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A logit model of retail investors' individual trading decisions and their relations to insider trades

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ABSTRACT

Among the various external information sources that influence individual investors' trading decisions, no research has considered the important influence of insiders' transactions. Retail investors might copy the behavior demonstrated by insiders' trading; therefore, this study establishes an approach to estimate the buying probability for a certain stock by a certain investor at a certain point in time and analyzes whether insider trade reports influence this probability. Using a sample of more than 270,000 retail trades in Germany between 2008 and 2009, along with more than 3000 insider trades in the same period, we find evidence of copying of insiders' trades by retail investors. The basic mimicry hypothesis holds, even when we consider an information event hypothesis and an insider attention effect hypothesis as alternative explanations. A robustness test also supports the findings.

1. Introduction

Information search by retail investors constitutes an important element of their investment decision process (Sirnes, 2011). Private investors' decisions are influenced by, for example, public news (Darrat, Zhong, & Cheng, 2007), information about firms' corporate governance (Giannetti & Simonov, 2006), terrorism (Drakos, 2010), or even television analysts' views (Busse & Green, 2002). Another potential information source is insiders' trading decisions.

Research on insider investment behavior is well developed, yet its influence on individual retail investors' decisions had not been examined. For example, transactions by corporate managers (i.e., insider investors) receive considerable interest from public media, the financial press (e.g., the U.S. *The Wall Street Journal*, the German *Handelsblatt*; Ma, Sun, & Tang, 2009), as well as academic research. Thus insider transactions are readily available to retail investors at low cost. Conventional wisdom suggests that insider investors have better information about their companies, or at least can better interpret information widely available to the public.

This perception is justified by empirical research that shows that insiders trade profitably (e.g., Jeng, Metrick, & Zeckhauser, 2003; Lakonishok & Lee, 2001; Seyhun, 1986 in the United States; Stotz, 2006 in Germany). Two factors likely support such abnormal returns. First, insiders have superior knowledge about the future cash flows of the company (Jiang & Zaman, 2010; Ke, Huddart, & Petroni, 2003). Second, insiders may exploit outsiders' biased views of a company's intrinsic value, so they invest as if they were contrarian investors (e.g., Lakonishok & Lee, 2001; Piotroski & Roulstone, 2005). Debate continues about whether outside investors can profit from copying insider transactions though. Net of transaction costs, Seyhun (1986) and Rozeff and Zaman (1998) show that outsiders do not earn abnormal returns, whereas Bettis, Vickrey, and Vickrey (1997) present contrasting evidence.

However, the very question of whether individual retail investors actually follow insider trades is rarely addressed. To analyze whether an individual retail investor copies the behavior of insider traders, we have developed an analytical approach that estimates the buying probability for a certain stock *j*, bought by an individual investor *i* at time *t*. For this estimation, we include various determinants of buying probability, such as stock and investor characteristics; then, beyond those influences, we determine whether reports of an insider trade also influence this buying probability. We accordingly offer a mimicry hypothesis: Retail investors tend to copy the trades of corporate insiders.

Our empirical results, based on a German sample of more than 270,000 retail trades between 2008 and 2009 and more than 3000 insider trades in the same period, provide strong evidence in support of the hypothesis that retail investors follow insider investors. With a logit regression analysis, we find that the likelihood of buying a stock also bought by insiders increases from about 60% to 70% on the day the trade is reported. If an insider sells a stock, buying probability decreases to 55% or less.

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These results remain stable even when we consider stock preferences, such as value/growth and investor characteristics such as age. Moreover, the mimicry explanation of retail investors' behavior is more effective than two alternative explanations that predict either that insiders' trading and retail investors' decisions correlate due to an underlying information event (information event hypothesis) or that insider trades are proxies for stock attention (Barber & Odean, 2008). We show empirically that the mimicry hypothesis holds even when we take these alternative explanations into account.

Therefore, in Section 2, we describe our theoretical considerations regarding the main hypothesis, as well as the alternative explanations. In Section 3, we describe the data set, and then we present the empirical results of our study in Section 4. Section 5 concludes.

2. A model of individual investors' buying probability

2.1. General approach

A direct test of the mimicry hypothesis requires a data set that includes stock trades by individual investors and their motivation for making each trade. Although data sets of individual stock trades are available and often analyzed, the reason for each trade is usually unknown. Therefore, we develop an indirect test, in which we estimate a buying probability (i.e., whether a particular stock is bought by a specific investor), then analyze whether an insider trade changes this buying probability for the focal retail investor. If the mimicry hypothesis holds, buying probability should increase for stocks that insiders also buy and decrease for stocks that the insiders sell. Alternatively, we might aggregate all individual trades in insider stocks and then observe how the aggregate buy–sell ratios of insider buy stocks and insider sell stocks differ (see, e.g., Stotz, 2011). However, this latter approach makes it difficult to control for stock characteristics and investor characteristics simultaneously. We suspect that a consideration of both characteristics will be critical for analyzing trades by individual investors. Therefore, we use a logit regression approach to estimate the buying probability for stock j by a retail investor i at time t:

$$TRADE_{ijt} = LOGIT\left(\begin{array}{l}\alpha + \beta_1 \cdot D\_BUY_{jt} + \beta_2 \cdot D\_SELL_{jt} \\ \quad +\beta_3 \cdot FALPHA_{jt} \cdot D\_BUY_{jt} + \beta_4 \cdot FALPHA_{jt} \cdot D\_SELL_{jt} \\ \quad +\beta_5 \cdot controls + \varepsilon_{ijt}\end{array}\right), \tag{1}$$

where $TRADE_{ijt}$ is a dummy variable that equals 1 if a trade by retail investor i in stock j on day t is a buy transaction and 0 if it is a sell transaction; *D_BUY* is a dummy variable that equals 1 if an insider's purchase of stock j is announced on day t (or the announced aggregate insider trading volume in stock j is positive, if we assess multiple insider trades) and 0 otherwise; and *D_SELL* is a dummy variable that equals 1 if an insider's sale of stock j is announced on day t and 0 otherwise. Furthermore, a positive (negative) coefficient for β_1 (β_2) increases (decreases) buying likelihood, compatible with mimicry hypothesis. We also add *FALPHA* · *D_BUY* and *FALPHA* · *D_SELL* to the regression to determine whether the future performance of an insider stock relates to buying probability. Thus, we can check whether retail investors are successful when they copy insider trades. For this determination, *FALPHA* is the future alpha from the four-factor Carhart (1997) model (see Appendix A for a detailed definition). The buying likelihood of a retail investor also may depend on other factors, which we discuss subsequently. If these factors correlate with insiders' decision to trade, the coefficients of β_1 and β_2 could be biased. Therefore, we must add control variables to logit model (1) to capture factors that influence buying probabilities. We consider two sets of variables: investor and stock characteristics.

2.1.1. Controlling for investor characteristics

Investor characteristics influence the likelihood that a retail investor buys a stock. In the lifecycle investment hypothesis, investors invest less in stocks as they age (e.g., Cocco, Gomes, & Maenhout, 2005), so the buying likelihood for stocks should be lower for older investors. If younger investors tend to follow insider trades more closely, β_1 and β_2 might depend on the age of the retail investor. We have no prior knowledge for this supposition, so age provides the first control variable. Korniotis and Kumar (2011) argue that age has two effects on investment decisions: a positive effect that derives from the accumulation of general investment skills, because older investors have greater knowledge about investing, but a negative effect on trading decisions due to cognitive aging and thus deteriorating investment skills. They suggest that the investment skills of investors older than about 70 years deteriorate sharply. To capture these potential old-age effects, we add a dummy variable that equals 1 if an investor is older than 70 years and 0 otherwise.

Financial wealth also might affect buying likelihood, because wealth increases risk-taking capacity. More financial wealth could relate positively to the proportion invested in stocks, in which case the buying likelihood should be higher for wealthier investors than for less wealthy investors.

Finally, Odean (1998) as well as Barber and Odean (2001) show that men tend to trade more and with greater risk than women. Thus, the buying likelihood could be related to gender. Ultimately then, we include the log of wealth (*WEALTH*), gender (*GENDER*), the log of age (*AGE*), and an age dummy (*D70*) in Eq. (1).

2.1.2. Controlling for stock characteristics

Stock characteristics also can influence the estimated coefficients in Eq. (1) if insider investors and retail investors have the same preferences for stock characteristics. In that case, when an insider buys, the alleged copy of this trade (β_1 and β_2 different from 0) may simply reflect that both groups of investors have the same preferences. For example, insider and retail investors both may prefer stocks that have recently fallen in value. If an insider buys stock A that has delivered a negative return in the past and retail investors buy the same stock A, the coefficient β_1 in Eq. (1) would be positive if we failed to control for the past return of stock A. Therefore, we control for potential stock characteristics that may influence a retail investor's buying probability.

Recent research indicates that retail investors generally prefer certain stock characteristics, such as small-cap growth stocks or high beta stocks (e.g., Barber & Odean, 2000). Thus, the likelihood of purchases of these stocks should be higher than that of stocks with other characteristics. We add four control variables derived from Carhart's (1997) four-factor model to capture the potential stock preferences of investors: beta risk (*BETA*) and three stock characteristics, size (*SIZE*), value (*VAL*), and momentum (*MOM*). Because these factors are related to stock returns (Fama & French, 1992; Jegadeesh & Titman, 1993), they could influence trading decisions. We also add the future four-factor alpha from Carhart's (1997) return model and denote it *FALPHA*. With this variable, we can judge whether stocks being bought by retail investors deliver better returns than stocks being sold and whether insider-related trades change their future performance.

In addition, we include a variable to capture general attention effects. Barber and Odean (2008) proxy for attention using abnormal trading volume; on days when a stock is heavily traded on the market, investors tend to pay more attention to it and have a stronger tendency to buy (i.e., not only trade) this stock. Because information about an insider trade may relate to attention, we include a general measure of attention. Stocks traded by insiders also may attract more attention because these transactions tend to be widely discussed in the financial press. We provide definitions of the six control variables in Appendix A.

2.2. A logit model for buying probability

Instead of including the control variables directly into Eq. (1), we separately estimate a logit model based on stock and investor characteristics. We refer to the buying probability we thus obtain as the *general buying probability* of a retail investor, which is independent of insider trades. This general buying probability provides an independent control