The Order Submission Behaviors surrounding Open-Market Repurchase Announcements: The Examination of a Missing Link Embedded in the Signaling Hypothesis

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This Draft: February 22, 2007

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Abstract

This paper highlights a concern for a link possibly missing in the traditional justification of the signaling hypothesis of open-market repurchases (OMRs). To recover the missing link, we employ the order-level data for the Taiwan stock market to contrast the order submission behaviors among different groups of investors surrounding OMR announcements — who trade the repurchased stocks and how they trade them. As a result, only from the standpoint of price behavior, OMR announcements are reliable signals to which the price reactions of those stocks are favorable. However, the observed order submission behaviors among most investors contradict the essence of the signaling hypothesis.

Keywords: open-market repurchase, the signaling hypothesis, price behavior, order submission behavior, order imbalance

Share buy backs have become one of the most popular equity management tools over recent decades. Jagannathan, Stephen, and Weisbach (2000) argue that the announced value of share buy backs has increased 750% from $15.4 billion to $113 billion between 1985 and 1996 in the U.S., while dividends have only risen by a factor of just over two during the same period. Grullon and Michaely (2002) show that the average dividend payout ratio fell from 21.4% in 1972 to 11.4% in 1998, while the average repurchase payout ratio increased from 2.8% to 12.4% during the same period. Furthermore, while share repurchase expenditures grew at an average annual rate of 26.1% over the period 1980 to 2000, dividends only grew at an average annual rate of 6.8%. Grullon and Ikenberry (2000) find that in 1998, U.S. firms distributed more cash to investors through share repurchases than through cash dividends. Grullon and Michaely (2004) and Bagwell and Shoven (1989) state that the open-market repurchase (OMR) has been the most popular method for firms to buy back their own stocks. Recognizing the growing importance and popularity of stock repurchase programs worldwide, the Taiwanese government implemented new OMR regulations allowing firms to repurchase their outstanding shares starting from August 2000.

The objective of this paper is to re-examine the signaling hypothesis by recovering a link possibly missing in its traditional justification, employing the order-level data for the Taiwan stock market.[1] Many prior studies have investigated the price behaviors of the repurchased stocks surrounding the OMR events. One of the most popular explanations of stock repurchase is that managers "signal" their optimism to the market (e.g., D'Mello and Shroff, 2000; Ikenberry, Lakonishok, and Vermaelen, 1995, 2000).[2] Given the observed positive price reactions (e.g., Li and McNally, 2003; Hatakeda and Isagawa, 2004), it is seemingly persuasive that the signaling hypothesis holds. However, an embedded "price-order" relation, often ignored in literature, may require a further clarification.

Consider a typical scenario for the OMR practice as follows. Suppose, first, that a firm motivated by undervaluation of its stock initiates an OMR program. Second, after managers make an announcement, a price reversal takes place. The subsequent positive price reaction is

[1] The Taiwan stock market is known as a fast globalizing and institutionalizing market. Since the early 1980s, the Ministry of Finance of Taiwan has globalized its stock market, widely dominated by individual investors (Harrison, 1994), in order to enhance its efficiency. After two decades, its achievements have been recognized. For instance, as shown in Figure 1, up to 25.4% of dollar trading volume in the Taiwan stock market is attributable to trades by institutional investors from 9/2002 to 12/2004. Contrast this with a mere 3% in 1989 (Schwartz and Shapiro, 1992) and we can see that institutional trading has rapidly increased over years.

[2] Besides the signaling hypothesis, there is an extensive literature which details the motives as to why firms buy back their own stocks. For instance, the decision to repurchase stocks is affected by firms' cash distributions (Lei, 2005; Grullon and Michaely, 2002, 2004; Jagannathan and Stephens, 2003), capital structures (Bagwell and Shoven, 1989; Jagannathan, Stephen, and Wesibach, 2000), corporate controls (Lee, Mikkelson, and Partch, 1992; Davidson and Garrison, 1989), and compensation policies (Jolls, 1998; Fenn and Liang, 2001).

often interpreted as evidence that managers' optimism boosts investors' confidence and thus valuation of the firm. Nevertheless, a crucial link embedded in the second phase is possibly missing in the justification of the signaling hypothesis. Specifically, is it always correct to assume that a positive price reaction to the announcement implies a favorable order reaction of "general" investors?

From Economics 101, we have learned that demand and supply jointly determine the price. On the surface the observed price reversal arises from a growing demand for the stock. If, however, the demand mainly comes from the repurchasing firm's net-buys and other investors neither agree with its optimism nor join it in net-buying the stock as such, the signaling hypothesis is less meaningful. Yet, it is difficult to assess the underlying forces of such behaviors without further data on how prices are actually formed. Perhaps due to the lack of the order or transaction data that distinguish different investors, most research takes for granted that the rising demand leading to the price reversal comes from general investors and implicitly ignores this link between the price and the order submission behaviors.

Unlike mostly prior studies, this paper analyzes the order submission behaviors among investors — who trade the repurchased stocks and how urgently they want to trade. To do so, we apply the order-level data that unambiguously classify each limit order into one of five groups, including foreign investors, securities investment trust companies (SITCs), securities dealers, individual investors, and regular institutions.[3] The classification of investors' orders helps us not only pin down separately their strategic roles in forming the observed price reaction, but also verify the extent to which the signaling hypothesis is supported by our data. To our knowledge, this is the first time that such voluminous order-level data have been involved to examine the hypothesis in depth.

Our results strikingly paint a different picture of the long-prevailing signaling hypothesis from a growing body of empirical research. First, if only from the angle of price behavior of the repurchased stocks as usual, the OMR announcements are indeed reliable signals to which the market reactions are favorable. This is the only similarity to prior research. Second, the most active and influential investors on the price behavior of the repurchased stocks are individual investors and regular institutions. Individuals extraordinarily net sell those stocks around the announcements except on the first trading day immediately after. Conversely,

[3] SITCs in the Taiwan stock market are solely composed of domestic mutual-fund firms, while the foreign investors cover a wide variety of foreign institutions, including foreign (investment) banks, insurance companies, mutual funds, pension funds, hedge funds, and so on. The regular institutions consist of all domestic institutional investors other than the domestic professional institutional investors, such as SITCs and securities dealers. The firms buying back their own shares are categorized as regular institutions.

regular institutions are persistently on the net-buy side before and after the announcements. Third, professional institutional investors (such as foreign investors, SITCs, and securities dealers) are not as enthusiastic about the OMRs, and their order imbalances are too small to make a difference. In summary, from the standpoint of order submission behavior, we cast a doubt on the signaling hypothesis.

This paper proceeds as follows. Section I briefly reviews the well-known signaling hypothesis as well as the trading behaviors of individual and institutional investors documented in prior studies. Section II describes the data sources and proposes two testable hypotheses. Section III reports the market reactions surrounding the OMR announcements. Section IV and V respectively discuss the unconditional and conditional order imbalances placed by each group of investors and their strategic role surrounding the OMR announcements. Section VI reports and interprets the results of the regression analysis. Finally, we conclude this paper in Section VII.

I. Related issues

In this section, we shall briefly discuss two relevant issues to investors' reactions to the OMR announcements: the signaling hypothesis and the submission behaviors of investors.

A. Stock repurchase, the price behavior, and the signaling hypothesis

There are two prevailing scenarios about this "signaling" story. First, a stock repurchase program conveys managers' expectations of future increases in a firm's earnings and cash flows not observed by the market (Lie and McConnell, 1998; Nohel and Tarhan, 1998; D'Mello and Shroff, 2000). Second, managers do not convey new information but simply express their disagreement with how the market is pricing their current performance (Netter and Mitchell, 1989; Ikenberry, Lakonishok, and Vermaelen, 1995). In either case, managers view the stock as undervalued.

Managers are believed to be insiders who know more about the firm's prospects than outside investors. If managers consider their firm undervalued, they may increase the long-term value of the shares of their firm by repurchasing stocks at what turn out to be bargain prices. McNally (1999) provides a signaling model in which the repurchase announcements increase stock prices.

Numerous studies have tested the signaling hypothesis and corroborated the positive

market reaction to share repurchases. Bartov (1991), Comment and Jarrell (1991), and Lie (2005) examine the announcements of OMR intentions in the U.S. and favor the signaling hypothesis. Work by Raad and Wu (1995), Ikenberry, Lakonishok, and Vermaelen (1995), Li and McNally (2003), and Hatakeda and Isagawa (2004) shows that stock price increases in response to the OMR announcements. The positive wealth effects often have been attributed to the signaling hypothesis, which predicts that firms use share buy backs as a vehicle to signal new and positive information about their future earnings prospects.

Literature also supports that OMRs could benefit insiders. For instance, prior to fixed price repurchase offers that do not follow takeover-related events, managers increase their buying and reduce their selling of their firm's shares (Lee, Mikkelson, and Partch, 1992; Raad and Wu, 1995). Ikenberry and Vermaelen (1996) model stock repurchases as an option for asymmetrically informed insiders to buy undervalued shares from uninformed shareholders through the facilities of firms. McNally (1999) presents a signaling model for OMRs that simulates the effects of a repurchase on the inside shareholders' utility.

B. The order submission behavior

As discussed earlier, little is known about the co-movement of stock price behavior and order submission behavior (of various types of investors) surrounding the OMR announcements, even for well-developed markets. Some of the related papers focus on the stock liquidity around the OMR announcements. For example, Barclay and Smith (1988) argue that the observed rising bid-ask spreads surrounding the announcements lead to an increasing cost of capital, but Singh, Zaman, and Krishnamurthi (1994), and Miller and McConnell (1995) do not find similar results. Cook, Krigman, and Leach (2004) observe that stock repurchases contribute to liquidity by narrowing bid-ask spreads.

There are nevertheless papers studying investors' order submission behaviors around other important events. For example, Lee, Mucklow, and Ready (1993) observe that spreads widen and depths fall in anticipation of earnings announcements; these effects are more pronounced for announcements with larger subsequent price changes. Jakob and Ma (2003) find that on ex-days there are more buys than sells in the number of orders, but not in the number of shares ordered, and the imbalance in the number of orders is limited to small orders. Small trades, often proxied for individuals' trading activities, are characterized by a persistent period of unusually high buying activity for both good and bad news earnings announcements (Lee, 1992). Unlike those papers using the order size or the trade size as a

proxy for investor types, this paper employs the data with a precise classification. Given that an informed (institutional) trader may camouflage his trades by splitting one large trade into several small trades (Kyle, 1985; Admati and Pfleiderer, 1988), this paper is hopefully immune from the measurement error as a result of imprecise classifications.

Regarding investors' behaviors in general, there is an extensive literature on the order placement strategies and their impacts. Grinblatt, Titman, and Wermers (1995) assert that institutional investors have a tendency to herd. Grinblatt and Keloharju (2000) find that Finnish individual investors are contrarian investors, while foreigners act as momentum investors. Barber and Odean (2004) conclude that attention is a major factor in determining what individual investors trade, but does not apply with equal force to institutional investors. Even among institutions, the trading strategies could be substantially different (e.g., Dennis and Strickland, 2002; Grinblatt, Titman, and Wermers, 1995).

Dennis and Strickland (2002) show that mutual fund managers pursue momentum-based strategies that are more likely to payoff in the short run. They trade stocks more frequently and impatiently than other institutional investors do. Pensioners and banks, by contrast, are conservative and make investment decisions based on long-term criteria. The difference in investor composition may lead to diversification in order submission behavior and thereby price impact (Ahn, Bae, and Chan, 2001; Handa, Schwartz, and Tiwari, 2003).

II. Data and hypotheses

This paper collects data on OMRs, stock returns, and intraday data from three datasets. The first one, the Market Observation Post System updated by the Taiwan Stock Exchange Corporation (TSEC),[4] records all dates of board of directors' announcements, official OMR purposes, and the repurchase sizes of OMRs. According to the Securities and Exchange Law in Taiwan,[5] a firm buying back its own shares at TSEC must announce the repurchase within two days after the decision of the board of directors is made. Usually, right after the board meetings, firms make announcements about their OMR programs, and investors can completely learn the directors' decisions and strategically react to the news.

The three legitimate purposes of an OMR include (1) maintaining the firm's credit and shareholders' equity, (2) transferring shares to employees, and (3) obtaining shares for issuing stock options and convertible bonds. In total, 353 OMR programs were executed to transfer

[4] The internet address is "http://emops.tse.com.tw/emops_all.htm".
[5] For details, please see "http://eng.selaw.com.tw/FLAWDAT0202.asp".

shares to their employees and 210 programs to maintain the firms' credit and shareholders' equity. Since only 6 programs in our data were designated to obtain shares to issue stock options and convertible bonds, they are excluded.

The second dataset, maintained by the Taiwan Economic Journal (TEJ), comprises the daily market returns including dividends, individual stock returns including dividends, and so forth. Two criteria are used for sample selection. First, a qualified OMR program of a firm is included, if the firm has been listed on the TSEC for at least 110 trading days prior to the OMR announcement date; second, the firm should have complete daily stock return data and intraday order-level data as required by this study.

The third one, obtained from the TSEC, contains the intraday data on original orders, trades, and quotes covering the entire stock trading in the Taiwan stock market.[6] The order and quote data cover the period from 7/1/2002 to 12/31/2004 while the trade data from 9/2/2002 to 12/31/2004. For each submitted order, our sample includes the time stamp (to the nearest one hundredth second), stock code, investor type, a buy-sell indicator, order size, and limit price. Noteworthy is that the investor type handily helps us classify all orders into five groups: SITCs, foreign investors, securities dealers, regular institutions, and individual investors, despite the absence of the exact identifications of investors. Odd-lot and bulk orders, separately drafted by the TSEC, are excluded from our sample. To further verify the accuracy of the return data we imposed filters to detect outliers including those related to missing quotes. As an additional check, we matched daily returns for the stocks computed using our intraday data with the TEJ daily return file.

Figure 1 illustrates the growing importance of institutional trading in the Taiwan stock market. Up to 25.4% (11.77%+3.96%+2.83%+6.87%) of dollar volume is attributable to trades by institutional investors. Given the documented differences in trading behavior between individuals and institutional investors discussed in the preceding section, the rising share of institutional trading could potentially change the price behaviors of stocks. In the rest of this paper, we mainly deal with the two sub-hypotheses extracted from the signaling hypothesis as follows:

Price behavior hypothesis: There is a price reversal of a given repurchased stock surrounding its OMR announcement.

[6] All listed securities in the Taiwan stock market are traded by auto-matching through TSEC's Fully Automated Securities Trading (FAST) system. It provides a fully centralized and computerized order-driven market without designated market makers or specialists. Similar to the Hong Kong Stock Exchange (Ahn, Bae, and Chan, 2001), it operates in a consolidated limit order book environment where only limit orders are accepted.

Order submission behavior hypothesis: There is a reversal of the (marketable) order imbalance for a given repurchased stock by investors other than regular institutions surrounding the OMR announcement.[7]

Most prior studies, without examining the link mentioned earlier, implicitly simplify the signaling hypothesis to the price behavior hypothesis. The order submission behavior hypothesis proposed above is designed to recover the missing link. According to the essence of the signaling hypothesis, surrounding the OMR announcement we should observe the reversals of not only the stock price but also the (marketable) order imbalance by investors other than the repurchasing firm.

III. Price behavior of the repurchased stocks

We begin our empirical analysis by summarizing the price behavior of the repurchased stocks, unconditionally and conditionally, surrounding the OMR announcements to corroborate the price behavior hypothesis for the Taiwan stock market.

A. Unconditional price behavior

Table 1 reports the average raw returns and the average abnormal returns over a designated event window covering from day -5 to day +5. All averages are equally weighted. Throughout this paper, day $-t$ ($+ t$) means t trading days before (after) the announcement date, day 0. The pre-announcement period throughout this paper covers day –5 to day –1 while the post-announcement period does day +1 to day +5. The abnormal return on a given day is the market model residual calculated as the difference between the actual return and the predicted return based upon the market model parameter estimates and the market return for that day. The parameters of the market model are estimated over a 100-day period from day -110 to day -11. For the purpose of comparison, we also report the cumulative returns over days -10 to -6 and days +6 to +10. A cumulative return over a given period is calculated by summing up the daily returns over that period. n represents the sample size (the number of the selected OMR events). Following Lee and Swaminathan (2000), *SzRnk* denotes the average size rank of the

[7] The definition of a marketable order is identical to that in prior studies (e.g., Peterson and Sirri, 2002). That is, a marketable buy (sell) order is a limit order whose limit price is greater (lower) than or equal to the prevailing best offer (bid). Marketable limit orders are analogous to the market orders for immediate execution at posted prices in a specialist or dealer market such as the New York Stock Exchange. For instance, Parlour (1998), Foucault (1999), and Cooney and Sias (2004) discuss the tradeoffs between demanding liquidity by placing market orders and supplying liquidity by submitting limit orders.

repurchased stocks over all corresponding announcement dates, based on the deciles portfolios of all listed stocks at the beginning of each announcement date.

Panel A of Table 1 presents the price behavior of the repurchased stocks using the whole sample. First, *SzRnk* (7.68) clearly shows that the repurchased stocks are larger than average (5.5 or so). Second, there are unambiguous price reversals from the pre-announcement to the post-announcement periods. For instance, the repurchased stocks have abnormal returns of -0.60%, -0.11%, and 1.31% on days -1, 0, and +1, respectively. The pattern is well consistent with the observations in most of the literature (e.g., Comment and Jarrell, 1991; Li and McNally, 2003; Hatakeda and Isagawa, 2004).

Note that all reported raw and abnormal returns except those on day 0 are significant at least at the 5% level. It is explicable that the returns on the announcement date are mixed and insignificant, because the announcement may occur either during or after the regular trading hours. After that, the price behavior from the pre-announcement period to the post-announcement period pertains to the signaling hypothesis that the announcement conveys favorable information to the market.

B. Conditional price behavior

Note that the results shown in the preceding sub-section are unconditionally derived using the entire sample. As noted in footnote 2, the repurchase programs with diverse motives have been well examined and many associated hypotheses (e.g., the signaling hypothesis and the free cash-flow hypothesis) have been developed. Many factors, such as the purpose of OMRs, the repurchase size, …, are proven deterministic in the price behavior of the repurchased stocks surrounding the OMR announcements. In this sub-section, we shall pay attention to the price behaviors conditional on some of these vital factors.

Panel B of Table 1 reports the returns on those stocks, conditional on the OMR purpose. As expected, for both purposes — maintaining the firm’s credit and shareholders' equity and transferring shares to employees, the price patterns are identical, that is, falling over the pre-announcement period and rising afterward. Comparing the intensity between the two cases, for the OMRs to maintain the firms’ credit and shareholders' equity, the stock prices fall more severely over the pre-announcement period and rise more distinguishably over the post-announcement period than those to transfer shares to employees. Note that the difference in *SzRnk* between the two groups is rather limited, implying that firm size does not matter.

Regarding the repurchase size, Davidson and Gorrison (1989), Raad and Wu (1995), and

Isagawa (2000) demonstrate a positive correlation between it and the abnormal return following repurchase announcements. Namely, the larger the repurchase size, the greater the degree of information is conveyed to the market and the stronger the market reaction over the post-announcement period. Panel C illustrates the effect of repurchase size on the stock price behaviors surrounding the OMR announcement date in the Taiwan stock market.

The repurchase size is defined as the proposed number of shares of the repurchase relative to the outstanding shares. We partition the full sample into three sub-samples: (0%, 2.5%], (2.5%, 5%], and more than 5%, based on the repurchase size. As a result, all sub-samples exhibit similar price reversals. The reversal in the largest group "more than 5%" is stronger over days +1 and +2 than others, but not over days +3, +4, and +5. Over days +2 to +5, both the raw return (1.84%) and the abnormal return (1.13%) are smaller than those in the smallest group (0%, 2.5%]. In addition, over days +6 to +10, the raw return is smaller than that in the middle group (2.5%, 5%]. The minor differences in *SzRnk* between the three groups suggest a limited effect of firm size on the price reversals. Overall, no evidence sustains the view that the repurchase size matters for the strength of the market reaction.

Let us shift our focus to the effect of firm size. The size anomaly on stock returns has been well recognized in modern finance (Fama and French, 1992; Daniel and Titman, 1997). To examine the role of firm size in the market reaction to the OMR announcement, at the beginning of each announcement date the repurchased stocks are sorted into five equal groups based on firm size available on the prior trading day. We study the return patterns of the firms in the smallest (largest) quintile. Panel D reports the results.

In general, the price reversals of the smallest and the largest firms are all solid. The smallest firms suffer less from price declines than the largest do over the pre-announcement period, while they recover faster over the post-announcement period. For example, the smallest and the largest firms lose respectively 4.43% (2.13%+1.74%+0.56%) and 5.97% (2.31% + 2.42% + 1.24%) over days –10 to –1 while gaining respectively 5.70% and 4.73% from days +1 to +10. After controlling for risk, the abnormal returns still demonstrate a similar pattern. The result is consistent with prior studies (e.g., Vermaelen (1981) and Ho and Michaely (1988)) that the market reacts to the OMRs of small firms more sharply than those of large firms.

Finally, we study the market reactions conditional on the market condition referred to as the cumulative 5-day market return over the pre-announcement period. All announcements are sorted into five equal groups, from small to large, based on the market condition. Then,

the announcements with the worst (best) 20% cumulative market returns are classified into the group of down- (up-) market. Panel E reports the raw and the abnormal returns.

In terms of the raw returns, the price tumbles much more severely before the announcement date in the down market than it does in the up market. Afterward, the price also recovers faster in the down market. For instance, the cumulative raw return from days +2 to +5 is 4.52% in the down market while 1.63% in the up market. In terms of the abnormal returns, the results are slightly weaker. Again, firm size (*SzRnk*) plays no role. This suggests that the price reversal is more visible in the down market than in the up market.

In general, the results for the Taiwan stock market quite resemble those documented by literature. Namely, the undervaluation before the announcement date and the price reversal afterward are solid, regardless of the selected condition. The evidence strongly supports the price behavior hypothesis proposed at the end of the previous section.

IV. Order submission behaviors: An unconditional analysis

As argued before, an essential link between the price behavior of the repurchased stock and the order submission behaviors among investors is possibly missing in literature studying the signaling hypothesis. If it truly holds, immediately following an OMR announcement an increasing number of market participants should positively react to the announcement. To profit from the OMR, those investors would build long positions on the repurchased stock as soon as possible. On the one hand, patient investors who supply liquidity would place more limit buy orders at lows than sell orders at highs, preventing the stock prices from falling much. On the other hand, aggressive investors who demand immediacy trade impatiently by placing more marketable buy limit orders to guarantee immediate executions, generating upward price pressure on the stocks.

In this section, in order to recover this missing link, we will start to use intraday order-level data to calculate the order imbalances placed by each group of investors and analyze their role in forming the observed price behavior surrounding the OMR announcements. Explicitly, we shall examine the order submission behavior hypothesis proposed in Section II.

A. Order imbalance

Excess order imbalance is often associated with either private information or the arrival

of public information, reducing liquidity at least temporarily and moving the market price permanently. A positive order imbalance signals the prevalence of demanders, engendering an upward price pressure, a positive transitory volatility, and a tighter spread (Ranaldo, 2004). Blume, MacKinley, and Terker (1989) argue that there is a strong relation between order imbalances and stock price movements, both in the analyses of time series and cross sections.

Table 2 reports the average order imbalances (%) in Panel A and the average abnormal order imbalances (%) in Panel B by each group of investors for all repurchased stocks surrounding the announcement date. The order imbalance (*OI*) by group *i* of investors for a given stock over a given day is defined as follows:

$$OI_i = (buy_i - sell_i) / (buy + sell), \quad (1)$$

where *buy* and *sell* are respectively the total buy and the total sell order volumes over that day, and the subscript *i* refers to the investor group. The abnormal order imbalance for the stock is defined as its order imbalance less its average order imbalance over trading days -25 to -6. The average order imbalances are order-volume weighted over the selected trading days.

Our results convey both statistical and economical significance. According to the order imbalances reported in Panel A, those by individual investors are all significantly negative at the 1% level inside and outside the event window except day +1. It appears that they are quite pessimistic about the repurchased stocks in both the pre- and post-announcement periods. By contrast, regular institutions are rather optimistic. Their order imbalances, exactly opposite to individual investors', are significantly positive inside and outside the event window. Over the post-announcement period, their impatient behavior is logical because of the execution of the OMRs, but the significantly positive order imbalances over the pre-announcement period and trading days [-25, -6] may imply the existence of information leakage.[8]

For professional institutional investors, the OMR announcement takes effect, albeit on a limited scale. They intend to net sell the repurchased stocks over the pre-announcement period, but their net-sell activities are reduced afterward. Compared to the order imbalances placed by individual investors and regular institutions, nevertheless, those by professional institutions (particularly over the post-announcement period) are rather small.

Panel B reports the abnormal order imbalance by each group of investors. It is defined as the order imbalance on a given day in excess of the average order imbalance over trading

[8] This finding is consistent with Lee, Mikkelson, and Partch (1992) and Seppi (1992) that insiders buy more or sell less the firms' shares prior to repurchase and earnings announcements. The issue on information leakage is, however, beyond the scope of this paper.

days [-25, -6]. Different from the order imbalance reported in Panel A, it emphasizes the changes in the submission behavior inside and outside the event window. As expected, the results are dissimilar to those in Panel A.

First, over the pre-announcement period, individual investors increasingly net-sell the repurchased stocks, relative to outside the event window. Over the post-announcement period their submission behavior changes dramatically. They significantly increase their buy orders more than sell orders on days 0 and +1, but reverse on days +3, +4, and +5. Second, regular institutions maintain a steady net-buy pace over the pre-announcement period, while they significantly increase their net buys over the post-announcement period. Third, professional institutional investors, particularly foreign investors and SITCs, increasingly net sell the repurchased stocks over the pre-announcement period. After that, SITCs change their behavior and decreasingly net sell those stocks. Finally, compared to the abnormal order imbalances placed by individual investors and regular institutions, those by professional institutional investors are small.

In summary, it is strikingly that no evidence sustains the order submission behavior hypothesis. All positive order imbalances supporting the prices of the repurchased stocks solely come from regular institutions. For other investors, the announcements neither serve as positive signals nor effectively reverse their net-sell activities.

One may argue that order imbalances counting all orders may not be informative about the relation between investors' intentions and price impacts of investors' orders. For instance, the buy (sell) orders with very low (high) submitted prices relative to the prevailing ask (bid) prices, counted in the order imbalances but rarely executed, are unlikely to impact the prevailing prices instantaneously. To distinguish the orders that can effectively form the prices, we additionally apply the marketable order imbalance in the following sub-section.

B. Marketable order imbalance

In a consolidated limit order book environment without market makers such as the TSEC, liquidity demanders place marketable limit orders that can be executed immediately against limit orders already standing in the limit order book. In order to emphasize the orders effectively forming the prices, Table 3 reports the marketable order imbalances placed by each group of investors. The marketable order imbalance (*MOI*) for a given stock is as follows:

$$MOI_i = (marketable\ buy_i - marketable\ sell_i)\ /(buy + sell), \quad (2)$$

where $marketable\ buy_i$ and $marketable\ sell_i$ respectively denote the marketable buy and sell order volumes submitted by group *i* of investors. The abnormal marketable order imbalance in Panel B is the difference between the marketable order imbalances on a given day and over days -25 to -6.

The pattern of the marketable order imbalances placed by each group of investors in Panel A of Table 3 is generally similar to the corresponding pattern of the order imbalances in Table 2. Individual investors and regular institutions are still the traders whose orders impact most the stock prices,[9] which confirms their roles in forming the observed price behavior surrounding the OMR announcements. Conversely, although professional institutions — foreign investors, SITCs, and securities dealers — are still in the net-sell side, their magnitudes of marketable order imbalances are too small to be decisive.

The results in Panel B reveal substantial changes in marketable order imbalance around the OMR announcement. Individual investors exhibit an increasingly strong net-sell tendency and impatience over the pre-announcement period. Over the post-announcement period, individuals' behavior is apparently affected by the announcements at least over a short period. They clearly reverse their position and largely increase their net-buy orders on days +1 and +2. After day +2, the changes are mixed. By contrast, regular institutions mildly increase their net-buy activity on days -3 and -2. After the announcement, their net-buy impatience sharply increases, possibly due to the executions of the projected OMRs.

Regarding professional institution investors, they increasingly net sell the repurchased stocks over the pre-announcement period, relative to outside the event window. Over the post-announcement period, foreign investors increasingly net sell the repurchased stocks, while SITCs and securities dealers net sell them in a decreasing manner. All these changes in the marketable order imbalance by professional institution investors are trivial, compared to those made by individual investors and regular institutions.

In the following sub-section, we would like to emphasize an essential issue — the shift in the order submission strategy surrounding the OMR announcements. By explicitly inspecting the cross difference between the order imbalance and the marketable order imbalance for given stocks over time, we are able to study whether and how investors' order

[9] As drawn in Figure 1, the average trading volume by regular institutions is merely 6.87% of the market. Thus, their marketable order imbalances are unproportionately high relative to other investors', particularly over the post-announcement period.

submission behaviors change, patiently or impatiently. If they buy, for instance, we would like to know how they intend to buy.

C. The difference between order imbalance and marketable order imbalance

According to *OI* and *MOI* respectively defined in (1) and (2),

if $OI_i > MOI_i$, then
(buy_i – *marketable* buy_i) > ($sell_i$ – *marketable* $sell_i$) or
(*patient* buy_i > *patient* $sell_i$),

where the *patient buy* and *patient sell* are the volumes of the buy and the sell orders, submitted by group *i* of investors, whose submitted prices are lower and higher than the best prevailing ask and bid prices, respectively. These limit orders, considered patient, enter the limit order book until they are cancelled or filled by marketable limit orders.

Suppose that the arrival of given public information impacts the order submission strategy of investors *i* for given stocks. Prior to the impact, for instance, $OI_i \leq MOI_i$; after that $OI_i > MOI_i$. The change could result from two conditions: these investors adjust their order submission behavior for those stocks after the impact and are willing to wait longer to buy them at lows (raising *patient buy*); or they tend to sell them immediately (reducing *patient sell*). If the former is the case, we should observe an increase in the order imbalance; otherwise, a decrease in the marketable order imbalance should take place.

By contrast, if $OI_i \geq MOI_i$ before and $OI_i < MOI_i$ after, investors *i* would like to either wait to sell the stocks at highs or buy them immediately. If the former is the case, the order imbalance should stay low; otherwise, the marketable order imbalance should rise. Table 4 records the over-time inequality for each group of investors.

In Table 4, two groups of investors — individual investors and regular institutions — exhibit remarkable changes in order submission behavior between the pre- and post-announcement periods. The difference of individual investors becomes more and more negative (from -1.11% to -5.53%) in the pre-announcement period while that of regular institutional investors is increasingly positive. Note that, first, the order imbalances placed by individual investors in Table 2 are reducing over-time (from -0.43% to -9.65%) over the post-announcement period. Second, the remarkable order imbalances reported in Table 3 are also reducing (from 0.68% to -4.12%). The evidence confirms that a growing number of individual investors intend to sell the repurchased stocks at highs after the announcement. By

the similar token, we find that regular institutions try to buy back their own stocks at lows over the post-announcement period. No persistently significant difference exists in Table 4 for the professional institutional investors.

Summing up the results observed in Tables 2, 3, and 4, first, individual investors and regular institutions are the decisive traders whose investment strategies and order submission behaviors influence most the stock price behavior surrounding the OMR announcement date. Individual investors are pessimistic and remarkably net sell the repurchased stocks over the pre-announcement period. After that, they reduce their net-sell activity over first two days and even turn their position to the net-buy side on days +1. Yet, they resume net selling those stocks from day +2. On the other hand, regular institutions are persistently on the net-buy side before day 0 and even net buy more afterward. Noteworthy is that after day 0 more individual investors intend to submit orders to sell the repurchased stocks at highs, while regular institutions try to buy back their own stocks at lows.

Second, professional institutional investors are not as enthusiastic about the OMRs as regular institutions. They are overall on the net-sell side over the pre-announcement period, and do not demonstrate a recognizable order submission pattern afterward. Compared to individual investors and regular institutions, neither the order imbalances by professional institutional investors nor their changes induced by the announcement are impressive.

Third and most importantly, from the aspect of price behavior of the repurchased stocks, the market reaction to the OMR announcements is indeed fruitful. However, from the aspect of order submission behaviors, the fruitful reaction is solely built on the strong net buys by regular institutions. Although we cannot exactly identify regular institutions, due to the limitation of our data, some of them are expected to be the firms that carry out the OMRs.

If the signaling hypothesis were not challengeable at all, most traders would interpret the announcement as positive news and rush into net-buy positions on the repurchased stocks by submitting more (marketable) buy orders than sell orders. In reality, most traders, including professional institutional investors and individual investors, do not celebrate the OMRs by net buying those stocks. Instead, they at most reduce their net selling activities. Even some individual investors take advantage of the OMRs and attempt to sell those stocks at highs. It appears that the market reaction in terms of stock returns can neither guarantee the general investors' behavior nor justify the signaling hypothesis. The justification still requires additional crosschecks on the (order submission) behaviors of individual groups of investors reacting to the announcements, as this paper has done.

V. Order submission behaviors: A conditional analysis

Note that the results shown in the preceding section are unconditional and derived using the entire sample. As noted in footnote 1, the repurchase programs possibly with different motives have been well examined and many related hypotheses (e.g., the free cash-flow hypothesis, the signaling hypothesis, the leverage hypothesis…) have been developed. Many influential factors, such as the purpose of OMRs, the repurchase size, …, could affect the price behavior of the repurchased stocks surrounding the OMR announcements. In this section, we shall analyze the results conditional on some of these factors. We will employ the marketable order imbalance to emphasize not only the submission behavior of each group of investors but also the linkage to the observed price behavior of the repurchased stocks outside and inside the event window.[10]

A. On the basis of repurchase purpose

In the Taiwan stock market, unlike mostly developed markets, firms are required to claim their purpose — maintaining the credit and shareholders' equity, transferring shares to employees, or obtaining shares for issuing stock options and convertible bonds — before carrying out an OMR program.[11] As shown in Panel B of Table 1, the price reaction to the programs to maintain the credit and shareholders' equity is slightly stronger than those to transfer shares to employees. In the following, we shall further compare the order submission behaviors of five groups of investors surrounding the OMR announcements conditional on the OMR purpose, in order to realize the driving forces of the pattern of price movements. Panel A of Table 5 reports the marketable order imbalance by each group of investors.

Comparing the results reported between Panel A of Table 5 and Panel B of Table 3, the patterns of the marketable order imbalances placed by each group of investors are generally similar. The order imbalances by individual investors and regular institutions play a deterministic role without doubt, regardless of the purpose. Some moderate differences are as follows. First, within the event window except day +1, the marketable order imbalances placed by individual investors under the purpose of maintaining the firms' credit and shareholders' equity are more extreme than those under the other. In other words, they are

[10] For brevity, the order imbalances and all *t* statistics in this section are not reported and available upon request from the authors.

[11] As mentioned earlier, due to the limited sample size, the OMRs under the purpose of obtaining shares for issuing stock options and convertible bonds are excluded.

more pessimistic about the repurchased stocks with that purpose.

Second, the order submission behavior of regular institutions is more impatient under the purpose of maintaining the firms' credit and shareholders' equity. If the OMR purpose truly reflects what regular institutions believe, the repurchased stocks are considered undervalued more seriously under the purpose of maintaining the firms' credit and shareholders' equity. It is thus not surprising that the repurchasing firms, included in the group of regular institutions, exert more efforts under that purpose.

B. On the basis of repurchase size

Literature (e.g., Raad and Wu (1995), and Isagawa (2000)) shows that the repurchase size is positively related to the abnormal return following stock repurchase announcements. However, according to the returns reported in Panel C of Table 1, we do not observe the role of the repurchase size in market reaction over the post-announcement period. To understand why the difference takes place, we pay attention to the driving force — order submission behavior — of the market reaction. Identical to the classifications applied in Panel C of Table 1, all sample events are partitioned into three groups: (0%, 2.5%], (2.5%, 5%], and more than 5%; the associated marketable order imbalances are reported in Panel C of Table 5.

First, in the largest repurchase size group (more than 5%), the market order imbalance by individual investors seems to be the most volatile surrounding the announcement date. For instance, their marketable order imbalance substantially shifts from –5.58% on day –1 to 5.22% on day +1. Nevertheless, after day +1, individual investors resume net selling the repurchased stocks.

Second, concerning regular institutions, their net-buy behavior is surprisingly more persistent and significant in the smallest repurchase size group ((0%, 2.5%]) over the event window. In the largest repurchase size group (more than 5%), their marketable order imbalances are insignificant over the pre-announcement period. Over days +1 to +3, the median group of repurchase size has the strongest order imbalances (2.35%, 2.38%, and 3.14%, respectively) but over days +4 and +5 (3.24% and 3.38%, respectively) the largest group does. The ambiguous pattern shows that the repurchase size is not positively related to the enthusiasm of regular institutions as expected.

Third, professional institutional investors, like individual investors, exhibit a persistently negative pattern of marketable order imbalances for the smallest repurchase size group over the pre-announcement period. Over the post-announcement period, their order imbalances are

mixed and mostly insignificant. In sum, the absence of clear relation between the order imbalance the repurchase size explains the ambiguous market reaction observed in Panel C of Table 1.

C. On the basis of firm size

In addition to the return anomaly associated with firm size, firm size is often regarded as a proxy for information efficiency. Since institutional investors are allowed to invest in small firms under more restrictions, financial analysts do not follow small firms as closely as they do large ones, which downgrades the information efficiency of small firms (Brennan and Subrahmanyam, 1995). Ikenberry, Lakonishok, and Vermaelen (1995) and Vermaelen (1981), and Ho and Michaely (1988) assert that small firms are expected to signal more information. Consistent with previous findings, Panel D of Table 1 shows that the market reaction of the smallest firms is more favorable than that of the largest firms.

Panel D of Table 5 reports the marketable order imbalances for the smallest and the largest quintiles of firms. First, individuals' reaction to the announcements of the smallest firms is more extreme than those of the largest firms. They net sell the smallest stocks more impatiently than the largest over the pre-announcement period. On day +1, they turn into an impatient net buy position (2.56%). Starting from day +3, they again net sell the smallest repurchased stocks in a more impatient way. Second, the submission behavior of regular institutional investors for the smallest stocks is more persistent than for the largest over the pre-announcement period. All the statistics for the smallest stocks are significant at least at the 10% level while those for the largest are insignificant on days -5, -4, and -1. Third, professional institutions trade more actively in the largest stocks, perhaps due to their preference toward larger stocks (Kang and Stulz, 1997; Gompers and Metrick, 2001).

D. On the basis of market condition

There is plenty of literature supporting that market conditions influence investors' behavior (e.g., Chiyachantana et al., 2004, Cooper, Gutierrez, and Hameed, 2004; Barber and Odean, 2004). In this sub-section we study the patterns of the order submission behaviors surrounding the OMR announcements conditional on market condition. Following the definition applied in Panel E of Table 1, the OMR announcements with the worst (best) 20% cumulative 5-day market returns are classified into the group of down- (up-) market. Panel D

of Table 5 reports the marketable order imbalances placed by each group of investors under the worst 20% and the best 20% market conditions.

As expected, first, individual investors are relatively optimistic in the up market over the pre-announcement period where their marketable order imbalances from days -4 to 0 are negative but insignificant. By contrast, those in the down market are significantly negative. Second, like individual investors, regular institutions relatively hesitate to net buy the repurchased stocks in the down market over the pre-announcement period. However, over the post-announcement period, they exert more effort to buy back those stocks to support their prices. Their marketable order imbalances are persistently positive and significant. Overall, they are the only group of investors persistently net buying the repurchased stocks over the event windows, regardless of market condition.

Third, regarding professional institutional investors, they are still unconcerned with the OMR programs. They net sell the repurchased stocks over the entire event window and are relatively pessimistic over the down-market days. In the up market, SITCs demonstrate a slightly stronger net-sell tendency than foreign investors and securities dealers.

E. The difference between order imbalance and marketable order imbalance (OI – MOI)

In this sub-section we shall examine the changes in the order submission strategy of investors under different situations surrounding the announcement date. Since Tables 1 to 4 show the minimum roles of professional institutional investors, for brevity, we will not pay attention to their order submission strategies for the time being. Figure 2 illustrates the differences between the order imbalance and the marketable order imbalance by individual investors (in Panel A) and regular institutional investors (in Panel B) conditional on the selected criteria for the repurchased stocks over the event window.

Recall that $OI_i > MOI_i$ in Section IV.C implies that group *i* of investors are conservative and inclined to wait longer to buy the selected stocks at lows under a certain condition. Conversely, $OI_i < MOI_i$ implies that they place more orders to patiently sell the selected stocks at highs. In Panel A of Figure 2, it is obvious that the order submission strategy of individual investors changes substantially in response to the OMR announcement. *OI–MOI* is mostly positive (except under the up market), reaches a peak on day 0, and sharply decreases afterward. This follows that, under most of the circumstances, individual investors tend to submit more orders with patience to buy the repurchased stocks at lows on day 0; after that they are likely to take advantage of the repurchasing firms and sell those stocks at highs.

Notice that the most distinguishable differences happen under the extreme market conditions. Individual investors tend to submit more sell limit orders for the repurchased stocks at highs all the time in the up market. By contrast, in the down market they place more buy limit orders at lows before day +2; after that they start net selling those stocks at highs.

However, the order submission strategy of regular institutions is quite different from that of individual investors. The pattern of the differences drawn in Panel B is nearly opposite to that in Panel A. Under most of the selected conditions, *OI–MOI* is positive. After day 0, *OI–MOI* rises dramatically. Intuitively, regular institutions tend to place buy limit orders for the repurchased stocks at lows. The tendency is much stronger over the post-announcement period than over the pre-announcement period.

Finally, comparing the behaviors under the selected conditions, we can find that regular institutions place limit orders with less patience to buy back their own stocks under the up market and under the purpose of maintaining the credit and shareholders' equity. It is understandable that firms aiming to maintain the credit and shareholders' equity could have a stronger disagreement with how the market is pricing their current performance. On the other hand, in the up market the lower probability to buy stocks at lows possibly discourages firms from placing orders patiently. To sum up, the net-sell tendency with patience of individual investors and the apathy of professional institutional investors toward the OMRs do not support the order submission behavior hypothesis as well as the signaling hypothesis.

VI. Regression analysis

To ensure the robustness of our conclusions to various conditions jointly, we propose the following cross-sectional regression to estimate the abnormal marketable order imbalance after controlling for simultaneous changes in the variables associated with the previously selected conditions over each day within the event window:

$$Dep_t = \sum_{i=-5}^{5} \alpha_i D_i + \sum_{i=-1}^{-2} \delta_i INDs_{t+i} + \sum_{i=-1}^{-2} \phi_i RIs_{t+i} + \sum_{i=-1}^{-2} \beta_i FIs_{t+i} + \sum_{i=-1}^{-2} \rho_i SITCs_{t+i} + \sum_{t=-1}^{-2} \pi_i SDs_{t+i} + \gamma \cdot Rp\_size + \omega \cdot Purpose + \theta \cdot Size + \eta \cdot Mkt + \varepsilon_t, \quad (3)$$

where the dependent variable (Dep_t) separately denotes FIs_t, $INDs_t$, RIs_t, SDs_t, and $SITCs_t$, the marketable order imbalances placed by foreign investors, individual investors, regular institutions, securities dealers, and SITCs, respectively, for a given stock over date *t* within

the event window. D_t is a dummy variable taking the value 1 on day t, $-5 \leq t \leq 5$, and 0 otherwise.

The control variables in (3), known to be important for either stock price behavior or order submission behavior, comprise the lagged marketable order imbalances placed by all groups of investors for that stock, the repurchase size (*Rp_size*), the OMR purpose (*Purpose*), the firm size (*Size*), and the market condition (*Mkt*). *Rp_size* is defined as the proposed number of shares of the repurchase relative to the outstanding shares. *Size* is the logarithm of market equity available on the day prior to the announcement date. *Purpose* is a dummy variable that takes the value of 1 if the OMR is to maintain the firm's credit and shareholders' equity and 0 otherwise. *Mkt* is the cumulative 5-day market return over the pre-announcement period.

Table 6 provides, over each day within the event window, the intercept estimate or the abnormal marketable order imbalance that cannot be explained by the included control variables. Generally, the estimates are consistent with the results reported in the preceding sections. After controlling for a variety of variables, individual investors and regular institutions are still the most influential investors especially over the post-announcement period. The intercept estimates for individual investors are significantly negative except that on D_1, while those of regular institutions are positive except those on D_{-1} and D_0.

On the other hand, albeit mostly significantly negative over the pre-announcement period, the intercept estimates for professional institutional investors over the post-announcement period are mixed and mostly insignificant. Hence, there is little evidence that investors other than regular institutions are attracted by the OMR announcements to net buy the repurchased stocks. At most, they net sell less those stocks, the observation that by no mean sustains the order submission behavior hypothesis as well as the signaling hypothesis.

VII. Summary and concluding remarks

The signaling hypothesis has been well recognized for decades. Given the documented price reactions surrounding the OMR announcements in literature, it is seemingly convincing that the signaling hypothesis holds. However, we draw attention to a concern that an essential price-order link is probably absent from its justification in literature. In this paper, we examine the stock price behavior and, more importantly, the order submission behaviors of investors for the repurchased stocks surrounding the OMR announcements. Using an order-level dataset that classifies all investors into five various groups in the Taiwan stock

market, we precisely identify the order submission behaviors among different groups of investors and re-justify the signaling hypothesis.

As a result, firstly, only from the standpoint of price reaction, we find that the OMR announcements serve as reliable signals after which price reversals for the repurchased stocks clearly take place. Secondly, the most influential investors on the observed price behavior are individual investors and regular institutional investors. Individual investors generally net sell the repurchased stocks over the event window, but regular institutional investors are persistently on the net-buy side. It is noteworthy that after the OMR announcements individual investors have a stronger tendency to net sell the repurchased stocks at highs, while regular institutional investors try to buy back their own stocks at lows. Thirdly, unlike regular institutional investors, professional institutional investors are not enthusiastic about the OMRs. They are on the net-sell side before the OMR announcements, and do not demonstrate a recognizable order submission pattern afterward. Our results are robust to a number of different conditions. Finally, after recovering the missing link, evidence shows the net-sell tendency of individual investors and the apathy of professional institutional investors toward the OMRs, which does not support the signaling hypothesis.

Our contributions beyond the previous literature can be primarily placed on, first, the examination in depth of the order submission behaviors of individual groups of investors reacting to the OMR announcements. Thanks to the employed data that can identify the investor types, our application provides investors and economists with a fresh look at the signaling hypothesis. Although the Taiwan stock market is known for its fast growing and institutionalizing properties, it is still dominated by individual investors. Given the prior documented behavioral differences between individual and institutions, it is rather valuable to do the similar analyses for other developed and institution-dominated markets.

Second, as Taiwan has gradually opened its financial markets and institutional trading increasingly has gained importance, Taiwan’s development may arouse the interests of policy makers of other emerging markets where officials, firms, and investors in these markets are less experienced in increasingly important OMR practices. Taiwan’s experience can assist them in establishing effective policies to promote the efficiency and fairness of price discovery.

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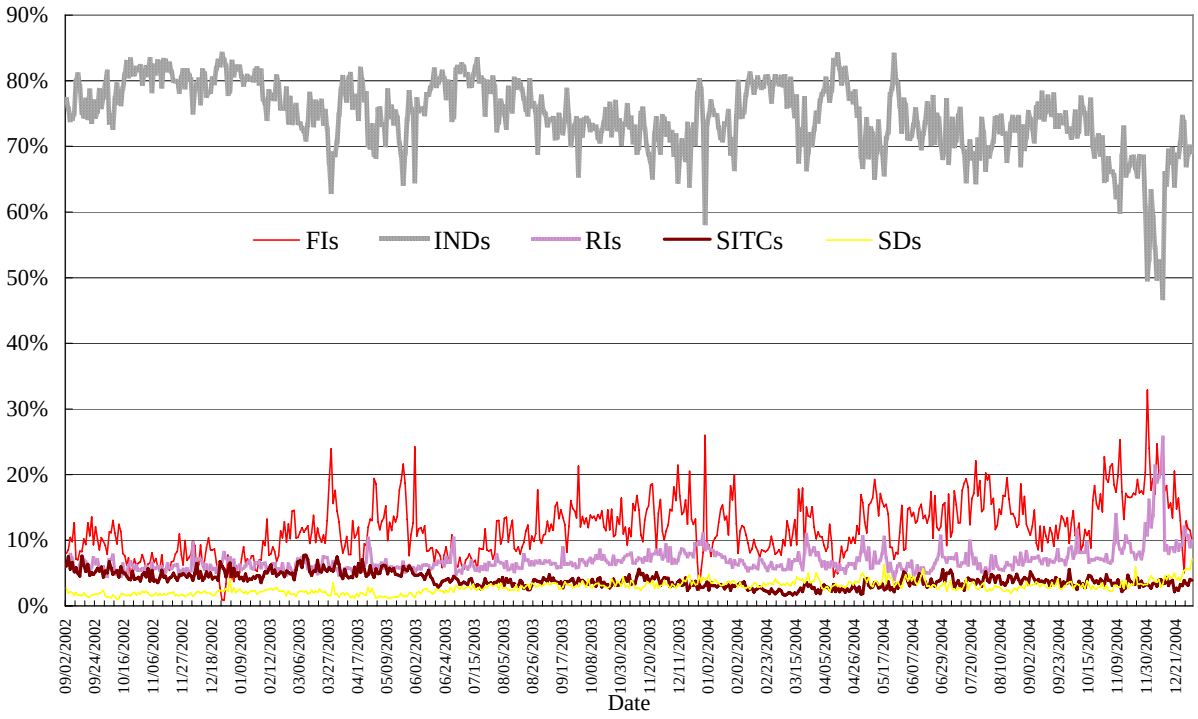
Figure 1. Percentage of total dollar trading volume by each group of investors from September 2, 2002 to December 31, 2004

FIs, SDs, SITCs, INDs, and RIs stand for foreign investors, securities dealers, securities investment trust companies, individual investors, and regular institutions, respectively.



Sample averages of FIs, SITCs, SDs, RIs, and INDs are respectively 11.77%, 3.96%, 2.83%, 6.87%, and 74.57%.

Table 1. Market reactions

The reported market reactions (%) consist of the average raw return (ARR) and the average abnormal (risk-adjusted) return (AAR) on the repurchased stocks over the 21-day event windows. The abnormal return is the difference between the raw return and the risk-adjusted return measured by the market model. All averages are equally weighted. Panel A discloses those returns over all events, while Panels B, C, D, and E over the events based on the purpose, repurchase size, firm size, and market condition. The data cover the period from 7/1/2002 to 12/31/2004. The firm size is the one available on the trading day prior to the announcement. The smallest (largest) firms are the ones included in the smallest (largest) quintile. The market condition refers to the market return over the 5 trading days prior to the announcement. The announcement days with the worst (best) 20% cumulative 5-day market returns are designated to the group of down- (up-) market. *n* represents the sample size (the number of the selected events). *SzRnk* is the average size (market equity) rank of the selected stocks, based on the deciles portfolios of all listed stocks at the beginning of the announcement date. The *t*-ratios are reported in parentheses. *, **, and *** indicate significance at respectively the 10%, 5%, and 1% levels.

Return	[-10, -6]	Event Window												[6, 10]
		[-5, -2]	-5	-4	-3	-2	-1	0	1	2	3	4	5	[2, 5]	
Panel A: All events (*n* = 563, *SzRnk* = 7.68)															
ARR	-2.20***	-2.71***	-0.56***	-0.78***	-0.62***	-0.76***	-1.00***	-0.21	1.44***	0.88***	0.31***	0.50***	0.15	1.84***	0.71***
	(-9.04)	(-9.75)	(-4.85)	(-6.70)	(-5.04)	(-5.89)	(-7.13)	(-1.48)	(10.83)	(7.80)	(2.73)	(4.63)	(1.45)	(8.27)	(3.10)
AAR	-1.27***	-1.67***	-0.26***	-0.46***	-0.40***	-0.55***	-0.60***	-0.11	1.31***	0.68***	0.21**	0.24***	0.13	1.26***	0.39**
	(-6.50)	(-7.84)	(-2.91)	(-5.32)	(-4.16)	(-5.54)	(-5.48)	(-0.95)	(11.57)	(7.27)	(2.33)	(2.80)	(1.51)	(6.85)	(1.98)
Panel B: The events based on the purpose															
Maintaining the firm's credit and shareholders' equity (*n* = 353, *SzRnk* = 7.87)															
ARR	-2.66***	-3.12***	-0.49***	-0.77***	-0.91***	-0.96***	-1.22***	-0.34*	1.32***	0.87***	0.38***	0.63***	0.15	2.04***	0.92***
	(-8.55)	(-8.75)	(-3.42)	(-5.40)	(-5.77)	(-5.96)	(-6.71)	(-1.89)	(7.72)	(6.05)	(2.63)	(4.70)	(1.18)	(7.35)	(3.12)
AAR	-1.51***	-1.86***	-0.20*	-0.46***	-0.56***	-0.64***	-0.76***	-0.17	1.21***	0.67***	0.19	0.33***	0.18	1.36***	0.50**
	(-6.12)	(-6.86)	(-1.88)	(-4.49)	(-4.56)	(-5.17)	(-5.31)	(-1.13)	(8.44)	(5.86)	(1.64)	(3.19)	(1.56)	(5.96)	(1.98)
Transferring shares to employees (*n* = 210, *SzRnk* = 7.42)															
ARR	-1.43***	-2.09***	-0.68***	-0.78***	-0.17	-0.47**	-0.70***	-0.04	1.65***	0.91***	0.16	0.28	0.16	1.51***	0.40
	(-3.63)	(-4.61)	(-3.39)	(-3.85)	(-0.87)	(-2.13)	(-3.21)	(-0.15)	(7.66)	(4.89)	(0.90)	(1.45)	(0.89)	(3.98)	(1.06)
AAR	-0.85***	-1.41***	-0.35**	-0.48***	-0.18	-0.40**	-0.37**	-0.03	1.49***	0.71***	0.23	0.06	0.08	1.08***	0.22
	(-2.62)	(-4.04)	(-2.19)	(-3.02)	(-1.11)	(-2.43)	(-2.22)	(-0.17)	(7.91)	(4.36)	(1.51)	(0.43)	(0.56)	(3.50)	(0.71)

Table 1. (Continued)

Return	[-10, -6]	Event Window													[6, 10]
		[-5, -2]	-5	-4	-3	-2	-1	0	1	2	3	4	5	[2, 5]	
Panel C: The events based on the repurchase size															
(0%, 2.5%] (*n* = 304, *SzRnk* = 7.77)															
ARR	-2.04***	-2.61***	-0.44***	-0.65***	-0.73***	-0.79***	-1.14***	-0.35*	1.08***	0.88***	0.40***	0.60***	0.23*	2.11***	0.30
	(-6.66)	(-7.77)	(-3.15)	(-4.25)	(-4.60)	(-4.71)	(-6.22)	(-1.80)	(6.33)	(6.13)	(2.63)	(4.21)	(1.67)	(7.54)	(1.00)
AAR	-1.20***	-1.50***	-0.18	-0.3.6***	-0.49***	-0.48***	-0.60***	-0.23	0.97***	0.63***	0.36***	0.33***	0.24**	1.55***	0.06
	(-5.10)	(-5.79)	(-1.61)	(-3.13)	(-3.99)	(-4.03)	(-4.36)	(-1.53)	(6.61)	(5.44)	(2.94)	(3.09)	(1.97)	(6.87)	(0.25)
(2.5%, 5%] (*n* = 198, *SzRnk* = 7.71)															
ARR	-2.50***	-2.87***	-0.67***	-0.75***	-0.58***	-0.87***	-0.83***	-0.38	1.67***	0.80***	0.24	0.47**	-0.08	1.43***	1.25***
	(-5.43)	(-5.64)	(-3.27)	(-3.81)	(-2.65)	(-3.72)	(-3.29)	(-1.57)	(7.09)	(3.97)	(1.31)	(2.43)	(-0.43)	(3.62)	(3.25)
AAR	-1.33***	-1.74***	-0.29*	-0.43***	-0.26	-0.76***	-0.60***	-0.11	1.59***	0.73***	0.05	0.16	-0.08	0.87**	0.74**
	(-3.43)	(-4.48)	(-1.85)	(-2.92)	(-1.56)	(-4.07)	(-2.99)	(-0.54)	(8.23)	(4.27)	(0.33)	(1.08)	(-0.49)	(2.53)	(2.11)
More than 5% (*n* = 67, *SzRnk* = 7.48)															
ARR	-2.06***	-2.74***	-0.73*	-1.42***	-0.25	-0.34	-0.87**	0.89*	2.37***	1.15***	0.06	0.18	0.45	1.84**	0.97
	(-2.88)	(-2.70)	(-1.73)	(-3.78)	(-0.62)	(-0.85)	(-2.08)	(1.99)	(5.81)	(2.97)	(0.16)	(0.53)	(1.45)	(2.37)	(1.24)
AAR	-1.37**	-2.20***	-0.52	-1.01***	-0.44	-0.23	-0.58*	0.46	1.99***	0.75**	0.05	0.04	0.30	1.13*	0.82
	(-2.54)	(-2.91)	(-1.65)	(-3.66)	(-1.20)	(-0.70)	(-1.67)	(1.41)	(5.41)	(2.38)	(0.16)	(0.13)	(1.09)	(1.85)	(1.20)

Table 1. (Continued)

Return	[-10, -6]	Event Window												[6, 10]
		[-5, -2]	-5	-4	-3	-2	-1	0	1	2	3	4	5	[2, 5]	
Panel D：The events based on firm size															
Smallest firms (*n* = 114, *SzRnk* = 3.91)															
ARR	-2.13***	-1.74***	-0.16	-0.31	-0.79***	-0.49*	-0.56*	-0.03	2.01***	1.24***	0.48*	0.58**	0.23	2.53***	1.16**
	(-3.96)	(-2.67)	(-0.56)	(-1.12)	(-2.84)	(-1.73)	(-1.89)	(-0.10)	(6.18)	(4.43)	(1.71)	(2.20)	(1.02)	(4.55)	(2.00)
AAR	-1.38***	-1.29**	-0.04	-0.13	-0.72***	-0.40*	-0.56**	-0.17	1.90***	0.84***	0.26	0.36*	0.35*	1.81***	0.75
	(-2.86)	(-2.39)	(-0.16)	(-0.61)	(-3.07)	(-1.69)	(-2.12)	(-0.61)	(6.61)	(3.31)	(1.05)	(1.67)	(1.67)	(3.76)	(1.44)
Largest firms (*n* = 114, *SzRnk* = 8.82)															
ARR	-2.31***	-2.42***	-0.61**	-1.01***	-0.09	-0.72**	-1.24***	-0.71**	1.50***	0.58**	0.43*	0.77***	0.50*	2.29***	0.94*
	(-4.87)	(-4.10)	(-2.39)	(-3.74)	(-0.31)	(-2.32)	(-4.00)	(-2.12)	(5.43)	(2.26)	(1.70)	(2.78)	(1.90)	(4.50)	(1.93)
AAR	-0.46	-0.97***	-0.10	-0.37*	-0.15	-0.35*	-0.07	-0.12	1.26***	0.29	0.35*	0.07	0.38*	1.08***	0.40
	(-1.27)	(-2.31)	(-0.56)	(-1.83)	(-0.84)	(-1.71)	(-0.31)	(-0.48)	(5.53)	(1.62)	(1.82)	(0.33)	(1.92)	(2.91)	(0.98)
Panel E: The events based on the market condition															
Up market (*n* = 113, *SzRnk* = 7.39)															
ARR	-3.07***	2.08***	0.15	0.40	0.66**	0.86***	1.15***	1.22***	1.82***	0.90***	0.33	0.22	0.18	1.63***	0.60
	(-4.75)	(3.57)	(0.51)	(1.47)	(2.49)	(2.97)	(4.15)	(4.27)	(6.58)	(3.48)	(1.32)	(0.95)	(0.86)	(3.36)	(1.18)
AAR	-2.16***	-1.01*	-0.41*	-0.54**	-0.25	0.18	0.26	0.63**	1.68***	0.68***	0.41*	0.07	0.07	1.24***	0.94**
	(-4.51)	(-1.95)	(-1.79)	(-2.39)	(-1.00)	(0.80)	(1.14)	(2.18)	(6.51)	(2.93)	(1.83)	(0.42)	(0.37)	(2.88)	(2.09)
Down market (*n* = 108, *SzRnk* = 7.66)															
ARR	-2.70***	-5.72***	-1.26***	-1.84***	-1.23***	-1.39***	-3.17***	-2.84***	1.64***	1.62***	0.23	1.89***	0.78***	4.52***	0.91**
	(-7.73)	(-8.86)	(-5.07)	(-6.76)	(-3.62)	(-5.16)	(-9.95)	(-8.65)	(4.94)	(5.54)	(0.87)	(6.46)	(3.13)	(9.29)	(2.09)
AAR	-1.39***	-2.32***	-0.35**	-0.52**	-0.45**	-1.01***	-1.15***	-1.13***	0.90***	0.93***	0.23	0.76***	0.37*	2.29***	0.81*
	(-4.37)	(-4.89)	(-2.05)	(-2.61)	(-2.00)	(-4.84)	(-4.38)	(-3.96)	(3.40)	(5.20)	(1.05)	(3.83)	(1.78)	(5.79)	(1.94)

Table 2. Order imbalance

This table reports the order imbalances (%) and the abnormal order imbalances (%) by each group of investors for the repurchased stocks surrounding the announcement days. The order imbalances are applied to all limit orders. The order imbalance for a given stock in a day is defined as a ratio of the difference between buy and sell orders to the sum of buy and sell orders for that stock. Its abnormal order imbalance is defined as the order imbalance less the order imbalance for that stock from days -25 to -6. The data cover the trading days from 7/1/2002 to 12/31/2004. All averages are order-volume weighted. The *t*-ratios are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. FIs, SDs, SITCs, INDs, and RIs stand for foreign investors, securities dealers, securities investment trust companies, individual investors, and the regular institutions, respectively.

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel A. Order imbalance												
INDs	-5.53***	-5.54***	-5.25***	-5.49***	-5.66***	- 6.13***	-1.89**	-0.43	-5.29***	-7.50***	-7.31***	-9.65***
	(-15.90)	(-8.03)	(-6.34)	(-6.83)	(-6.32)	(-6.58)	(-2.36)	(-0.54)	(-8.03)	(-11.78)	(-11.09)	(-14.26)
RIs	1.28***	1.36***	1.41***	1.84***	1.76***	1.55***	1.52***	4.19***	5.47***	5.76***	5.37***	5.43***
	(5.97)	(4.25)	(4.41)	(5.82)	(5.23)	(4.53)	(4.62)	(10.65)	(14.27)	(13.11)	(12.95)	(13.17)
FIs	-0.01	-0.13	-0.74***	-0.21	-0.52**	- 0.80***	-0.44	0.02	-0.36*	-0.42*	-0.12	-0.03
	(-0.09)	(-0.54)	(-3.03)	(-0.99)	(-2.03)	(-2.95)	(-1.54)	(0.08)	(-1.66)	(-1.69)	(-0.58)	(-0.11)
SITCs	-0.46***	-0.31***	-0.55***	-0.72***	-0.84***	-0.84***	-0.58***	-0.26*	-0.01	0.06	-0.14	-0.08
	(-7.12)	(-2.62)	(-3.71)	(-4.31)	(-4.33)	(-4.39)	(-3.48)	(-1.92)	(-0.01)	(0.41)	(-1.24)	(-0.66)
SDs	-0.20***	-0.14***	-0.48***	-0.29**	-0.42***	-0.51***	-0.22*	-0.16*	-0.03	-0.02	0.02	-0.06
	(-5.30)	(-1.56)	(-4.52)	(-2.44)	(-4.12)	(-4.25)	(-1.80)	(-1.94)	(-0.34)	(-0.21)	(0.23)	(-0.58)
Panel B. Abnormal order imbalance												
INDs		0.02	0.32	0.05	-0.10	- 0.60	3.65***	5.11***	0.27	-1.93***	-1.75**	-4.06***
		(0.03)	(0.38)	(0.07)	(-0.11)	(-0.64)	(4.53)	(6.29)	(0.41)	(-2.93)	(-2.57)	(-5.74)
RIs		0.08	0.12	0.57*	0.48	0.28	0.24	2.89***	4.17***	4.45***	4.08***	4.12***
		(0.31)	(0.44)	(1.92)	(1.56)	(0.84)	(0.73)	(7.28)	(11.00)	(10.31)	(9.47)	(9.86)
FIs		-0.11	-0.73***	-0.20	-0.51**	-0.79***	-0.43	0.03	-0.35	-0.41	-0.11	-0.02
		(-0.58)	(-3.10)	(-1.00)	(-2.02)	(-2.80)	(-1.38)	(0.12)	(-1.44)	(-1.49)	(-0.48)	(-0.06)
SITCs		0.15	-0.09	-0.26	-0.38*	-0.38*	-0.12	0.20	0.44***	0.51***	0.31**	0.38***
		(1.27)	(-0.63)	(-1.64)	(-1.94)	(-1.92)	(-0.72)	(1.40)	(3.48)	(3.33)	(2.30)	(2.89)
SDs		0.06	-0.28***	-0.09	-0.22**	-0.31***	-0.03	0.03	0.16	0.18*	0.22**	0.13
		(0.62)	(-2.84)	(-0.82)	(-2.34)	(-2.62)	(-0.22)	(0.36)	(1.54)	(1.83)	(2.15)	(1.21)

Table 3. Marketable order imbalance

This table reports the marketable order imbalances (%) and the abnormal marketable order imbalances (%) by each group of investors for the repurchased stocks surrounding the announcement days. A marketable limit order is a buy (sell) limit order whose price is greater (lower) than or equal to the prevailing best offer (bid). The marketable order imbalance for a given stock in a day is defined as a ratio of the difference between marketable buy and sell orders to the sum of marketable buy and sell orders for that stock. Its abnormal order imbalance is defined as the marketable order imbalance less the marketable order imbalance for that stock from days -25 to -6. The data cover the trading days from 7/1/2002 to 12/31/2004. All averages are order-volume weighted. The *t*-ratios are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. FIs, SDs, SITCs, INDs, and RIs stand for foreign investors, securities dealers, securities investment trust companies, individual investors, and the regular institutions, respectively.

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel A. Marketable order imbalance												
INDs	-3.09***	-3.22***	-5.74***	-5.14***	-6.45***	- 7.19***	-3.65***	0.68	-1.48***	-3.32***	-2.32***	-4.12***
	(-22.34)	(-7.69)	(-8.56)	(-8.39)	(-9.01)	(-9.71)	(-5.76)	(1.12)	(-3.20)	(-8.96)	(-5.78)	(-9.44)
RIs	0.60***	0.53***	0.57***	0.91***	0.91***	0.52**	0.41**	1.90***	2.36***	2.57***	2.71***	2.68***
	(6.34)	(3.98)	(3.37)	(5.33)	(4.65)	(2.50)	(2.17)	(9.23)	(11.19)	(11.32)	(11.54)	(11.44)
FIs	-0.03	-0.06	-0.69***	-0.29**	-0.36***	- 0.55***	-0.55***	-0.05	-0.34***	-0.34**	-0.26*	-0.13
	(-0.63)	(-0.44)	(-4.55)	(-2.17)	(-2.59)	(-3.66)	(-3.06)	(-0.46)	(-2.91)	(-2.41)	(-1.90)	(-0.92)
SITCs	-0.25***	-0.15**	-0.35***	-0.42***	-0.54***	-0.61***	-0.39***	-0.16*	0.00	-0.02	-0.08	-0.03
	(-7.30)	(-2.29)	(-3.94)	(-4.03)	(-3.93)	(-3.85)	(-3.63)	(-1.74)	(-0.03)	(-0.26)	(-1.18)	(-0.38)
SDs	-0.09***	-0.05	-0.28***	-0.15**	-0.25***	-0.36***	-0.17**	-0.16**	-0.09	0.04	0.00	-0.06
	(-5.69)	(-0.79)	(-4.61)	(-2.12)	(-4.43)	(-4.71)	(-2.50)	(-2.46)	(-1.24)	(0.71)	(0.17)	(-1.14)
Panel B. Abnormal marketable order imbalance												
INDs		-0.11	-2.62***	-2.04***	-3.33***	- 4.10***	-0.54	3.77***	1.63***	-0.21	0.78*	-1.01**
		(-0.28)	(-3.85)	(-3.26)	(-4.60)	(-5.44)	(-0.85)	(6.12)	(3.48)	(-0.55)	(1.93)	(-2.27)
RIs		-0.07	-0.04	0.31*	0.30*	-0.08	-0.20	1.29***	1.75***	1.96***	2.10***	2.07***
		(-0.59)	(-0.25)	(1.95)	(1.72)	(-0.43)	(-1.07)	(6.17)	(8.29)	(8.93)	(8.82)	(8.83)
FIs		-0.03	-0.65***	-0.26*	-0.33**	- 0.52***	-0.52***	-0.02	-0.31**	-0.31**	-0.23	-0.10
		(-0.23)	(-4.14)	(-1.94)	(-2.35)	(-3.32)	(-2.76)	(-0.17)	(-2.46)	(-2.01)	(-1.57)	(-0.67)
SITCs		0.10	-0.10	-0.18*	-0.29**	-0.36**	-0.15	0.09	0.25***	0.22**	0.16**	0.22***
		(1.40)	(-1.14)	(-1.75)	(-2.10)	(-2.23)	(-1.34)	(0.93)	(3.41)	(2.36)	(1.20)	(3.30)
SDs		0.04	-0.19***	-0.06	-0.16***	-0.27***	-0.09	-0.07	0.00	0.13**	0.10*	0.02
		(0.73)	(-3.15)	(-0.91)	(-2.95)	(-3.52)	(-1.22)	(-1.09)	(-0.01)	(2.11)	(1.74)	(0.43)

Table 4. The difference between the order imbalance and the marketable order imbalance

This table reports the difference (%) between the order imbalance and the marketable order imbalance by each group of investors for the repurchased stocks surrounding the announcement days. A marketable limit order is a buy (sell) limit order whose price is greater (lower) than or equal to the prevailing best offer (bid). The (marketable) order imbalance for a given stock in a day is defined as a ratio of the difference between (marketable) buy and sell orders to the sum of all buy and sell orders for that stock. The data cover the trading days from 7/1/2002 to 12/31/2004. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. FIs, SDs, SITCs, INDs, and RIs stand for foreign investors, securities dealers, securities investment trust companies, individual investors, and the regular institutions, respectively.

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
INDs	-2.44***	-2.32***	0.49**	-0.35**	0.79***	1.06***	1.76***	-1.11***	-3.81***	-4.18***	-4.99***	-5.53***
RIs	0.68***	0.83***	0.84***	0.93***	0.85***	1.03***	1.11***	2.29***	3.11***	3.19***	2.66***	2.75***
FIs	0.02	-0.07	-0.05	0.08	-0.16	-0.25*	0.11	0.07	-0.02	-0.08	0.14	0.10
SITCs	-0.21	-0.16	-0.20	-0.30	-0.30	-0.23	-0.19	-0.10	-0.01	0.08	-0.06	-0.05
SDs	-0.11	-0.09	-0.20	-0.14	-0.17	-0.15	-0.05	0.00	0.06	-0.06	0.02	0.00

Table 5. Conditional analyses on marketable order imbalance during the event windows

This table reports the average marketable order imbalances (%) by each group of investors for the repurchased stocks surrounding the announcement days based on the OMR purpose, repurchase size, firm size, and market condition in Panels A, B, C, and D, respectively. The marketable order imbalance for a given stock in a day is defined as a ratio of the difference between marketable buy and sell orders to the sum of all buy and sell orders for that stock. The repurchase size is defined as the proposed number of shares of the repurchase relative to the outstanding shares. Firm size is available on the trading day preceding the announcement. The smallest (largest) firms are the ones included in the smallest (largest) quintile. The market condition is based on the cumulative market return over the pre-announcement period. The lowest (highest) 20% of market returns are denoted as the down (up) market. The data cover the trading days from 7/1/2002 to 12/31/2004. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. FIs, SDs, SITCs, INDs, and RIs stand for foreign investors, securities dealers, securities investment trust companies, individual investors, and the regular institutions, respectively.

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel A. On the basis of the purpose												
Maintaining the firm's credit and shareholders' equity												
INDs	-3.36***	-5.42***	-4.40***	-3.73***	-4.73***	-6.44***	-2.72**	1.90**	-1.57**	-3.98***	-3.13***	-4.49***
RIs	0.81***	0.54*	1.07***	1.19***	1.33***	0.69*	0.64***	2.09***	3.29***	3.35***	3.14***	3.47***
FIs	0.09	-0.72**	-0.96***	-0.29	-0.31	-0.66**	-0.75*	0.03	-0.35	-0.49	-0.19	0.09
SITCs	-0.14***	-0.16***	-0.30***	-0.21	-0.31*	-0.41***	-0.20	-0.21	-0.13	-0.18	-0.16	-0.07
SDs	-0.07***	-0.29***	-0.42***	-0.05	-0.09	-0.26***	-0.25*	-0.17	0.01	0.12	-0.01	-0.02
Transferring shares to employees												
INDs	-2.97***	-4.28***	-6.62***	-6.05***	-7.64***	-7.86***	-4.28***	-0.04	-1.44**	-3.02***	-1.90***	-3.91***
RIs	0.48***	0.61***	0.28	0.75***	0.70***	0.43*	0.27	1.82***	1.85***	2.16***	2.49***	2.25***
FIs	-0.07	-0.48**	-0.53***	-0.30*	-0.39**	-0.50***	-0.43*	-0.11	-0.29**	-0.19	-0.30	-0.27
SITCs	-0.31***	-0.35***	-0.36***	-0.54***	-0.67***	-0.75***	-0.51***	-0.13	0.08	0.05	-0.04	0.00
SDs	-0.09***	-0.12**	-0.19***	-0.21***	-0.35***	-0.42***	-0.13*	-0.15***	-0.14	0.00	0.01	-0.08

Table 5. (Continued)

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel B. On the basis of the repurchase size												
(0%, 2.5%]												
INDs	-3.06***	-2.72***	-4.95***	-4.87***	-6.37***	-7.40***	-3.88***	-0.76	-1.72***	-3.48***	-2.41***	-4.43***
RIs	0.82***	0.67***	0.85***	1.24***	1.09***	0.87***	0.65**	1.68***	2.42***	2.29***	2.43***	2.65***
FIs	-0.03	-0.09	-0.73***	-0.29	-0.26	-0.69***	-0.72**	0.03	-0.42**	-0.38*	-0.31	-0.04
SITCs	-0.27***	-0.16	-0.42***	-0.62***	-0.80***	-0.73***	-0.42***	-0.12	0.05	0.07	0.02	0.00
SDs	-0.12***	-0.06	-0.29***	-0.15	-0.31***	-0.37***	-0.29***	-0.25**	-0.14	0.14	0.08	0.01
(2.5%, 5%]												
INDs	-3.01***	-3.62***	-5.46***	-6.50***	-7.30***	-7.41***	-3.88***	1.34	-1.35	-3.11***	-2.08***	-4.67***
RIs	0.46***	0.37	0.22	0.52**	0.88***	0.31	-0.05	2.35***	2.38***	3.14***	2.93***	2.46***
FIs	-0.09	-0.16	-0.72***	-0.25	-0.48**	-0.53**	-0.47**	-0.10	-0.35*	-0.29	-0.29	-0.20
SITCs	-0.23***	-0.14	-0.23*	-0.11	-0.23	-0.58**	-0.48**	-0.26	-0.05	-0.12	-0.14	-0.06
SDs	-0.05	-0.08	-0.18	-0.15	-0.21***	-0.24**	-0.03	-0.04	-0.02	-0.08	-0.08	-0.14**
More than 5%												
INDs	-3.46***	-4.17***	-9.92***	-2.24	-4.05*	-5.58***	-1.77	5.22***	-0.66	-3.02**	-2.53*	-0.92
RIs	0.02	0.36	0.27	0.57	0.12	-0.48	0.68**	1.46***	1.97***	2.07***	3.24***	3.38***
FIs	0.14	0.35	-0.33	-0.37*	-0.47**	0.08	-0.03	-0.26	0.04	-0.29	0.03	-0.34
SITCs	-0.22***	-0.17	-0.34	-0.43**	-0.27	-0.14**	-0.02	-0.02	-0.08	-0.16	-0.36	-0.03
SDs	-0.05**	0.12	-0.46**	-0.12	-0.08	-0.67*	-0.05	-0.05	-0.06	-0.03	-0.05	-0.17

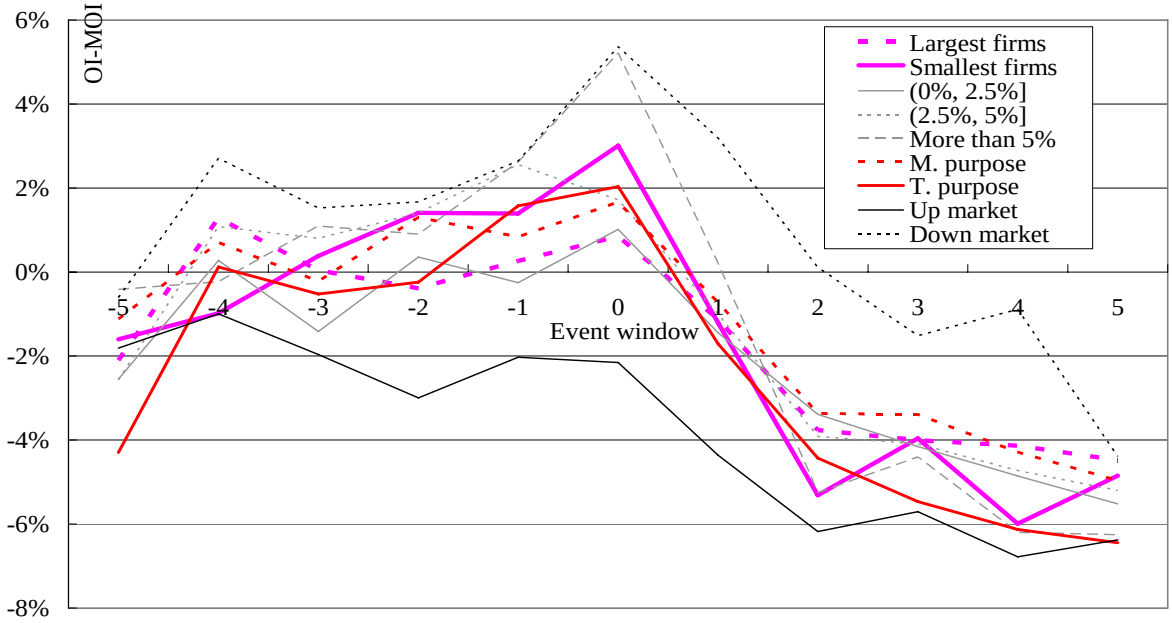
Table 5. (Continued)

Investor type	[-25, -6]	Event Window										
		-5	-4	-3	-2	-1	0	1	2	3	4	5
Panel C. On the basis of firm size												
Smallest firms												
INDs	-3.85***	-4.95***	-6.11***	-6.73***	-6.15***	-5.85***	-4.43***	2.56*	-0.86	-2.72***	-1.56	-3.78***
RIs	0.60***	0.45*	1.14**	1.11***	1.10**	1.42***	1.44***	2.04***	2.51***	1.95***	3.36***	3.89***
FIs	-0.01	-0.06	0.12	0.01	0.01	-0.08	-0.21	-0.08	0.03	0.09	0.13	0.16
SITCs	-0.08*	-0.14	-0.26	-0.20	-0.30*	-0.37	-0.26	-0.16	0.03	-0.27	-0.09	-0.02
SDs	-0.04*	0.06	-0.10	-0.05	-0.08	-0.16	-0.11	-0.02	0.01	-0.12*	-0.10	-0.04
Largest firms												
INDs	-2.05***	-2.53***	-1.63**	-2.77***	-4.53***	-7.41***	-3.65***	-0.21	-1.86***	-2.52***	-1.38	-2.98***
RIs	0.64***	0.35	0.47	1.26***	1.61***	0.80	0.13	2.68***	2.68***	2.61***	2.36***	2.34***
FIs	-0.25	0.07	-2.53***	-0.91*	-0.70	-1.50***	-1.87**	0.04	-1.08**	-1.08*	-0.88*	-0.16
SITCs	-0.31***	-0.38**	-0.26*	-0.36***	-0.54***	-0.52***	-0.39**	-0.20	-0.18	0.26*	-0.08	0.08
SDs	-0.19***	-0.11	-0.59***	-0.11	-0.42**	-0.69***	-0.46*	-0.10	0.18	-0.05	0.11	0.07
Panel D. On the basis of market condition												
Up market												
INDs	-3.79***	-4.04***	-1.19	-1.30	-1.04	-0.85	-0.07	2.85***	-0.65	-3.40***	-3.15***	-3.31***
RIs	0.82***	0.45*	0.65**	1.06**	0.93**	1.18***	0.77**	1.37***	1.49***	1.88***	2.31***	1.98***
FIs	-0.26**	-0.39	0.39	0.10	0.11	0.21	0.15	0.23	-0.09	0.43	0.53*	0.53**
SITCs	-0.30***	-0.13	-0.55***	-0.48***	-0.35*	-0.04	0.03	0.02	0.19	0.09	0.10	0.08
SDs	-0.06***	-0.05	-0.05	0.05	-0.02	-0.43	0.11	0.04	-0.16	0.03	0.01	-0.06
Down market												
INDs	-2.63***	-2.89***	-12.75***	-10.35***	-7.51***	-19.44***	-12.59***	0.88	0.53	-3.88***	1.40	-1.91*
RIs	0.50**	0.48	0.38	1.09***	1.73***	-0.09	0.20	2.50***	2.83***	2.82***	2.53***	2.82***
FIs	0.04	-0.32	-1.77***	-1.49***	-0.46	-1.94***	-2.47***	-0.08	-0.78*	-1.17***	-0.86***	-0.03
SITCs	-0.30***	-0.09	-0.16	-0.34**	-0.23	-0.83**	-0.74***	-0.57**	-0.16	0.00	-0.14	-0.15
SDs	-0.09***	-0.05	-0.32**	0.02	-0.22**	-0.52***	-0.47*	0.01	0.10	-0.25**	0.16	0.00

Figure 2. OI – MOI by individual investors and the regular institutions

This figure illustrates the conditional differences between the order imbalance and the marketable order imbalance by individual investors (in Panel A) and the regular institutions (in Panel B) for the repurchased stocks surrounding the announcement date. The differences are conditional on the repurchase purpose, firm size, size of the repurchase, and market condition. A marketable limit order is a buy (sell) limit order whose price is greater (lower) than or equal to the prevailing best offer (bid). The (marketable) order imbalance for a given stock in a day is defined as a ratio of the difference between (marketable) buy and sell orders to the sum of all buy and sell orders for that stock. The data cover the trading days from 7/1/2002 to 12/31/2004.

Panel A. By individual investors



Panel B: By regular institutions

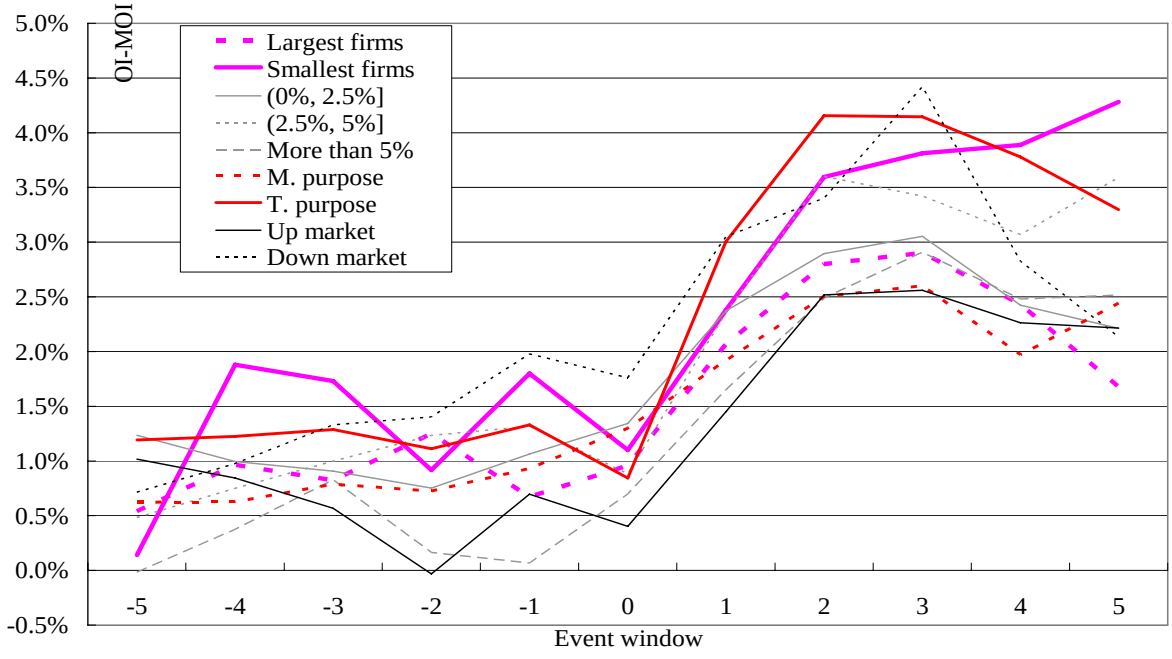


Table 6. Regression analysis of the marketable order imbalance

This table provides intercept estimates from the cross-sectional regressions as follows,

$$Dep_t = \sum_{i=-5}^{5} \alpha_i D_i + \sum_{i=-1}^{-2} \delta_i INDs_{t+i} + \sum_{i=-1}^{-2} \phi_i RIs_{t+i} + \sum_{i=-1}^{-2} \beta_i FIs_{t+i} + \sum_{i=-1}^{-2} \rho_i SITCs_{t+i} + \sum_{t=-1}^{-2} \pi_i SDs_{t+i} + \gamma \cdot Rp\_size + \omega \cdot Purpose + \theta \cdot Size + \eta \cdot Mkt + \varepsilon_t,$$

where Dep_t separately denotes FIs_t, $INDs_t$, RIs_t, SDs_t, and $SITCs_t$, the marketable order imbalances placed by foreign investors, individual investors, regular institutional investors, securities dealers, and securities investment trust companies, respectively, for a given repurchased stock over date *t* of the event window. D_t is a dummy variable taking the value 1 on day *t*, $-5 \le t \le 5$, and 0 otherwise. *Rp_size* is defined as the proposed number of shares of the repurchase relative to the outstanding shares. *Size* is the logarithm of market equity available on the day prior to the announcement date. *Purpose* is a dummy variable that takes the value of 1 if the OMR is to maintain the firm's credit and shareholders' equity and 0 otherwise. *Mkt* is the cumulative 5-day market return over the pre-announcement period. *t*-statistics are calculated using White's robust standard errors. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Intercept dummy	Dependent variable (*MOI*)									
	INDs	*RIs*	*FIs*	*SITCs*	*SDs*	*INDs*	*RIs*	*FIs*	*SITCs*	*SDs*
	Coefficient (%)					*t*-statistic				
D_{-5}	-2.35***	0.17	0.11	-0.05	0.00	-4.26	0.91	0.83	-0.50	0.02
D_{-4}	-4.92***	0.26	-0.62***	-0.27***	-0.25***	-8.94	1.41	-4.48	-2.92	-4.10
D_{-3}	-3.85***	0.49***	-0.09	-0.29***	-0.07	-6.95	2.70	-0.62	-3.05	-1.15
D_{-2}	-5.20***	0.39**	-0.21	-0.36***	-0.20***	-9.35	2.14	-1.54	-3.87	-3.20
D_{-1}	-5.72***	-0.09	-0.40***	-0.39***	-0.28***	-10.27	-0.47	-2.85	-4.18	-4.45
D_0	-2.09***	-0.09	-0.35**	-0.14	-0.07	-3.72	-0.50	-2.47	-1.45	-1.11
D_1	1.37**	1.55***	0.12	0.02	-0.11*	2.45	8.44	0.89	0.21	-1.70
D_2	-1.52***	1.59***	-0.32**	0.07	-0.06	-2.75	8.72	-2.28	0.78	-0.96
D_3	-2.66***	1.40***	-0.22	-0.02	0.09	-4.78	7.64	-1.62	-0.26	1.37
D_4	-1.13**	1.38***	-0.11	-0.09	0.03	-2.02	7.48	-0.81	-0.97	0.44
D_5	-3.16***	1.26***	-0.02	-0.02	-0.05	-5.65	6.82	-0.13	-0.22	0.02