Competition in the stock market with asymmetric information

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ABSTRACT

We build a game theoretical model to examine how the level of information advantage of insiders and the competition between insiders and sophisticated investors affect stock price movements and traders' trading strategies and profits. We show that the competition between insiders and sophisticated investors can reduce the losses of less sophisticated investors, and thus alleviates the disadvantaged position of the less sophisticated investors. Further, traders' profits are affected by the accuracy of insiders' private information, and the number of days that insiders have obtained the information in advance. These findings show the importance of information transparency and the role of sophisticated investors in limiting insiders' trading advantages and mitigating the expropriation of investors by insiders.

1. Introduction

It has been widely acknowledged that investors are asymmetrically informed. A large body of research has examined the possibility of insiders' making profits by trading on private information in the stock market. The strong form of the efficient market hypothesis (Fama, 1970) characterizes a market where public and private information are fully reflected in prices, and no individual can earn higher expected trading profits than others. Although most of countries have enacted laws and rules deterring insiders from trading with private information (Bhattacharya and Daouk, 2002), prior studies report that insiders can circumvent such regulations by trading strategically (e.g., Noe, 1999; Ke et al., 2003; Jagolinzer, 2009), and earn profits by trading on inside information (e.g., Jaffe, 1974; Finnerty, 1976; Leland, 1992; Noe, 1999; Fried, 2000; Jagolinzer, 2009; Louis et al., 2010; Narayan et al., 2014; Westerlund and Narayan, 2015). Such findings are inconsistent with the strong form of the efficient market hypothesis.

The effect of insider trading on asset pricing has been widely debated in the literature. Critics of insider trading have made a wide array of arguments against insider trading. It is argued that allowing insiders to trade creates a perverse incentive for managers to make investment in risky projects to increase their trading profits at the expense of firm value (Carlton and Fischel, 1983). If uninformed traders know they are uninformed and believe that they would be better off not trading (Carlton and Fischel, 1983), insider trading can

give rise to adverse selection problem and thus reduce market liquidity. Insider trading may also make current stock prices more volatile, which will hurt liquidity traders (Leland, 1992; Wang, 1993). In contrast, proponents of insider trading argue that, in a world of costly monitoring and imperfect information, insider trading provides a way of communicating information to outsiders that allows new private information to be revealed and priced rapidly and thus contributes to market efficiency (Carlton and Fischel, 1983; Holden and Subrahmanyam, 1992; Aktas et al., 2008; Chau and Vayanos, 2008; Hsu and Lee, 2014). Despite continued debate on the effects of insider trading on asset pricing and market efficiency, it has been acknowledged that the potential contribution of insiders' trades to price discovery and market efficiency depends on the ability of other traders to identify insider trading (Carlton and Fischel, 1983), and that insiders' trading profits are achieved at the expense of outside investors (Leland, 1992).

In this paper, we analyze the effects of asymmetric information on insider trading through a new direction. We develop a model in which the following three roles have asymmetric information about the market: an insider, an information follower, and a price-sensitive trader. Specifically, this study explores the trading strategies used by each of these three roles, how the stock price moves after the insider obtains information about future news events, and how the competition between the insider and the information follower affects traders' trading strategies and profits. Unlike previous research, in our model,

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the insider has some inside information about a future event, but he/she is not necessarily certain that the event will occur, the information follower analyzes the actions of the insider to decide his/her trading strategies, and the price-sensitive trader follows a trading strategy in which he/she buys when prices decline and sells when prices increase.

The three roles in the model commonly exist in the real world. The empirical literature and insider trading laws and regulations generally define the management or large shareholders of listed companies as insiders (e.g., Chaney and Lewis, 1995). Sophisticated investors such as institutional investors reflect the information follower role in the model; they have the incentive and ability to collect firm-specific information and analyze insiders' trading activities (Ajinkya et al., 2005). The price-sensitive trader reflects a less sophisticated type of investor (e.g., common small investors and some nonprofit institutions) that does not have the expertise or incentives to collect and analyze information to make investment decisions, and tends to buy when prices decline and sell when prices increase. This trading strategy of buying losers and selling winners adopted by less sophisticated investors has been well documented by empirical and experimental studies on both developed and less developed markets (e.g., Shefrin and Statman, 1985; Weber and Camerer, 1998; Odean, 1999; Grinblatt and Keloharju, 2000, 2001; Oehler et al., 2003; Ng and Wu, 2007).

This paper contributes to the literature in a number of ways. First, it extends the literature on insider trading by linking insider trading profits to levels of information asymmetry and information environment in the market. Our study relates to, but is different from, prior studies that build models to analyze insiders' trading strategies and profits under information asymmetry. In a seminal article, Kyle (1985) builds a dynamic model of insider trading with sequential auctions, and shows that insiders make profits from inside information. In Kyle's model, only the monopolistic insider knows the *ex post* liquidation value of the risky asset while noise traders trade randomly, and market makers set prices efficiently. Subsequent studies introduce multiple insiders into Kyle's model to examine competition between insiders and market efficiency, and show that competing insiders generally reveal their information faster than monopolists, and that competition among insiders reduces the profitability of their trades (e.g., Holden and Subrahmanyam, 1992; Foster and Viswanathan, 1996; Back et al., 2000). Some recent studies also incorporate public disclosure into their models. Baiman and Verrecchia (1996) show that the expected profits of insider trading decrease as financial disclosure becomes more precise. Huddart et al. (2001) and Liu and Zhang (2011) find that the public disclosure of insider trading accelerates the price discovery process, increases market efficiency and lowers insider profits, while Grégoire and Huang (2012) present a trading game and show that under certain circumstances, insiders may benefit from publicly disclosing information to the market. Gong and Liu (2012) show that the public disclosure of insiders' trades and competition among insiders lead to accelerated price discovery and higher market depths.

However, the models proposed by prior studies do not fully capture the characteristics of inside information and the information environment. In real world financial markets, the level of information asymmetry between insiders and outsiders is likely to vary depending on insiders' information advantages in specific circumstances such as the nature of the news, the level of the insiders' privileged access to the private information, and the characteristics of the firms. For example, managers' inside information about earnings to be announced in their firms' financial reports is likely to be more accurate than their inside information about potential merger deals, as the latter is likely to be affected by factors beyond the managers' control such as the other parties' bargaining power and market conditions. Similarly, previous studies (e.g., Seyhun, 1986; Lakonishok and Lee, 2001) show that insiders have better information advantages in small firms than in large firms. Further, some insiders such as the chairperson of a board of directors are more knowledgeable with the overall affairs of a firm, and thus have a greater predictive ability of future stock price movements

(e.g., Seyhun, 1986). Additionally, if aware of information asymmetry, some uninformed traders may gather information to reduce their information disadvantage (Admati and Pfleiderer, 1988; Barth et al., 2001). Conversely, other uninformed traders may not have the expertise, or incentives to collect and analyze information to make investment decisions. Thus, it is reasonable to expect that information asymmetry varies among uninformed traders.

The novelty of the model proposed in this study is that it seeks to capture the level of information advantage of insiders by using the level of accuracy of the inside information and the length of the timing advantage of the inside information. In addition, it accounts for varying levels of investor sophistication among outsiders by distinguishing between more sophisticated investors (the information follower in our model) and less sophisticated investors (the price-sensitive trader in our model). The model allows us to better approximate information asymmetry problems in real world financial markets, and to provide insight into how varying levels of insiders' information advantages and competition between insiders and sophisticated investors determine traders' trading profits and stock price movements.

The second contribution of the paper is that it adds to the literature on stock price movements by reconciling the conflicting evidence on the effects that news events have on stock price movements. Some studies (e.g., Cutler et al., 1989; Mitchell and Mulherin, 1994) find that news events play a minor role in stock price movements; however, other studies show that price jumps are related to unexpected extreme news (Asgharian et al., 2011), or associated with pre-scheduled earnings announcements and other company-specific news events (Lee and Mykland, 2008). Our model reconciles this conflict by showing that price jumps are related not only to the effects of news events, but also to the accuracy of insiders' private information.

The findings of this study also have practical and policy implications that will be of interest to policy makers and market participants concerned with insiders' strategic trades and interested in limiting insiders' trading advantages. Previous studies (e.g., Leland, 1992) show that insider trading profits are earned at the expense of outside investors. However, our model shows that competition between the insider and the information follower can alleviate the disadvantaged position of the price-sensitive trader. The findings emphasize the important role of sophisticated investors in limiting the ability of insiders to earn profits using private information and mitigating the expropriation of outsiders by insiders. These findings are consistent with the findings of Frankel and Li (2004), who find that increased analyst following is associated with the reduced profitability of insider trades.

The remainder of the paper is organized as follows. Section 2 discusses the assumptions of the proposed model. Section 3 analyzes the strategies of the insider and the information follower and how stock price moves. Next, a Monte Carlo simulation is designed to understand the premiums of different roles and stock price movements. The last section concludes the paper.

2. Assumptions

The model assumes that there is only one stock and three roles in the stock market: (i) an insider; (ii) an information follower; and (iii) a price-sensitive trader.

2.1. Assumption 1: economic state

In our model, we define a variable that only reflects news events that have occurred. We call this new variable 'economic state' or e. We assume that:

(1) the economic state can only be changed by the occurrence of a news event;
(2) each role in the stock market cannot precisely know the previous