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Informed trading and the price impact of block trades: A high frequency trading analysis[☆]

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ABSTRACT

Using high frequency data from the London Stock Exchange (LSE), we investigate the relationship between informed trading and the price impact of block trades on intraday and inter-day basis. Price impact of block trades is stronger during the first hour of trading; this is consistent with the hypothesis that information accumulates overnight during non-trading hours. Furthermore, private information is gradually incorporated into prices despite heightened trading frequency. Evidence suggests that informed traders exploit superior information across trading days, and stocks with lower transparency exhibit stronger information diffusion effects when traded in blocks, thus informed block trading facilitates price discovery.

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1. Introduction

The role played by information in the price discovery process is well documented. Early informed trading studies suggest that informed traders prefer using large trades in order to minimise transaction costs and to maximise the profit gained from their informed trading activities. This is because they face competition from other informed traders and their private information could be short-lived (Easley & O'hara, 1987; Karpoff, 1987). In contrast with this paper, most existing studies on how private information is incorporated into stock prices through block trades focus mainly on trading evolution around corporate events in order to control for private information. This is because evidence suggests that corporate events can stimulate the pre-announcement drive for acquiring private information (Daley, Hughes, & Rayburn, 1995). Permanent price impact measures are usually employed as proxies for

the informativeness of block trades, since they reflect observable price adjustment for information.

Despite the large volume of existing literature on informed trading, there are several unresolved questions about how and when informed traders choose to employ private information. For example, a stream of literature which includes Kyle (1985), Holden and Subrahmanyam (1992), Foster and Viswanathan (1994) and Hong and Stein (1999), argues that informed traders would employ their private information gradually rather than quickly. However, Easley and O'Hara (1987) and Karpoff (1987) differ, suggesting that informed traders are more likely to aggressively trade with their private information rather than gradually exploit it. Also, Barclay and Warner (1993) and Chakravarty (2001) argue that informed traders are more likely to exploit their information using medium-sized trades, while Blau, Van Ness, and Van Ness (2009) hold that informed traders do indeed still prefer block trades for informed trading.

This paper contributes to the literature on the informativeness of block trades by testing the competing information diffusion hypotheses stated above. Our contributions are three-fold: firstly, the models employed in this paper present new empirical evidence on the diffusion process of private information in a high frequency trading environment. Instead of focusing trades around short term corporate events and insider trading sample, we expand observations of block trades to

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normal trading periods. This is because informed trading activities occur not only around corporate events but also across regular trading hours.

Secondly, we find intraday and inter-day patterns within this information diffusion process. The results suggest that the impounding of information into stock prices is stronger in the first trading hour than at other time periods during the normal trading day. Further, informed trading at day $t-1$ could still affect informed traders' block transaction at day t . These results support the theoretical frameworks of Kyle (1985), Holden and Subrahmanyam (1992), Foster and Viswanathan (1994) and Hong and Stein (1999) that suggest that private information is gradually impounded into instrument prices because informed traders slowly exploit the private information across trading days. The results, however, run contrary to the expectation that informed traders quickly take advantage of their private information by trading quickly and aggressively, as suggested by Easley and O'Hara (1987) and Karpoff (1987). It is interesting that high frequency data from an era that is characterised by short-termism in trading terms could validate theoretical propositions (such as that of Kyle, 1985) from an era in which buy and hold strategies were more orthodox.

Thirdly, since the probability of the occurrence of an informed trade (PIN) also reflects the level of firms' financial transparency (Vega, 2006), we stratify our sample stocks into four portfolios according to the mean value of their daily PINs, and show that the information incorporation process can vary across stocks with different levels of financial transparency. The results imply that the larger the levels of informed trading in a stock, the higher the permanent price impact of block trades. There are several implications of this, including that informed trading aids the price discovery process for less transparent stocks.

Permanent price impact reflects the *lasting* price changes in a stock as a result of a trade; this implies that such trade contains information. Hasbrouck (1991a,b) utilises the vector autoregression (VAR) model to examine the informativeness of trades leading to permanent price impact. Seppi (1992) finds that the permanent price impacts of block trades prior to earnings announcements correlate with quarter earnings surprise. Daley et al. (1995) focus on block trades around the earning announcement periods. They suggest that the permanent price impact of block trades during the five days prior to the earning announcement is larger than during the post-earning announcement period of the same duration. However, Barclay and Warner's (1993) stealth trading hypothesis indicates that, in order to hide information, informed trades are concentrated on the medium size transactions during the pre-tender offer announcement period. Using audit trail data for a sample of NYSE firms, Chakravarty (2001) finds that institutional traders are more informed, and medium-sized institutional trades are the drivers in the movement of prices, thus supporting Barclay and Warner's (1993) findings on the informativeness of medium sized trades.

Other studies such as Huang and Masulis (2003) and Alexander and Peterson (2007) also offer evidence on order-splitting strategies from informed traders. Blau et al. (2009) provide a comprehensive explanation of the association between informed trades and block trades. Their results show that informed traders still prefer block trades during the periods of high trading activities because a deep market can provide natural camouflage to hide information. Yang (2009) suggests that informed traders focus on medium sized trades from six to ten days prior to the quarterly earnings announcements. However, informed traders aggressively increase their order size five days before the announcement. Frino and Romano (2010) employ a theoretical model to show that market conditions could determine the size of informed trades. They suggest that information effect plays a role in *weak* bull and bear markets rather than *strong* bull and bear markets. Informed traders are likely to trade large orders when informational profit outweighs the transaction cost in weak bull and bear markets. Saar (2001) suggests that portfolio managers search for block trades based on favourable private information, and rebalance portfolios by selling stocks that have less favourable prospects. Using permanent price impact as an adjustment to private information around corporate events,

this research implies that block trade is a powerful indicator for information asymmetry. If a stock is traded based on liquidity reasons rather than information motives, then the price impact of block trade should be relatively small. Hence, the more informative trading is, the bigger its permanent price impact should be (Aktas, De Bodt, Declerck, & Van Oppens, 2007).

Besides examining trades around corporate events, researchers also investigate the impact of informed trades by looking into insider trading activities. John and Lang (1991) find evidence of signalling theory of dividends by looking at how the information content of dividends may be 'nuanced' by inside trading prior to the dividend announcement. Their results reveal that for firms with good growth expectations, the market reacts positively to dividend initiations even when insiders are net sellers. Meulbroek (1992) illustrates that price responds rapidly to illegal insider trading. Lin and Rozeff (1995) examine the speed of price adjustment to private information and find that more than 85% of private information is absorbed within one day. Lakonishok and Lee (2001) examine net purchases and sales from insider trading activities, and their results show statistically significant but economically insignificant market movement around the insider trading activities.

Most informed trading studies mainly focus on the periods around corporate events and insider trading activities, which account for a very small fraction of stocks' normal trading hours. This paper is motivated by the need to examine the evolution and impact of informed trading throughout normal trading hours. We also investigate the characterisations of the information diffusion process by testing intraday effects, long-lived information and firms' various levels of financial transparency. Our empirical models are based on the assumption that informed traders prefer to execute block trades. Kyle (1985) and Hong and Stein (1999) explain the gradual information diffusion process using theoretical equilibrium frameworks. These findings are supported by Hong, Lim, and Stein's (2000) analysis, in which analyst coverage is used to proxy firm-specific information flow. Hong et al. (2000) provide some empirical evidence that stock momentum reflects the gradual diffusion of firm specific information. However, Vega (2006) argues that the analyst coverage is not a good proxy for information flow across traders.

This paper employs probability of information-based trading (PIN) to proxy the proportion of the unobservable informed trades across normal trading hours. PIN has been elaborated in previous work (see for example Easley, Kiefer, & O'hara, 1996, 1997a; Easley, Kiefer, O'hara, & Paperman, 1996). Easley, Hvidkjaer, and O'hara (2002) find that a difference of 10% in PIN between two stocks leads to a difference in the excessive returns of 2.5% per annum. This implies that uninformed investors demand a premium to hold stocks with higher information risk. PIN has been extensively used to capture information asymmetry. Easley, Hvidkjaer, and O'hara (2010) use the returns of high and low-PIN portfolios to construct a risk factor which explains portfolio returns. Vega (2006) constructs PIN to test market efficiency, suggesting that the more information investors have about the true value of an asset, the smaller the abnormal return drift. Chung, Li, and Mcinish (2005), using a sample of NYSE stocks, examine the relationship between price impacts of all trades, serial correlation in trade direction, and PIN. They find that there is a positive relationship between PIN and permanent price impacts of all trades, and stocks with higher PIN exhibit higher correlations in the trade direction. Their result is consistent with information hypothesis that strategic trading of informed trades results in serially correlated trades. Based on three months-worth of NYSE and NASDAQ transactions data, Lee and Chung (2009) find a negative relationship between price improvement in NYSE stocks and PIN. This suggests that liquidity providers on the NYSE offer greater price improvements for stocks with a lower PIN. However, Lai, Ng, and Zhang (2014) deconstruct PIN into risk and liquidity components and they find that only the liquidity component is priced. Lai et al. (2014) also construct stock-level PINs over a 15-year period in 47 stock markets worldwide. Their results show the variations of PIN between emerging

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