



The impact of reduced pre-trade transparency regimes on market quality

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ABSTRACT

This paper studies the effects of pre-trade quote transparency on spread, price discovery and liquidity in an artificial limit order market with heterogeneous trading rules. Our agent-based numerical experiments suggest that full quote transparency incurs substantial transaction costs to traders and dampens trading activity in an order-driven market. Our finding reveals that exogenous restriction of displayed depth, up to several best quotes, does not benefit market performance. On the contrary, endogenous restriction of displayed quote depth, by means of iceberg orders, improves market quality in multiple dimensions: it reduces average transaction costs, maintains higher liquidity and moderate volatility, balances the limit order book, and enhances price discovery.

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1. Introduction

As a branch of financial market regulation debates, there is a growing literature on the benefits and pitfalls of reduced market transparency with a special alacrity regarding electronic limit order markets where the mere speed of trading exacerbates any malfunctioning of the system and can potentially undermine the principles of fair trading. This paper investigates the problem of limited market transparency using an artificial double auction setup.

Within the spectrum of markets with reduced transparency, some exchanges display only the depth at a few best quotes in the limit order book, whereas other exchanges endogenize the regulation of transparency by permitting traders to submit iceberg orders that conceal partly or entirely the limit order size, such as the Toronto Stock Exchange, Euronext, the Swiss Stock Exchange, the Madrid Stock Exchange, and the Australian Stock Exchange. Many new trading venues display only partial information about incoming orders and market depth striving to gain a competitive advantage over older existing exchanges, by circumventing the positive order flow externality that those older exchanges exercise. This is particularly the case of dark pools: according to Fidessa datasource (Fidessa, 2012), the cumulative volume transacted on the European dark venues has increased more than tenfold in the past years¹ and continues a stable positive trend. The proliferation of dark

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¹ Figures have grown from around €250 million in November 2008 to almost €3.5 billion in November 2012.

and semi-transparent venues gives rise to a variety of interesting questions: what are the aggregate gains from reduced pre-trade transparency rules, what type of agents take advantage of opacity, and how frequently traders are misled by excessive uncertainty in these markets? Narrowing exogenously the number of displayed quotes potentially mitigates price manipulations. However, in the case of less liquid assets the visible part of the limit order book may prove insufficient to form accurate expectations and become misleading in this respect. On the other hand, iceberg orders are designed primarily for large institutions that employ block trading and thereby require delicate cost and exposure management.

In order to understand the regulators' dilemma in prescribing or banning the use of iceberg orders, consider a following example. Up until the formal introduction of iceberg orders in public limit order markets, brokers established their own automated order processing systems that divided particularly large orders received from the customers into several smaller tranches and then routed these tranches to the market in succession. This strategy permitted us to sell the whole amount of stocks preserving the price. However, this strategy, without being explicitly communicated to the exchange, would not eliminate the risk of being traded through. Indeed, suppose that the market is trading at £ 23–25 and a seller has an order with a broker for 10,000 shares at £25. If an aggressive buyer arrived to purchase 2500 stocks at the market, he would fill 1000 at £25 and buy the rest from the next seller, for example, at £26. As a result both parties would have missed the opportunity of better trade terms: the large seller would have suffered from longer total execution time or only partial execution, and the buyer would have bought at a higher price being unaware of a better price offer. In response to the inefficiency of this large order transmission routine iceberg orders appeared as an innovation that enabled brokers to hold a full customer order in the public order book while displaying only a small fraction of it. In the above scenario with an aggressive buyer all 2500 shares would be purchased at £25, benefiting the buyer by achieving a better price, and the seller by faster execution, and thus increase overall market liquidity.

Beneficial as iceberg orders seem, they entail a certain trade-off: hidden liquidity affects the ability of traders to evaluate the true market conditions, deeming the collective benefits of opacity obscure. As from the individuals perspective, there are three types of risks incumbent for iceberg orders: execution risk, pick-off risk and front running risk. Execution risk, that is the risk an order of a given size and price not to get filled in a specified time period, is amplified for iceberg orders, since each renewal of the peak loses time priority. To compete for liquidity traders should increase the visible part of an iceberg order, thereby attracting impatient traders that monitor the market and facilitating quicker execution. At the same time, with new information arriving to the market, such as change in the fundamental asset value, passive orders recorded in the book may become mispriced and can be quickly "picked off" by incoming market orders. Minimizing the visible part of the iceberg, therefore, protects traders from winner's curse trap. Lastly, displaying an order in the book gives a signal about trader's private information and can result in undercutting. Traders can reduce their exposure impact and discourage such front-running by hiding the full order size and minimizing the visible part. In designing their strategy, traders must balance these risks and find the optimal trade-off.

Our paper contributes to the research on pre-trade market transparency by exploring how it affects the bid-ask spread, price efficiency and market liquidity. In an artificial double auction market, where agents use the information about volumes in the limit order book to formulate their trading strategies, we compare four market types: a quasi-transparent market structure, whereby the exchange explicitly regulates the number of publicly displayed quotes, an opaque market structure, where the amount of displayed volume is determined by the proportion of iceberg orders, and two extreme cases – a dark market and a perfectly transparent market.

Empirical studies, for instance, [Aitken et al. \(2001\)](#), [Anand and Weaver \(2004\)](#), [Boehmer et al. \(2005\)](#), [Henderhott and Jones \(2005\)](#), and [Bloomfield and O'Hara \(1999\)](#), as well as theoretical works of [Bessembinder \(2005\)](#) and [Moinas \(2010\)](#) explore the subject of market opacity and its influence on market quality, while a number of papers investigate empirically the determinants of the decision to hide order size ([Anand and Weaver, 2004](#); [DeWinne and D'Hondt, 2007](#); [Frey and Sandås, 2009](#); [Bessembinder et al., 2009](#)) and evaluate analytically the effects of hidden orders on traders' welfare ([Buti and Rindi, 2013](#)). Despite availability of data, there is no consensus in the literature on the role of imperfect transparency: in certain markets reduced transparency widens the spread and deteriorates efficiency ([Flood et al., 1999](#); [Henderhott and Jones, 2005](#)), other research reports partially or exactly opposite outcomes ([Bloomfield and O'Hara, 1999](#); [Madhavan et al., 2005](#)) or no significant impact ([Anand and Weaver, 2004](#)). [Pardo and Pascual \(2012\)](#) examine stocks traded on the Madrid Stock Exchange, documenting that spreads do not widen and depth does not shrink after hidden order executions. A recent comparative study of an introduction, ban (in 1996) and subsequent reinstatement (in 2002) of hidden orders on the Toronto Stock Exchange conducted by [Anand and Weaver \(2004\)](#) does not detect any discernible changes in the spread width. [Bloomfield and O'Hara \(1999\)](#) use laboratory experiment to determine the effects of trade and quote disclosure on market efficiency, bid-ask spreads, and trader welfare, and find that trades disclosure significantly improves the informational efficiency of the markets but causes opening spreads to widen dramatically. In contrast, quote disclosure appears to have no effect on opening spreads. [Madhavan et al. \(2005\)](#) examine the April 1990 decision by the Toronto Stock Exchange to provide the top five prices on either side rather than just the top of the book and find a wider spreads post-event. In contrast [Boehmer et al. \(2005\)](#) study the 2002 introduction of OpenBook, a real-time NYSE limit order book data feed, and find lower trading costs and more aggressive limit order submission as a result of the increase in quote transparency. Similarly [Henderhott and Jones \(2005\)](#) showed that when Island went dark in 2002, the exchange-traded funds market worsens in terms of price discovery and trading costs, as a consequence of an altered competition for order flows from other trading venues with the provision of liquidity becoming less competitive on Island. Finally [Flood et al. \(1999\)](#) compare the effects of price disclosure on market performance in an experimental multiple-dealer market with professional market makers who

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