Dynamic Interactions between Institutional Investors and the Taiwan Stock Exchange Corporation: One-regime and Threshold VAR Models

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Abstract

This paper constructs a six-variable VAR model (including NASDAQ returns, TSE returns, NT/USD returns, net foreign purchases, net *dic* purchases, and net *rtf* purchases) to examine: (i) the interaction among three types of institutional investors, particularly to test whether net foreign purchases lead net domestic purchases by *dic* and *rtf* (the so-called demonstration effect); (ii) whether net institutional purchases lead market returns or vice versa and (iii) whether the corresponding lead-lag relationship is positive or negative? The results of unrestricted VAR, structural VAR, and multivariate threshold autoregression models show that net foreign purchases lead net purchases by domestic institutions and the relation between them is not always unidirectional. In certain regimes, depending on whether previous day’s TSE returns are negative or previous day’s NASDAQ returns are positive, we find ample evidence of a feedback relation between net foreign purchases and net domestic institutional purchases. The evidence also supports a strong positive-feedback trading by institutional investors in the TSE. In addition, it is found that net *dic* purchases negatively lead market returns in Period 4. The MVTAR results indicate that net foreign purchases lead market returns when previous day’s NASDAQ returns are positive and have a positive influence on returns.

Key words: Foreign investment, Demonstration effect, Lead-lag relationship, Multivariate threshold autoregression model, Structural VAR and Block Granger Causality.

JEL classification: G14; G15; D82

**The Interaction among Three Groups of Institutional Investors and Their**

**Impacts on the Stock Returns in Taiwan**

I. **Foreword**

 As financial markets are gradually liberalized in emerging economies, capital investments have been flowing into these countries at increasing rates. Needless to say, such capital movements in terms of bringing in direct investment along with technological know-how can be instrumental in raising a nation’s productivity. On the downside, capital inflows directed at investing in the host country’s security markets can be disruptive. From a macroeconomics perspective, foreign capital inflows are beneficial in that they provide much-needed capital. From a microeconomics perspective, they also lower the cost of capital and enhance competitiveness. Nevertheless, capital inflows can also be disruptive if arbitrage is their main purpose. When capital flight occurs, as was the case in the 1997 Asian financial debacle and the 1994 Mexican Peso crisis, movements in foreign capital could be extremely disruptive and damaging.

 Given the potentially negative impact of foreign investments, Taiwan’s Ministry of Finance exercised caution by implementing foreign capital policies in a three-stage process. First, it directed a number of local trust companies to issue investment funds abroad for the local stock market. Second, qualified foreign investment companies were allowed to invest in Taiwan’s stock market. Third, foreign individual as well as institutional investors were permitted to directly participate in trading in the Taiwan Stock Exchange Corporation (hereafter TSE). The first stage took effect from September 1983 until December 29, 1990, when the second stage replaced the first stage with a maximum investment limit of $2.5 billion. In response to the strong demand to invest in the TSE, the ceiling was raised to $5 billion and to $7.5 billion in August 1993 and March 1994, respectively. Foreign investments later increased substantially (see Table 1), and as a result the ceiling was lifted entirely in 1996 except for a maximum investment limit to each individual stock.

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|  Insert Table 1 about Here |

The relatively slow pace in allowing foreign investment in Taiwan was the result of ongoing debates between the Central Bank of China and the Securities and Futures Commission of the Ministry of Finance regarding the stability of foreign investment. The focus of the discussion was on the following three questions. First, are there differences in the trading behaviors of different type of institutions? One objective of opening up the domestic market to foreign investments is to utilize its advantages in information acquisition, information processing, and trade execution to improve the overall performance of local institutional investors.[[2]](#footnote-2) Second, will the trades of the three groups of classified institutional investors affect stock returns of the TSE? Third, will the lifting of restrictions on foreign capital contribute to the volatility of both the foreign exchange and stock markets in Taiwan?

 The purpose of this paper is to provide answers to two of the aforementioned issues: (1) Are there differences in the trading behaviors of different types of institutions? Typically, we examine interaction among the three types of institutions: qualified foreign institution investors (*qfii*), domestic investment companies (*dic*), and registered trading firms (*rtf*). (2) Does institutional trading “cause” stock returns or do institution investments follow movements in stock prices? The distinction between this paper and previous literature lies in following aspects: i) Most previous studies uses low-frequency－yearly, quarterly, or at best weekly－data (Nofsinger and Sias, 1999; Cai and Zheng, 2002; Karolyi, 2002). In this paper we employ daily data to help explore these issues in detail and to provide new evidence on the short-term dynamics among institutional investors and stock returns.[[3]](#footnote-3) ii) Unlike previous studies that used a bivariate VAR model (Froot et al., 2001), we use a six-variable VAR model, which includes three types of institutional trades, stock returns in the TSE, NT/USD exchange rate changes, and NASDAQ index returns to test related relationships. iii) Improving on the conventional linear VAR analysis in the previous studies, we employ the threshold concept and split data into two regimes based on whether previous trading day’s market returns are positive or negative.

A number of studies have examined the relationship between investment flows and stock returns. Brennan and Cao (1997) develop a theoretical model of international equity flows that relies on the informational difference between foreign and domestic investors. The model predicts that if foreign and domestic investors are differently informed, portfolio flows between two countries will be a linear function of the contemporaneous return on all national market indices. Moreover, if domestic investors have a cumulative information advantage over foreign investors about domestic securities, the coefficient of the host market return is expected to be positive.

Nofsinger and Sias (1999) use U.S. annual data to investigate the relationship between stock returns and institutional and individual investors. They identify a strong positive correlation between changes in institutional ownership and stock returns measured over the same period. Their results suggest that (i) institutional investors practiced positive-feedback trade more than individual investors and (ii) institutional herding impacted price more than that by individual investors. Nofsinger and Sias show that institutional herding is positively correlated with lag returns and appears to be related to stock return momentum.

Choe, Kho, and Stulz (1999) use order and trade data from November 30, 1996 to the end of 1997 to examine the impact of foreign investors on stock returns. They found strong evidence of positive-feedback trading and herding by foreign investors before South Korea’s economic crisis. During the crisis period, herding lessened and positive- feedback trading by foreign investors mostly disappeared.[[4]](#footnote-4)

Grinblatt and Keloharju (2000) use a Finland data set to analyze it to the extent that past returns determine the propensity to buy and sell. They find that foreign investors tend to be momentum investors, buying past winning stocks and selling past losing ones. Domestic investors, particular households, tend to be contrarians.

Froot, O’Connell and Seasholes (2001) by making use of daily international portfolio flows (44 countries from 1994 ~ 1998) along with a bivariate unrestricted VAR model find that lagged returns are statistically significant in predicting future flows. The evidence of the predictability of returns by flows is, however, ambiguous. In developed markets, there is no statistical evidence of stock predictability. For emerging markets, the evidence for predictability is strong, although less so for the Emerging European region. However, they estimate a restricted VAR model that assumes current inflows will affect current prices, and the causality does not run from contemporaneous returns to the flows. They provide the evidence of a positive contemporaneous correlation between current inflows and returns in emerging markets.

Hamao and Mei (2001) investigate the impact of foreign investment on Japan’s financial markets. Using monthly data from July 1974 to June 1992, they find that: (1) trades of foreign investors tend to increase market volatility more than that by domestic investors; (2) foreign investors have more sophisticated investment technology than do domestic investors; and (3) foreign investors seem to make investment decisions on the basis of not only short-term gains, but also long-term fundamentals.

Cai and Zheng (2002) use institutional holding data from the third quarter of 1981 to the last quarter of 1996 in order to examine the lead-lag relationship between portfolio excess returns and the institutional trading. Beyond it, they compute institutional trading as the change of institutional holdings from last quarter to the current quarter. The unrestricted VAR analysis indicates that stock returns Granger-cause institutional trading on quarterly basis, not vice versa. This implies the institutions “herd” on past price behavior instead of being dominant price-setters in the market.

Using weekly data of Japan, Karolyi (2002) find consistent positive-feedback trading among foreign investors before, during and after the Asian financial debacle. Japanese banks, financial institutions, investment trusts and companies are, on the other hand, aggressive contrarian investors. There is no evidence that the trading activity by foreigners destabilized the markets during the crisis.[[5]](#footnote-5)

Griffin, Harris, and Topaloglu (2003) study the daily and intraday relationship between stock returns and trading of institutional as well as individual investors for NASDAQ 100 securities. The daily unrestricted VAR results indicate that the institutional buy-sell imbalances are positively related to previous day’s returns and the institutional buy-sell imbalances (previous day) are not associated with current return. The results are consistent with the finding by Sias and Starks (1997) using U.S. data. Griffin et al. (2002) estimate a structural VAR with the contemporaneous returns in the institutional imbalance equation and discover a strong contemporaneous relationship between daily returns and institutional buy-sell imbalances.

Kamesaka, Nofsinger, and Kawakita (2003) use Japanese weekly investment flow data over 18 years to investigate the investment patterns and performance of foreign investors, individual investors, and five types of institutional investors. Not surprisingly, they find individual investors perform poorly, while securities firms, banks, and foreign investors perform admirably over the sample period.

Several related studies focus mainly on Taiwan’s stock market. Huang and Hsu (1999) detect decreased volatility in the weighted TSE using Levene’s F-statistic following market liberalization. Lee and Oh (1995), implementing a vector autoregression (VAR) model, find a reduction in the explanatory power of macroeconomics variables. Wang and Shen (1999) indicate that foreign investments exert a positive impact on the exchange rate with only a limited effect on the TSE. In addition, by using the turnover rate as a proxy for non-fundamental factors and earnings per share for fundamental factors within the framework of a panel data model, Wang and Shen are able to identify that: (i) the non-fundamental factors impacted the returns of the TSE before market liberalization, and (ii) both the fundamental and non-fundamental factors exerted an impact following market liberalization.

Lee, Lin, and Liu (1999) investigate interdependence and purchasing patterns among institutional investors, large and small individual investors. Their results, based on 15-minute intra-day transaction data (three months for 30 companies), highlight the important role played by large individual investors, whose trading affects not only stock returns, but also small individual investors. However, net buys (i.e. the difference between total buy and total sell) by institutional investors have no effect on the TSE returns, and vice versa.

The previous literature is predominantly focused on the relationship between institutional trading and stock returns, rarely on the interaction among institutional investors. For example, the majority of prior studies find evidence of positive-feedback trading by institutions, with the exception of Froot et al. (2001), who discover that in Latin America and emerging East Asian markets the trading by institutions positively predicts future returns. Karolyi (2002) also detects that foreign investors in Japan are positive-feedback traders while Japanese financial institution and companies are contrarian investors.

Most of the studies to date on these issues have been on the U.S. and Japanese markets despite that some of the literature gives scant attention to Taiwan’s stock market. When investigating the related issues in large countries such as the U.S. and Japan, the influence of the foreign sector on the domestic market could be neglected; however, for a small country such as Taiwan, it should not be ignored. This is because the electronics industry in Taiwan is closely connected to the U.S. companies listed on the NASDAQ. Ultimately, after examining the interaction among institutional investors and the dynamic relationship between stock returns and institutional investors, the conclusion may also be affected by whether returns of domestic market are positive or negative.

To circumvent the above problems, this paper employs a six-variable VAR model, which takes into account trades of three types of institutional investors (*qfii*, *dic*, and *rtf*), foreign returns, domestic returns, and changes in the NT/USD exchange rate to jointly test hypotheses under different market conditions. Using daily data, we find that net foreign purchases lead net domestic purchases. However, such a relation is not uni-directional. Under certain conditions (either when previous day’s TSE returns are negative or previous day’s NASDAQ returns are positive), we identify a feedback relation between net foreign purchases and net domestic purchases. It highlights the well-known argument in Taiwan regarding foreign investors： The demonstration effect on domestic institutional investors is not entirely correct. As for the lead-lag relation between market returns and institutional trading, we find that in most cases market returns at least lead both net foreign and *dic* purchases; however, market returns also lead net *rtf* purchases if the relationship between contemporaneous returns and institutional trading is considered. On the other hand, our results also indicate that net *dic* purchases lead market returns and are negatively associated with market returns in the 4th period. The MVTAR analysis shows that when previous day’s NASDAQ returns are positive, net foreign purchases positively lead stock returns.

The remainder of this paper is organized as follows. Section 2 describes the sample data and the basic statistics. Section 3 investigates the lead-lag relation for three groups of institutional investors in order to explore the issue of whether foreign investments give rise to demonstration effects in Taiwan’s stock market and examines the relationship between institutional trading activity and stock returns of the TSE. To further explore the interaction among three types of market participants, the sample is divided into two regimes based on either the sign of the market returns or that of the NASDAQ index returns of previous trading day, respectively. The last section provides a conclusion.

2. **Sample Data and Basic Statistics**

This paper employs daily data from December 13, 1995 to May 13, 2004 for a large sample analysis.[[6]](#footnote-6) The variables considered include purchases (*qfiibuy*) and sales (*qfiisell*) by *qfii*, purchases (*dicbuy*) and sales (*dicsell*) by *dic*, purchases (*rtfbuy*) and sales (*rtfsell*) by *rtf*, TSE daily weighted stock index (), NASDAQ stock index (), and the NT/USD exchange rate . The data are from the Taiwan Economic Journal (TEJ). The changes in the exchange rate and the logarithmic returns on TSE and NASDAQ indices are defined as

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Net foreign purchases () are computed as the daily purchases () less sales () of Taiwan stocks by foreigners. Similarly, net *dic* purchases () are computed as the daily purchases () less sales () of Taiwan stocks by *dic*, and net *rtf* purchases () are computed as the daily purchases () less sales () of Taiwan stocks by *rtf*. The VAR analysis used here depends on whether the time series are stationary; hence, a unit root test is to be performed in advance to avoid spurious regression. The Phillips and Perron test is applied and the results are illustrated in Table 2.

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The Phillips and Perron test results indicate that all time series are statistically significant at 1% level. There is no further differencing needed before applying VAR. Table 3 presents the summary statistics for the time series used in this paper.

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The average percentage change in the exchange rate on the daily basis is 0.011%; the average daily TSE return is 0.0083%; and the average daily NASDAQ return equals 0.0302%. Overall, *qfii* are net purchasers on average and two other domestic institutional investors are net sellers of equity over the sample period, reflecting different trading strategies adopted by foreign and domestic institutional investors. Such distinct trading activities among institutional investors can also be seen in Figure 1.

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|  Insert Figure 1 about Here |

Figure 1 presents the cumulative net purchases and daily net purchases by *qfii*, *dic*, and *rtf* and how they are associated with the TSE returns, NASDAQ returns, and NT/USD exchange rate. Over the entire period, the cumulative net purchases by *qfii* suggest an upward trend in general, while those of *dic* and *rtf* tend to present a downward trend. Overall, the NASDAQ index is more volatile than the TSE index (1995/ 12/ 13 =100), and it seems that there exists some correlation between the two indices. During the Asia financial crisis in 1997, the NT/USD exchange rate suffered a great upward swing (depreciation of New Taiwan Dollar) followed by a slight downward slide in 1999 and then rose again from 2002 onwards. Over the sample period, the volatility of net purchases by foreigners seemed to have increased since 2002. As for the relationship between net purchases by institutions and stock returns, no clear correlation could be detected as shown in Figure 1. To grasp a better understanding on their linkages, the contemporaneous correlation of net purchases by the three types of institutional investors, stock returns, and currency returns are displayed in Table 4.

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An inspection of Table 4 points out that returns on the NT/USD exchange rate (currency returns) are negatively correlated with both the TSE returns and net purchases by the three types of institutional investors, especially by foreign investors. Such relations are very much in line with the expectation. When stock prices rise following the influx of foreign capital, the local currency is expected to appreciate to a degree and as such negative correlations among them is expected. In addition, we find that returns on the TSE and NASDAQ are positively correlated. It is noteworthy that there exists a positive contemporaneous correlation between net purchases by the three types of institutional investors and the TSE returns with the correlation coefficients raging from about 0.3 (and ) to 0.4419 (and ). In short, this finding largely echoes the previous results (e.g., Froot et al., 2001 and Karolyi, 2002).

The greatest correlation between institutional trading and NASDAQ returns is that of  and  at 0.0938 followed by  and , respectively. Owing to the time difference, the TSE returns may be influenced by NASDAQ index returns. If  is used instead, a higher correlations between  and net purchases by institutions are found： 0.3441 for , 0.2369 for , and 0.1428 for , respectively. It implies that previous day’s NASDAQ returns exert a greater impact on net purchases by each institutional investor in the TSE than do the current NASDAQ returns.

3. **Lead-lag Relation among the Three Groups of Institutional Investors in the TSE**

 3.1 **The Unrestricted VAR Model**

Note that prices of many Taiwanese electronics securities are affected by the NASDAQ returns and hence foreign portfolio inflows may induce fluctuations of exchange rate. To investigate interactions emanated from the three types of institutional investors and the relationship between institutional trading activity and stock returns in Taiwan, we employ a six-variable VAR model using the NASDAQ returns (), currency returns (), TSE returns (), net foreign purchases (), net *dic* purchases (), and net *rtf* purchases () as the underlying variables. We attempt to answer the issues pertaining to (i) the interaction among trading activities of the three types of institutions and (ii) the relationship between stock returns and institutional trading. First, we propose a six-variable unrestricted VAR model shown below:

(1) ,

Where  is the polynomial lag of the jth variable in the ith equation. To investigate the lead-lag relation among three types of institutional investors, we need to test the hypothesis that each off-diagonal element in the sub-matrix  is zero.

On the other hand, to determine whether the TSE returns of the previous day lead net purchases by the three types of institutional investors, we test the hypothesis that each polynomial lag in the vector  is zero. Conversely, if we want to determine whether previous day’s net purchases by institutional investors lead current market returns, we test the hypothesis that each element in the vector is zero. Before applying the VAR model, an appropriate lag structure needs to be specified. A three-day lag is selected based on the Akaike information criterion (AIC). Table 5 presents the lead-lag relation among the six time series using block exogeneity tests.

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 The  block represents the potential interaction among three types of institutional investors. The results indicate that net foreign purchases lead net *dic* purchases and the dynamic relationship between these two variables can be provided by the impulse response function (IRF) in Figure 2a. Clearly, a one-unit standard error shock to net foreign purchases leads to an increase in net *dic* purchases, but this effect dissipates quickly by Period 2. Figures 2b and c indicate a feedback relation between net purchases by *qfii* and *rtf*. A one-unit standard error shock to net foreign purchases results in a positive response to net *rtf* purchases over the next two periods, which become negative in Period 3, followed by a positive response again after Period 4. Furthermore, a one-unit standard error shock to net *rtf* purchases also gives rise to an increase in net foreign purchases, which decays slowly over 10 -period horizon.

Figure 2d shows that net purchases by *dic* lead net *rtf* purchases. A one-unit standard error shock to net *dic* purchases produces an increase in net *rtf* purchases in the first 3 periods, and then declines thereafter. Overall, these impulse responses suggest that previous day’s net foreign purchases exert a noticeable impact on net *rtf* purchases, while previous day’s net *rtf* purchases also has an impact on net foreign purchases. It implies that not only do foreign capital flows affect the trading activity of domestic institutional investors, the relation is not uni-directional. To be specific, there is a feedback relation between net *rtf* purchases and net foreign purchases.

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| Insert Figure 2 about Here |

As for the effect of the three types of institutional trading activity on stock returns in the TSE, Table 5 reveals that net *dic* purchases on previous day lead the TSE returns. We can also see in Figure 2e that after Period 3, net *dic* purchases exert a negative (and thus destabilizing) effect on market returns, while the other two institutional investors do not have such an effect over the sample period. Examining the relationship between market returns and trading activity of the three types of institutional investors, we find that either the net foreign purchases or net *dic* purchases on previous trading day are affected by the previous day’s TSE returns. Moreover, the IRFs in Figures 2g and 2g also reveal a significant positive relation between TSE returns and net foreign purchases up to four periods and a significant positive relation between TSE returns and net *dic* purchases for 2 periods, which becomes negative after Period 3. In other words, foreign investors in the TSE engage in positive-feedback trading, while those of the *dic* tend to change their strategy and adopt negative-feedback trading after Period 3.

On the other hand, Table 5 indicates that previous day’s NASDAQ returns significantly affect both current TSE returns and net purchases by the three types of institutional investors. The impulse response in Figures 2h to 2k also confirms that previous day’s NASDAQ returns are positively related to both current returns and net purchases by these institutional investors, with the exception that a negative relation between net *dic* purchases and previous day’s NASDAQ returns is found after Period 4. Such results are much in sync with the expectation since the largest sector that comprises the TSE weighted stock index is the electronics industry to which many listed companies on NASDAQ have a strong connection. In addition, although previous day’s net *qfii* and *dic* purchases also lead the NASDAQ returns, we find that no significant relation exists except for Period 4 with a significantly negative relation between them (Figures 2l and 2m) .

The liberalization of Taiwan’s stock market has ushered in significant amount of short-term inflows and outflows of foreign capital, which have induced fluctuations in the exchange rate. As is seen from Table 5, the TSE returns lead currency returns and it appears that the initial significant effect of stock returns on currency returns is negative for the first 3 periods and then turns to be significantly positive thereafter (Figure 2n). Given that foreign investors are positive-feedback traders, the capital inflows is expected to grow in order to increase their stakes in TSE securities when stock prices rise. Consequently, NT/USD is expected to appreciate.

3.2 **The Structural VAR Model**[[7]](#footnote-7)

The unrestricted VAR model does not consider the effect of current returns on net purchases by institutions. The prior study by Griffin et al. (2003) includes current returns in the institutional imbalance equation and finds a strong contemporaneous positive relation between institutional trading and stock returns. Therefore, to further examine the relationship between institutional trading and stock returns, we introduce the current TSE returns () in the net purchases equations of the three types of institutional investors and re-estimate the VAR model before conducting the corresponding block exogeneity tests. Table 6 presents the estimation results.

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As indicated in the last row of Table 6, we find evidence of a strong contemporaneous correlation between current returns and net institutional purchases, which confirms the finding by the previous research. Moreover, as shown in Table 5, we find no evidence that past returns lead net *rtf* purchases when the unrestricted VAR model is used. In contrast to it, when the contemporaneous impact of stock returns on net institutional purchases is considered, we find that past returns also lead net *rtf* purchases as well as net purchases by *qfii* and *dic* when the structural VAR model is used (Table 6). In other words, net purchases by the three types of institutions are affected by past stock returns as was evidenced by previous studies. The corresponding impulse response relations are presented in Figure 3.

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| Insert Figure 3 about Here |

Comparing the impulse response relations in Figures 2 and 3, it is clear that when the impact of current returns on net institutional purchases is considered, a one-unit standard error shock from does not produce a positive impulse response in institutional trading until Period 2.[[8]](#footnote-8) The responses of foreign investors are rather distinct from those of domestic institutional investors after Period 3. In general, a sustained positive response from foreign investors is observed, while a negative response is witnessed for *dic* and sometimes, an insignificant response for *rtf* manifests itself after Period 3.

3.3 **The Threshold VAR Analysis**

 We pool all the data together when estimating either the unrestricted or restricted VAR model; however, the trading activity of institutional investors may depend on whether stock prices rise or fall.[[9]](#footnote-9) A small economy like Taiwan also depends to a large degree on the sign of NASDAQ index returns. Consequently, to investigate institutional trading under distinct regimes based on market returns, we use the multivariate threshold autoregression (MVTAR) model proposed by Tsay (1998) to test the relevant hypotheses. Let  be a 6×1 vector and the MVTAR model can be described as

(2) ,

where , , and  is an index function, which equals 1 if the relation in the bracket holds. It equals zero otherwise. is the threshold variable with a delay (lag) d.

In order to explore whether institutional trading activity would change during different domestic and foreign market return scenarios, the potential threshold variables used are  and .[[10]](#footnote-10) Before estimating equation (2), we need to test for possible potential non-linearity (threshold effect) in this equation. Tsay (1998) suggests using the arranged regression concept to construct the  statistic to test the hypothesis , . If can be rejected, it implies that there exists the non-linearity in data with as the threshold variable. Tsay (1998) proves that is asymptotically a chi-square random variable with  degrees of freedom, where is the lag length of the VAR model and *k* is the number of endogenous variables.[[11]](#footnote-11) Table 7 presents the estimation results of the  statistic.



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 As shown in Table 7, the null hypothesis is rejected using either past returns on the TSE or NASDAQ, suggesting that our data exhibit nonlinear threshold effect. Theoretically, one needs to rearrange the regression based on the size of the threshold variable  before applying a grid search method to find the optimal threshold value . Nonetheless, our goal is to know whether the institutional trading behavior depends on the sign of market returns, as such the threshold is set to zero in a rather arbitrary way.[[12]](#footnote-12) Table 8 lists the results of block exogeneity tests for the lead-lag relation in the  and  regimes, respectively.



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| Insert Table 8 about Here |

The interaction among institutional investors is depicted in Figure 8: current net purchases by foreign investors affect that by domestic institutions when previous day’s TSE returns are negative. Note that no such relation is evidenced when previous day’s TSE returns are positive. A feedback relation between *rtf* and *qfii* is observed when  is positive or negative. However, *dic* is found to lead *rtf* only when  is positive. Such results reveal different institutional trading strategies under distinct return regimes. The demonstration effect － previous day’s net foreign purchases have on domestic institutions using the unrestricted VAR model － seems to surface only when previous day’s market returns are negative. Therefore, it may produce misleading results if we fail to consider the sign of previous returns.

The impulse responses in Figure 4 illustrate that the responses of *dic* and *rtf* from the *qfii* shock are quite similar to the ones in Figures 2f and 2g.[[13]](#footnote-13) As for the impact of previous day’s market returns on current net purchases by institutions, it can be shown via the MVTAR model that market returns lead net purchases by *qfii* and *dic* when previous day’s market returns are negative, which is consistent with the finding using the one-regime VAR model. When previous day’s market returns are positive, market returns lead net purchases by the *dic* only. Obviously, returns have more influence on net institutional purchases when pervious day’s returns were negative. In addition, we find that net *dic* purchases on the previous day may affect current returns when the one-regime VAR model is used. Actually, the MVTAR analysis reveals that such a relation emerges only when previous day’s market returns are positive. The impulse responses depicted in Figure 4 (Panel B) demonstrate that a one-unit standard error shock to net *dic* purchases produces an increase in market returns in Period 2, and then they turns to be negative after Period 4, a result similar to those using the one-regime VAR model.

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| Insert Figure 4 about Here |

Among the listed companies on the TSE, the electronics sector has the largest market share, which accounts for more than 60% of all trades. This being the case, Taiwan’s stock market is closely related to the NASDAQ index as is evidenced using the conventional VAR model. To further investigate whether the interaction among institutions and the relationship between institutional trading and stock returns are affected by the sign of previous day’s NASDAQ index return,  is used as the threshold variable. That is, block Granger causality tests are performed by splitting our data into two regimes based on the sign of the variable. Table 9 reports the results.

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The results indicate that net *qfii* purchases lead that of two domestic institutional investors regardless of the sign of previous day’s NASDAQ returns. Moreover, when , net *rtf* purchases lead net *qfii* purchases, which is in line with that using the one-regime VAR model. However, when, the net purchases by either *dic* or *rtf* lead net *qfii* purchases, and net *qfii* purchases lead net purchases by either *dic* or *rtf*. In other words, we find strong evidence of a feedback relation between net foreign purchases and two domestic net purchases when previous day’s NASDAQ returns are positive. The results pertaining to the impact of previous day’s returns on institutional trading parallel those using the unrestricted VAR model: previous day’s returns have an impact on the net purchases by *qfii* and *dic*, but not on net purchases by *rtf* regardless of the sign of previous day’s NASDAQ returns. As for the impact of net institutional purchases on previous day’s stock returns, only net *dic* purchases still lead stock returns when , as was the case in the one-regime model. However, we find that net *qfii* purchases also lead stock returns when .

The results from Panel B of Figure 5g indicate that a one-unit standard error shock from net *qfii* purchases made on previous days produces a positive response to stock returns in Period 2, but no significantly negative responses are found during other periods. The results of the MVTAR model also capture the phenomenon in the one-regime model: net *dic* purchases exert a negative impact on market returns. However, such an effect is witnessed when previous day’s NASDAQ returns are negative.

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| Insert Figure 5 about Here |

4. **Conclusion**

In this paper we investigate whether the trading behavior of foreign investors leads that of Taiwanese institutional investors (i.e. the demonstration effect) and whether institutional trading has a destabilizing effect on the stock market. The reason we select Taiwan in our study is due to her unique role of being gradually opened up to foreign investment and her high stock returns volatility. To provide more information to these issues, this paper has constructed a six-variable VAR model including trading activities of three types of institutional investors, the TSE returns, NASDAQ returns, and currency returns so as to examine the interaction and the dynamic relationship between institutional trading and stock returns using daily data from December 13, 1995 to May 13, 2004.

 The results from the conventional unrestricted VAR model indicate that net purchases by foreign investors lead those by domestic institutions (and thus the demonstration effect), while net purchases by *rtf* also lead those by foreign investors. That is, there exists a feedback relation between them. As for the relationship between institutional trading and stock returns, we find that except for *rtf*, both foreign and *dic* net purchases are positively affected by previous day’s TSE returns. That is, both the *qfii* and *dic* engage in positive-feedback trading. We also find that previous day’s net *dic* purchases first produce a positive and then a negative impact on stock returns. Furthermore, we employ a structural VAR model with the contemporaneous returns included in the three net institutional purchase equations. A comparison of the structural and unrestricted VAR models suggests that the TSE returns positively lead net *rtf* purchases using the structural VAR model, which cannot be observed when the unrestricted VAR model is used. In other words, if the contemporaneous relation between returns and net institutional purchases is taken into account, we find that *rtf* are also positive-feedback traders.

 On the other hand, the sign of market returns does affect trading activities of the institutions. As a result, this paper makes use of the MVTAR model introduced by Tsay (1998). By splitting data into two regimes based on the sign of both TSE and NASDAQ returns on the previous trading day, we find that the demonstration effect that foreign investors have on domestic institutions arises only when previous day’s TSE returns are negative. In addition, when previous day’s TSE returns are negative, stock returns lead both net purchases by *qfii* and *dic*. However, stock returns lead only net *dic* purchases when previous day’s TSE returns are positive. Finally, we find the relation that net *dic* purchases lead market returns using the unrestricted VAR model tends to emerge only when previous day’s TSE returns are positive.

 As for the effect of NASDAQ returns on institutional trading, the results from this paper suggest that when previous day’s NASDAQ returns are positive, a feedback relation between net foreign purchases and net domestic purchases prevails. Moreover, it is found that the net *dic* purchases lead the TSE returns, as do the net foreign purchases. The latter, however, exert a positive influence on the TSE returns.

In summary, our results suggest that net foreign purchases do lead net domestic purchases, but more details manifest when the threshold model is applied. When previous day’s TSE returns are negative (or previous day’s NASDAQ returns are positive), a feedback relation between net foreign purchases and net domestic purchases is observed. It implies that the widespread argument that foreign investors have a demonstration effect on domestic institutions in Taiwan is not entirely correct. In examining the relation between market returns and institutional trading, we find that market returns at least lead net purchases by both *qfii* and *dic* in most cases. Market returns also lead net *rtf* purchases if the relationship of contemporaneous returns and institutional trading is considered. Our analysis also indicates that net *dic* purchases lead market returns and are negatively associated with market returns in Period 4. The results of the MVTAR model suggest that when previous day’s NASDAQ returns are positive, net foreign purchases positively lead stock returns, and thus will not exert a destabilizing influence on the market.

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Table 1

Inflows and Outflows of Foreign Capital Investment in the TSE

 Unit: millions of US dollars

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Securities Investment Companies | Foreign Institutional Investors | Natural Person | Foreign Total |
| inflow | outflow | inflow | outflow | inflow | outflow | Net inflow |
| 1991 | 263 | 53 | 448 | 0 | 0 | 0 | 658 |
| 1992 | 57 | 61 | 447 | 17 | 0 | 0 | 426 |
| 1993 | 653 | 93 | 1,859 | 97 | 0 | 0 | 2,322 |
| 831994 | 451 | 207 | 2,279 | 634 | 0 | 0 | 1,889 |
| 1995 | 664 | 457 | 3,509 | 1,506 | 0 | 0 | 2,210 |
| 1996 | 565 | 477 | 6,213 | 3,881 | 334 | 8 | 2,747 |
| 1997/1 ~4 | 12 | 644 | 4,442 | 2,529 | 261 | 78 | 1,465 |
| Cumulative Amount | 2,664 | 1,992 | 19,198 | 8,664 | 595 | 85 | 11,716 |

Source of Data: Securities and Futures Commission, Ministry of Finance, Taiwan.

Table 2

Unit Root Tests for the Six Time Series

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test |  |  |  |  |  |  |
| PP | -44.04\* | -42.76\* | -43.32\* | -28.47\* | -31.12\* | -29.90\* |

Notes. The sample period starts from December 13, 1995 to May 13, 2004, a total of 1989 observations.  and = purchases and sales by qualified foreign institutional investors, and  = -.  and  = purchases and sales by domestic investment companies, and  = -.  and  = purchases and sales by registered trading firms, and  = -. are the NASDAQ index returns.  is the TSE index return.  is changes in the NT/USD exchange rate.  is net purchases by *qfii*.  is net purchases by *dic*, and  are net purchases by *rtf*. y denotes the level of the variable. ∆y denotes the first difference of the variable. \* denotes statistical significance at one percent level.

Table 3

Summary Statistics for the Net Institutional Purchases, Stock Returns and NT/USD Currency Returns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Mean | Median | Maximum | Minimum | Std. Dev. |
|  | 0.0105 | 0.0000 | 3.4014 | -2.9609 | 0.3331 |
|  | 0.0083 | -0.0438 | 8.5198 | -12.6043 | 1.7839 |
|  | 0.0302 | 0.1300 | 13.2546 | -10.4078 | 2.0210 |
|  | 5386.30 | 4130 | 31415 | 151 | 4513.78 |
|  | 4675.17 | 3601 | 44000 | 74 | 4027.41 |
|  | 711.11 | 372 | 19408 | -23772 | 3171.87 |
|  | 3191.66 | 2924 | 14980 | 192 | 1643.79 |
|  | 3306.13 | 3096 | 11854 | 141 | 1556.99 |
|  | -114.49 | -120 | 10070 | -8876 | 1277.43 |
|  | 1814.00 | 1418 | 10972 | 49 | 1433.95 |
|  | 1837.15 | 1504 | 18024 | 32 | 1384.79 |
|  | -23.15 | -36 | 6379 | -11177 | 934.55 |

Notes: For variable definitions, see Table 2.

Table 4

Correlation Matrix of Net Purchases by Institutions, Stock Returns, and Exchange Rate Changes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | 1.0000 |  |  |  |  |  |
|  | -0.1338 | 1.0000 |  |  |  |  |
|  | 0.0124 | 0.1322 | 1.0000 |  |  |  |
|  | -0.1270 | 0.2976 | 0.0482 | 1.0000 |  |  |
|  | -0.0991 | 0.3750 | 0.0586 | 0.2400 | 1.0000 |  |
|  | -0.0767 | 0.4419 | 0.0938 | 0.3559 | 0.3779 | 1.0000 |

Note. See also Table 3.

Table 5

Results of Granger Causality Tests Using the Unrestricted VAR Models

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| All |  |  |  |  |  |  |
|  |  | 5.23(0.16) | 103.73\*(0.00) | 329.58\*(0.00) | 103.46\*(0.00) | 40.92\*(0.00) |
|  | 2.77(0.43) |  | 2.66(0.45) | 2.01(0.57) | 5.98(0.11) | 4.66(0.20) |
|  | 0.04(1.00) | 17.43\*(0.00) |  | 14.22\*(0.00) | 97.30\*(0.00) | 0.27(0.97) |
|  | 12.67\*(0.01) | 5.81(0.12) | 4.38(0.22) |  | 9.55\*\*(0.02) | 33.95\*(0.00) |
|  | 9.38\*\*(0.02) | 0.85(0.84) | 15.97\*(0.00) | 5.83(0.12) |  | 12.70\*(0.01) |
|  | 0.66(0.88) | 0.81(0.85) | 2.33(0.51) | 52.84\*(0.00) | 0.85(0.84) |  |

Notes: \*,\*\*, and \*\*\* denote statistical significance at 1%, 5%, and 10% levels respectively. Values in parentheses are p values. The optimal lag length of three is selected based on the Akaike information criterion.

Table 6

Results of Granger Causality Tests Using the Structural VAR models

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| SVAR |  |  |  |  |  |  |
|  |  | 5.23(0.16) | 103.73\*(0.00) | 265.94\*(0.00) | 54.67\*(0.00) | 6.75\*\*\*(0.08) |
|  | 2.77(0.43) |  | 2.66(0.45) | 1.85(0.60) | 7.06\*\*\*(0.07) | 4.45(0.22) |
|  | 1.26(0.74) | 20.63\*(0.00) |  | 98.84\*(0.00) | 264.71\*(0.00) | 75.05\*(0.00) |
|  | 12.67\*(0.01) | 5.81(0.12) | 4.38(0.22) |  | 14.05\*(0.00) | 36.64\*(0.00) |
|  | 9.38\*\*(0.02) | 0.85(0.84) | 15.97\*(0.00) | 5.09(0.17) |  | 11.09\*(0.01) |
|  | 0.66(0.88) | 0.81(0.85) | 2.33(0.51) | 50.56\*(0.00) | 0.83(0.84) |  |
|  |  |  |  | 332.55\*[10.91] | 247.47\*[18.10] | 213.66\*[21.43] |

Notes: The structural VAR model includes current TSE returns in the institutional trading equations to take the contemporaneous correlations into consideration. See also Table 5 for definitions.

Table 7

The C(d) Statistic

|  |  |
| --- | --- |
| Threshold Variable | Statistic |
|  | 195.08(0.00) |
|  | 136.22(0.08) |

Note. Values in parentheses are p values. The delay (d) is assumed to be one.Table 8

Results of Granger Causality Tests Using the MVTAR Models with Threshold Variable 

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  | 3.07(0.38) | 84.21\*(0.00) | 167.80\*(0.00) | 53.71\*(0.00) | 30.12\*(0.00) |
|  | 0.51(0.92) |  | 2.01(0.57) | 1.00(0.80) | 3.11(0.37) | 0.65(0.89) |
|  | 2.28(0.52) | 12.41\*(0.01) |  | 8.57\*\*(0.04) | 22.40\*(0.00) | 3.14(0.37) |
|  | 7.75\*\*(0.05) | 3.04(0.39) | 4.33(0.23) |  | 9.79\*\*(0.02) | 32.73\*(0.00) |
|  | 3.83(0.28) | 0.46(0.93) | 4.92(0.18) | 2.38(0.50) |  | 4.62(0.20) |
|  | 1.23(0.75) | 1.62(0.65) | 1.62(0.66) | 19.99\*(0.00) | 2.83(0.42) |  |

Note. The results are premised on the condition that when previous day’s TSE returns are negative. See also Table 5.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  | 3.72(0.29) | 27.57\*(0.00) | 168.61\*(0.00) | 49.94\*(0.00) | 12.25\*(0.01) |
|  | 5.97(0.11) |  | 1.78(0.62) | 2.73(0.44) | 5.16(0.16) | 7.01\*\*\*(0.07) |
|  | 0.88(0.83) | 13.00\*(0.00) |  | 3.02(0.39) | 43.44\*(0.00) | 1.68(0.64) |
|  | 4.83(0.18) | 5.87(0.12) | 1.85(0.60) |  | 5.72(0.13) | 5.16(0.16) |
|  | 8.99\*\*(0.03) | 2.04(0.56) | 13.17\*(0.00) | 3.90(0.27) |  | 12.54\*(0.01) |
|  | 0.22(0.97) | 0.58(0.90) | 2.53(0.47) | 39.46\*(0.00) | 2.15(0.54) |  |

Note. The results are premised on the condition that when previous day’s TSE returns are positive. See also Table 5.

Table 9

Results of Granger Causality Tests Using the MVTAR Models with Threshold Variable 

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  | 0.92(0.82) | 36.02\*(0.00) | 50.15\*(0.00) | 15.42\*(0.00) | 12.53\*(0.01) |
|  | 0.50(0.92) |  | 4.95(0.18) | 0.29(0.96) | 3.81(0.28) | 3.08(0.38) |
|  | 2.13(0.55) | 8.09\*\*(0.04) |  | 8.54\*\*(0.04) | 48.61\*(0.00) | 1.80(0.62) |
|  | 4.62(0.20) | 9.55\*\*(0.02) | 3.25(0.35) |  | 7.43\*\*\*(0.06) | 14.74\*(0.00) |
|  | 6.94\*\*\*(0.07) | 1.05(0.79) | 7.97\*\*(0.05) | 2.77(0.43) |  | 9.64\*(0.02) |
|  | 0.12(0.99) | 1.48(0.69) | 1.33(0.72) | 28.94\*(0.00) | 1.93(0.59) |  |

Note. The results are premised on the condition that when previous day’s NASDAQ returns are negative. See also Table 5.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  | 2.64(0.45) | 29.58\*(0.00) | 115.60\*(0.00) | 59.06\*(0.00) | 16.76\*(0.00) |
|  | 6.72\*\*\*(0.08) |  | 5.21(0.16) | 3.85(0.28) | 5.63(0.13) | 5.73(0.13) |
|  | 1.49(0.68) | 27.44\*(0.00) |  | 14.75\*(0.00) | 55.66\*(0.00) | 0.27(0.96) |
|  | 11.39\*(0.01) | 0.60(0.90) | 7.76\*\*(0.05) |  | 7.00\*\*\*(0.07) | 33.48\*(0.00) |
|  | 3.48(0.32) | 3.25(0.35) | 11.08\*(0.01) | 6.74\*\*\*(0.08) |  | 3.47(0.32) |
|  | 1.82(0.61) | 2.59(0.46) | 4.12(0.25) | 25.09\*(0.00) | 4.65(0.20) |  |

Note. The results are premised on the condition that when previous day’s NASDAQ returns are positive. See also Table 5.

Figure 1

Trends of Cumulative Net Purchase, Net Purchases by the Three Types of Institutions, Taiwan Stock Prices, NASDAQ Index, and the NT/USD Exchange Rate

a-1) Cumulative Net *qfii* Purchase

a-2) Net *qfii* Purchase

b-1) Cumulative Net *dic* Purchase

b-2) Net *dic* Purchase

c-1) Cumulative Net *rtf* Purchase

c-2) Net *rtf* Purchase

Notes: *qfii*: qualified foreign institutional investors

 *dic*: domestic investment companies

 *rtf*: registered trading firms

Figure 2

Impulse Responses to Innovations in the Unrestricted VAR Models (Up to 10 Periods)

Notes: Solid lines represent response path and dotted lines are bands for the 95% confidence interval around response coefficients. r = TSE returns. nasr = NASDAQ returns. de = exchange rate changes. qfiibs = net *qfii* purchases. dicbs = net *dic* purchases. rtfbs = net *rtf* purchases.

Figure 3

Selected Impulse Responses to Innovations Up to 10 Periods in the Structural VAR Models

Note. See also Figure 2.

Figure 4

Selected Impulse Responses to Innovations Up to 10 Periods in the MVTAR Models

A. 

B. 

Notes: See also Figure 2.

Figure 5

Impulse Responses to Innovations Up to 10 Periods in the MVTAR Models (Portion)

A. 

B. 

Notes: See also Figure 2.

1. a Corresponding author. [↑](#footnote-ref-1)
2. This is because foreign institutions may well have better research teams and buy stocks according to the fundamentals such as the firm’s future profitability. In contrast, local institutions and individual investors usually choose stocks based on insider information or what the newspapers write about. However, if stocks bought by foreign investors have a better performance than that of local institutions and individual investors, the latter tend to buy the stocks bought by successful foreign investors the previous day. Hence this gives rise to the so called “demonstration effect.” Such a concept is similar to the “herding” which Lakonishok, Shleifer, and Vishny (1992) referred to as correlated trading across institutional investors. Nonetheless, their definition is close to the contemporaneous correlation rather than the lead-lag relation under study, and as such this leads to the demonstration effect which we documented. [↑](#footnote-ref-2)
3. Froot et al. (2001) also use daily data, but they examine the behavior of capital flows across countries. In addition, our models and approaches used in the estimation differ drastically from theirs. [↑](#footnote-ref-3)
4. Lakonishok et al. (1992) refer to the positive-feedback trading or trend chasing as buying winners and selling losers and the negative feedback trading or contrarian as buying losers and selling winners. Cai and Zheng (2002) point out that feedback trading occurs when lagged returns act as the common signal that the investors follow. [↑](#footnote-ref-4)
5. Karolyi (2002) reaches such a conclusion because there is little evidence of any impact of foreign net purchases on future Nikkei returns or currency returns. [↑](#footnote-ref-5)
6. The data began on December 13, 1995 since the inception of the TEJ. [↑](#footnote-ref-6)
7. The main purpose of this paper is to improve our understanding on the interaction among institutional investors and the relationship between institutional trading and stock returns. The following discussion will therefore focus on these two issues. [↑](#footnote-ref-7)
8. Figures 2f and 2g show significantly positive responses of  and  to  in Period 1 if the impact of current returns is not considered. [↑](#footnote-ref-8)
9. Recall that both the positive-feedback and negative-feedback trading are associated with the sign of market returns on the previous trading day. [↑](#footnote-ref-9)
10. Here, we assume that net purchases by institutions are only affected by market returns on the previous trading day. [↑](#footnote-ref-10)
11. For more details see Tsay (1998). [↑](#footnote-ref-11)
12. A previous study by Sadorsky (1999) also splits data into two regimes based on the sign of the variable to discuss whether variables used would change their behaviors under different regimes. [↑](#footnote-ref-12)
13. To economize space, only relevant impulse responses are presented here; the remaining are available upon request. [↑](#footnote-ref-13)