



An empirical study on pre-trade transparency and intraday stealth trading[☆]



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ABSTRACT

The aim of this research is to determine whether investors utilize stealth trading strategies to shield information with greater pre-trade transparency on the Taiwan stock market. Because the disclosure of trading information has increased, investors can now observe the trading decisions of other people clearly, potentially leading them to follow the shrewd traders (Lin, 2009). For these reasons, the shrewd traders could try to conceal their real motives to avoid information leaks. The main contribution of this research lies in extending the stealth trading strategies suggested by Barclay and Warner (1993) and Blau, Van Ness, and Van Ness (2009) to cover the influence of pre-trade transparency and to consider how shrewd traders can utilize the selection of both the trade size and the time interval to conceal themselves in the more transparent market. The empirical results show that with greater transparency, the weighted price contributions (WPC) of the larger trades decrease while those of smaller trades increase significantly. According to the order placement pattern and the distribution of order quantity for each type of order size differs for institutional and individual investors, I infer that the price changes for the median-low trades could be attributed to the order splitting strategies of institutions, while the cause of the increasing price changes for small trades could be that individuals are undertaking trades more confidently as the observed information is added. Additionally, the intraday patterns of the price changes for the larger trades display a U pattern, while those for the smaller trades are an inverse-U pattern, particularly in the more transparent market.

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1. Introduction

The recent trend in exchanges around the world has been to increase the pre-trade transparency of the limit order books (LOB). Most of the related literature focused on the effect of transparency on market performance and do not have concordant opinions (e.g., Boehmer, Saar, & Yu, 2005; Madhavan, Porter, & Weaver, 2005). Few studies have examined the impact of transparency on the investor order placement strategies except for Boehmer et al. (2005) and Ma, Lin, and Chen (2008), who have discussed order aggressiveness and cancellations, respectively. However, the market reveals a hide-and-seek phenomenon with enhanced information disclosure. When the disclosure of trading information is increased, the investors can observe the trading decisions of other people more clearly such that they can form a strategy to follow the shrewd traders (Lin, 2009). For these reasons, the shrewd traders could attempt to conceal their real motive to avoid information leaks. The interesting question is whether the investors who have more information will choose different stealth strategies when there are different market states during different time intervals, thereby changing the intraday pattern of price volatility. This research contributes to the literature by considering how the shrewd traders can utilize the selection of both trade size and time interval to conceal them in a market

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with enhanced transparency. The order flow disclosure in the Taiwan Stock Exchange has substantially increased since January 2003, providing a unique opportunity to empirically explore this issue.

The related literature includes research on market transparency and stealth trading. First, considering market transparency, most studies primarily focused on the relationship between information and the security's price, that is, how does market transparency influence each aspect of market quality, for instance, the liquidity, the transaction cost and the process of price discovery? In fact, the theoretical and empirical studies on the impact of transparency are inconclusive. In terms of the theoretical studies, [Madhavan \(1996\)](#) demonstrated that market transparency can increase the price volatility and reduce the market liquidity in a thin market. [Pagno and Röell \(1996\)](#) compared the price formation process in several stylized trading systems with different degrees of transparency and found that, overall, greater transparency generates lower trading costs for uninformed traders, although not necessarily for all trade sizes. Using an experimental approach, [Bloomfield and O' Hara \(2000\)](#) examined whether transparency accelerates price discovery. However, [Flood, Huisman, Koedijk, and Mahieu \(1999\)](#) found that increased pre-trade transparency slows the price discovery in a multi-dealer market.

Regarding the empirical findings, [Friedman \(1993\)](#) demonstrated that displaying the entire book (as opposed to only the best bid and offer) reduces the market bid/ask spread but does not significantly vary the price information efficiency. [Gerke, Arneht, Bosch, and Syha \(1997\)](#) found lower volatility in the transparent setting but no difference in the spreads. Furthermore, [Madhavan et al. \(2005\)](#) studied the effect of an increase in the pre-trade transparency for the Toronto Stock Exchange and found that with increasing transparency, volatility and execution costs increase while liquidity decreases.¹ [Boehmer et al. \(2005\)](#) studied the impact of increased order book transparency in the NYSE and obtained results contrary to those obtained for the Canadian market, finding that greater order flow transparency leads to increased liquidity and reduced trade execution costs.² Moreover, [Dong, Han, & Li, 2006](#) examined the effects of improved transparency in China's A share markets and found that the market quality is improved, demonstrated by lower volatility, higher market liquidity and improved informative efficiency. [Chung and Chuwonganant \(2009\)](#) also found that SuperMontage improved the market and execution quality on NASDAQ through greater pre-trade transparency and the integrated, more efficient quotation and trading system. [Eom, Ok, and Park \(2007\)](#) found that the market quality of the Korea Exchange (KRX) is increasing and concave in pre-trade transparency, with significantly diminishing returns above a certain point. Further, [Kuo \(2006\)](#) explored the effect of pre-trade transparency on information asymmetry in Taiwan stock market, and found that overall no significant impact on information asymmetry with greater transparency. [Chiu \(2010\)](#) examined the impact of increasing transparency on bid-ask spreads, market depth, and price efficiency in Hong Kong stock market, and suggested the asymmetric information component of spread may increase significantly following the open limit book of pre-opening trading session. However, [Bontempi and Lucarelli \(2012\)](#) analyzed pre-trade transparency in the Italian Stock Exchange and showed that increased transparency affects the dynamic trade pattern emerging from interacting strategic decisions of different traders. Overall, pre-trade transparency enhancement should reduce the informative disequilibrium among market participants and improve the quality of the market. Additionally, [Ma et al. \(2008\)](#) utilized the data of Taiwan stock market to indicate that greater pre-trade transparency intensifies aggressiveness in order placement, reduces extreme order placement by individual investors, and also changes trader order sizes. On the other hand, greater transparency increases volatility, but not liquidity and efficiency. This study also shows that the impact of transparency on market performance and the changes in order placement strategies are simultaneously determined. [Lin, Ma, and Chen \(2011\)](#) continued to analyze the influence of transparency on information content of the limit order book, and its effect on order placement strategies. They found that the best quotes of unexecuted orders for individual traders always contain more information than the average quotes from steps 2 to 5, whereas this does not apply for institutional investors.

Summing up the research as stated, with the exception of those of [Boehmer et al. \(2005\)](#), [Ma et al. \(2008\)](#) and [Lin et al. \(2011\)](#), the above studies on transparency focused primarily on market performance but did not explore the influence of transparency on the investor order placement strategies. Even [Boehmer et al. \(2005\)](#), [Ma et al. \(2008\)](#) and [Lin et al. \(2011\)](#) only stressed the cancelation rate, the order size, the order aggressiveness and the information content of limit order books and did not clarify whether the stealth trading strategy exists in a more transparent market.

Second, in stealth trading, the theoretical models of [Kyle \(1985\)](#) and [Admati and Pfleiderer \(1988\)](#) create the framework for the stealth trading hypothesis. [Kyle \(1985\)](#) argued that the profit-maximizing insider makes positive profits by exploiting his monopoly power optimally in a dynamic context where noise trading provides camouflage to conceal his trading from the market makers. Based on the consideration of a monopolist with no competition, the monopolistic informed trader causes his information to be incorporated into the price gradually. [Admati and Pfleiderer \(1988\)](#) revised [Kyle's \(1985\)](#) assumption of exogenous liquidity demands. They argued that informed and uninformed traders are inclined to engage in large trades when the market is thick because the liquidity traders can reduce the monopolistic power of the informed traders and then attract the informed traders into the market where they can conceal themselves.

Additional scholars (e.g., [Holden & Subrahmanyam, 1992](#); [Foster & Viswanathan, 1994](#); [Foster & Viswanathan, 1996](#); [Back, Cao, & Willard, 2000](#)) later continued adding even more assumptions regarding the realistic market, for example, considering multi-period, multi-informed traders and the information correlation among the informed traders. [Holden and Subrahmanyam \(1992\)](#) developed a multi-period auction model in which multiple privately informed agents strategically exploit their long-lived information. They showed that these traders compete aggressively and cause most of their common private information to be

¹ On April 12, 1990, the Toronto Stock Exchange (TSE) provided real-time public dissemination of the best bid and offer and associated depth (bid and ask size) as well as the depth and limit order prices for up to four levels away from the inside market in both directions.

² On January 24, 2002, the NYSE enabled traders off the exchange floor to observe depth in the limit order book in real time.

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