen, 2005): When a large trader needs to liquidate a portfolio quickly, other investors sell and subsequently buy back the asset. This strategy lowers the price at which they can obtain the liquidated portfolio.

#### Excess volatility and volatility clustering

One of the consequences of price overshooting in thin markets is excess price volatility. That is, the presence of the price impact leads to excess return volatility and changes in volatility unrelated to changes in fundamentals. Since, in addition, the price impact varies over time, periods of high price impact feature high price volatility, thereby inducing volatility clustering.

#### Limits to arbitrage

Another novel feature of thin markets is the coexistence of anticipated price differentials and limits to arbitrage in equilibrium. According to the competitive theory of asset pricing, whenever there are anticipated price differentials, a trader can make infinite profit by taking unbounded positions. When a market is thin, however, price impact naturally limits the benefits from arbitrage for active traders and also reduces incentives to enter the market. Therefore, unlike in a competitive model, the profits from entering the market are bounded, and even small fixed entry costs may prevent outsiders from arbitraging the price differentials. These entry costs include explicit trading costs, such as transaction costs, but also the cost associated with learning the characteristics of the stocks. Empirically, it may take months for outside capital to bid prices back to their fundamental value (Mitchell, Pedersen and Pulvino, 2007).

#### Asset valuation

In the presence of price impact, the market value of a large block of shares no longer coincides with the cash value that could be obtained by liquidating the portfolio. To account for the difference, valuation specialists often apply a so-called blockage discount. A typical instance where blockage discounts are applied involves the transfer of a property in a case of divorce. It is in the interest of the divorcees to claim a large price impact (and blockage discount) which implies a large tax discount. The practical approach is based on the implementation shortfall (Perold, 1988), which measures the difference between the closing or arrival price and the final execution price.

### Implications for market design

Market thinness has further prompted changes in market design towards automation of the trade execution. To ease competition through the trading cost of price impact, many exchanges have adopted an electronic trading system with posted orders (e.g. Nasdaq, NYSE, Euronext, and the stock exchanges in London, Toronto and Vancouver). In the presence of asymmetric information, market thinness can perversely reduce liquidity under continuous trading. Therefore, several markets have returned to more traditional trading systems.

### See Also

- arbitrage
- countervailing power
- efficient markets hypothesis
- exchange
- liquidity constraints
- Pareto efficiency

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