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Can margin traders predict future stock returns in Japan?☆

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ABSTRACT

A growing body of literature suggests that investor sentiment affects stock prices both at the firm level and at the market level. This study examines the relationship between investor behavior and stock returns focusing on Japanese margin transactions using weekly data from 1994 to 2003. Margin trading is dominated by individual investors in Japan. In analysis at the firm level, we find a significant cross-sectional relationship between margin buying and stock returns. Both market-level and firm-level analyses show that margin buying traders follow herding behavior. They seem to follow positive feedback trading behavior for small-firm stocks and negative feedback trading behavior for large firm stocks. Our results show that information about margin buying helps predict future stock returns, especially for small-firm stocks at short horizons. The predictive power does not diminish even after controlling for firm size and liquidity.

> Why do the mechanisms of borrowing securities and selling them short appear so underdeveloped? Why are some crucial securities that arbitrageurs need missing altogether? (From Ch.7, Open Problems)Andrei Shleifer, Inefficient Markets (2000).

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1. Introduction

A growing section of the finance literature suggests that investor sentiment affects stock prices both at the firm level and at the market level. This paper extends this literature by linking investor sentiment to margin trades and examines how these quantities predict future stock returns in Japan. De Long et al. (1990) demonstrate that if risk-averse arbitrageurs know that prices may diverge further away from their fundamental values before they converge, they will take smaller positions when betting against mispricing. Therefore, if the sentiments of noise traders are systematically correlated and there are constraints on arbitrage, their investment behavior may predict future market prices. Yet, the direction of causality is not entirely clear because the behavior of noise traders may be influenced by the market.

Fisher and Statman (2000) examine the usefulness of a variety of sentiment variables in predicting short-horizon market returns. Baker and Wurgler (2006) examine how investor sentiment affects the cross-section of stock returns. When sentiment is pessimistic, subsequent returns are relatively high for smaller stocks, high-volatility stocks, unprofitable stocks, non-dividend-paying stocks, extreme-growth stocks, and distressed stocks. When sentiment is optimistic, these patterns attenuate or, in several cases, fully reverse. Brown and Cliff (2004) document that returns cause sentiment rather than vice versa.

In his analysis of volatility, Brown (1999) finds deviations from the mean level of investor sentiment are positively related to volatility during the same period. Wang et al. (2006) examine the relationship between sentiment, returns, and volatility and find that investor sentiment is caused by returns and volatility rather than vice versa. In addition, lagged returns cause volatility.

Odean's (1998) model shows that investor overconfidence will increase trading volume. Gervais and Odean (2001) argue that high past market returns may cause overconfidence in individual investors if they happened to invest in stocks in the same period. Using monthly market data, Statman et al. (2004) show that investor overconfidence is positively related to trading volume. Baker and Stein (2004) propose a model that explains why increases in liquidity are associated with lower subsequent returns at both the firm level and the aggregate level. When short sales are constrained, unusually high liquidity is a symptom of market domination by irrational investors who underreact to the information contained in order flow.

Individual investors have long been considered to be noise traders. They are less informed or trade for non-informational reasons. Nevertheless, if their trades are correlated and arbitrage is limited in some way, their investments will change asset prices. Lee et al. (1991) argue that the discount on closed-end funds can be explained by the irrational behavior of individual investors. Because of leverage, margin transactions are sometimes considered speculative and major players in these transactions tend to be individual investors. Therefore, we argue that margin transactions tend to reflect individual investor sentiment.

This study examines the relationship between investor behavior and stock returns by focusing on margin transactions in Japan. Margin trades are widely thought to be dominated by individual investors in Japan. First, we confirm that margin transactions are indeed dominated by individual investors. Second, we examine how margin transactions are related to stock returns. We look for specific patterns that are consistent with apparently irrational behavior. Our market-level analysis shows that margin buying is dominated by individual investors, but that margin selling is not. In analysis at the firm level, we find a significant cross-sectional relationship between margin buying and stock returns. We do not find significant patterns for margin selling. Both the market-level and firm-level analyses show that margin buying traders follow herding behavior. They seem to follow positive feedback trading behavior for small-firm stocks and negative feedback trading behavior for large firm stocks. As predicted, margin traders heavily impact the stock prices of small firms over a certain period of time. The deviation from previous value exists longer and is more pronounced for small-firm stocks that are mainly owned by individual investors.

Our results show that information about margin buying shares outstanding helps predict future stock returns, especially for small-firm stocks. The predictive power does not diminish even after controlling for liquidity. This is consistent with De Long et al. (1990), who show that stock prices deviate from their fundamental values for a certain period of time due to excess demand by noise traders.

This is the first comprehensive study of Japanese margin trading using weekly data over a long period of time. These weekly data cover most stocks eligible for margin trades. Standardized margin trades have been practiced in Japan for more than fifty years. In contrast to the United States, the Japanese margin trading system is advanced and highly centralized. The Japanese system allows stockbrokers to borrow securities and funds from specialized securities finance companies when there is a shortage of securities and funds.

Because of this highly evolved system, margin traders almost always use the standardized margin trading system when they can satisfy its requirements. Japanese margin data are complete and market-wide compared to U.S. data, which include margin transactions for only the largest brokerage firms. Furthermore, individual firm data are not available in the U.S.

The structure of the paper is as follows. The next section describes and compares margin transactions in Japan and the U.S. The third section discusses Japanese margin data. The fourth section discusses results for the aggregate market. The fifth section examines margin transactions and stock returns at the firm level. A brief conclusion follows.

2. Margin transactions in Japan

There are two types of margin transactions that are currently practiced in Japan; the first is negotiation based margin trading and the second is standardized margin trading. Negotiation margin transactions are usually between large financial institutions. The terms and fees are freely negotiated. On the other hand, standardized margin trades must follow specific rules determined by the stock exchange. The stock exchange determines which stocks are eligible for margin trading on the basis of liquidity. Standardized margin trading in Japan is similar to margin trading in the U.S., but certain features are importantly different.

Japan started its standardized margin transactions system in 1951. Loans and borrowed stock certificates for these margin transactions are provided by specialized securities finance companies, the largest of these being the Japan Securities Finance Company. The goal of the system was to stabilize and expand Japan's securities market amid the confusion of the early postwar period. The system allows stockbrokers to easily borrow securities and funds from securities finance companies. This process is called a security loan transaction (*taishaku torihiki*). The system's intent is to attract more individual investors. Standardized margin transactions proceed in the following way: brokers accepting orders from investors for standardized margin transactions will check their inventory of stocks, and match the order with other orders for the same stock by other investors. When the margin order by an investor cannot be met with the inventory that is on hand or that is available through the matching process, brokers will then go to securities finance companies to fill the gap. It is likely that standardized margin transactions are mainly used by individual investors because they are less creditworthy. The transactions are quite convenient for individuals because various conditions, especially interest rates, are fixed by the system with little regard to their creditworthiness, unlike other transaction modes.[1]

Accelerated financial deregulation, due to the Japanese version of the financial Big Bang, triggered the full-scale start of ordinary security loan transactions in December 1998. In this system, ordinary loan transactions were liberalized so that the borrowing rate and repayment period can be freely negotiated by investors and brokers. This was the start of negotiation based margin trading. Although this type of margin transaction is available for almost all Tokyo Stock Exchange (TSE) stocks and is more flexible, the major investors in ordinary loan transactions are institutions, not individuals. Individual investors are usually less creditworthy than institutional investors, hence this type of transaction is usually not available to them. Since this margin system is relatively new, its volume is still much smaller than that of standardized margin transactions.

It is highly likely that the buying entities and the selling entities in margin transactions are different investors. The buying entities, who effectively borrow money from their brokers, are likely to be individual investors. Institutional investors do not have to borrow money from their brokers to invest. On the other hand, margin selling entities are not necessarily individual investors. Institutional investors will sell short just like individual investors. In summary, we argue that margin buying is mainly the activity of individual

[1] Standardized margin transaction positions are required to be closed out within 6 months. Before the Japanese Big Bang, brokerage commissions, margin interest, *shinagashi-ryo* (premium charges), administration fees, and *haito-chosei-gaku* (ex-dividend adjustment) were determined by the stock exchange. After the Big Bang, only *shinagashi-ryo* and *haito-chosei-gaku* have been regulated. When stock loans outstanding exceed outstanding loans between the brokers and the securities finance companies, the cost of providing securities is charged to all the investors who sell the particular stock on margin; this is *shinagashi-ryo*. Though stockbrokers can now set their own conditions on margin transactions, they generally set the same conditions as security loans transactions. Both for standardized margin trades and for negotiation based margin trades, investors deposit 300,000 yen plus an additional 30% or more of the contract's value with their broker. These deposit levels are determined by cabinet office regulations and stock exchange rules. Investors are obligated to contribute additional funds to their margin account when a paper loss is incurred.

investors, but margin selling will be conducted by both institutions and individuals. Therefore, the analysis of margin buying is particularly interesting because these transactions are likely to be a result of individual investor sentiment.

3. Data

Our sample consists of all stocks eligible for margin transactions listed on the 1st and 2nd sections of the TSE during the period from December 17, 1994 through May 17, 2003.[2] The number of margin shares outstanding is collected from weekly TSE reports.[3] The final sample has 431 observations and 494,460 firm-weeks from a possible 440 observations and 834,491 firm-weeks.

This study examines the relationship between short-term stock returns and margin trading using both aggregate market-level data and firm-level transaction data. In the market-level analysis, we aggregate the number of shares outstanding of all margin transactions for all eligible stocks. Fig. 1 shows aggregate margin transaction shares outstanding (on the left-hand axis) and a TSE index (on the right-hand axis).[4]

While it is premature to draw conclusions, the figure shows a high degree of co-movement between margin buying and stock prices. The co-movement is especially striking from the late 1990s. The number of shares outstanding for margin buying rose substantially from 1999, whereas the number of selling shares outstanding stayed relatively lower until late 2001. On average, the number of shares outstanding for margin buying was almost double that of selling for much of the sample period. Table 1 shows basic summary statistics for our margin transactions data. We also show summarized trading volume for all stocks in this table. Average margin buying outstanding is much higher than that of margin selling. This indicates that the market for margin buying is much larger and more liquid. The average change in margin buying outstanding is almost equal to the average change in margin selling outstanding. The standard deviation of the shares outstanding for buying is somewhat larger than that of selling. We also compute the serial correlation of all of the variables. The change in margin buying is serially correlated at lag one. This means that an increase in MBO this week is followed by an increase in MBO in the subsequent week. As expected, the levels of both margin buying and margin selling are highly serially correlated.

In the market-level analysis, we examine the relationship between the weekly change in margin transactions outstanding and both market returns and market volatility. We are concerned with how margin traders' investment behavior is related to market returns and volatility. De Long et al. (1990) demonstrate that if risk averse, well-informed investors know prices may diverge further away from fundamental values before eventually converging, they may take smaller positions when they attempt to arbitrage mispricing. Hence, the sentiment of herding noise traders may predict future prices and volatility. We argue that MBO is a plausible proxy of the sentiment of Japanese noise traders. In addition, we investigate the relationship between margin transactions outstanding and trading volume because Baker and Stein (2004) predict that high liquidity is a symptom of market domination by irrational investors.[5] The important question to be asked is who the major margin traders are. In order to identify major margin traders, we use investor data from the Tokyo Stock Exchange to focus on four types of investors: individuals, financial institutions, securities firms, and foreign investors. Financial institutions include insurance companies, long-term credit banks, regional banks, and trust banks.

We use the Tokyo Stock Exchange Price Index (TOPIX) to calculate market returns. The TOPIX is a value-weighted market index of all firms listed on the 1st section of the TSE. Fig. 2 shows the return period construction; t is the weekend measurement point. The returns in the portfolio formation period, from

[2] In some of the subsequent analysis we divide this sample into two sub-periods: December 17, 1994 to March 6, 1999 and March 13, 1999 to May 17, 2003. We explore these sub-periods because of a substantial increase in margin buying that started in late 1998/early 1999. This increase could indicate a change in the trading behavior of investors and may correspond to a telecommunications/internet bubble and/or financial deregulation in the late 1990s.

[3] The TSE publishes the previous Friday's closing number of margin shares outstanding on Tuesday. We use outstanding margin shares measured in terms of trading units that adjust for stock splits. We exclude data for weeks in the very few cases where the TSE did not make a margin announcement.

[4] This TSE index is the TOPIX that is described below. The Nikkei 225, another well-known index, also suggests that stock prices and margin purchases move together.

[5] Trading volume is defined as the total number of shares traded during a given week on the TSE in terms of trading units after adjustment for stock splits.

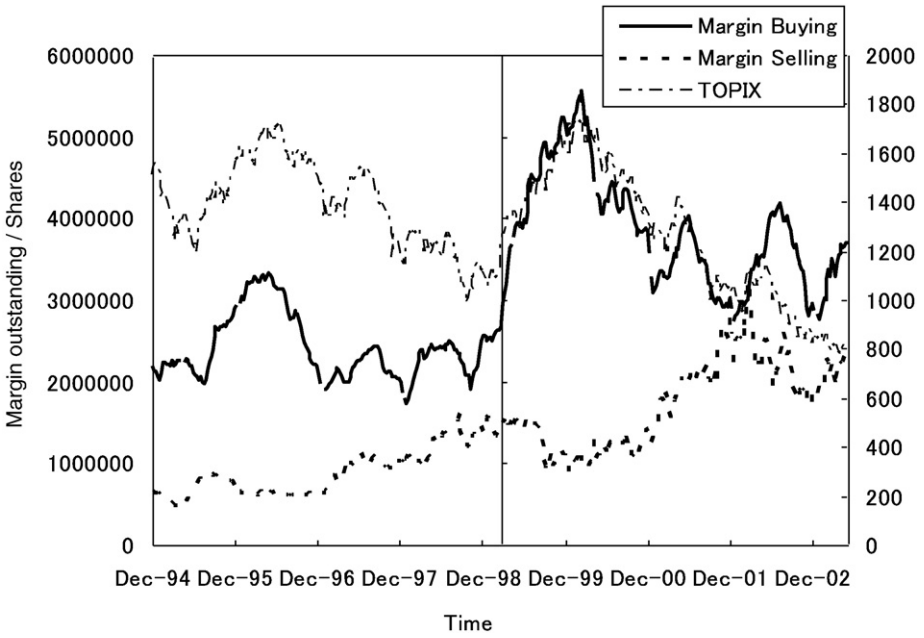

Fig. 1. Aggregate outstanding margin transactions. This figure shows aggregate shares outstanding of margin transactions for all eligible stocks listed on the Tokyo Stock Exchange (TSE) 1st and 2nd sections. The TOPIX is a value-weighted index of 1st section of the TSE stock prices. The sample period is from December 17, 1994 to May 17, 2003 on a weekly basis. Shares outstanding of margin transactions are made public by the TSE. The shares are adjusted for stock splits and scaled by trading units. There are 431 observations.

weekend $t-1$ to weekend t, are described as $K=0$. The returns in the next n weeks measured as holding periods are described as $K=n$, and in the pre-formation periods, from weekend $t-n$ to weekend $t-1$, are described as $K=-n$. Average weekly rates of return in these periods are calculated and used in the analysis. The same return definitions are used in the firm-level analysis.

In the firm-level analysis, we examine the behavior of individual stock returns when margin traders change their aggregate position. We rank individual stocks and create five portfolios on the basis of the change in their buying position from the previous week. Five portfolios are also created on the basis of the

Table 1
Summary statistics for aggregate margin transactions

	Level				Change			
	MBO	MSO	Net	Trading volume	MBO	MSO	Net	Trading volume
Mean	3,121,125	1,318,303	1,802,822	1,318,303	5151	5,515	−364	3461
Median	2,988,254	1,171,622	1,541,737	1,171,622	2807	1,040	−5,561	8365
Max	5,554,973	3,248,912	4,492,425	3,423,105	262,299	445,466	390,196	1,223,126
Min	1,738,647	473,832	−243,315	291,574	−298,561	−416,613	−550,634	−915,943
Standard deviation	905,610	601,211	932,311	601,211	82,063	87,504	116,685	252,935
Skewness	0.632	0.707	0.911	0.707	−0.143	0.245	−0.245	0.147
Kurtosis	2.558	2.600	3.395	2.600	4.416	7.522	5.216	5.237
Ac(1)	0.994	0.984	0.992	0.810	0.427	−0.015	0.200	−0.249
Ac(2)	0.984	0.969	0.980	0.710	0.227	−0.031	0.104	−0.176
Ac(3)	0.973	0.955	0.967	0.678	0.191	−0.016	0.055	−0.096

This table shows summary statistics of the aggregate shares outstanding of margin transactions. MBO and MSO refer to shares outstanding of margin buying and margin selling, respectively. The "Net" column shows statistics for margin buying less margin selling. Shares outstanding of margin transactions and trading volume are in trading units. Trading volume is defined as average daily trading volume for the week. The sample period is from December 17, 1994 to May 17, 2003. Ac(x) in the leftmost column is the xth order's serial correlation.

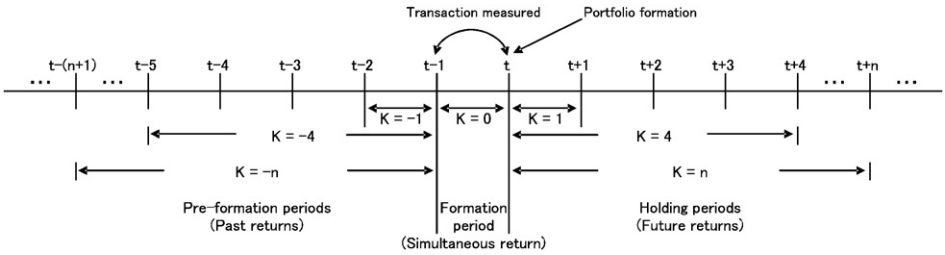

Fig. 2. Return periods. The values denoted by $K=0$ describe returns in the week which measure the change in shares outstanding of margin transactions. The $K=-n$ returns are average weekly returns over the pre-formation n weeks. The $K=n$ returns are average weekly returns over the holding period n weeks.

change in their selling position from the previous week. We examine the excess returns of these portfolios before and after the formation period to investigate the characteristics of margin traders. We use the Fama and French (1993, 1995) three-factor model to compute these excess returns. The intercept of these Fama–French regressions is used as a proxy of excess returns. In addition, the relationship between margin transactions and liquidity, which is often used as a proxy for investor sentiment, is analyzed.

4. Market-level analysis

In this section, aggregate market data for margin transactions are used to investigate: (1) the relationship between margin shares outstanding (change in margin shares outstanding) and market returns; (2) the relationship between margin shares outstanding (change in margin shares outstanding) and market volatility; (3) major margin traders; and, (4) the relationship between the change in margin shares outstanding and trading volume.

4.1. Relationship with market returns and volatility

In order to examine the relationship between market returns and margin shares outstanding, we estimate a simple regression. This analysis illustrates how margin traders' transactions are related to past and future weekly market returns. If margin traders follow positive feedback trading behavior, market returns in the previous several weeks should be positively correlated with the change/level of margin shares outstanding. If their trades impact on stock prices, the market returns in the same week will also be positively related.

Examining the relationship between future market returns and margin shares outstanding is also interesting. If margin traders do not rely on information, we should observe return reversals in the following week. We estimate the regression using margin information as a dependent variable for the past and contemporaneous returns and as an explanatory variable for the future returns. Table 2 shows the relationship between market returns and margin shares outstanding. In the case of margin buying, the level of margin buying outstanding (MBO) is weakly positively related to previous market returns. MBO becomes higher when market returns are high in the previous 52 weeks; this is consistent with positive feedback trading.[6] Stronger patterns are observed when the change in margin buying outstanding (ΔMBO) is used instead of MBO.[7] On the other hand, neither MBO nor ΔMBO is significantly related to market returns in the same week. Margin buyer transactions do not seem to impact stock prices. In general, margin buyers (we argue individual Japanese investors) seem to have positive feedback trading behavior consistent with Odean (1998).

[6] An interesting point could be made here that it is not really margin buying that is linked to market returns, but rather total trading volume. The idea is that total buying in the stock market volume displays positive feedback trading behavior. We argue that MBO uniquely captures the sentiment of individual Japanese investors, but perhaps MBO just tracks all buying on the Tokyo Stock Exchange. To test this, we also examine the relation between total buying (VOL) and the TOPIX return in Table 2. The table shows that there is no meaningful relation between total buying and past market returns.

[7] The change in MBO (MSO) is calculated as the difference between MBO (MSO) this week and last week. We also use the deviation from the previous 52-week mean of MBO (MSO) instead of previous week of MBO (MSO) when we compute ΔMBO (ΔMSO). The results remain qualitatively unchanged. We only report results that use the former definition of ΔMBO (ΔMSO).

Table 2
The relationship between aggregate margin transactions and market returns

	Past market returns					$K=0$	Future market returns				
	$K=-52$	−13	−4	−2	−1		$K=1$	2	4	13	52
MBO	0.488	2.107	3.642	5.148	7.238	−4.364	−0.088	−0.035	−0.027	−0.088	−0.176
	(2.07)	(1.71)	(0.85)	(0.61)	(0.44)	(−0.27)	(−0.62)	(−0.25)	(−0.19)	(−0.61)	(−1.18)
MSO	−0.234	−0.587	−0.561	−0.922	−3.000	−3.470	−0.174	−0.140	−0.117	−0.084	−0.124
	(−1.34)	(−0.69)	(−0.20)	(−0.16)	(−0.28)	(−0.32)	(−0.81)	(−0.67)	(−0.56)	(−0.40)	(−0.47)
ΔMBO	0.003	0.258	1.901	5.023	10.365	−0.067	−1.760	−0.386	0.605	1.146	0.610
	(0.13)	(2.38)	(5.54)	(7.24)	(7.45)	(−0.05)	(−1.12)	(−0.25)	(0.39)	(0.71)	(0.31)
ΔMSO	−0.006	−0.044	−0.046	0.029	−0.501	4.850	0.739	−0.353	−0.438	0.099	−0.131
	(−0.21)	(−0.35)	(−0.11)	(0.95)	(−0.32)	(3.09)	(0.50)	(−0.25)	(−0.30)	(0.06)	(−0.07)
VOL	−0.048	−0.120	1.762	3.999	9.647	14.795	0.064	0.033	−0.029	−0.117	−0.337
	(−0.28)	(−0.16)	(0.70)	(0.79)	(1.00)	(1.54)	(0.27)	(0.15)	(−0.13)	(−0.49)	(−1.24)
ΔVOL	−0.007	−0.165	−0.716	−2.580	−5.422	12.583	0.438	0.545	0.188	0.138	0.024
	(−0.09)	(−0.47)	(−0.61)	(−1.10)	(−1.21)	(2.83)	(0.86)	(1.12)	(0.38)	(0.27)	(0.04)

This table shows OLS regression results for aggregate margin transactions. Market returns are calculated from the TOPIX index. MBO and MSO refer to shares outstanding of margin buying and margin selling respectively. VOL is stock market trading volume, or "total buying". The K columns show return periods used in the regressions. For $K=-52$ to $K=0$, the estimated equation is $X=\alpha+\beta$ (return or volatilities). In this case, the variable X in the leftmost column is the explained variable. For $K=1$ to $K=52$, the estimated equation is (return or volatilities)$=\alpha+\beta X$. In this case, the variable X in the leftmost column is the explanatory variable. Stocks are adjusted for splits. The numeraire of margin transactions is 1000s of trading units for prior regressions and millions of trading units for later regressions. T-statistics are shown in parentheses.

In the case of margin selling, neither the level of margin selling shares outstanding (MSO) nor the change in margin selling shares outstanding (ΔMSO) is significantly related to market returns in previous weeks. However, the contemporaneous relationship between ΔMSO and market returns is positive, significant. This suggests that margin selling does not impact stock prices. Instead, these trades are passive and provide liquidity to the market.

Table 2 also shows that the change in margin shares outstanding is not related to future market returns. Information about aggregate margin transactions does not help predict future market returns. Assuming that margin traders' activities represent investor sentiment, our results are consistent with Brown and Cliff's (2004) argument that stock returns determine sentiment rather than vice versa. We discuss this issue in more detail in the following section.

4.2. Characteristics of margin transactions

Time-series models are used to investigate how liquidity and purchases by investors are related to margin transactions. First, we identify which type of investor dominates in this market. Secondly, the relationship between margin transactions and liquidity is examined. Table 3 shows results for MBO (Panel A) and MSO (Panel B). The following regression equation is estimated in this analysis:

$$X_t = \alpha + \gamma \Delta \text{Volume}_t + \sum \theta_j \text{ Investor Class}(j)_t + \sum \beta_j \text{ Control Variables} + \varepsilon_t \quad (1)$$

where X represents ΔMBO or ΔMSO. The TOPIX is used as a proxy for the market rate of return, a control variable. The number of shares traded in the week is defined to be trading volume. The number of shares purchased by each investor type in a particular week is the proxy for investor activity. In separate unreported work, we find current volatility and past market returns are related to ΔMBO; hence we include these variables in the regression as control variables.[8] ΔMBO, ΔMSO, trading volume, and the number of shares purchased by each investor are measured during the $K=0$ period.

Table 3 shows that the coefficient for individual investors is significantly positive for ΔMBO. This means that margin purchases are mainly conducted by individual investors. Generally, institutional investors such as trust banks, life insurance companies, and investment trust companies are well capitalized, so they have less need to borrow money through margin transactions. The result that margin buying is dominated by

[8] As was shown in Table 1, past ΔMBO is serially correlated at lag one. And as was shown in Table 2, past and contemporaneous returns are related to the change in margin transactions.

Table 3
Time-series regression analysis of changes in aggregate margin transactions

ΔVol	Investor classification				Adjusted R^2
	Indi.	Foreign	Fin.	Broker	
Panel A: ΔMBO					
0.004					0.25
(1.39)					
	0.599	0.108	−0.043	−0.059	0.42
	(5.66)	(1.64)	(−0.62)	(−0.89)	
0.005	0.606	0.092	−0.041	−0.074	0.43
(2.35)	(5.77)	(1.41)	(−0.60)	(−1.12)	
Panel B: ΔMSO					
0.018					0.12
(5.43)					
	−0.125	−0.004	−0.030	−0.066	0.01
	(−0.83)	(−0.05)	(−0.30)	(−0.61)	
0.019	−0.075	−0.049	−0.019	−0.112	0.12
(5.60)	(−0.53)	(−0.58)	(−0.20)	(−1.10)	

$$X_t = \alpha + \gamma\Delta\ \text{Volume}_t + \sum \theta_j\ \text{Investor Class}(j)_t + \sum \beta_j\ \text{Control Variables} + \varepsilon_t$$

X represents ΔMBO or ΔMSO. ΔX_t is defined as $X_t - X_{t-1}$. This table shows time-series regression results for margin transactions. Market returns (R_t and R_{t-1}) and lagged X (X_{t-1}) are used as control variables. Margin buying (ΔMBO) or selling (ΔMSO) are defined as the change in shares outstanding of margin buys or sales for the week. ΔVolume_t is defined as $\text{Volume}_t - \text{Volume}_{t-1}$. Volume is share volume in trading units. Returns are rates of return in percent form. The market returns are from the TOPIX. Investor classification means net purchase amounts (in millions of yen) for each investor class. Indi., Foreign, Fin. and Brok stand for individuals, foreigners, financial institutions, and stockbrokers, respectively. *T*-statistics are shown in parentheses. These regressions are adjusted for heteroskedasticity.

individual investors is consistent with conventional wisdom. Therefore, it is likely that margin buying information reflects individual investor sentiment. On the other hand, margin selling is not significantly related to any particular investor type.

Our results are consistent with Gervais and Odean's (2001) overconfidence hypothesis; they argued that past high market returns make investors overconfident. In their model, investors learn about their own investment abilities through their investment experience. In particular, investors tend to overestimate their own abilities in the early stages of their trading careers. The fact that the main participants in Japanese standardized margin buying are unsophisticated individual investors, whose access to information is inferior to that of institutional investors, together with the fact that margin transactions are relatively speculative investments, may have made positive feedback trading in margin buying appear more conspicuous. However, the apparent link between overconfidence and positive feedback trading cannot be formally tested with the available data. Our data do not allow us to identify individual agents' trades, so we cannot determine whether the individual investors who traded successfully at $K=-1$ are the same investors who traded at $K=1$ with excessive confidence. Still, our results for margin buying do suggest that investor sentiment is affected by past market returns.

Both margin buying and selling significantly increase as market volume increases. The increase in margin buying is consistent with Baker and Stein's (2004) argument that high liquidity is a symptom of market domination by irrational, individual investors. Margin traders provide liquidity to the market and their activities are not negligible. Our results imply that the change in margin buying reflects individual investor sentiment.

5. Firm-level analysis

The previous section showed that: (1) Japanese margin buying is mainly by individual investors; (2) it has a positive feedback bias; and, (3) margin transactions do not have a large impact on stock prices at the market level. These results suggest that the change in margin buying reflects individual investor sentiment.

Table 4
The persistence of margin transactions in the following weeks

	Period	Q1 (decrease)	Q2	Q3	Q4	Q5 (increase)	Q1−Q5 (difference)
ΔMBO/OUTS	$K=-1$	−0.043	−0.009	−0.003	0.003	0.058	−0.101
		(−15.36)	(−12.90)	(−7.02)	(5.47)	(19.76)	(−34.46)
	$K=0$	−0.122	−0.019	−0.002	0.011	0.137	−0.259
		(−46.78)	(−30.58)	(−8.33)	(18.91)	(32.67)	(−56.54)
	$K=1$	−0.049	−0.007	−0.000	0.006	0.055	−0.104
		(−17.85)	(−8.80)	(−0.15)	(9.19)	(18.37)	(−33.64)
ΔMSO/OUTS	$K=-1$	−0.004	−0.004	−0.005	−0.005	0.023	−0.027
		(−2.06)	(−10.28)	(−14.26)	(−12.27)	(18.29)	(−13.31)
	$K=0$	−0.100	−0.012	−0.001	0.008	0.111	−0.211
		(−60.00)	(−30.28)	(−4.65)	(21.91)	(57.11)	(−80.44)
	$K=1$	−0.021	0.005	0.006	0.005	0.011	−0.032
		(−16.70)	(11.42)	(13.22)	(10.23)	(6.62)	(−16.76)

This table shows margin transaction characteristics for portfolios shown in the leftmost column. Stocks are sorted into portfolios by the margin transaction indicator shown in the leftmost column. Margin buying (ΔMBO) or selling (ΔMSO) are defined as the change in shares outstanding of margin buys or sales for the week. OUTS is the total shares issued. The rows labeled $K=0$ show characteristics for the week in which the portfolio is formed. The rows labeled $K=1$ and $K=-1$ show the characteristics in the next week and in the previous week, respectively. The Q1 portfolio has the smallest sorted indicators, and Q5 has the largest. *T*-statistics are shown in parentheses.

In this section, we investigate whether there is a cross-sectional relationship between margin transactions and stock returns at the individual firm level. We conduct quintile analysis in order to determine how margin transactions influence individual stock returns. All eligible stocks are first sorted by the margin transaction measures at the end of each week as shown in Fig. 2. We construct five equal-weighted portfolios on the basis of these margin transaction measures, each containing an equal number of stocks. The smallest margin transaction stocks are in the Q1 portfolio and the largest in the Q5 portfolio. We rebalance these portfolios at each weekend and compute these portfolios' returns. We use the Fama and French (1993, 1995) three-factor model to adjust for risk.

If there is a cross-sectional relationship between margin transactions and stock returns, we should observe significant differences between the returns of sorted portfolios after adjusting for risk. The next part in this section analyzes the relationship between margin transactions and liquidity, a proxy of investor sentiment.

5.1. Cross-sectional characteristics of margin transactions

In the previous section, we showed that for Japanese margin transactions, especially for margin buying, investors seem to follow positive feedback trading behavior. Initially, we confirm that this tendency is also observed in the cross-sectional analysis. The change in margin transactions may be related to trading volume or the total number of shares issued by each firm. In order to standardize the change in margin transactions, we divide margin shares outstanding by total number of shares issued and trading volume. In subsequent analysis, we use these standardized ΔMBO (ΔMSO).[9]

Initially, we examine the persistence of margin transactions. From the market-level analysis, we found serial correlation in the change in margin buying; it is interesting to investigate whether similar patterns are observed at the portfolio level. The results are shown in Table 4. Stocks with high margin purchases tend to be also bought on margin in the following week.[10] The general pattern observed for margin buying also exists for margin selling. The main result from Table 4 is consistent with that of our market-level analysis. Margin buying traders, who are mainly individual investors, seem to herd on particular stocks for several weeks.

[9] Since the results are qualitatively similar, we do not report results for standardized ΔMBO (ΔMSO) using trading volume.

[10] This is true for both of the sub-periods as well. Apparently the substantial increase in aggregate margin buying from the late 1990s is not associated with a change in margin-trading behavior. We also examine the persistence of margin transactions from $t=-4$ to $t=4$ in work not reported here. The results are essentially the same, hence we report only $t=-1$ and $t=1$ in Table 4.

Table 5
Fama–French three-factor model alphas for portfolios sorted by margin buying

		Excess returns					
		Q1 (decrease)	Q2	Q3	Q4	Q5 (increase)	Q1−Q5 (difference)
K=	−20	−0.03	−0.03	0.02	−0.00	0.04	−0.06
		(−1.74)	(−2.32)	(2.01)	(−0.19)	(2.63)	(−5.92)
	−4	0.12	0.06	0.02	−0.12	−0.00	0.13
		(3.54)	(2.28)	(1.09)	(−5.13)	(−0.14)	(4.91)
	−1	0.37	0.27	−0.00	−0.31	−0.18	0.55
		(5.02)	(5.11)	(−0.02)	(−6.33)	(−2.57)	(10.19)
	0	0.92	0.53	0.01	−0.76	−0.59	1.50
		(12.14)	(9.84)	(0.10)	(−14.76)	(−6.47)	(18.54)
	1	−0.16	−0.19	−0.09	0.08	0.32	−0.48
		(−2.25)	(−3.54)	(−1.85)	(1.60)	(4.63)	(−8.55)
	4	−0.07	−0.08	−0.05	0.02	0.09	−0.16
		(−2.07)	(−3.08)	(−2.16)	(0.61)	(3.11)	(−7.16)
	20	−0.03	−0.01	−0.01	0.00	0.00	−0.03
		(−1.95)	(−0.90)	(−1.10)	(0.33)	(0.17)	(−3.57)

At the end of each week, 5 groups of stocks are formed. The stocks are sorted by margin buying indicators in ascending order. These portfolios are equal-weighted. Q1 is the portfolio that has the smallest margin buying values (ΔMBO/OUTS), Q5 has largest values. ΔMBO is the change in margin buying shares outstanding. OUTS is total shares issued. This variable is defined as net margin buying (New contracts−Settled contracts). The numbers in the K=0 rows are Fama–French three-factor model alphas when margin transactions are measured. Those in the $K=n/-n$ rows show average alphas over n post-/pre-formation weeks. T-statistics are shown in parentheses. The null hypothesis is that the alpha=0.

In the market-level analysis, we observed positive feedback trading behavior for margin buying. We investigate if similar patterns are present for individual stocks. We examine how the cross-sectional difference in margin transactions affects the cross-sectional difference in returns. If there are significant impacts on stock prices caused by these transactions, information on margin trades will help make subsequent stock returns predictable.

Table 5 shows excess returns using the three-factor model for margin buying sorted portfolios. The leftmost column shows the period of the excess return; each value in the body of the table shows the weekly average excess return during each measurement period. Since the Q5 portfolio returns before and during the formation period are significantly negative, margin buyers seem to follow negative feedback trading behavior. The rightmost column (Q1–Q5) shows the difference in quintile portfolio excess returns. The returns for the rows labeled K=−4, and −1 show that portfolio Q1 realizes higher returns than Q5 a few weeks before the formation period. Investors who reduce their buying position may have realized a higher return in the past. On the other hand, portfolio Q5 has high excess return in the following week. The excess returns decrease as the change in MBO gets smaller in the following few weeks (K=1, K=4). These results imply that information about margin trading may help predict future stock returns. High levels of margin buying tend to precede positive excess returns.[11] This result is consistent with the model developed by Chordia and Subrahmanyam (2004) that describes the relationship between microstructure and returns. They argue that positively autocorrelated order imbalances[12] (plausibly related to our MBO variable) predict future returns because of the way risk-averse market-makers resolve inventory and adverse selection issues. Their empirical analysis of NYSE order imbalances support their model. Our result is also similar to Barber et al. (2006) and Hvidkjaer (2006) who study the trading behavior of individual American investors. They find that stock heavily purchased by individuals (assuming that small trades are by

[11] In sub-period analysis not reported here, the association between margin buying and future excess returns is somewhat stronger in the 1999 to 2003 period.

[12] Order imbalance is a measure of buying/selling pressure. Chordia and Subrahamyan calculate order imbalance using an algorithm developed by Lee and Ready (1991) that classifies a trade as buyer (seller) originated if the price is closer to the ask (bid) price of the prevailing quote. We do not have bid/ask data, so we are unable to make an exact comparison of Japanese margin buying to Chordia and Subrahamyan's order imbalance result for the NYSE.

Table 6
Fama–French three-factor model alphas for portfolios sorted by margin selling

		Excess returns					
		Q1 (decrease)	Q2	Q3	Q4	Q5 (increase)	Q1−Q5 (difference)
$K=$	−20	0.16	−0.02	−0.08	−0.08	0.03	0.13
		(11.50)	(−1.18)	(−6.29)	(−6.39)	(2.11)	(14.63)
	−4	0.29	−0.03	−0.19	−0.15	0.16	0.12
		(9.15)	(−1.30)	(−7.47)	(−6.21)	(5.15)	(5.34)
	−1	0.21	−0.12	−0.29	−0.13	0.45	−0.25
		(3.33)	(−2.41)	(−5.79)	(−2.59)	(6.55)	(−5.21)
	0	−1.34	−0.85	−0.33	0.42	2.07	−3.42
		(−21.90)	(−15.81)	(−6.61)	(8.05)	(24.45)	(−45.08)
	1	−0.12	0.07	0.09	−0.07	0.02	−0.14
		(−2.05)	(1.25)	(1.71)	(−1.35)	(0.35)	(−3.33)
	4	−0.11	0.03	0.04	−0.01	−0.03	−0.08
		(−3.94)	(1.25)	(1.39)	(−0.29)	(−1.26)	(−4.39)
	20	−0.07	0.01	0.03	0.02	−0.04	−0.03
		(−4.96)	(0.79)	(2.23)	(1.32)	(−3.11)	(−3.80)

At the end of each week, 5 groups of stocks are formed. The stocks are sorted by margin selling indicators in ascending order. These portfolios are equal-weighted. Q1 is the portfolio that has the smallest margin selling values (ΔMSO/OUTS), Q5 has the largest values. ΔMSO is the change in margin selling shares outstanding. OUTS is total shares issued. This variable is defined as net margin selling (New contracts−Settled contracts). The numbers in the $K=0$ rows are Fama–French three-factor model alphas when margin transactions are measured. Those in the $K=n/-n$ rows show the average alphas over n post-/pre-formation weeks. T-statistics are shown in parentheses. The null hypothesis is that the alpha=0.

individuals) in one week earn high returns in the subsequent week. Stocks heavily sold in one week earn poor returns in the following week.

Here our focus moves to the change in margin selling outstanding. This analysis is shown in Table 6. The table shows that the Q1 and Q5 portfolios have significantly positive excess returns in the weeks before portfolio formation. At $K=0$, the excess returns have opposite signs. The Q1 excess return is significantly negative and the Q5 excess return is significantly positive. The patterns of Q1 and Q5 portfolios indicate that margin sellers sell (buy back) shares when stock prices rise (fall). Margin sellers' transactions seem to push stock prices back to their fundamental values quickly since we observe insignificant excess returns after the $K=0$ formation period. These results are consistent with the view that margin sellers are information-based traders. This is consistent with the findings in the previous section.

Using cross-sectional return data, we do not find positive feedback trading behavior for margin buying traders, though their position changes imply herding on particular stocks. Margin buying traders seem to follow negative feedback trading behavior instead. Margin buying traders increase or decrease their positions in a timely fashion. When their position increases (decreases), the following period's stock returns become significantly positive (negative). We argue that margin buying trades, which we view as herding by individual Japanese investors, perhaps in conjunction with the trades of risk-averse market-makers and constrained arbitragers, impact on stock prices in the following period. When investor sentiment is optimistic, the following period's excess returns are significantly positive. Our results show that information about margin buying shares outstanding helps predict future stock returns in Japan.

In order to understand the relationship between investor behavior and stock returns around the formation week, we plot in Fig. 3 excess returns, ΔMBO, and ΔMSO for both the Q1 and Q5 portfolios during the period from 10 weeks before to 10 weeks after the formation week.[13] Margin traders' activities are concentrated in the few weeks before and after the formation week. Japanese margin traders' sentiments seem to be short-term. The behavioral finance literature generally assumes investor sentiments are longer lasting, on the order of months and years. However, we argue that Japanese margin traders will tend to have much shorter-lived sentiments. There are good reasons to believe this is true. By regulation,

[13] We examined periods up to 20 weeks before and after the formation period, but no significant patterns are observed beyond 10 weeks.

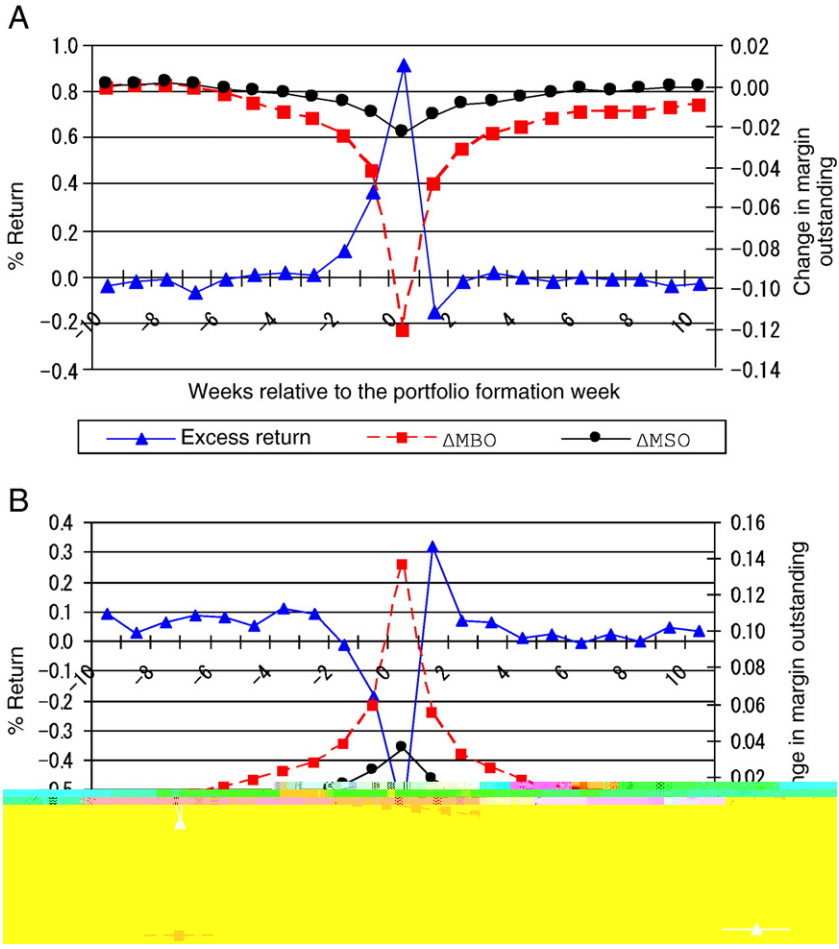

Fig. 3. A. Excess returns and margin transaction characteristics for the ΔMBO/OUTS Q1 portfolio (smallest margin transaction stocks). B. Excess returns and margin transaction characteristics for the ΔMBO/OUTS Q5 portfolio (largest margin transaction stocks).

standardized margin positions must be closed out within 6 months. While it is possible to circumvent this regulation, doing so can be inconvenient and costly.[14]

Fig. 3 shows that the margin trading patterns of the Q1 and Q5 portfolios are symmetric. Margin buying traders gradually increase (decrease) their positions in the ten weeks before and after the $K=0$ formation week though stock prices do not change very much until the $K=-1$ previous week. Margin traders significantly increase (decrease) their positions as stock prices fall (rise) over the three weeks before the $K=0$ formation week. Trades by margin buyers seem to impact stock prices in the following week. Margin sellers seem to change their positions at the same time as margin buyers. It is at least possible that the small excess returns after the formation week are partially due to margin sellers' trades.

Though we find evidence of significant excess returns for the Q5 portfolio in the following week, this does not necessarily prove the existence of economically meaningful profits. Because information about

[14] One further reason for short-term sentiment is that the managements of Japanese firms are obligated to make public announcements when they anticipate that earnings in the current accounting period will be substantially different from what were originally forecast. Accounting periods were general six months in the period for our data, though Japanese firms now generally report quarterly results. These earnings revision announcements, or lack of announcements, provide important short-term information that traders might rationally use in their decision to roll over or close out their margin positions.

margin trading is released on Tuesday in the following week, it may not be possible to construct a Q5 portfolio to capture the following week's excess returns. In the following two sections, we examine how these margin buying results are related to firm size and liquidity.

5.2. Firm size

Firm size may be an important factor in the analysis of investor sentiment since small-firm stocks are less liquid and more volatile. Small firm, less liquid stocks also potentially cause significant inventory, adverse selection and portfolio problems for market-makers and arbitragers. We expect to observe stronger, clearer results for the stocks of small firms. In order to examine this issue, we construct double-sorted portfolios. Stocks are first sorted into three portfolios on the basis of firm size; these portfolios are then each sorted into five sub-portfolios using the change in margin buying outstanding indicator. The results are presented in Table 7. Both large- and small-firm excess returns are significantly positive in the $K=1$ period (Panel C) for the Q5 portfolio. Surprisingly, our findings in the previous section are mainly observed for large firm stocks. Individual investors buy more (a significant 0.065) on margin at period $K=0$ of large firm stocks that were *down* (a significant −0.65) at period $K=-1$. However, individual investors buy more (a significant 0.204) on margin at period $K=0$ of small firms that were *up* (a significant 0.29) at period $K=-1$. Margin traders seem to follow negative feedback trading behavior for large firm stocks and positive feedback trading for small-firm stocks. The excess returns of the Q1 portfolio for both large and small firms during the three-week period are consistent with this conjecture. The change in margin buying for the Q5 portfolio is positive, significant for all three periods regardless of firm size. We find evidence of price continuation for small-firm stocks. Small-firm stocks that were bought heavily at $K=0$ (a significant 0.204) had significant positive returns (0.46) at $K=1$. Market-maker inventory concerns as suggested by Chordia and Subrahmanyam (2004) and the difficulty in arbitraging small-firm stock mispricings seem plausible explanations for this result.

Table 7
Fama–French three-factor model alphas for firm-size sorted portfolios

	Q1		Q5		Q1−Q5	
	Return	ΔMBO/OUTS	Return	ΔMBO/OUTS	Return	ΔMBO/OUTS
Panel A: K=−1						
Small	−0.05	−0.065	0.29	0.087	−0.34	−0.152
	(−0.58)	(−12.61)	(2.86)	(16.23)	(−4.31)	(−26.73)
Large	0.87	−0.016	−0.65	0.023	1.53	−0.040
	(15.16)	(−15.83)	(−11.84)	(17.01)	(23.01)	(−29.53)
Small−Large	−0.92	−0.048	0.94	0.064		
	(−11.32)	(−9.75)	(9.71)	(11.91)		
Panel B: K=0						
Small	−0.02	−0.179	0.42	0.204	−0.44	−0.384
	(−0.19)	(−37.38)	(3.32)	(27.60)	(−3.78)	(−47.41)
Large	2.36	−0.061	−1.92	0.065	4.28	−0.126
	(32.48)	(−35.84)	(−27.20)	(29.86)	(39.80)	(−39.11)
Small−Large	−2.38	−0.119	2.34	0.139		
	(−24.44)	(−23.20)	(19.84)	(18.87)		
Panel C: K=1						
Small	−0.10	−0.075	0.46	0.086	−0.56	−0.161
	(−1.08)	(−15.01)	(5.01)	(15.99)	(−6.98)	(−27.43)
Large	−0.25	−0.019	0.21	0.021	−0.46	−0.039
	(−4.92)	(−17.72)	(3.84)	(14.86)	(−7.68)	(−28.57)
Small−Large	0.15	−0.056	0.25	0.066		
	(1.79)	(−11.44)	(2.89)	(12.23)		

Stocks are classified into three groups by market capitalization. For each size, sorted portfolios are formed on ΔMBO/OUTS. ΔMBO is the change in margin buying shares outstanding. OUTS is total shares issued. The left-hand values in each cell are portfolio returns. The right-hand values are the average of ΔMBO/OUTS. Five equal-weighted portfolios are formed at $K=0$. Panels A, B and C show mean returns and ΔMBO/OUTS at $K=-1$, 0 and 1, respectively. The rightmost column shows the Q1 portfolio minus the Q5 portfolio characteristic. Fama–French three-factor model alphas are reported. *T*-statistics are in parentheses.

It is highly unlikely that individual investors use the three-factor model to examine past stock performance when they trade stocks. We therefore conduct the same analysis again using raw returns. The results remain essentially unchanged. These results indicate that the predictive power of margin buying is significant regardless of the firm size. Our results are not consistent with the view that margin buying traders are noise traders. Instead, they seem to time the market very well when they trade, or perhaps microstructure issues limit the ability of the market to quickly correct mispricings.

In order to fully understand the relationship between investor behavior and stock returns around the formation week, we plot in Fig. 4 excess returns, ΔMBO, and ΔMSO for the smallest and largest firm groups of the Q1 and Q5 portfolios over the period from ten weeks before to ten weeks after the formation week.[15] The patterns for small-firm stocks are interesting. Contrary to our previous findings, we observe significant positive excess returns a few weeks before and after the formation period for the Q5 portfolio. This is consistent with our finding in the market-level analysis that margin buyers follow positive feedback trading. Since margin buyers' sentiments are optimistic for some reason, their trades perhaps in conjunction with risk-averse market-makers push up these stock prices after the formation period for a few weeks. However, we do not observe an opposite pattern for the Q1 portfolio. Since we observe positive excess returns for the Q5 portfolio a few weeks after the formation week, a trading strategy on the basis of margin trading information may be profitable. The results are consistent with De Long et al. (1990).

In the case of large firm stocks, margin traders seem to follow negative feedback trading behavior. We observe positive excess returns for the Q5 portfolio and negative excess returns for the Q1 portfolio in the following week. The patterns of excess returns and the change in MBO are symmetric between the Q1 and Q5 portfolios surrounding the formation period. The significantly positive (negative) excess returns over the following week indicate that margin traders' transactions impact large firm stock prices though the effect is not as striking as that for small-firm stocks. In addition, significant excess returns are not observed after the second week. The market quickly absorbs the excess demand/supply of margin traders for large firm stocks that are mainly traded by institutional investors. Since information about margin transactions is released on Tuesday in the following week, it is very unlikely that a margin information-based trading strategy can earn economic profits.

5.3. Liquidity

The results so far suggest that the predictive power of margin buying information is different from firm-size anomalies. Our market-level analysis shows that margin transactions are significantly positively related to liquidity. A growing body of empirical literature suggests that liquidity predicts stock returns. Brennan and Subrahmanyam (1996) and Brennan et al. (1998) find that measures of increased liquidity are associated with lower future returns. Both Odean (1998) and Baker and Stein (2004) argue that overconfident investors generate high liquidity, which may result from optimistic investor sentiment. If investor sentiment dominates the market, stocks with high trading volume may experience subsequent poor performance. Since Japanese margin buying is mainly the activity of individual investors, the margin buying effect documented in this paper should be a good proxy for short-term investor sentiment. Our question here is how the margin buying effect is related to liquidity.

To examine this issue, we again apply a double-sorted portfolio approach similar to that employed in the previous section. The analysis asks whether the margin buying effect disappears after controlling for liquidity or if the difference in returns caused by liquidity disappears after controlling for the margin buying effect.[16] 25 portfolios are created by sorting all stocks on the basis of the weekly turnover ratio (ΔTOR) before being sorted into quintile portfolios on the basis of changes in margin transactions outstanding.[17] The first round of sorting adjusts for the effects of liquidity and the second round of sorting for the effect of margin buying.[18] The results are presented in Table 8, which shows portfolio excess returns in the following week ($K=1$) for 25 portfolios.

[15] We also expand our estimation period up to 20 weeks before and after the formation period; however, no significant patterns are observed beyond 10 weeks.

[16] We also conduct the same analysis for margin selling. We do not find any meaningful patterns for margin selling.

[17] TOR is defined as average shares traded each day/number of shares outstanding. We proxy liquidity with volume in the form of TOR.

[18] TWe also examine the difference in portfolio returns (K=1) between the first and fifth portfolios sorted on the change in margin transactions outstanding after being sorted by the change in the weekly turnover. The results remain qualitatively unchanged.

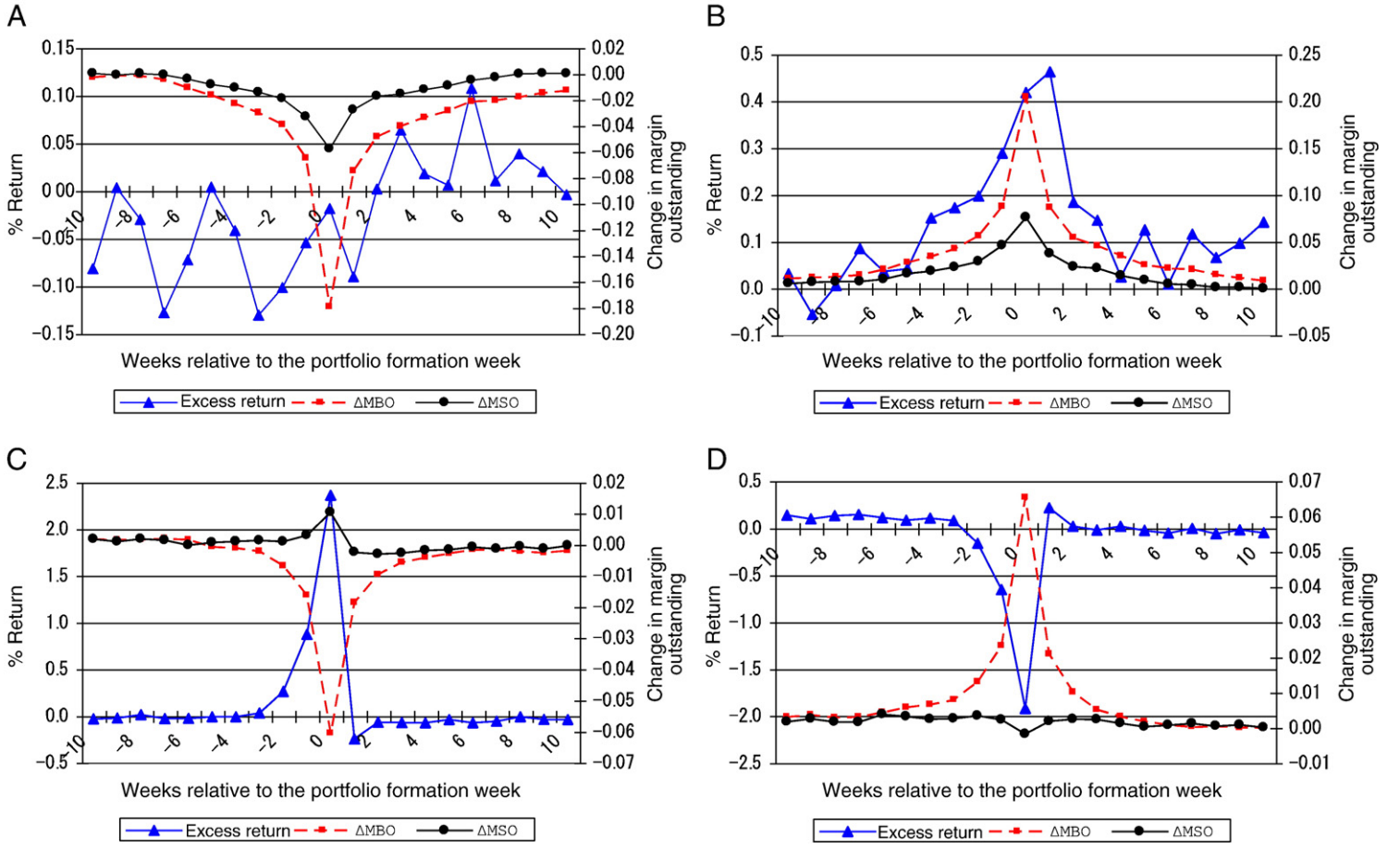

Fig. 4. A. Excess returns and margin transaction characteristics for the ΔMBO/OUTS, small firms Q1 portfolio (smallest margin transaction stocks). B. Excess returns and margin transaction characteristics for the ΔMBO/OUTS, small firms Q5 portfolio (largest margin transaction stocks). C. Excess returns and margin transaction characteristics for the ΔMBO/OUTS, large firms Q1 portfolio (smallest margin transaction stocks). D. Excess returns and margin transaction characteristics for the ΔMBO/OUTS, large firms Q5 portfolio (largest margin transaction stocks).

Table 8
Double-sorted portfolio market model alphas: ΔTOR (First) and margin transactions (Second)

	Q1 (decrease)	Q2	Q3	Q4	Q5 (increase)	Q1–Q5 (difference)	Average
Q1	−0.22	−0.20	−0.13	−0.02	0.11	−0.34	−0.09
(TOR decrease)	(−2.55)	(−2.74)	(−2.16)	(−0.33)	(1.24)	(−3.99)	(−1.50)
Q2	−0.20	−0.22	−0.09	0.04	0.27	−0.47	−0.04
	(−2.61)	(−3.52)	(−1.59)	(0.70)	(3.84)	(−7.62)	(−0.75)
Q3	−0.14	−0.18	−0.07	0.06	0.29	−0.43	−0.01
	(−2.04)	(−2.95)	(−1.14)	(0.98)	(4.39)	(−7.84)	(−0.13)
Q4	−0.16	−0.19	−0.11	0.16	0.38	−0.54	0.02
	(−2.16)	(−3.19)	(−2.04)	(2.65)	(5.43)	(−8.71)	(0.29)
Q5	−0.12	−0.14	−0.01	0.26	0.40	−0.52	0.08
(TOR increase)	(−1.34)	(−1.98)	(−0.13)	(3.52)	(3.70)	(−4.94)	(1.24)
Q1−Q5	−0.11	−0.06	−0.12	−0.28	−0.29		−0.17
	(−1.21)	(−0.83)	(−1.67)	(−3.97)	(−2.86)		(−3.05)
Average	−0.17	−0.18	−0.08	0.10	0.29	−0.46	−0.01
	(−2.51)	(−3.46)	(−1.79)	(2.07)	(4.56)	(−9.40)	

This table shows two-dimensional classifications by ΔTOR and margin buying (ΔMBO/OUTS). TOR is the weekly trading volume turnover ratio, a liquidity proxy. ΔMBO is the change in margin buying shares outstanding. OUTS is total shares issued. Stocks are first sorted by ΔTOR at $K=0$ into 5 groups. Stocks are then sorted on the change in margin buying shares outstanding for each portfolio. 25 portfolios are formed with approximately the same number of stocks in each week. The table reports Fama–French three-factor model alphas for each equal-weighted portfolio. *T*-statistics are shown in parentheses.

The bottom row of Table 8 shows average excess returns in the following week for margin buying ranked portfolios. The rightmost column of Table 8 shows the difference in average excess returns in the following week for liquidity ranked portfolios. Both margin buying and liquidity are significantly positively related to future returns. The difference in excess returns between the first and the fifth portfolios sorted on turnover ratios is significant only for the largest and the second largest change in margin buying portfolios. On the other hand, the difference in excess returns between the first and the fifth portfolios sorted on change in margin buying is significant for all liquidity ranked portfolios. Our results indicate that the margin buying effect is independent of liquidity while the liquidity effect is present only for the stocks in which margin traders increase their positions.

6. Conclusion

This study examines the relationship between investor behavior and stock returns focusing on Japanese margin transactions. We use weekly margin transactions data from 1994 to 2003 for our analysis. Our market-level analysis shows that Japanese margin buying is dominated by individual investors. Individual investors appear to follow positive feedback trading behavior because the change in margin buying shares outstanding is positively autocorrelated, and is positively related to stock market performance in the recent past. Aggregate margin selling transactions, however, are practiced by all investors and may be strongly influenced by institutions. This is consistent with the conventional wisdom that institutional investors do not need to borrow money to purchase stocks. We do not find evidence of positive feedback behavior for margin selling.

Our individual firm-level analysis shows that margin buying investors do not follow positive feedback trading behavior. Instead, they seem to follow negative feedback trading. Margin buying investors increase their positions in particular stocks when the recent performance of the market was high but the recent performance of these stocks was poor. Interestingly, excess returns of these stocks in the following week are significantly positive. On the other hand, the subsequent excess returns of stocks in which margin traders reduce their positions are significantly negative. Margin traders' herding behavior seems to impact stock prices in the following week. One possible explanation is that the trading decisions of risk-averse market-makers and constrained arbitragers contribute to the relation between margin buying and subsequent returns. Analysis of firm size suggests that margin traders follow positive feedback trading behavior for small-firm stocks and negative feedback trading for large firm stocks. Yet, predictability persists regardless of firm size. In addition, the predictive power of margin trades does not diminish after adjusting for liquidity.

It is extremely puzzling that individual Japanese margin traders follow positive feedback trading behavior for small-firm stocks while also following negative feedback trading behavior for large firm stocks. How individual Japanese margin traders can so effectively time the market and the related microstructure issues for market-makers is an intriguing topic for future research.

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