

Did the Asian Financial Crisis Scare Foreign Investors Out of Japan?

Abstract

Foreigners became net sellers of Japanese equities during the Asian financial crisis in 1997. In this study, I examine whether this shift in aggregate foreign portfolio investment activity in Japan exacerbated the effect of the crisis on markets, or whether it simply reflected positive feedback trading behavior. The data draws from weekly reports to the Tokyo Stock Exchange of aggregate purchases and sales of Japanese equities by foreigners and local institutional and individual investors. I find evidence of consistent positive-feedback trading before, during and after the Asian crisis among foreign investors, while Japanese banks, financial institutions, investment trusts and companies themselves were aggressive contrarian investors. There is no evidence that this trading activity by foreigners destabilized the markets during the crisis.

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“Despite our bitterness over the attempts to push us back by a decade through forced devaluation of our currency, through the rape of our share market, we in South East Asia and in Asia are still keen to receive investments from Europe and America. But you should also appreciate that we of South East Asia at least are now very scared about foreign capital. We thought they were helping us to prosper. But we will have to be more circumspect. We still believe there are sincere investors out there. But there are also quite a few rogues who can cause an avalanche forcing others to run for cover.”

Malaysia’s Prime Minister Mahathir bin Mohamad, Hong Kong, September 20, 1997

“...The current crisis has aggravated the asymmetry between markets at the center of the financial system and those at the periphery. The center has actually benefited from the crisis, while the periphery is suffering from the outflow of capital and is wallowing in depression. All the talk about capital controls is somewhat misdirected. It is like building the Maginot Line after the First World War. The flow of capital has been reversed. The task now is to re-establish the flow or to find a way to inject liquidity directly into the periphery.”

George Soros, New York, December 10, 1998

I. Introduction

Net cross-border portfolio equity flows cumulatively exceeded \$1 trillion between 1986 and 1996.¹ Of the total, Japan and the Asia-Pacific markets captured the greatest proportion; almost 60 percent of the \$250 billion in net equity flows to emerging stock markets were directed to the Asia-Pacific region and foreign investors in Japan alone accumulated \$270 billion during the 1990s.² By the second half of 1997 and during 1998, however, macroeconomic conditions in the Asia-Pacific region had seriously deteriorated.³ It is difficult to pinpoint the precise start of the crisis, but analysts often point to the 17 percent devaluation of the Thai baht on July 2 as the triggering event. In the following six months, the Hong Kong, Filipino, Indonesian, Korean and

¹ See presentation by Michael Mussa and Anthony Richards of the Research Department of the International Monetary Fund at the World Bank Conference on “Capital Flows, Financial Crises and Policies” (April 15, 1999). See other detailed data in Kaminsky et al. (2001).

² Tokyo Stock Exchange *Fact Book 1998*, p. 98.

³ Corsetti, Pesenti and Roubini (1998a, 1998b) present a useful overview of the Asian currency and financial crisis including a macroeconomic overview and a review of the policy debate. Professor Nouriel Roubini also provides a useful chronology of the crisis on his homepage <http://www.stern.nyu.edu/~nroubini/asia/AsiaChronology1.html>.

Malaysian currency and stock markets declined dramatically, and Japan's Nikkei 225 index and yen fell to its lowest level in more than two years.

While the crisis likely reflected structural and policy distortions in the countries of the Asia-Pacific region, foreign investors were often blamed for exerting a destabilizing influence on stock prices and foreign currency values. The objective of this paper is to examine foreign investor trading behavior in Japan around the time of the Asian crisis and evaluate its impact on stock and currency returns. Did foreign investors in Japan sell off their holdings during the crisis or did they reveal themselves to be long-term investors? Did foreign investor trading behavior exacerbate stock and currency market volatility? Did foreign investors profit at the expense of domestic investors during the crisis?

Studies have shown that a positive relationship exists between monthly foreign portfolio investment flows and stock returns (Tesar and Werner, 1993; Bohn and Tesar; 1996; Brennan and Cao, 1997).⁴ This relationship could reflect positive feedback trading (buying following market rises, selling following market declines), or it could reveal good market timing skills by foreigners. Even if evidence of positive-feedback trading is detected, DeLong, Shleifer, Summers and Waldmann (1990) show that it does not necessarily have to destabilize the markets; after all, the trades of foreign investors could simply be associated with permanent price changes due to new information or changing risk premia.⁵ Using daily data on aggregate

⁴ Stulz (1999) provides a comprehensive survey of the literature on international portfolio flows.

⁵ Brennan and Cao (1997) model the contemporaneous correlation between local stock returns and foreign portfolio flows as a function of the asymmetry of information about local markets among foreigners and domestic investors. The sufficient condition for their result is that foreigners be less well informed about local markets than local investors and that the locals information advantage is due to superior research and not periodic, larger information leakages. Rigobon (1998) and Bacchetta and van Wincoop (1998) develop behavioral models of learning in which foreigners have uncertainty about underlying fundamentals in a local market. Their model rationalizes destabilizing speculative attacks by foreign investors and high short-run volatility in capital flows. These studies extend the herding and informational cascades model of Bikhchandani, Hirshleifer and Welch (1992). Bekaert and Harvey (1998) offer an empirical technique to isolate the effects of speculative behavior on emerging market returns.

portfolio flows to 46 countries between 1994 and 1998, Froot, O'Connell and Seasholes (2001) find evidence of positive-feedback trading among foreign investors that use State Street Bank & Trust as their custodian. Choe, Kho and Stulz (1999, 2000) and Kim and Wei (1999) use transactions data from Korea to find strong evidence of positive feedback trading and herding among foreign investors in 1997, especially compared to domestic institutional and individual investors who tend to be contrarian. More importantly, they find no evidence of any destabilizing effect of their trading before or after the crisis began.⁶

Japan is an interesting case study for several reasons. First, it is the largest market in the region and, as noted above, it attracted the largest proportion of foreign portfolio equity flows into Asia during the decade leading up to the crisis. In fact, by 1997, foreigners owned over 12 percent (40.9 trillion yen or \$351 billion) of the market value of Japanese equity and comprised 23.3 percent of all equity trading compared to only 4 percent and 5 percent, respectively, in 1990.⁷ Second, Japan was not immune to the economic crisis. For example, in the first two weeks of November of 1997, the Nikkei index outpaced all other Asian markets and declined 10.1 percent led by its troubled financial sector. In fact, the Hokkaido Takushoku Bank and Yamaichi Securities companies both declared bankruptcy during that month (see Appendix). Third, research by Hamao and Mei (2001) has indicated that foreign investors in Japan are long-term players in the market and their presence has helped to improve overall liquidity. Using monthly stock returns and aggregate portfolio flows by foreigners from 1974 to 1992, they show

⁶ Clark and Berko (1996), Frankel and Schmukler (1996), Portes and Rey (1999), Choe et al. (2000), Grinblatt and Keloharju (2000) and Seasholes (2000) study informational effects for foreign and local investors around the time of the 1994 peso currency crisis in Mexico, in Korean stocks during the Asian crisis, among the largest Finnish stocks in the mid 1990s and around earnings announcements in Taiwan during the 1990s, respectively. Bekaert, Harvey and Lumsdaine (1999) examine the importance of structural breaks in equity flows to emerging markets and their relationship to returns, dividend yields and interest rates. Their focus is on liberalization events and they use monthly data with a vector autoregression model.

⁷ Tokyo Stock Exchange *Fact Book 1998*, p. 104, and *Fact Book 1997*, p. 74.

that foreign investors have no impact on underlying market volatility, that there is little evidence of superior market timing ability and that the flows are strongly related to long-term dividend and interest rate information. Our study thus closely complements their effort by asking whether this long-term investing approach of foreign investors changed in 1997 and 1998.

This study differs from other recent studies by the availability of information on trading by type of investors from the Tokyo Stock Exchange (TSE). Weekly reports from TSE members with minimum capital requirement of 300 million yen indicate the value of trading (in yen) that are initiated for customers or on members' accounts, and broken out by customer type including corporations, securities companies, individuals, banks, insurance companies, investment trusts and foreigners. Though it is collected at only weekly intervals and only since 1995, the data presents an advantage for researchers in that it enables us to benchmark the pattern and impact of trading by foreign investors against different classes of domestic investors. After all, it may be that an increase in foreign net sales leads to a statistically significant decrease in subsequent market returns, but this may be economically much smaller than the impact of trading activity by domestic banks, insurance and securities companies. The TSE data, therefore, allow us to calibrate the economic as well as statistical magnitude of the results.

Overall, we find that foreign investors became net sellers of Japanese equity during the Asian crisis in 1997 and 1998. Before July 2, 1997, foreign investor net purchases averaged about 78.1 billion yen (\$751 million) per week; by contrast, after the crisis began, foreign investors became net sellers of 14.9 billion yen (\$144 million) per week. To test the joint dynamics of market and currency returns and foreign portfolio flows, we employ a tri-variate vector auto-regression (VAR) model in which we allow Nikkei stock index and yen/U.S. dollar returns to depend not only on past returns, but also on past net purchases of foreigners. Similarly,

net purchase activity, which is highly serially correlated, is allowed to depend on past net purchases and past returns to test for positive-feedback trading behavior. Overall, we find that foreigners are positive-feedback traders and that net purchases are sensitive to both fluctuations in the Nikkei index and yen/dollar returns. Using an impulse response analysis that standardizes the unit random shocks in net purchases and returns, we show that the positive-feedback response of foreigners is large in magnitude and decays slowly over the next month. Moreover, it contrasts strongly with that of aggressive contrarian trading by companies, banks, and to a lesser extent individual investors, investment trusts and insurance companies. There is no evidence that net purchase activity of foreigners impacts the stock prices. Interestingly, we do find that positive feedback trading is somewhat stronger during the crisis especially with regard to yen/dollar returns shocks during the crisis. Finally, we show that foreigners are good market timers: they were able to accumulate over 1,250 billion yen (\$12.1 billion) over the entire period, including 210 billion yen (\$1.8 billion) during the crisis period.

Section 2 describes the data, offers summary statistics and outlines the VAR methodology. The main findings are presented in Section 3 with the test results from the VARs and impulse response analysis for each investment sector. I then evaluate the effect of the Asian financial crisis. Conclusions follow.

2. *Data and Methodology*

2.1 Data

The Tokyo Stock Exchange obtains reports of different types of investors on the yen value of purchases and sales during a week from proprietary trading of securities firms and trading at their clients' orders. The clients are classified into insurance companies, banks and other

financial institutions, investment trusts (mutual funds), non-financial corporations and other firms, non-TSE member securities firms, individuals and foreigners. The original data are obtained from the Tokyo Stock Exchange Monthly Statistics since 1975, but it has been compiled on a weekly basis since January 1995. The trading figures are reported by “integrated” securities firms, which are investment houses with at least 3 billion yen of capital and which are capable of lead-underwriting roles and are licensed in all lines of business (brokerage, sales, proprietary dealing and underwriting).⁸

We limit the number of investor types into seven categories: companies, individuals, foreigners, securities companies, life insurance companies, financial companies and investment trusts. The foreign sector includes both institutions and individuals. These aggregate purchases and sales are reported for trades on all three major stock exchanges in Japan: TSE, Osaka and Nagoya. For weekly aggregate stock returns, we use Friday closing index values for the Nikkei 225 Stock index, a price-weighted index of the largest 225 stocks traded on the First Section of the TSE. yen/U.S. dollar exchange rate quotes are similarly obtained for Friday close. These are available from Datastream International.

Figure 1 plots the Nikkei index and yen/dollar values during the period from January 1995 through March 2001. The Nikkei reached its peak value of 22,500 in June of 1996, but continued a prolonged decline to well below 13,000 by the end of the period. Similarly, the yen depreciated from around 100 yen/U.S. dollar to its lowest value of 146.3 in August of 1998 and it has recovered to around 120 yen/dollar. The figure also shows that yen aggregate trading value on the three exchanges has averaged around two trillion yen per week with occasional weeks that

⁸ Member securities firms are required to report on behalf of clients by Tuesday following the Friday close summarizing the week’s activity. The data are compiled by the research department of the TSE and a press release is prepared by Thursday noon. The sector classifications by the reporting firms are generally reliable up to arm’s-

exceed 9 trillion yen (during March 2000). Finally, the net foreign purchases (weekly purchases less sales of Japanese stocks by foreigners) and cumulative net foreign purchases (assuming zero initial value in January 1995) indicate that foreigners were, in fact, aggressive net purchasers of Japanese equity during the first two-and-a-half years of the sample. As a class of investor, they accumulated over 10 trillion yen of stock by June of 1997. However, after July 1997, they began to sell off their Japanese holdings up to the end of 1998. Thereafter, foreign investors continued to accumulate another 5 trillion yen of Japanese stock (through March 2001). It is, however, this apparent change in investment behavior during the 18 months of the Asian financial crisis and its impact on the underlying market that is the focus of the current study.

2.2 Summary Statistics

Table 1 presents the overall summary statistics for trading activity by investment sectors in Japan for the overall period, January 1995 through March 2001. I report the mean, standard deviation, minimum, maximum, median, first three auto-correlation coefficients and the Box-Ljung portmanteau test for the three lags. For each investment sector and for aggregate net purchases, I compute the ratio relative to the maximum of aggregate purchases or sales.⁹ Overall, trading activity totals over 2.9 billion yen per week, but this can range from as low as 142 million yen (first week of January 1997 with holidays) to 10.7 billion yen (mid-March 2000). The largest sectors that comprise this total were financial companies (including banks) at 830 million yen per week, corporations themselves at 880 million yen per week, foreigners at almost 750 million yen per week, followed by individual investors, investment trusts, securities companies, and life insurance companies. Over the entire period, foreigners were the most

length transactions by affiliate firms of large international brokerages or investment firms. I thank Masato Hirota for details on reporting process and data reliability.

⁹ Because the reports are obtained from only the larger (3 billion yen or more) integrated securities houses, these results are not equal and can represent a discrepancy of 0.45 percent on average over the entire period of analysis.

aggressive net purchasers of Japanese equity at 51 million yen per week, almost 1.7 percent of the total trading activity. Securities companies were also net purchasers over the period at less than one million yen per week (more than 0.02 percent of total trading). By contrast, financial institutions, investment trusts, insurance companies, corporations and individual investors were net sellers of equity. It is important to note that the net purchase activity overall and for each sector displays strong persistence with first-order auto-correlation coefficients ranging from 0.28 to 0.54.

In order to test for changes in net purchase activity at the onset of the Asian crisis, Table 2 presents means and standard deviations of weekly net purchases before, during and after the Asian crisis periods and F-tests of the differences across periods. Here and throughout the study, we employ June 30, 1997 as the last week before the Asian crisis, employing the Thai baht devaluation on July 2, 1997 as the triggering event (see Appendix). Although an arbitrary choice, we proceed by defining the end of 1998 as the end of the crisis period, as it corresponds with the timing of the reversal of the net selling activity in Figure 1. Overall, trading activity declined only slightly in the markets, continuing to hover around 2.2 billion yen per week, though this activity increased substantially following the crisis period to 4.1 billion yen per week. Interestingly, overall net purchase activity did decline significantly from 0.5 percent of the total per week to around 0.3 percent per week during the crisis and further to 0.2 percent per week thereafter. Examining this shift by sector highlights again the unique role that foreigners played during this period. Net purchases by foreigners (as seen in Figure 1) shifted significantly from 3.1 percent of total weekly trading activity (or, 78.1 billion yen per week) to -0.95 percent (or, -14.9 billion yen per week) – that is net sellers of Japanese equity -- during the crisis back to net purchasers of 1.9 percent or 67.2 billion yen per week. The F-statistic of 14.82 easily rejects the

null hypothesis that the mean net purchases weekly by foreigners were equal across the three subperiods. By contrast, corporations shifted from on average net sellers of equity before and after the crisis into net purchasers at 3.4 percent of total trading per week during the crisis (F-statistic of 14.00). Banks became aggressive net purchasers at 3.6 percent per week, but shifted to net sellers at 1.5 percent after the crisis (F-statistic of 10.81). Individual investors became less aggressive net sellers during the crisis, but the statistical precision of the shift is less dramatic (F-statistic of 2.29).

Table 3 presents the correlations of weekly net purchases for each of the seven investment sectors with the returns on the Nikkei 225 and yen/dollar exchange rate for the pre-crisis, crisis and post-crisis periods. The investment behavior of foreigners is distinctly different than each of the domestic investment sectors overall and during each subperiod. Weekly net purchases by foreigners are most significantly and strongly negatively related to corporations and banks and financial companies trading activity. This is generally consistent with a similar table in Hamao and Mei (2001) using monthly data from 1974 to 1992. Interestingly, the magnitude of these negative correlations diminishes during the crisis period (Panel B). Among domestic investment sectors we find strong positive correlations in weekly trading activity: corporations, financial institutions, and life insurance companies have strong and statistically significant positive correlations.¹⁰ Another noteworthy feature of the table is the strong positive contemporaneous correlation of net purchases by foreigners and Nikkei index returns. The overall correlation of 0.321 is consistent with similar results in Brennan and Cao (1997, monthly), Bohn and Tesar (1996, monthly) and Tesar and Werner (1995, quarterly). Finally, the correlations of foreign net

¹⁰ The strong positive correlations are suggestive of herding behavior, similar to Lakonishok, Shleifer and Vishny (1992) and Wermers (1999) and uncovered among foreign investors in Korea by Kim and Wei (1999) and Choe, Kho and Stulz (1999). The aggregate level of the TSE data precludes any reliable measure the degree of herding among different investment sectors in Japan.

purchases and Nikkei returns increased during the crisis period to 0.391 from 0.248 before the crisis, but continued after the crisis to a level of 0.472.

2.3 VAR Methodology

In order to test whether net purchase activity by foreigners has a destabilizing impact on the underlying stock or currency returns, or whether these foreigners were positive-feedback traders, we employ a tri-variate VAR model of weekly stock and currency returns and net purchases or flows. While summary statistics in Table 3 showed that a strong positive contemporaneous correlation between flows and Nikkei index returns, it is difficult to make inferences about positive-feedback trading or price-destabilizing trading because there are auto-correlation patterns in returns and flows themselves (Table 1). The VAR model represents a simple structural model in which foreign trading activity can be driven by past trading activity and past stock index and currency returns, and stock index and currency returns can be driven by past returns and past flows.

Formally the VAR can be written,

$$\mathbf{y}_t = \mathbf{C} + \sum_{s=1}^L \mathbf{B}_s \mathbf{y}_{t-s} + \mathbf{u}_t \quad E(\mathbf{u}_t \mathbf{u}_t') = \Sigma \quad (1)$$

where \mathbf{y}_t is a 3 X 1 vector of weekly observations of Nikkei index returns, yen/dollar returns and foreign net purchases, and \mathbf{C} , \mathbf{B}_s are 3 X 1 and 3 X 3 matrices of parameters. L is the lag length for the VAR and \mathbf{u}_t is a column vector of forecast errors of the best linear predictor of \mathbf{y}_t given all the past \mathbf{y} 's. The (i,j) th component of \mathbf{B}_s measures the direct effect that a change in the return on the j th variable would have on the i th variable in s weeks. We estimate this system for each investment sector's net purchase series. Zero-block exclusion tests (F-statistic) are used to evaluate whether a block of lags of past returns or purchases are jointly significant predictors of future returns or purchases. Using a Bayes-Schwarz criterion, we estimate a number of lag

structures to the system and determine that four weekly lags were enough to capture linear dependencies for most of the different net purchase series.

Complex cross-equation feedback makes direct inferences from coefficient estimates in (1) difficult. As Sims (1980) shows, it is better to trace out the system's moving average representation in order to analyze the system's reaction to typical random shocks. By successive substitution on the right-hand side of (1), we can write,

$$\mathbf{y}_t = \sum_{s=0}^{\infty} \Phi_s \mathbf{u}_t \quad (2)$$

which gives \mathbf{y}_t as a linear combination of current and past one-step-ahead forecast innovations.

The (i,j) th component of Φ_s measures the response of the i th variable in s weeks to a unit random shock in the j th variable and none in other variables. Because elements of vector \mathbf{u}_t are contemporaneously correlated, we cannot observe the distinct response patterns of the VAR system. To achieve this, we transform the error terms using a Choleski factorization in which $\Sigma = \mathbf{V}\mathbf{V}'$ and $\mathbf{u} = \mathbf{V}\mathbf{e}$ so that \mathbf{e}_t has an identity covariance matrix. Equation (2) can be rewritten,

$$\mathbf{y}_t = \sum_{s=0}^{\infty} \Phi_s \mathbf{V}\mathbf{e}_t = \sum_{s=0}^{\infty} \mathbf{C}_s \mathbf{e}_t \quad (3)$$

where $\mathbf{C}_s = \Phi_s \mathbf{V}$. Then the (i,j) th component of \mathbf{C}_s represents the impulse response of the i th variable in s periods to a shock of one standard error in the j th variable.¹¹ In our application, we trace out these impulse responses graphically and compute 95 percent confidence bands using standard errors from the Monte Carlo integration technique of Kloek and Van Dijk (1978).¹²

¹¹ See Appendix of Eun and Shim (1989), Chapter 11 of Hamilton (1994) and Section 8.5 of the *RATS User's Manual* (1996) for a detailed description of the orthogonalization process.

¹² Since impulse responses are highly nonlinear functions of the estimated parameters, calculating confidence bands by linearization is not feasible. Section 10.1 of the *RATS User's Manual* (1996) outlines the routines to compute the Kloek and Van Dijk (1978) Monte Carlo bands from a Normal-inverse Wishart posterior distribution of the covariance matrix of the system. The code is available from the author upon request.

Another advantage of using orthogonalized innovation is that we can also allocate the variance of each element of \mathbf{y}_t to sources in elements of \mathbf{e}_t since \mathbf{e}_t is serially and contemporaneously uncorrelated. The orthogonalization provides the quantity,

$$= \sum_{s=0}^T C_{ij,s}^2, \quad (4)$$

the component of forecast error variance in the $T+1$ step ahead forecast of y_i which is accounted for by innovations in y_j . This decomposition of forecast error variance provides a measure of the overall relative importance of the markets in generating the fluctuations in weekly net flows from past net flows, Nikkei stock returns and yen/dollar exchange rate returns. In each VAR regression, we report the fraction (in percent) of total forecast error variance for Nikkei returns, yen/dollar exchange rates and net flows up to 6, 12 and 18 weeks ahead accounted for by innovations of past Nikkei returns, exchange rate and net flows.

3 Results

3.1 VAR Regression Results

Table 4 presents the VAR estimation results for each of the seven different investment sectors. For each sector, the first four lagged coefficient estimates are reported for the lagged Nikkei 225 index returns, the yen/dollar returns and the net purchases with indications of statistical significance using White (1980) heteroscedasticity-consistent standard errors. I also report adjusted coefficients of determination (R^2), F-statistics associated with zero-block exclusion tests for different blocks of lags and the variance decomposition by variable of 6-, 12- and 18-week ahead forecasts accounted for by each variable.

The estimation results for the foreign investors (far right panel) reveal expected auto-correlation patterns in the Nikkei index returns and the net flows, as in Table 1. First- and

second-lag coefficients for the foreign net purchase series are significant and positive coefficients of 0.35 and 0.23, respectively; the Nikkei returns series has a negative and significant negative first-lag coefficient of -0.113. The cross-dependence in Nikkei and currency returns and foreign net purchases is strongly asymmetric. That is, large and statistically significant coefficients on lagged Nikkei and currency returns arise for the foreign net purchases, whereas those for lagged net purchases for current Nikkei or currency returns are small and usually insignificant. The coefficients for three lagged Nikkei returns are large positive values of 0.25, 0.13 and 0.19; those for the two lagged yen/dollar returns have marginally significant negative values -0.15, and -0.23. These results are suggestive of positive-feedback trading, as foreign investors are more likely to purchase Japanese equity following weeks of Nikkei market increases and yen appreciation. There is very weak evidence of any impact of foreign net purchases for future Nikkei or currency returns. The marginally-significant positive second-lagged coefficient and insignificant negative third-lagged coefficient for Nikkei returns suggests a complex cyclical pattern. The zero-block exclusion tests concur with this asymmetry. F-statistics of 1.54 and 0.69 reject the null that the lagged net purchases are unimportant for future Nikkei and currency returns, respectively; the F-statistic for lagged Nikkei returns for net foreign purchases of 3.292 is significant at the 5 percent level of significance.

In comparison with the results for other domestic investment sectors, we find the net purchases of foreign investors are much less likely to be destabilizing than those for corporations, investment trusts and especially banks and financial institutions. The second- and third-lagged coefficients for net purchases by companies and financial institutions are significantly negative with associated zero-block exclusion F-statistics of 4.79 and 3.13, respectively, both significant at the 1 percent level. Negative values surprisingly suggest that trading activity by these sectors

is typically associated with a decline in the Nikkei index returns. Recall from Table 1 that these two sectors comprise the largest fraction of total trading activity. The results for investment trusts are weaker, though still yield negative coefficients. Another distinctly different feature of these domestic sectors compared to foreign investors in Japan is that they are more likely to be contrarian or negative-feedback traders. The first lagged coefficient of net purchases for Nikkei returns for companies is negative at -0.52 and for banks is -0.59 . Again, investment trusts and life insurance companies are contrarian but to a weaker extent with first-lagged coefficients of only -0.13 and -0.04 , respectively, though both are significant. The zero-block exclusion tests confirm the statistical significance of this negative-feedback trading among companies, financial institutions and investment trusts with F-statistics of 5.72, 6.33 and 6.09, in respective order. The cross-correlation dynamic patterns for net purchase activity with stock and currency returns of individual investors, securities companies and life insurance companies are weak.

The variance decomposition of forecast error variances yield similar inferences about the economic magnitude of the asymmetry of return and net flows and of the differences in positive-feedback and contrarian trading among sectors. For VAR regressions with any sector of investors, about 97 percent of the total forecast variance in Nikkei and yen/dollar exchange rates is accounted for by their own past innovations. The differences across investment sectors lie with the decomposition of forecast variances for net flows. The positive-feedback trading of foreign investors is not only statistically significant (coefficient t-statistics, F-statistics for zero-block exclusion tests), but also economically significant as over 30 percent can be associated with innovations in Nikkei and yen/dollar returns. The contrarian-trading activity of companies, individuals and financial institutions are comparably important ranging from 20 to 35 percent; by

contrast, those for securities companies, life insurance companies and investment trusts are small (less than 10 percent).

3.2 Impulse Response Analysis

Figure 2 provides a graphical presentation of the dynamic responses of each of the three weekly series (Nikkei returns, yen/dollar returns, net purchases) to unit random shocks from each. The figures are presented in 9 panels that correspond to the nine-panel exhibits in Table 4. The shocks to each series are orthogonalized using the Choleski factorization procedure so that these impulse responses are the coefficients from the moving average representation in equation (3) to shocks of one standard error in each variable. The Kloek and Van Dijk (1978) Monte Carlo integration procedure is used to display the 95 percent confidence bounds around the impulse response coefficients.

The figure for foreigner net flows (Figure 2c) confirms our inferences from the VAR regression results. First, we can detect strong auto-correlation patterns in Nikkei and yen/dollar returns that dissipate within 1 week and in foreign net purchases which decay more slowly over five to possibly ten weeks. Second, the weak zero-block exclusion tests for lagged net purchases for Nikkei and yen/dollar returns is confirmed in the bottom-left and bottom-center plots, which reveals a cyclical pattern that decays quickly to zero within three weeks – the confidence bands comfortably straddle the zero axis for both plots. By contrast, the unit standard error shock to Nikkei returns leads to a 1.8 percent increase in foreign net purchases within one week that slowly decays to zero by week 10. A one standard error yen/dollar return shock (depreciation) indicates a 0.6 percent decline in net purchases, but this effect dissipates more quickly by week 3. These impulse responses suggest that this positive-feedback trading behavior of foreigners is economically as well as statistically robust. In response to a one standard error shock to the

Nikkei 225 index of 3.02 percent (or 450 points for Nikkei index around the 15,000 level), a 1.8 percent increase in net purchases represents a net inflow of 926 million yen (\$7.9 million) in the first week and cumulatively almost 3.2 billion yen (\$27.5 million) over the next ten weeks.

The other six figures display similar plots for the domestic investment sectors. The autoregressive patterns of responses to own-variable shocks are strong, especially for the net purchase series. The negative-feedback, or contrarian, investing behavior of companies and financial institutions are notable. A one standard error shock to the Nikkei is associated with net selling by companies of 2.4 percent in the first week that decays to zero by week ten. For financial institutions, such a shock leads to net selling of 2.0 percent that dissipates more quickly by week 6.¹³ The negative-feedback trading among securities companies, individual investors, life insurance companies and investment trusts is always visible in the plots but typically much smaller (initial net purchase response coefficients greater than 0.5 percent are rare at any lag). Again, this may not be surprising given the scope of their trading activity, as seen in Table 1. It is important to note that the impact of currency fluctuations for trading activity among the domestic investment sectors is weak; the impulse response coefficients are typically within the 95 percent confidence band of zero.

The extent to which any price-destabilizing activity can be discerned in the impulse response plots is limited. However, the response of the Nikkei to the shocks to net purchases of companies and financial institutions reveal a marginally significant -0.5 percent in week 2 and positive 0.5 percent in week 3, which concurs with the cyclical pattern suggested by the VAR regression results. Economically, this is not a dramatic reaction. Weeks in which companies increase net equity purchases by 168 billion yen (\$1.5 billion) or financial institutions increase net purchases

¹³ Readers are cautioned that the scale of each of the impulse response figures change, which makes comparisons across different investment sectors more challenging.

by 182 billion yen (\$1.6 billion) are rare, and these events would translate into a decline in the Nikkei of less than 100 points (for a index level of 15,000). For the securities companies, individual investors, life insurance companies and investment trusts, the confidence bands are wide which suggests very little precision in these estimates.

3.3 The Impact of the Asian Financial Crisis

Our preliminary analysis of the trading activity of foreigners and other investment sectors indicated an important structural shift around the beginning of the Asian financial crisis in July 1997. That is, foreign investors in Japan shifted from being aggressive net buyers of Japanese equity (78.1 billion yen per week) to net sellers of Japanese equity (14.9 billion yen per week). In this section, I ask whether this shift in overall sentiment toward Japan revealed a shift in their positive-feedback trading behavior, as exhibited earlier in this section. Moreover, can we associate net purchase or selling activity by foreigners with any price-destabilizing effects during the crisis? To answer these questions, we repeat our VAR regression and impulse response analysis, but allow for a structural break in the joint dynamics around July 1997, the beginning of the crisis, and December 1998, my arbitrary end for the crisis period. I report the zero-block exclusion F-statistics for each investment sector in Table 5, the complete VAR regression results for just the foreign investors in Table 6 and the before, during and after crisis impulse response plots for foreign investors in Figure 3.¹⁴

Table 5 shows that there were some changes in overall patterns of trading activity during the crisis period. First, foreigners positive feedback trading became no less important, but clearly statistically less precise. The F-statistic associated with the block of lags for Nikkei returns was marginally significant at 1.95 before and during the crisis, but fell to an insignificant value of

¹⁴ Complete VAR regression results and impulse response analysis plots for before and during the crisis for each investment sector is available from the author upon request.

1.25 after the crisis. Table 6 shows that the coefficients during the crisis have larger positive values, though the short sample period limits any precise inferences. On the other hand, the response of foreigners' net selling of equity to a depreciation of the yen is statistically significant; the first lagged coefficient on the yen/dollar returns was less than -0.1 before the crisis, increased to -0.73 during the crisis, and then became a statistically significant positive coefficient of 0.50 after the crisis. The F-statistic associated with this block of lags is 4.33 during the crisis, compared to 0.20 before the crisis and an insignificant 1.68 after the crisis. There is no discernible impact of current or past net purchase activity by foreigners for Nikkei or currency returns for before, during or after the crisis.

The negative-feedback, or contrarian, trading activity of companies and financial institutions also diminishes with the advent of the crisis. Part of this result may be sample size limitations again. However, an interesting feature is the increased importance of shocks to the yen/dollar exchange rate during the crisis for net purchases by companies, individual investors, securities companies, financial companies and investment trusts. Although not reported, these currency shocks reveal consistent negative-feedback trading; that is, a yen depreciation is associated with current and lagged increases in net purchases. A final point worth noting in Table 5 is that contemporaneous and lagged currency fluctuations are significantly associated with Nikkei returns during the Asian crisis period.¹⁵

The impulse response plots and variance decomposition results for before, during and after the crisis in Figure 3 and Table 6, respectively, show that the economic magnitude of the positive-feedback trading may be less precise statistically, but is likely economically more

¹⁵ How currency risk affects stock index returns in regression tests such as the VAR model here has been the focus of a long line of research since Adler and Dumas (1984). See Jorion (1990), Bodnar and Gentry (1993) and also the recent study by Griffin and Stulz (1998) for updated references.

important. Unit standard error Nikkei shocks revealed responses of only 0.5 percent in net purchases before the crisis, but as much as 2.4 percent during and, surprisingly, after the crisis. Moreover, the decay in the impulse response coefficients was much slower persisting out to week 5 or 6. Another interesting visual contrast is between the response functions to unit standard error shocks to the yen/dollar exchange rate. Before and after the crisis, the curve is virtually zero, but during the crisis, the first- and second-lags are strongly negative at -2.1 percent and 1.3 percent, but dissipate to zero quickly thereafter. From the variance decomposition results, we can see a substantial increase in the proportion of the variance of foreign net flows that can be associated with innovations in the Nikkei and yen/dollar exchange rate. In the pre-crisis period, the Nikkei and yen/dollar returns comprised 15 percent and 1 percent of net flow variances, but, in the crisis period, these allocations increased to 32 percent and 14 percent, respectively. During the post crisis period, the economic importance of positive-feedback trading remains and even increases with respect to innovations in the Nikkei to 37 percent, but that relative to the yen/dollar exchange rate abates to only 3 percent.

3.4 Did Foreign Investors Profit During the Crisis?

Our evidence indicates that foreign investors in Japan were consistently positive-feedback traders before, during and after the crisis period, while corporations, investment trusts and financial institutions were negative-feedback or contrarian traders. Which investing strategy was profitable? The nature of the TSE data precludes our ability to answer this question directly. After all, we only have weekly total purchase and sales activity of foreigners and various types of domestic investors, we have only aggregate level data by investor class, and we do not know

specifically which securities they invested in.¹⁶ Nevertheless, we propose a simple experiment to evaluate the potential profitability of the different strategies, based on the performance measurement techniques of Grinblatt and Titman (1993). They develop a “portfolio change” measure that captures the positive covariance between the return on an asset, R_j , and the proportional holdings of that asset, w_j , for an informed investor for all stocks j in their portfolio of N stocks,

$$\text{cov} = \sum_{j=1}^N E[(w_j - E(w_j))R_j] \quad (5)$$

Assuming the past period’s weight as the expected weight for asset j and averaging across time periods yields (their equation (4b)),

$$\text{cov} = \sum_{t=1}^T \sum_{j=1}^N (w_{j,t} - w_{j,t-1})R_{j,t} / T \quad (6)$$

They demonstrate that under the null hypothesis of no superior information, both current and past weights are uncorrelated with current returns which will lead to zero covariance, and they show how this measure can be interpreted as an average dollar return, or end-of-period value per unit of investment.

For each investor class in our sample, we compute the change in weights per week as the net purchases (in billions of yen) and proxy the returns by the weekly Nikkei index returns. We compute the weekly average covariance measure and cumulate over different horizons of analysis, so that the cumulative performance is measured as the yen value of the investments. Figure 4 presents two plots: the first demonstrates the cumulative wealth gain for the entire sample period 1995 to 2001 and the second presents the performance since the beginning of the Asian crisis period through 1998. Our diagnostic offers evidence of the success of the foreigners’

¹⁶ Kang and Stulz (1997) analyzed the portfolio holdings of foreign investors in Japan between 1975 and 1991 and found that they overweight Japanese stocks in manufacturing industries, large firms, and firms with good accounting performance, high systematic risk, and low leverage

positive-feedback trading strategy during this period. For the first nine months, their performance was neutral, but following September 1995 foreigners would have accumulated over 600 billion yen by January 1997 and ended up with over 1,200 billion yen by March 2001. By contrast, the negative-feedback, or contrarian, strategy of financial institutions, investment trusts and corporations would have lost cumulatively 1,700 billion yen, 540 billion yen, and 240 billion yen, respectively. Individual investors would have lost only 105 billion yen over the course of the seven-year period. To put the economic magnitude of the events into context, an interesting observation in both figures was the week of November 14, 1997, when the Nikkei lost over 800 points or about 5 percent of its value due to “concerns about the financial sector” (see Appendix). During this week, foreigners as a group increased their sales from 555 to 868 billion yen. This shift was absorbed by increases in purchases from 471 to 760 billion yen by corporations and 374 to 627 billion yen by banks and other financial institutions.

4 *Conclusions*

Did the Asian financial crisis in 1997 scare foreign investors out of Japan? Yes. Foreign investors had aggressively purchased Japanese equity during the 1990s, so that by 1997, they owned over 12 percent (40.9 trillion yen or \$351 billion) of the market value of Japanese equity. From July 1997 through October 1998, foreigners divested their Japanese holdings at a rate of 15 billion yen per week. Was this change in sentiment the result of a change in investment strategy? My findings in this paper suggest not. Before the onset of the Asian crisis, foreigners as a class of investors engaged in positive-feedback trading (buying on Nikkei index increases and yen/dollar appreciations). During the crisis, their strategy did not change. Though the sample period is short and statistical precision is difficult, our VAR results and impulse response

analysis suggest that the positive-feedback trading in response to shocks to Nikkei index and yen/dollar returns is even stronger during the crisis period. By contrast, domestic investors, especially financial institutions and corporations, were negative-feedback, or contrarian, traders consistently before, during and after the crisis.

While our overall findings parallel the recent findings of Kim and Wei (1999), Choe, Kho and Stulz (1999) on positive-feedback trading by foreign investors, they differ in important ways, also. Choe et al. find that the strategy weakens after the crisis began and Kim and Wei find that domestic residents switched to positive-feedback from contrarian trading at that time. Our findings also extends but challenges the earlier findings of Hamao and Mei (2001) which found that foreign investors in Japan are long-term contrarian players in the market. Indeed, during this crisis period and unlike the 1975 to 1992 period, domestic investors, especially the banks and corporations, appeared to lose to the foreign investors by a net gain of over 225 billion yen over the three-year period. Finally, consistent with these studies and Froot, O'Connell and Seasholes (2001), I find no evidence of any price-destabilizing effects of the trading activity of foreign investors in Japan before or during the Asian crisis.

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Table 1. Summary Statistics for the Trading Activity of Investment Sectors in Japan, 1995-2001.

Summary statistics are computed for weekly sales and purchases on the three major Japanese stock exchanges and for the log-returns on Nikkei 225 and Yen / U.S. dollar exchange rate from January 1995 to March 2001 (325 obs.). The “% of Total” figures are calculated for the time series of the ratios of each flow variable to the maximum of the total purchases and total sales. Q(3) is the Box-Ljung Portmanteau test for the third autocorrelations. The data was obtained from the Tokyo Stock Exchange *Monthly Statistics Reports* and from Datastream International.

	Mean	SD	Max	Min	Median	ρ_1	ρ_2	ρ_3	Q(3)	% of Total	
										Mean,%	SD,%
FLOWS (billion Yen)											
Total Purchases	2,901,605	1,557,143	10,727,782	142,627	2,514,499	0.82	0.69	0.64	511.41		
Total Sales	2,893,084	1,557,952	10,727,664	138,199	2,529,582	0.82	0.69	0.64	513.18		
Net Purchases	8,521	15,560	67,232	-49,401	8,516	0.29	0.12	0.05	31.80	0.369	0.654
Co. Purchases	859,105	518,155	4,621,876	39,062	759,947	0.72	0.45	0.32	271.37	30.129	7.804
Co. Sales	887,207	573,505	4,684,838	24,627	763,664	0.70	0.44	0.31	255.39	30.274	8.387
Co. Net Prurchases	-28,102	187,853	759,447	-720,321	-11,183	0.47	0.30	0.32	135.17	-0.145	7.045
Indiv. Purchases	412,881	314,445	1,770,812	26,070	294,979	0.88	0.82	0.77	668.90	13.899	5.599
Indiv. Sales	439,462	324,633	1,724,000	29,525	325,775	0.87	0.80	0.76	643.70	14.906	5.874
Indiv. Net Purchases	-26,581	68,697	355,932	-276,230	-18,213	0.34	0.15	-0.04	44.99	-1.007	2.238
Foreign Purchases	767,744	452,923	2,392,396	51,285	601,421	0.84	0.75	0.73	585.78	26.577	7.056
Foreign Sales	716,276	448,074	2,834,184	37,977	543,145	0.85	0.78	0.80	643.58	24.883	7.884
Foreign Net Purchases	51,469	158,448	776,573	-496,065	42,114	0.54	0.45	0.35	202.90	1.694	5.483
Secur. Purchases	49,594	31,843	181,371	4,128	41,298	0.84	0.76	0.75	600.62	1.700	0.506
Secur. Sales	48,835	29,566	159,823	4,721	40,078	0.83	0.78	0.73	593.83	1.701	0.490
Secur. Net Purchases	759	8,598	44,509	-35,382	-6	0.31	0.14	0.08	40.58	0.001	0.282
Life Purchases	49,460	75,431	556,120	759	20,796	0.54	0.31	0.21	138.50	1.485	1.787
Life Sales	69,703	76,260	581,493	695	43,326	0.49	0.27	0.21	115.92	2.396	2.080
Life Net Purchases	-20,243	33,738	154,986	-174,443	-18,228	0.28	0.21	0.27	64.04	-0.910	1.398
Finance Purchases	828,596	659,221	5,469,857	17,988	647,149	0.71	0.40	0.23	233.30	28.763	13.749
Finance Sales	834,229	703,579	5,618,262	8,564	639,225	0.67	0.37	0.21	204.52	27.815	13.539
Finance Net Purchases	-5,633	212,173	914,242	-833,942	13,838	0.28	0.24	0.26	66.68	0.948	7.922
Inv. Trust Purchases	65,590	49,904	536,778	6,087	55,363	0.51	0.49	0.48	238.75	2.446	2.106
Inv. Trust Sales	68,157	35,957	197,774	2,304	62,278	0.64	0.55	0.53	323.92	2.692	1.509
Inv. Trust Net Purchases	-2,567	47,039	445,405	-140,449	-6,295	0.41	0.37	0.34	136.77	-0.246	2.093
RETURNS											
(% per week)											
Nikkei 225	-0.0014	0.0302	0.1105	-0.1129	-0.0007	-0.12	0.10	-0.01	8.09	-	-
US\$/Yen Exchange Rate	0.0007	0.0192	0.0596	-0.1461	0.0026	-0.03	0.01	-0.02	0.43	-	-

Table 2. Descriptive Statistics of the Fund Flows of Different Investment Sectors.

Means and standard deviations for weekly purchases and sales of the seven investment sectors (companies, individual investors, foreign investors, securities companies, life and non-life insurance companies, finance companies, and investment trusts) are computed for three sub-periods: crisis period, June 30, 1997 through December 31, 1998 (79 observations); pre-Crisis period from January 9, 1995 to June 29, 1997 (130 observations) and the post-Crisis Period from January 1, 1999 to March 16, 2001 (116 observations). Total purchases and sales are in millions of yen. Purchases, sales and net purchases by sector are computed as a fraction of total purchases and net purchases as a fraction of the larger of total purchases and sales.

	Pre-Crisis Period Jan'95 – Jun '97		Crisis Period Jul'97 – Dec'98		Post-Crisis Period Jan '99 – Mar '01		Test of Difference between Means	
	Mean, %	Mean, %	SD, %	SD, %	Mean, %	SD, %	F-stat	p-value
Total Purchases	2,227,949	915,465	2,153,073	838,214	4,154,079	1,707,181		
Total Sales	2,216,226	911,278	2,146,763	837,142	4,147,633	1,709,792		
Total Net Purchases	0.547	0.733	0.312	0.599	0.21	0.544	8.95***	0.00
Co. Purchases	32.863	6.816	34.173	7.612	24.37	5.205		
Co. Sales	34.097	8.197	30.782	8.492	25.681	6.002		
Co. Net Purchases	-1.234	7.160	3.391	7.774	-1.31	5.502	14.00***	0.00
Individual Purchases	14.316	4.568	9.576	2.776	16.341	6.364		
Individual Sales	15.592	5.005	10.169	3.553	17.328	6.214		
Individual Net Purchases	-1.276	2.007	-0.593	2.225	-0.987	2.455	2.29	0.10
Foreign Purchases	22.360	5.316	27.030	7.244	30.961	5.776		
Foreign Sales	19.222	5.351	27.986	7.877	29.092	6.348		
Foreign Net Purchases	3.138	4.463	-0.956	6.841	1.869	4.85	14.82***	0.00
Secur. Purchases	1.839	0.425	1.350	0.430	1.781	0.53		
Secur. Sales	1.863	0.464	1.373	0.421	1.741	0.457		
Secur. Net Purchases	-0.024	0.262	-0.023	0.230	0.041	0.33	1.94	0.15
Life Ins. Purchases	1.563	1.992	1.010	1.439	1.718	1.709		
Life Ins. Sales	2.645	2.307	1.987	1.392	2.393	2.171		
Life Ins. Net Purchases	-1.082	1.798	-0.977	0.775	-0.675	1.173	2.74*	0.07
Financial Purchases	35.951	13.384	31.376	13.619	19.012	6.875		
Financial Sales	34.375	14.132	27.820	14.140	20.517	7.424		
Financial Net Purchases	1.576	9.152	3.556	7.494	-1.505	5.813	10.81***	0.00
Inv. Trust Purchases	3.268	3.004	1.540	0.605	2.142	0.847		
Inv. Trust Sales	3.938	1.305	2.180	1.355	1.651	0.49		
Inv. Trust Net Purch.	-0.670	2.968	-0.640	1.145	0.491	0.851	11.99***	0.00

Table 3. Cross-Correlations of Flows from Different Investment Sectors.

Correlations of weekly net purchases of the seven investment sectors (companies, individual investors, foreign investors, securities companies, life and non-life insurance companies, finance companies, and investment trusts) and returns on the Nikkei 225 index and Yen/dollar exchange rate are computed for different sub-periods.

Panel A. Pre-Crisis Period (from Jan 13, 1995 to June 27, 1997, 130 observations).

	Companies	Individuals	Foreigners	Sec Cos	Life Ins.	Fin Cos.	Inv. Trust	Nikkei
Companies	1.000							
Individuals	0.052	1.000						
Foreigners	-0.701**	-0.180**	1.000					
Securities Co.	0.088	0.594**	-0.133	1.000				
Life Ins.	0.425**	0.081	-0.160*	0.094	1.000			
Finance Co.	0.864**	-0.006	-0.559**	0.046	0.524**	1.000		
Inv. Trusts	0.362**	0.107	-0.399**	0.048	-0.001	0.210**	1.000	
Nikkei 225	-0.402**	-0.382**	0.248**	-0.129	-0.138	-0.271**	-0.173**	1.000
Yen/\$ FX	-0.157*	-0.102	0.083	-0.122	-0.214**	-0.238**	-0.036	0.208**

Panel B. Crisis Period (from June 29, 1997 to Dec 31, 1998, 79 observations).

	Companies	Individuals	Foreigners	Sec Cos	Life Ins.	Fin Cos.	Inv. Trust	Nikkei 225
Companies	1.000							
Individuals	0.368**	1.000						
Foreigners	-0.630**	-0.604**	1.000					
Securities Co.	0.197*	0.807**	-0.387**	1.000				
Life Ins.	0.418**	0.169	-0.398**	-0.017	1.000			
Finance Co.	0.921**	0.237**	-0.542**	0.075	0.492**	1.000		
Inv. Trusts	0.123	0.087	-0.072	0.111	-0.082	-0.002	1.000	
Nikkei 225	-0.474**	-0.556**	0.391**	-0.377**	-0.298**	-0.373**	-0.015	1.000
Yen/\$ FX	0.110	-0.122	0.084	-0.118	0.087	0.136	-0.071	-0.069

Panel C. Post-Crisis Period (from Jan 2, 1999 to Mar 16, 2001, 116 observations).

	Companies	Individuals	Foreigners	Sec Cos	Life Ins.	Fin Cos.	Inv. Trust	Nikkei 225
Companies	1.000							
Individuals	0.053	1.000						
Foreigners	-0.668**	-0.312**	1.000					
Securities Co.	-0.040	0.441**	-0.173*	1.000				
Life Ins.	0.424**	-0.099	-0.290**	0.088	1.000			
Finance Co.	0.892**	-0.098	-0.523**	-0.175*	0.322**	1.000		
Inv. Trusts	0.249**	0.111	-0.329**	0.366**	0.273**	0.093	1.000	
Nikkei 225	-0.269**	-0.311**	0.472**	-0.125	-0.178*	-0.142	0.065	1.000
Yen/\$ FX	0.017	0.123	-0.181*	0.041	-0.078	-0.023	-0.038	-0.113

Table 4. VAR statistics.

Parameters are estimated for the following VAR structural models: $\mathbf{R}_t = \mathbf{a} + \mathbf{B}(L)\mathbf{R}_t + \boldsymbol{\varepsilon}_t$, where L is the lag operator (4 lags are used), \mathbf{a} is the vector of constants, and \mathbf{B} is the matrix of coefficients. $\mathbf{R}_t \equiv [\text{RNK}_t, \text{RFX}_t, \text{XNP}_t]^T$, where RNK and RFX are log-returns on the Nikkei 225 index and the Yen/Dollar exchange rate, and XNP is the net purchases of investment sector X (e.g., companies, individuals, foreigners, etc.). Variance decomposition is computed for the N-month ahead forecast for variable of interest, where N is 6-, 12- or up to 18-months ahead. Significance of the coefficients at 10%, 5%, and 1% is denoted by *, **, and *** respectively.

		Companies			Individuals			Foreigners		
		Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow
Nikkei 225	-1	-0.124 *	0.016	-0.523 ***	-0.123 *	0.054	0.083 *	-0.113 *	0.045	0.247 ***
	-2	-0.021	0.003	-0.081	0.090	0.005	0.045	0.020	0.025	0.132
	-3	0.032	-0.007	-0.191	0.063	-0.018	-0.058	-0.009	-0.001	0.193 **
	-4	-0.017	0.067	0.131	-0.009	0.036	0.044	-0.042	0.035	-0.044
Yen/\$ FX	-1	0.009	-0.021	0.124	0.037	-0.030	-0.038	0.022	-0.023	-0.151
	-2	-0.099	-0.001	0.101	-0.112	0.002	0.152 **	-0.112	0.004	-0.227 *
	-3	0.102	-0.016	-0.233	0.110	-0.024	-0.066	0.111	-0.025	0.146
	-4	-0.097	0.059	0.278 *	-0.063	0.048	0.012	-0.069	0.051	-0.130
Net Flow	-1	-0.049	-0.021	0.319 ***	-0.044	0.002	0.383 ***	0.022	0.004	0.348 ***
	-2	-0.080 **	0.010	0.175 ***	0.027	-0.003	0.146 **	0.091 **	-0.040	0.226 ***
	-3	0.127 ***	-0.025	-0.029	0.144	-0.064	-0.139 **	-0.064	0.039	0.039
	-4	-0.046	0.054 ***	0.172 ***	0.017	-0.005	0.057	0.010	0.000	0.018
Const		-0.001	0.001	-0.001	0.000	0.000	-0.006 ***	-0.002	0.001	0.007 ***
R²		0.057	0.002	0.380	0.008	-0.019	0.139	0.017	-0.014	0.401
Zero Block Exclusion Tests (F-statistics)										
F-tests	Nikkei 225	1.027	0.762	5.722 ***	1.542	0.642	1.750	0.993	0.521	3.292 **
	Yen/\$ FX	1.034	0.332	1.480	0.998	0.294	2.045 *	1.014	0.297	1.789
	Net Flow	4.796 ***	1.965 *	22.242 ***	0.839	0.365	13.698 ***	1.536	0.699	26.025 ***
Variance Decomposition by Variable of N-Week Ahead Forecasts (in percent)										
Nikkei 225	6	92.86	1.26	34.69	97.51	1.15	19.99	96.55	1.00	29.61
	12	92.60	1.38	35.13	97.47	1.16	20.00	96.47	1.05	29.98
	18	92.59	1.39	35.17	97.47	1.16	20.00	96.47	1.05	29.99
Yen/\$ FX	6	1.12	96.46	0.75	1.55	98.45	1.95	1.48	98.03	1.72
	12	1.23	96.24	0.82	1.57	98.44	1.95	1.53	97.96	1.88
	18	1.23	96.22	0.83	1.57	98.44	1.95	1.53	97.96	1.88
Net Flow	6	6.02	2.28	64.56	0.94	0.40	78.06	1.97	0.97	68.68
	12	6.17	2.38	64.05	0.96	0.40	78.04	2.00	0.99	68.14
	18	6.18	2.39	64.00	0.96	0.40	78.04	2.00	0.99	68.12

Table 4 (continued).

		Securities Cos.			Life Insurance Cos.			Financial Institutions		
		Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow
Nikkei 225	-1	-0.087	0.055	0.001	-0.109 *	0.052	-0.035 *	-0.106 *	0.039	-0.597 ***
	-2	0.093	0.010	0.004	0.083	0.002	-0.011	0.036	0.009	-0.219
	-3	0.011	-0.004	0.000	0.011	-0.003	-0.022	0.023	-0.005	-0.362 **
	-4	-0.030	0.036	0.010 *	-0.030	0.037	-0.032	-0.018	0.053	0.016
Yen/\$ FX	-1	0.041	-0.033	-0.012	0.017	-0.026	0.018	0.020	-0.021	-0.005
	-2	-0.103	0.004	0.004	-0.120	0.007	0.022	-0.129	0.004	0.136
	-3	0.096	-0.025	-0.012	0.103	-0.029	-0.010	0.107	-0.024	-0.221
	-4	-0.066	0.044	0.001	-0.083	0.053	0.048	-0.082	0.062	0.212
Net Flow	-1	0.920	0.132	0.227 ***	-0.189	0.032	0.433 ***	-0.030	0.003	0.188 ***
	-2	0.080	-0.061	0.065	0.035	0.033	0.003	-0.045 *	-0.002	0.165 ***
	-3	0.012	-0.537	0.000	0.171	-0.216 **	0.228 ***	0.080 ***	-0.018	0.038
	-4	-0.291	-0.253	0.069	-0.142	0.071	0.036	-0.025	0.031 *	0.125 **
Const		-0.001	0.001	0.000	-0.002	0.000	-0.003 ***	-0.001	0.001	0.003
R²		0.005	-0.014	0.061	0.009	-0.008	0.360	0.037	-0.010	0.259
Zero Block Exclusion Tests (F-statistics)										
F-tests	Nikkei 225	1.328	0.789	1.143	1.659	0.741	1.510	1.021	0.720	6.335 ***
	Yen/\$ FX	0.858	0.287	1.220	1.062	0.347	0.718	1.210	0.380	0.712
	Net Flow	0.617	0.698	5.715 ***	0.876	1.156	40.030 ***	3.132 **	1.044	11.616 ***
Variance Decomposition by Variable of N-Week Ahead Forecasts (in percent)										
Nikkei 225	6	97.71	1.14	4.96	97.44	1.10	5.90	94.56	0.99	24.23
	12	97.69	1.15	4.99	97.38	1.13	6.64	94.43	1.07	24.86
	18	97.69	1.15	4.99	97.38	1.14	6.71	94.43	1.07	24.89
Yen/\$ FX	6	1.55	98.10	2.29	1.57	97.55	0.81	1.43	97.53	0.66
	12	1.57	98.07	2.32	1.61	97.43	0.97	1.49	97.42	0.66
	18	1.57	98.07	2.32	1.61	97.42	0.99	1.49	97.42	0.66
Net Flow	6	0.74	0.76	92.74	0.99	1.35	93.30	4.00	1.47	75.11
	12	0.74	0.78	92.69	1.01	1.44	92.39	4.08	1.51	74.48
	18	0.74	0.78	92.69	1.02	1.45	92.30	4.08	1.51	74.46

Table 4 (continued).

		Investment Trusts			
		Nikkei 225	Yen/\$ FX	Net Flow	
Nikkei 225	-1	-0.118 **	0.042	-0.126 ***	
	-2	0.064	-0.014	-0.019	
	-3	-0.012	-0.008	0.040	
	-4	-0.043	0.036	0.064 **	
Yen/\$ FX	-1	0.017	-0.031	0.040	
	-2	-0.126	0.003	-0.022	
	-3	0.075	-0.030	-0.004	
	-4	-0.078	0.053	0.007	
Net Flow	-1	-0.089	-0.120 **	0.204 ***	
	-2	-0.062	0.017	0.049	
	-3	-0.063	-0.032	0.045	
	-4	-0.106	-0.047	0.128 ***	
Const		-0.002	0.000	-0.002 **	
R²		0.014	-0.002	0.162	
Zero Block Exclusion Tests (F-statistics)					
F-tests	Nikkei 225	1.685	0.616	6.097 ***	
	Yen/\$ FX	0.922	0.373	0.272	
	Net Flow	1.314	1.649	10.545 ***	
Variance Decomposition by Variable of N-Week Ahead Forecasts (in percent)					
Nikkei 225	6	97.57	0.79	7.27	
	12	97.51	0.81	7.27	
	18	97.51	0.81	7.27	
Yen/\$ FX	6	1.54	97.92	0.64	
	12	1.55	97.85	0.64	
	18	1.55	97.85	0.64	
Net Flow	6	0.89	1.29	92.09	
	12	0.93	1.34	92.08	
	18	0.93	1.34	92.08	

Table 5. Comparisons of Net Flow Activity Before, During and After the Crisis using F-statistics from Zero-Block Exclusion Tests of the VAR model by Sector.

Parameters are estimated for the following VAR structural models: $\mathbf{R}_t = \mathbf{a} + \mathbf{B}(L)\mathbf{R}_t + \boldsymbol{\varepsilon}_t$, where L is the lag operator (4 lags are used), \mathbf{a} is the vector of constants, and \mathbf{B} is the matrix of coefficients. $\mathbf{R}_t \equiv [\text{RNK}_t, \text{RFX}_t, \text{XNP}_t]^T$, where RNK and RFX are log-returns on the Nikkei 225 index and the Yen/Dollar exchange rate, and XNP is the net purchases of investment sector X (e.g., companies, individuals, foreigners, etc.). Significance of the coefficients at 10%, 5%, and 1% is denoted by *, **, and *** respectively.

		Pre-Crisis Period			Crisis Period			Post-Crisis Period		
		Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow
Companies	Nikkei 225	1.290	0.896	3.588 ***	0.409	0.363	1.745	0.513	0.562	3.921 ***
	Yen/\$ FX	0.743	1.816	0.187	2.419 *	0.092	4.486 ***	0.233	0.561	1.782
	Net Flow	2.602 **	0.617	7.833 ***	2.887 **	0.604	4.865 ***	0.944	1.193	5.678 ***
Individuals	Nikkei 225	3.165 **	0.777	1.685	0.313	2.248 *	0.842	0.664	0.250	3.124 **
	Yen/\$ FX	1.079	1.528	0.999	2.009	0.298	3.113 **	0.428	0.525	1.887
	Net Flow	1.584	1.222	10.006 ***	0.678	2.181 *	1.685	1.410	0.139	6.067 ***
Foreigners	Nikkei 225	1.308	0.492	1.945 *	0.569	0.700	1.941 *	0.431	0.825	1.248
	Yen/\$ FX	0.540	1.472	0.204	3.578 **	0.193	4.329 ***	0.384	0.652	1.680
	Net Flow	1.172	0.834	11.662 ***	2.171 *	0.682	5.769 ***	0.564	0.927	5.682 ***
Securities Cos	Nikkei 225	2.029 *	0.594	2.260 *	0.533	1.718	1.507	0.124	0.308	1.202
	Yen/\$ FX	0.696	1.191	1.158	1.600	0.139	1.199	0.281	0.522	0.706
	Net Flow	0.863	0.651	4.652 ***	0.712	2.077 *	0.761	0.402	0.377	1.290
Life Ins Cos.	Nikkei 225	1.892	0.375	3.611 ***	1.479	1.033	0.667	0.253	0.374	0.321
	Yen/\$ FX	0.629	2.094 *	1.714	1.937	0.103	0.342	0.243	0.536	0.103
	Net Flow	0.423	2.294 *	27.658 ***	1.392	0.606	1.693	2.877 **	0.419	6.597 ***
Fin Inst.	Nikkei 225	1.190	0.645	3.240 **	0.403	0.556	2.699 **	0.291	0.558	3.939 ***
	Yen/\$ FX	0.630	1.638	0.408	2.548 **	0.051	3.663 ***	0.178	0.547	1.109
	Net Flow	2.345 *	0.119	2.455 **	2.465 *	1.237	4.348 ***	0.793	1.171	1.586
Inv. Trusts	Nikkei 225	2.308 *	0.717	3.680 ***	0.912	1.288	6.857 ***	0.352	0.184	8.357 ***
	Yen/\$ FX	0.202	2.417 *	2.222 *	1.649	0.150	3.391 **	0.330	0.602	0.510
	Net Flow	2.480 **	2.603 **	1.382	0.706	0.964	3.511 **	0.776	0.382	14.336 ***

Table 6. VAR statistics: Comparing foreigner net flow activity before, during and after the Crisis.

Parameters are estimated for the following VAR structural models: $\mathbf{R}_t = \mathbf{a} + \mathbf{B}(L)\mathbf{R}_t + \boldsymbol{\varepsilon}_t$, where L is the lag operator (4 lags are used), \mathbf{a} is the vector of constants, and \mathbf{B} is the matrix of coefficients. $\mathbf{R}_t \equiv [\text{RNK}_t, \text{RFX}_t, \text{XNP}_t]^T$, where RNK and RFX are log-returns on the Nikkei 225 index and the Yen/Dollar exchange rate, and XNP is the net purchases of investment sector X (e.g., companies, individuals, foreigners, etc.). Variance decomposition is computed for the N-month ahead forecast for variable of interest, where N is 6-, 12- or up to 18-months ahead. Significance of the coefficients at 10%, 5%, and 1% is denoted by *, **, and *** respectively.

		Pre-Crisis Period			Crisis Period			Post-Crisis Period		
		Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow	Nikkei 225	Yen/\$ FX	Net Flow
Nikkei 225	-1	-0.153	-0.038	0.256 **	-0.001	0.174	0.331	-0.101	-0.028	0.287 *
	-2	0.132	0.019	0.062	-0.069	0.107	0.320	-0.102	-0.036	0.011
	-3	0.031	-0.005	0.196	-0.083	0.008	0.304	0.058	0.006	0.189
	-4	0.005	0.053	0.078	-0.182	0.016	-0.249	-0.021	0.108	-0.073
Yen/\$ FX	-1	0.081	0.139	-0.094	-0.063	-0.060	-0.726 ***	0.126	-0.145	0.504 **
	-2	0.049	-0.006	-0.072	-0.367 **	-0.018	-0.402	-0.050	-0.015	-0.231
	-3	0.106	0.083	-0.086	0.405 **	-0.100	0.505 *	-0.131	-0.070	0.086
	-4	-0.213	0.131	-0.078	-0.146	0.001	-0.312	0.101	0.004	0.111
Net Flow	-1	-0.016	-0.036	0.378 ***	-0.041	-0.007	0.290 **	0.061	0.014	0.346 ***
	-2	0.126	0.004	0.172 *	0.240 ***	-0.107	0.392 ***	0.058	0.022	0.131
	-3	-0.093	0.063	-0.055	-0.113	0.074	-0.063	-0.094	-0.047	0.052
	-4	0.077	0.007	0.163 *	-0.076	0.031	-0.047	0.052	-0.054	0.073
Const		-0.002	0.000	0.012 ***	-0.006	0.001	-0.001	-0.003	0.002	0.008
R²		0.023	0.014	0.358	0.127	-0.060	0.443	-0.073	-0.046	0.298
Zero Block Exclusion Tests (F-statistics)										
	Nikkei 225	1.308	0.492	1.945 *	0.569	0.700	1.941 *	0.431	0.825	1.248
	Yen/\$ FX	0.540	1.472	0.204	3.578 **	0.193	4.329 ***	0.384	0.652	1.680
	Net Flow	1.172	0.834	11.662 ***	2.171 *	0.682	5.769 ***	0.564	0.927	5.682 ***
Variance Decomposition by Variable of N-Week Ahead Forecasts (in percent)										
Nikkei 225	6	94.27	6.64	14.33	76.95	3.57	32.06	96.91	2.89	37.14
	12	93.66	7.21	15.84	76.76	3.75	32.07	96.87	3.16	37.47
	18	93.62	7.30	15.99	76.76	3.75	32.06	96.87	3.17	37.48
Yen/\$ FX	6	1.43	91.13	0.68	13.44	91.50	13.94	1.16	94.95	3.43
	12	1.46	89.86	1.07	13.59	91.33	14.01	1.17	94.50	3.43
	18	1.47	89.61	1.17	13.59	91.33	14.02	1.17	94.49	3.43
Net Flow	6	4.30	2.23	84.99	9.61	4.92	54.00	1.92	2.16	59.43
	12	4.88	2.93	83.09	9.65	4.92	53.92	1.96	2.34	59.11
	18	4.91	3.09	82.84	9.65	4.92	53.92	1.96	2.35	59.09

Appendix A Chronological Table of the Asian Crisis

Date	Event
Early May 1997	Japanese officials threat to raise interest rates.
May 14-15, 1997	Thailand's baht currency is hit by massive sell-off.
June 30, 1997	Thai Prime Minister assures there will be no devaluation of the baht.
July 2, 1997	The Bank of Thailand announces a managed float of the baht and calls on the International Monetary Fund for "technical assistance." The announcement effectively devalues the baht by about 15-20 percent.
Oct. 20-23, 1997	The Hong Market loses nearly a quarter of its value in four days.
Oct. 27, 1997	The Hang Seng index loses 5.8%, Dow Jones 7.2%, stock markets in Latin America suffered record losses.
Nov. 3, 1997	Asian stock markets rallied after financial aid package for Indonesia.
Nov. 10, 1997	Losses in Asian stock markets again as a result of turmoil in global financial markets.
Nov. 12, 1997	Nikkei 225-share index fell to its lowest level in more than two years as the yen slid against the U.S. dollar
Nov. 14, 1997	Major sell-off in Japan as a result of rising concerns about the health of the financial system.. Nikkei 225 fell 2.23 percent, it is down 4.76 percent on the week.
Nov. 17, 1997	Sharp recovery in Tokyo's stock market. Nikkei 225 rose 7.96%. Government let the Hokkaido Takushoku Bank to collapse. Investors hope market forces will reconfigure the troubled financial sector.
Nov. 19, 1997	Nikkei 225 average plunged 5.3%. Weak bank shares were responsible.
Nov. 20, 1997	Most Asian currencies fell following the 10% fall in the Korean Won.
Nov. 24, 1997	In Tokyo, Yamaichi Securities Co. closed. The next day the yen tumbled to its lowest level against the dollar in more than five years, and Tokyo stocks plunged 5%.
Nov. 26, 1997	Joint statement by Finance Minister Hiroshi Mitsuzuka and Bank of Japan Governor Yasuo Matsushita promised no more major bankruptcies among financial institutions. Next day stocks rose 3.5% boosted by hopes that public money will be used to cope with financial firms' bad loans.
Dec. 4, 1997	A record loan package by IMF to bail out South Korea.

Source: <http://www.stern.nyu.edu/~nroubini/asia/AsiaChronology1.html>.

Figure 1
Foreign Portfolio Investment Activity in the Japanese Equity Market: 1995-2001

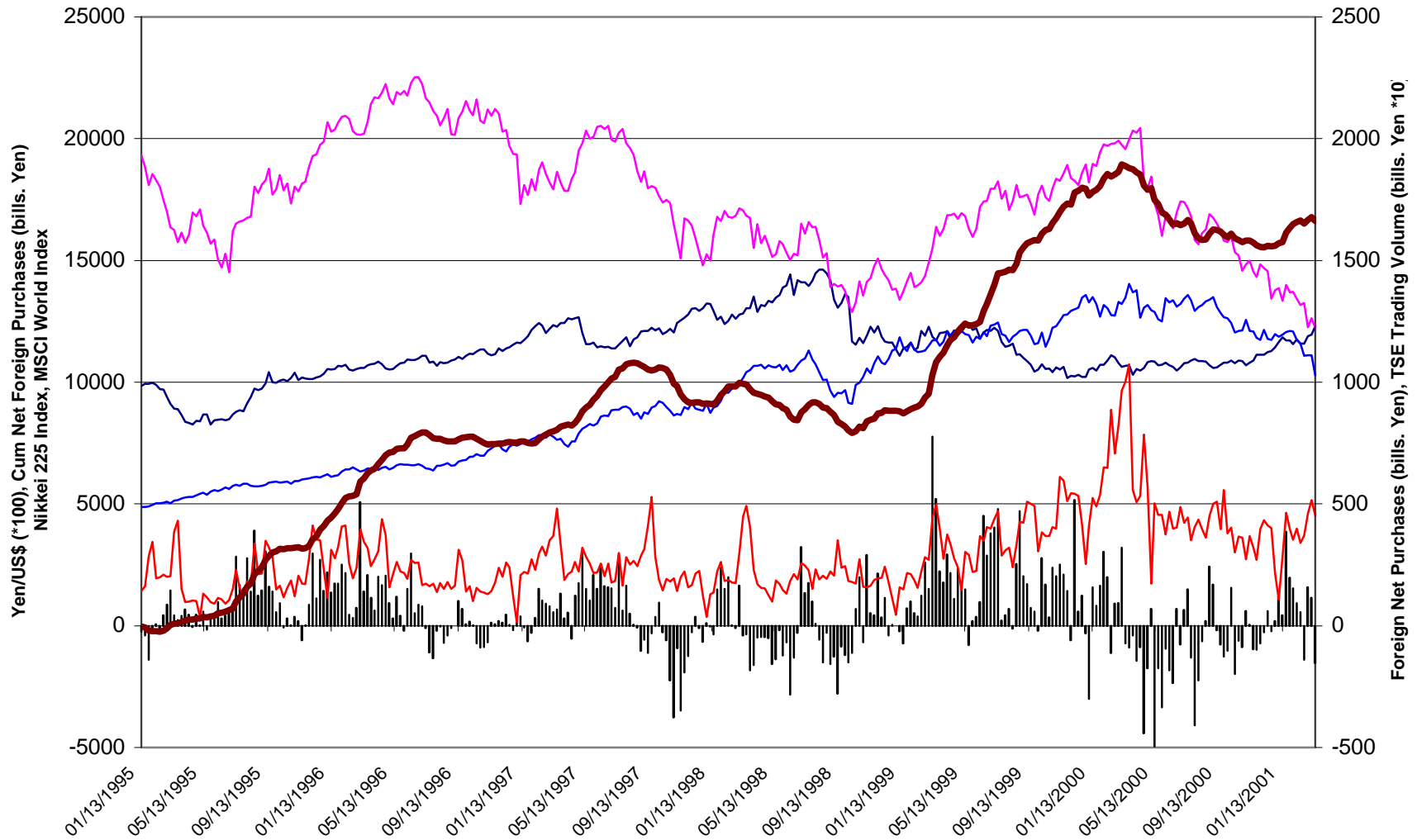


Figure 2 – VAR Impulse Response Analysis of Nikkei and Yen/US\$ Returns and Net Purchases by Investment Sector

Figure 2a – Individuals

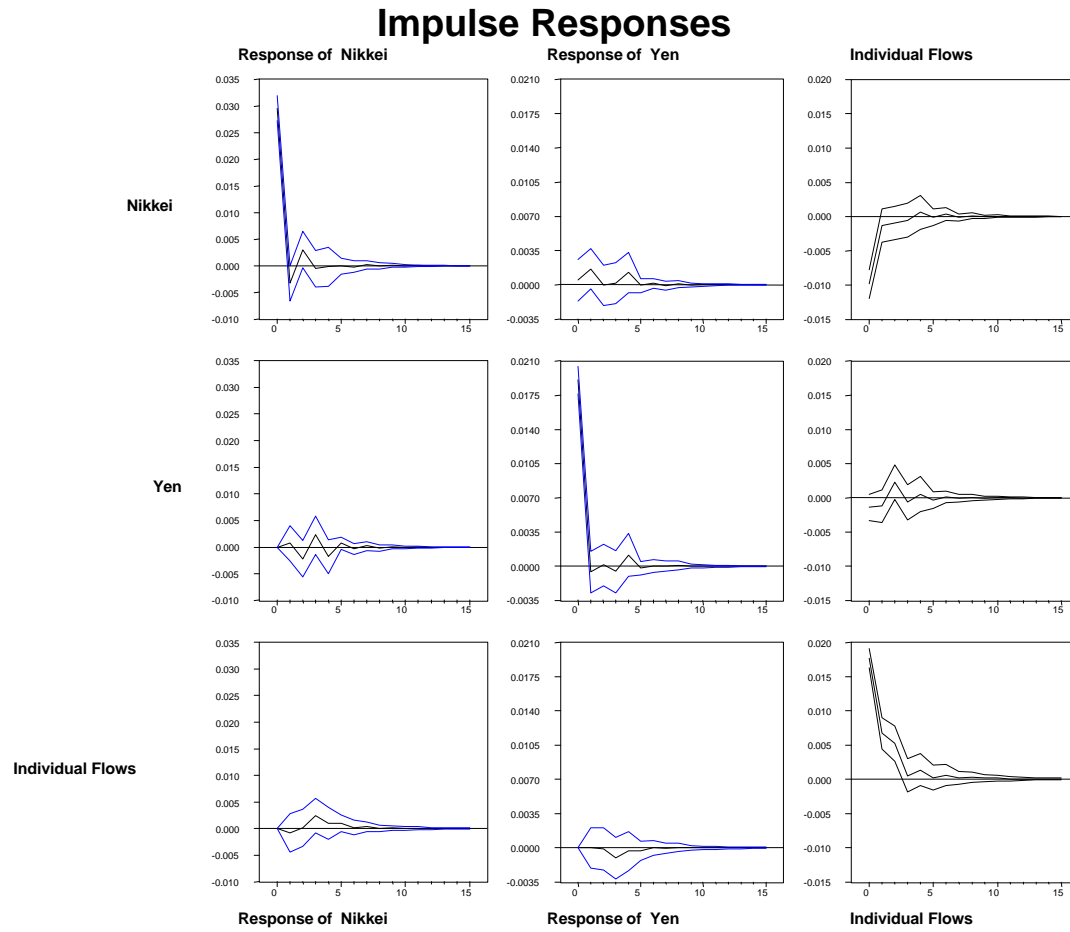


Figure 2b – Companies

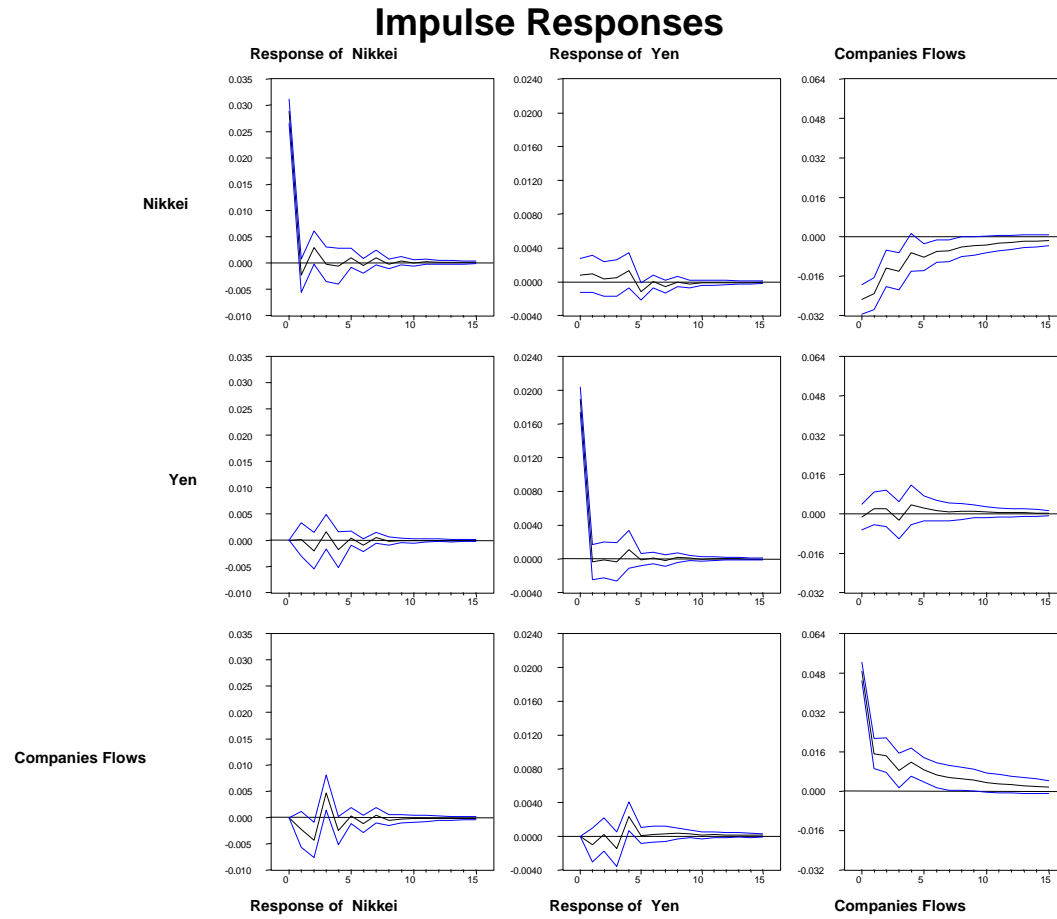


Figure 2c – Foreigners

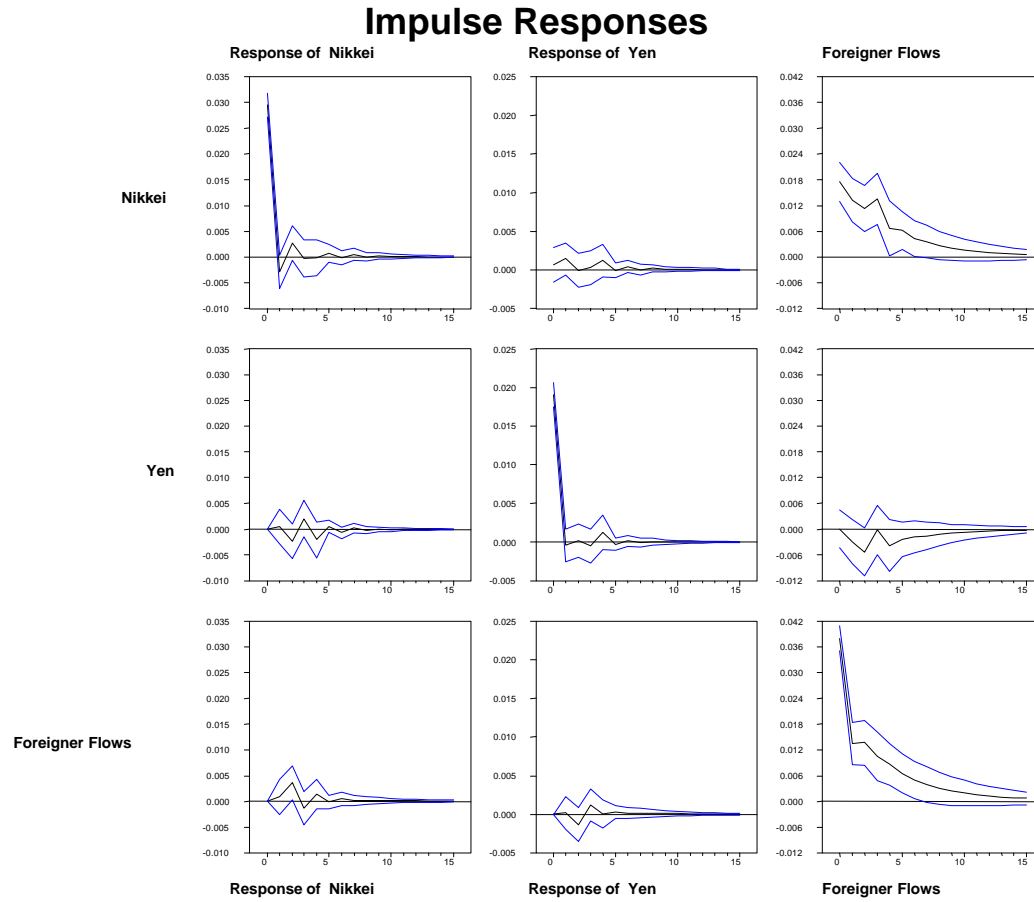


Figure 2d – Securities Cos.

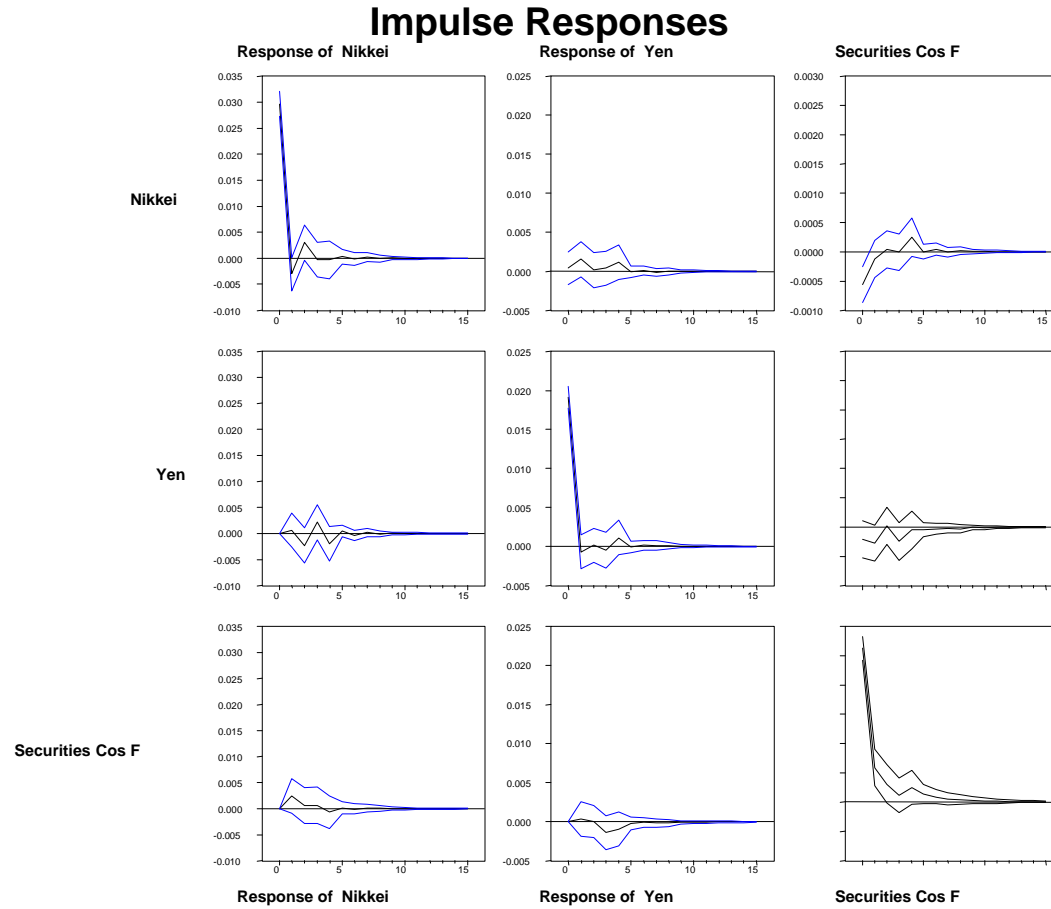


Figure 2e – Financial Cos.

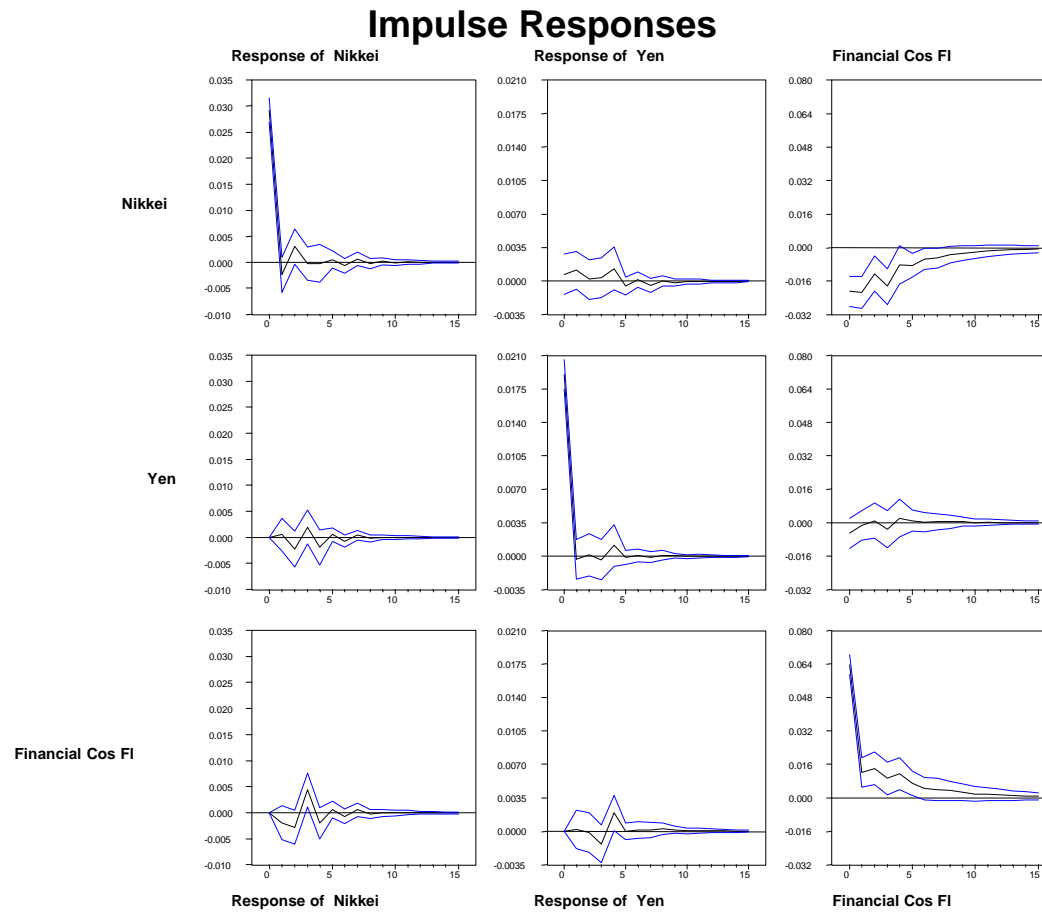


Figure 2f – Life Ins. Cos.

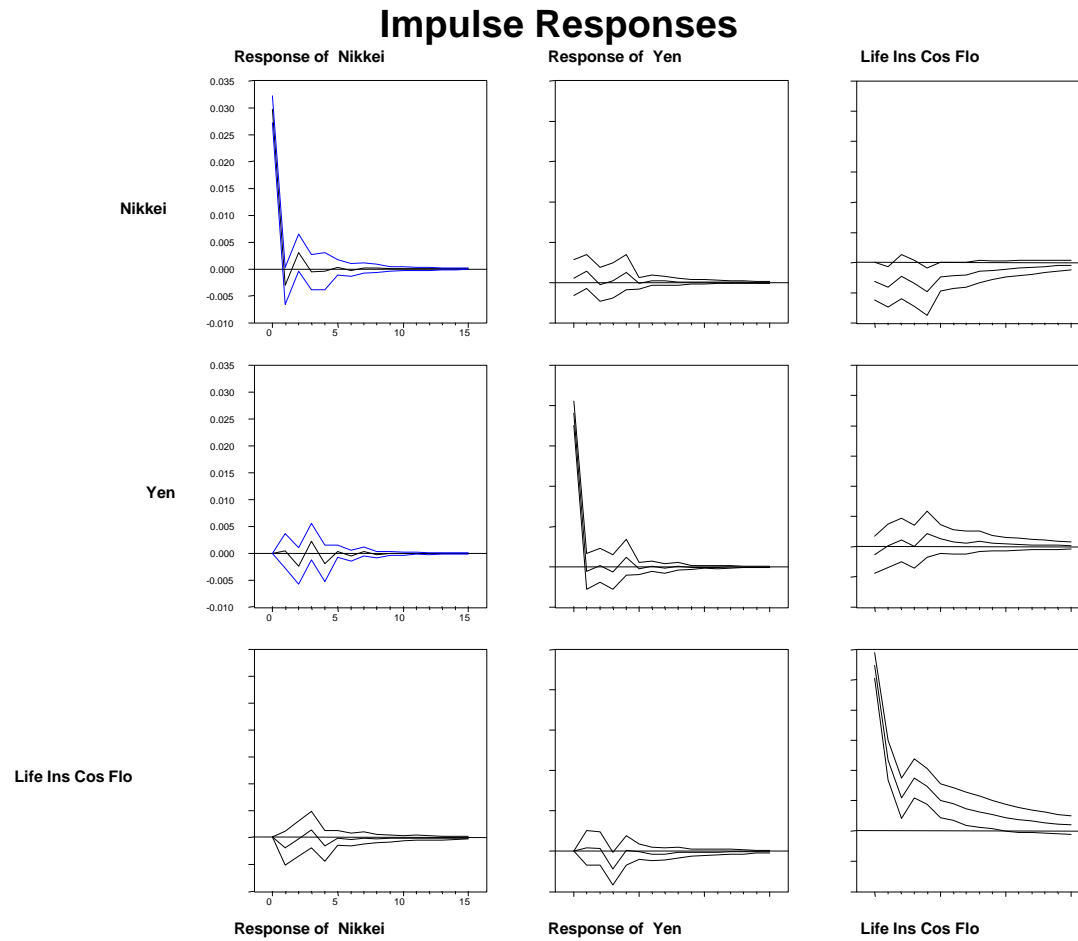


Figure 2g – Investment Trusts

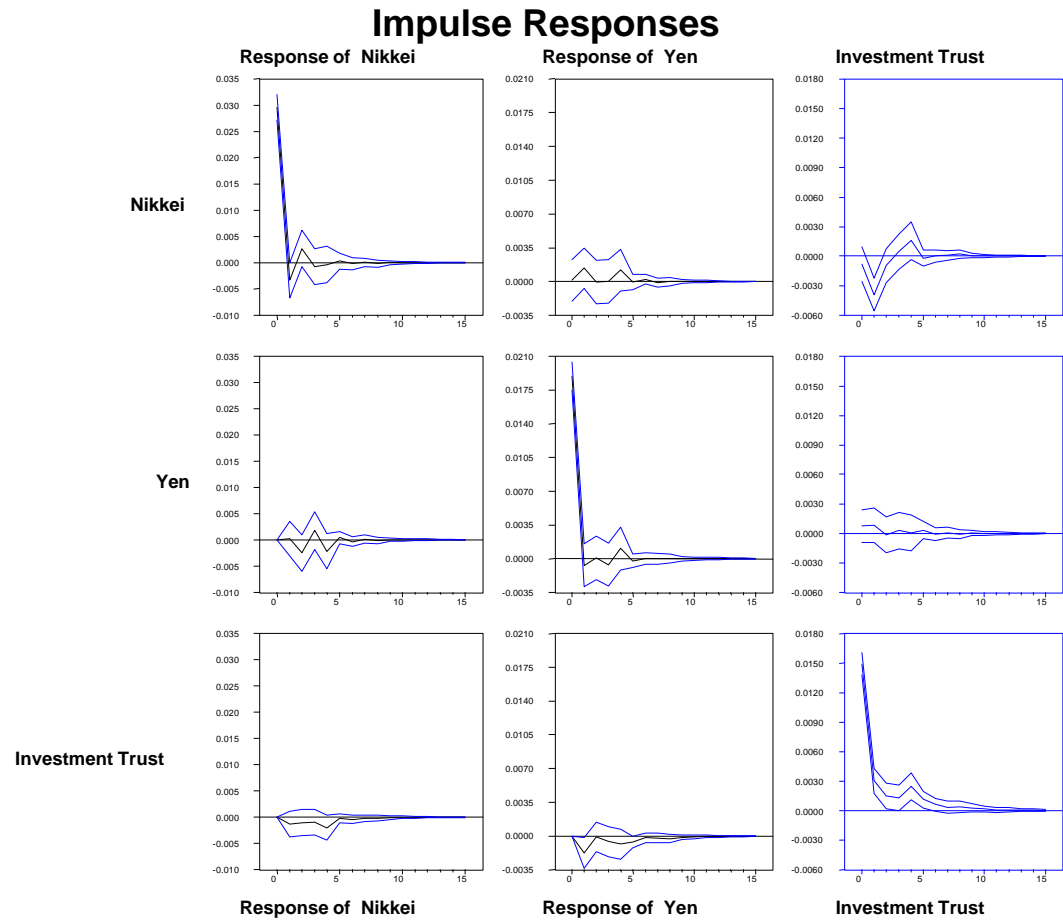


Figure 3 – VAR Impulse Response Analysis of Nikkei and Yen/US\$ Returns and Foreigner Net Purchases: Comparisons among Pre-Crisis, Crisis and Post-Crisis Periods

Figure 3a – Pre-Crisis Period (January 13, 1995 to July 1, 1997)

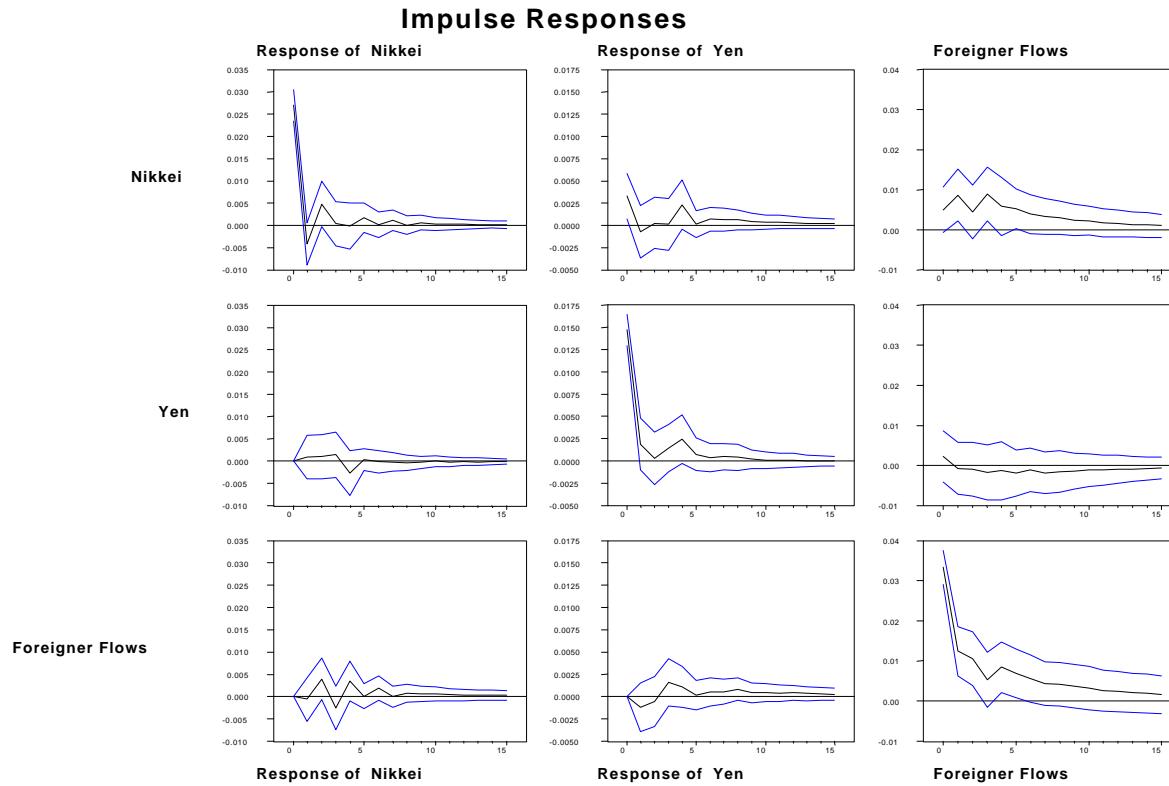


Figure 3b – Crisis Period (July 2, 1997 to December 31, 1998)

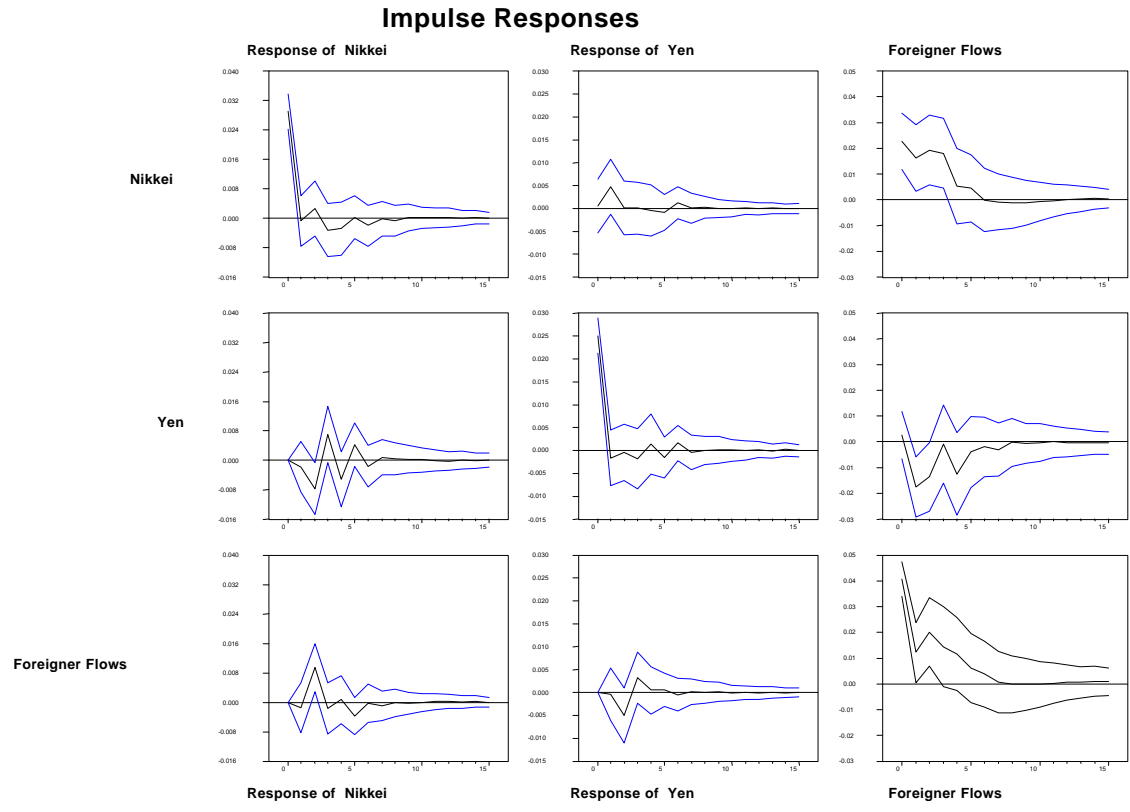


Figure 3c – Post-Crisis Period (January 1, 1999 to March 16, 2001)

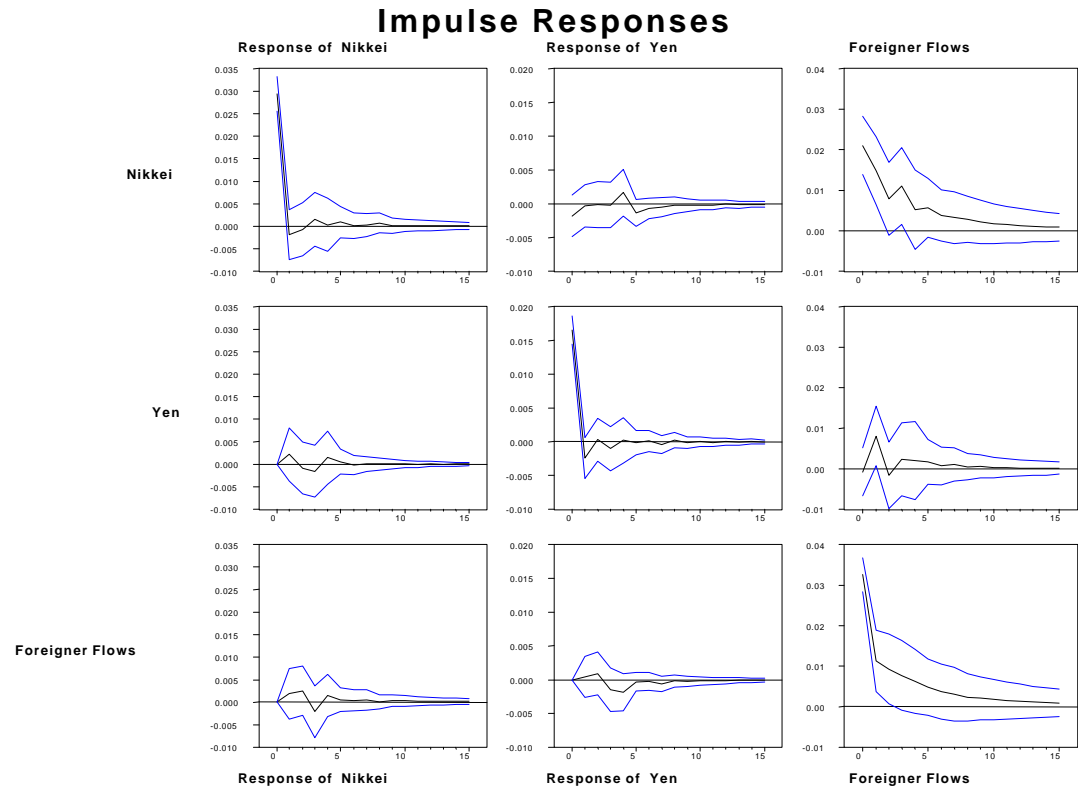


Figure 4a
Cumulative Performance of Different Investment Sectors in Japanese Equity Markets: 1995-2001

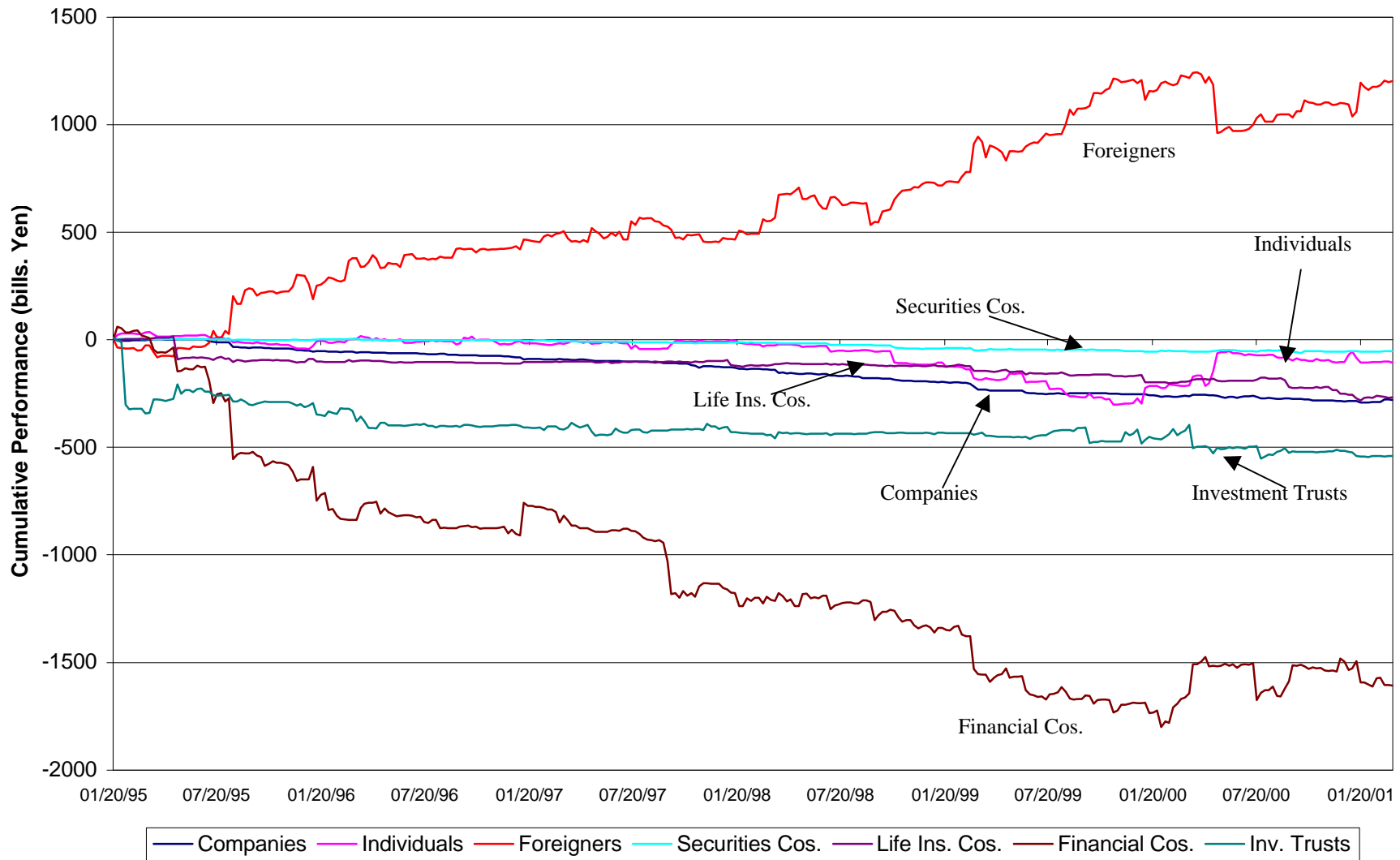


Figure 4b
Cumulative Performance of Different Investment Sectors in Japanese Equity Markets:
During the Asian Crisis

