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International Transmission of the 2008 Crisis: Evidence from the Japanese stock market^{*}

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Abstract

We investigate the international transmission of the credit crisis triggered by the Lehman default in September 2008 using Japan's stock market data. Using cumulative returns (CR) during the crisis, starting from the day of Lehman's default and lasting until the day prior to the news of the TARP capital injection, we find that CR is negatively correlated with the export-to-sales ratio, the loan-to-asset ratio, and the share owned by foreign investors. Once controlling for market risk, however, cumulative abnormal returns (CAR) during the same period shows a different picture. CAR is not negatively correlated with export shares or the share owned by foreign investors, which implies that neither trade channels nor portfolio-rebalancing by foreigners are unique characteristics of the crisis, but can be observed in normal downturns. We find that CAR is negatively correlated with the loan-to-asset ratio, suggesting that market participants were worried about the credit crunch. We also find that CAR is negatively correlated with the shares of exports to North America and Asia after controlling for total exports, suggesting that the composition of export destination matters. Finally, we find that the concentration of export destination is also relevant.

Keywords: international transmission, financial crisis, Japan, and firm-level data.

JEL Classification: F30; F40; G15

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1. Introduction

The US credit crisis triggered by the subprime loan debacle in 2007 and culminated by the Lehman default in September 2008 was quickly transmitted beyond borders, becoming the global crisis. Foreign financial institutions, especially those European banks that held US toxic assets were severely affected by the sharp drop in their prices. However, the transmission was far wider and deeper than just through the asset price collapse or the liquidity dry-up in the financial market.

Japanese financial institutions incurred relatively small losses from the subprime-related assets. Total realized losses of depository institutions from sub-prime mortgage securities over the period from April 2007 through March 2009 were just 2.1 percent of total Tier 1 capital.¹ Nonetheless, as Figure 1 depicts, Japan's stock market index (TOPIX) fell as much as the US, Euro, and Asian's stock market indices (the Standard and Poor's 500, its Euro, and its Asia 50, respectively). Figures 2A and 2B shows that Industrial production and real GDP dropped by one of the largest rates in the world. We investigate the transmission of the 2008 credit crisis to the Japanese economy using the event-study methodology.

Various transmission mechanisms of financial crises can be classified into trade and financial linkages. Trade linkages include the bilateral trade with the crisis-hit area and the competition in the third market through the change in exchange rates. Financial linkages work through the liquidity dry-up in financial markets, the credit crunches by financial intermediaries, and the portfolio rebalance by crisis-hit investors.

The event-study methodology with firm-level data is expected to distinguish the importance of those various channels (Forbes, 2004). In addition, since Japan's financial institutions incur relatively small losses from securities products, we can focus on the channels through the sustained stress in the international financial markets or through the depressed demand for exporting goods in foreign markets. If abnormal returns of exporting firms were lower than non-exporting firms, trade channels are of importance. On the other hand, if firms with abundant liquid assets or small amounts of loans saw higher abnormal returns, then liquidity and credit channels are of relevance. Finally, if firms whose shares are held more by crisis-hit foreign investors went through lower abnormal returns, then the fire-sales or

¹ Realized losses and Tier 1 capital are 1.0 and 4.8 trillion yen, respectively. Total valuation losses and realized losses from securitized products, including sub-prime mortgage securities, CLO, CDO, RMBS, CMBS, and leveraged loans, are 3.3 trillion yen, or 6.9 percent of Tier 1 capital. (Financial Service Agency, 2009)

portfolio-rebalance channels are working.

In analyzing stock market performance, it is useful to distinguish cumulative returns (CR, without market-risk adjustment) and cumulative abnormal returns (CAR, with market-risk adjustment). Suppose, for example, that exporters are more sensitive to market returns (with high β). Even if exporters' CR were lower than non-exporters during the crisis, such exporters' poor performance may not be unique to the crisis period, but could be observed in normal downturns. In that case, exporters' CAR would not be low. Since we are interested in how the transmission mechanism of the crisis is different from that of normal times, we mainly focus on CAR, though we examine CR as well.

There is vast literature on the international transmission of financial crises. One strand of literature examines the correlation among different economies in interest rates, stock prices and sovereign spreads to see whether the correlation increases in the wake of a crisis (see Forbes and Rigobon (2001) for a survey). Though most of the studies find an increase in correlation in asset returns after the crisis, it is often difficult to distinguish between the international transmission of the crises and the correlation of economic fundamentals using time series data (Dornbusch et al., 2000)². Another strand of literature, introduced by Eichengreen et al. (1996) and Sachs et al. (1996), examines whether the likelihood of crisis in a country is higher after a crisis in other countries (see Dornbusch et al. (2000) for surveys). Though, in principle, those studies can identify trade and financial channels using a cross-country dataset, it is actually difficult to do so, since countries are often closely connected both by trade and financial ties. Partly because of such a high correlation between trade and financial ties, previous studies obtain mixed results about the relative importance of trade and financial channels³. To identify the transmission mechanism, it is useful to use firm-level data, which contain a large variation in the exposures to trade and financial shocks. Forbes (2004) utilizes firm-level data during the Asian and Russian crises and finds that trade linkages are important factors⁴.

² Forbes and Rigobon (2002) also point out the heteroskedasticity-driven bias associated with the correlation coefficient. For a recent study, see Dungey and Martin (2007), among others.

³ Eichengreen et al. (1996) examine 20 industrial economies from 1959 through 1993 and show that trade linkages were important. Glick and Rose (1998) also find that trade linkages were important by examining five episodes of currency crises and 161 countries. On the other hand, Baig and Goldfajn (1998) find that trade linkages among East Asian countries were weak. Mason (1998) also claims that trade was not a significant transmission mechanism in the Mexican and Thai crises. Kaminski and Reinhart (2000) support the financial channel in the Asian crisis (through Japanese major banks as a common creditor). Frankel and Schmukler (1998) analyze the closed-end country funds data and find that the Mexican crisis produced spillover effects which were less strong in Asia than in Latin America.

⁴ Some other studies examine capital flows (e.g., Froot et al., 2001) or the portfolio of mutual

Some recent papers study the international transmission of the recent global credit crisis using cross-country data. Interestingly, they do not find evidence of significant transmission that was often observed in previous crises. Evidences from Rose and Spiegel (2009) do not support trade or finance linkages. Kamin and Demarco (2010) do not find a financial channel on CDS spreads, suggesting that the US subprime crisis may have been a mere trigger for a global bank run. We examine the international transmission of the 2008 crisis using firm-level data.

The composition of the rest of the paper is as follows. In Section 2, we present our hypotheses on the transmission mechanism of financial crises. In Sections 3 and 4, we describe our dataset and the event window we choose. In Section 5, we show the graphs and descriptive statistics of the cumulative returns (CR) and the cumulative abnormal returns (CAR) during the window. In Sections 6 and 7, we present our estimation results for CR and CAR, respectively. Section 8 concludes.

2. Hypotheses

Transmission mechanisms of financial crises can be classified into trade and financial linkages. We find it useful to further divide the financial channels into liquidity, credit, and portfolio-rebalance effects, though they are often interrelated with each other.

A. Trade Linkages

Trade linkages work through the following three channels. First, as the crisis-hit foreign market falls into recession, import demand in that market decreases through the income effect. Second, if the currency of crisis-hit area depreciates, import demand both in the crisis-hit market and the third market decreases through the price effect. Finally, devaluation in the crisis-hit country may put devaluating pressure on those currencies that do not float freely, especially when those countries compete in the third markets. Such competitive devaluations may result in capital outflows from those countries. Preceding studies find evidence supporting some kinds of trade linkages (e.g., Eichengreen, Rose and Wyplosz, 1996; Glick and Rose, 1998; Forbes, 2004) ⁵

We use three kinds of variables to capture the trade linkages. The simplest one we use is the export dummy that takes one if the firm exports and zero otherwise. Next, we use total export shares in total sales to distinguish the degree of the exposure to

funds (e.g., Kaminsky et al., 2004) to investigate the financial linkages.

⁵ Lahiri and Vegh (2003), however, find evidence against “contagion through competitive devaluation.”

trade shocks among exporting firms. Next, the share of exports to Northern America in total exports captures the bilateral income and competition effects from the US. We also use the share of other markets in total exports to capture the relative importance of income and price effects from those markets.

Figures 2A and 2B suggest that income effects are stronger for exports to Europe, while, as Figure 3 depicts, Japanese firms lost price competitiveness first in Asian markets (except for China) and later in the US, China, and Europe due to the appreciation of yen against those currencies

B. Financial Linkages through Liquidity

The liquidity linkages work if financial institutions that incur losses from foreign assets may be forced to sell illiquid assets at an unusually low price (Adrian and Shin, 2008). Such a fire-sale dries up domestic asset markets, depresses asset prices further, and makes firm funding difficult. The liquidity shortage and asset price falls will reduce firm investment. Some empirical studies found evidence of increased correlation in asset returns after financial crises, suggesting the existence of liquidity linkages (Calvo and Reinhart, 1996; Baig and Goldfajn, 1999). In Japan, as Figures 4A and 4B illustrate, the issuance of commercial papers and corporate bonds decreased temporarily after the Lehman default, indicating that liquidity in those markets temporarily dried up.

We use the liquid asset-to-sales ratio as a rough measure of the resilience to the shortage in funding liquidity. In addition, we use the corporate bond and commercial paper dummies that take unity if the firm has positive corporate bond and commercial paper outstanding, respectively, as the susceptibility of the liquidity dry-up effect of financial markets.

C. Financial Linkages through Credit

If financial intermediaries that incurred losses from problem assets shrink their lending, their client firms will be adversely affected. Even non-hit intermediaries may cut lending if the market liquidity is dried up and they face difficulty in raising short-term debt. There are some evidences that support a negative international transmission of the shock to foreign banks' balance sheets (e.g., Peek and Rosengren, 1997; Popov and Udell, 2010). On the other hand, financial institutions that suffer little from foreign assets may increase loans to their client firms that face liquidity shortage.

In Japan, credits from foreign lenders are scarce, so that direct credit crunches from foreign crisis-hit intermediaries were not likely to affect Japanese firms severely.

In addition, Japanese banks incurred little losses from sub-prime-related securities and other securitized products. On the other hand, Japanese banks incurred losses from the sharp drops of stock prices as they held a significant share of their client firms' stocks. Figure 5 shows, however, that at an aggregate level, Japanese banks increased loans after the Lehman default in response to the liquidity dry-up in commercial paper and corporate bond markets .

We use loan-to-asset ratio to capture the effects through bank loans, which may be positive or negative. As the borrowing ratio is higher, firms are more likely to be affected by banks' credit fluctuations.

Finally, we investigate the possibility of a shrink in trade finance that firms need from financial intermediaries when they export. Chor and Manova (2010) point out the importance of trade finance in influencing international trade patterns during the global crisis⁶. Since no direct measure of trade credit was available, we use the intersection of the export dummy and the short-term loans-to-asset ratio. The idea is that as firms export and at the same time depend more on short-term borrowings, they are more susceptible to the shrink in trade credit.

D. Financial Linkages through Portfolio-Rebalance

The portfolio-rebalance linkages work if crisis-hit investors sell stocks and other risky assets either to reduce asset risk, to obtain liquidity for collateral or haircuts. For example, capital outflow by mutual funds was attributed to the international transmission of the Asian financial crisis (Kaminsky et al., 2004)⁷. Such portfolio-rebalance or fire-sales will directly depress stock prices even if firm operating performance is not affected.

Considering that Japanese financial institutions incur relatively small amounts of losses, we neglect the portfolio-rebalance of Japanese banks and focus on that of foreign investors. We use the share owned by foreign investors as a proxy of the portfolio-rebalance channels.

Figure 6 depicts sales net of purchases by foreigners, domestic individuals, and domestic corporations, showing that foreigners continued to be a net seller over the six months after the Lehman shock.

⁶ Amiti and Weinstein (2009) find that trade finance accounts for about one-third of the decline in Japanese exports in the financial crises of the 1990s.

⁷ Van Rijckeghem and Weder (2001) provide evidence that spillovers through bank lending can help explain the transmission of the Mexican, Thai, and Russian crises after controlling for the degree of trade competition and macroeconomic fundamentals, but their results are not robust in the case of the Asian crises.

3. Data

We combine the stock return data with financial statements and firm activity data. For the stock return, we refer to *Stock Price CD-ROM* published by Toyo Keizai Shimpou-sha. Financial statements are obtained from NEEDS-CGES published by Nikkei Media Marketing and Corporate Financial Databank published by Development Bank of Japan. Information on firm activities, including exports, is obtained from Basic Survey of Japanese Business Structures and Activities (BSJBSA), published by Ministry of Economy, Trade, and Industry. We use the pre-crisis firm characteristics variables, typically as of March 2008.

The number of the stock return data we can obtain from *Stock Price CD-ROM* is 3215. After the stock return data is linked to the *BSJBSA* and *Corporate Financial Databank* to get information about firms' exports and financial statements, the size of sample becomes 1841. Data appendix provides a more detailed description of the data set.

4. Event Windows

Two major events occurred in the fall of 2008. On September 15 (September 16 in Japan) Lehman Brother Holdings announced that it would file for Chapter 11 bankruptcy protection. On September 29 (September 30 in Japan), the legislation of bailout (Emergency Economic Stabilization Act of 2008) failed at the United State House of Representatives.

If the market fully understood the impacts of those events instantaneously, we should choose each one day as an event window. However, in the case of unprecedented events like the crisis, market participants may understand them gradually. In addition, new information on the severity of a crisis is likely to be continuously provided (Forbes, 2004).

Figure 1 depicts S&P 500, showing that while Lehman's failure induced only a temporary fall in US stock prices, the bill failure caused a persistent drop, which continued until the US government announced revisions in TARP (Troubled Asset Relief Program) to warrant the nine US major financial institutions on October 14. The persistent declining trend after the bill failure suggests that markets realized the impacts and severity of the crisis gradually.

To take into consideration this possibility, we choose relatively long windows. Specifically, we choose 18 operating days from the day of the Lehman default (September 16 (date 1) to October 10 (date 18) in Japan time). We chose the ending day considering that news about TARP equity plan was leaked on October 13, though

it was formally released on the following day⁸. We also divide the window into the first 9 operating days (September 16 to September 29) and the last 9 operating days (September 30 to October 10).

5. Graphical Preview

We divide the sample firms into four kinds of two subgroups based on whether each of the key variables (export-to-sales ratio, liquidity-to-asset ratio, loan-to-asset ratio, share of foreigners) is higher or lower than the median, and preview their stock market performance in terms of the cumulative returns (CR, without risk adjustment) in Figure 7 and the cumulative abnormal returns (CAR, with risk adjustment) in Figure 8 over the window. Because about half of the firms are non-exporters and the median of export share is zero, we divide the sample firms into exporters and non-exporters. We describe in details how we adjusted the market risk in Section 7. Some interesting facts can be observed.

First, exporting firms tended to perform worse than non-exporters in terms of CR. On the other hand, in terms of CAR, exporting firms were first outperformed by non-exporters, but eventually overturned them. Risk adjustment accounts for such a difference. As we see below, stock returns of exporters are more sensitive to market index (i.e., with higher β), suggesting that their prices drop more than stock prices of non-exporters during downturns. Such a difference in the sensitivity can be observed in normal times (we estimate β using pre-crisis data). Once we control for this difference, we find that exporters outperformed non-exporters in the last phase of the window.

Second, liquidity did not significantly matter for the performance of CR or CAR.

Third, firms with high loan-to-asset ratios tended to perform initially better but later worse both in terms of CR and CAR.

Finally, firms owned more by foreign investors performed worse in terms of CR, while they performed initially worse and later better in terms of CAR. Again, risk adjustment accounts for the difference; stock returns owned more by foreigners are more sensitive to the market index.

Tables 1 and 2 show the medians of CA and CAR, respectively, for each of the subgroups over the entire window. The CR of exporters is lower than those of non-exporters by 4.9 percent, while the CAR of exporters is higher than non-exporters

⁸ See, e.g., Reuter news. Beltratti and Stultz (2009) also examine cumulative stock returns of financial institutions for the periods of the entire credit crisis from July 1, 2007 to December 31, 2008 and the Lehman bankruptcy month from September 12 to October 10, 2008. Erkens et al. (2009) investigate cumulative stock returns of financial institutions around the world from the first quarter of 2007 to the third quarter of 2008.

by 2.8 percent. The differences of CR and CAR between liquidity-rich firms and liquidity-scarce firms are not statistically significant. The CR and CAR of firms with high loan-to-asset ratios are lower than firms with low loan-to-asset ratios by 4.2 percent and 1.1 percent, respectively. The CR of firms owned more by foreigners is lower than firms owned less by foreigners by 2.5 percent, while the CAR of the former is higher than the latter by 5.8 percent.

It should be noted that we just look at the bivariate relationship between the firm characteristics and CR or CAR in this section. To examine the marginal effects of each firm characteristics variable, we conduct regression analyses below.

6. Cumulative Returns

We first regress the cumulative stock returns (CR) on the firm's trade and financial variables. Though this approach ignores the market risk factor and as such is not appropriate to event studies, it captures casual observations. Later we demonstrate how the results will change once we take into consideration the market risk factor.

Let R_{it} denote the period- t return for stock i , and CR_{it} the cumulative stock return over the c -day window. Assuming that no dividend or other cash flow to shareholders exists during the window, we can compute $R_{it} = \frac{P_{it}}{P_{i,t-1}} - 1$, and

$CR_{it} = \frac{P_{ic}}{P_{i0}} - 1$, where P_{it} denotes the stock price of firm i at period t and period 0 denotes one day prior to the window⁹. Let *TRADE* denote the trade variables, *LIQUIDITY* the liquidity variables, *CREDIT* the credit variables, and *PORTFOLIO* the portfolio-rebalance variables. Then, our first regression is

$$(1) \quad CR_i = \lambda_0 + \lambda_1 \text{TRADE}_i + \lambda_2 \text{LIQUIDITY}_i + \lambda_3 \text{CREDIT}_i + \lambda_4 \text{PORTFOLIO}_i + u_i$$

for $i = 1, \dots, n$,

⁹ $CR_{it} = \sum_{\tau=1}^c R_{i\tau}$ if P_{it} exists for all $\tau = 1, 2, \dots, c$. In reality, however, some stock price data are

missing during the window. That is why we compute CR as $CR_{it} = \frac{P_{ic}}{P_{i0}} - 1$. Another way to

handle the missing data would be to assume that the missing day's price were the same as the price on the last day when actual data is available. This alternative method yields almost the same result as we obtained below.

where u_i is the disturbance term.

Table 3a shows the estimation result for the entire window. In Column 1, we use the export dummy as *TRADE*, the liquidity-to-asset ratio as *LIQUIDITY*, the loan-to-asset ratio as *CREDIT*, and the share owned by foreign investors as *PORTFOLIO*. The export dummy is significantly negative with the absolute value of 4.1 percent. The liquidity ratio is not significant. The loan ratio is significantly negative, with the absolute value of 8.4 percent. The share of foreign investors is significantly negative with the absolute value of 6.3 percent. Those results for CR are consistent with the trade, credit, trade finance, and portfolio-rebalance hypotheses, but it should be noted that we do not control for the market risk factor.

To further explore the liquidity channel, we add the corporate bond and commercial paper (CP) dummies in Column 2, finding that neither is significant.

In Column 3, we further investigate the trade channel by adding the two variables: the intersection of the export dummy and the share of exports in total sales, and the intersections of the export dummy and the shares of major export destinations in total exports. The intersection of the export dummy and the share of exports, which captures the exposure of trade shocks among exporters, is significantly negative with the absolute value of 7.3 percent. The intersections of the export dummy and the shares of major export destinations capture the difference in the demand for Japanese goods. In our dataset, export destination is divided into seven areas: Asia, Middle-East, Europe, North America, Middle and South America, Africa, and Oceania, of which we pick up the three major destinations: Asia, North America, and Europe. We find that no export destination share is significant.

Next we examine whether or not the concentration of export destination matters. Among the firms whose export destination is one area, 90 percent of them export to Asia and 5 percent to North America. In Column 4, we add the four dummies that take unity if the firm exports to one, two, three and four or more areas. The coefficients on those dummies are all significantly negative but not in a monotonic way. In Column 5 we add the Herfindahl Index of export destination, finding that the Index is not significant.

Finally, in Column 6, we examine the trade finance channel by adding the intersection of the export dummy and short-term loans-to-asset ratio to the baseline specification, obtaining that the intersection term is negative and significant.

Tables 3b and 3c show the estimation results for the two sub-period windows, respectively. The first window covers the 9 operating days from the Lehman default prior to the bill failure. The last window covers the 9 operating days from the bill

failure prior to the news of TARP capital injection. The export dummies and the export shares are significantly negative in both periods. No regional export share is significant in either period. The number of export destination does not show any monotonic effect and the Herfindahl Index is not significant in either period. The liquid asset ratio is significantly positive in the first half period, but significantly negative for the last half period. The corporate bond and CP dummies are not significant in either period. The loan-to-asset ratio and the intersection term of the loan ratio and export dummy are significantly negative only in the last period. The share of foreign investors is significantly negative only for the first half period.

7. Cumulative Abnormal Returns

7.1 Methodology

We have not adjusted the market risk of stock returns so far. Suppose, for example, that exporting firms tend to be more sensitive to the market return. The stock returns of such firms perform worse than the market return when the latter is negative. So, we may find that exporting firms tend to perform worse during the crisis. But this is a usual observation and not necessarily particular to the event we are interested in. We are interested in the special effect of the crisis on stock returns. For this purpose, we have to look at abnormal returns, which are adjusted for the market risk. To this aim, we follow the standard event-study methodology (e.g., MacKinlay, 1997).

First, we estimate the following market model using OLS to obtain normal returns during the pre-crisis period.

$$(2) \quad R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \text{ for each } i = 1, \dots, n \text{ and } t = 1, \dots, p$$

where R_{it} denotes the period- t return for stock i , R_{mt} the period- t market return,

and ε_{it} the disturbance term with $E(\varepsilon_{it}) = 0$ and $Var(\varepsilon_{it}) = \sigma_i^2$. Denoting the

market index as of period t by P_{mt} , we construct the market return as $R_{mt} = \frac{P_{mt}}{P_{m,t-1}} - 1$.

We set the pre-crisis period (of length p) as the 225 days before the crisis period, so that the sample period covers October 17, 2007 through September 11, 2008.

Next, we calculate abnormal returns (ARs) for each stock during the crisis period of c days as follows.

$$(3) \quad AR_{it} = \hat{\varepsilon}_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \text{ for } \tau = 1, \dots, c,$$

where each of the fitted parameters are estimates of (1).

Then we construct the cumulative abnormal returns during the event window as¹⁰

$$(4) \quad CAR_i = \left(\frac{P_{ic}}{P_{i0}} - 1 \right) - \hat{\alpha}_i - \hat{\beta}_i \left(\frac{P_{mc}}{P_{m0}} - 1 \right)$$

Finally, we regress the CARs on the firm's trade, liquidity, credit, and portfolio-rebalance variables.

$$(5) \quad CAR_i = \gamma_0 + \gamma_1 TRADE_i + \gamma_2 LIQUIDITY_i + \gamma_3 CREDIT_i + \gamma_4 PORTFOLIO_i + \eta_i$$

for $i = 1, \dots, n$,

where η_i is the disturbance term.

7.2 Results

Before looking at the estimation results for the CARs, we examine whether there is significant difference in β depending on the export and financial variables. Table 4 shows the descriptive statistics of β . We find that β is higher for exporting firms, firms with low loan-to-asset ratios, and firms owned more by foreign investors. Those differences in β may yield some different results between CR and CAR, as we suggested in Section 5.

Table 5a presents the estimation results for CAR for the entire window.

Column 1 shows the baseline specification result. Export dummy is not significant, not supporting the trade channel. Even though exporting firms performed worse in terms of CR during the crisis, such relative deterioration is normal and not unique to the 2008 crisis. The liquid asset ratio is significantly negative, against the liquidity channel hypothesis. The loan-to-asset ratio is significantly negative, supporting the credit channel hypothesis. Even though Japanese banks incurred little from securities products, market participants seem to have worried about credit crunches. The foreign investor share is positive and significant, which does not support the fire-sales or portfolio-rebalance hypothesis.

The liquidity channel hypothesis is not supported as, in Column 2, corporate bond is positive and marginally significant.

Though total exports do not matter, export destination seems to matter. In

¹⁰ $CAR_i = \sum_{\tau=1}^c AR_{i\tau}$ if P_{it} exists for all $\tau = 1, 2, \dots, c$. Because some data of P_{it} is missing,

we calculate CAR as (4). Assuming that the missing day's price were the same as the price on the last day when actual price data is available, we obtained almost the same results as below.

Column 3, while export dummy and its intersection with the export share are both significantly positive, the shares of exports to North America and Asia are significantly negative, suggesting that controlling for total export share, the exposure to North America and Asia especially worsened firm performance in the crisis.

The number and concentration of export destination also seem to matter. In Column 4, one-area export destination dummy is significantly negative while four-or-more-area export destination dummy is significantly positive. In Column 5, the intersection of the export dummy and the Herfindahl Index of export is significantly negative.

The trade finance channel is supported. In Column 6, the intersection of the export dummy and the short-term loan-to-asset ratio, a proxy of trade finance, is negative and significant.

Tables 5b and 5c show the estimation results for the two sub-periods. The export dummy and the export share are not significant in the first sub-period, but significantly positive in the last sub-period. The shares of exports to North America and Asia are negative and significant only for the last sub-period. The number and concentration of export destination are also significant only in the last sub-period. The liquidity ratio is significantly negative for the last sub-period. The corporate bond and CP dummies are significantly positive for the last period. The loan-to-asset ratio is significantly negative in the last period. The proxy of trade credit is significant in the first sub-period. The shares owned by foreign investors are significantly positive in both periods.

In sum, as for the trade channel, the composition and concentration of export markets matter rather than total export as a ratio of sales. As for the financial channels, market participants seemed to have worried about credit crunch rather than the effects of the liquidity dry-up in capital markets. We did not find evidence supporting that the portfolio-rebalance or fire-sales by foreign investors negatively affected CARs.

7.3 Robustness

We check the robustness of our results for CAR in two ways.

First, we extend the estimation period of (2) that serves to construct CAR. This is important because if our baseline estimation period includes some credit crisis effects, the estimated CAR removes too much of the “usual” effects. Specifically, we extend the estimation period from 225 days (one year) to 495 days (two-years). Table 6 shows the estimation results for the newly constructed CAR for the entire window. We find that most of the baseline results are robust to the change in the selection of the

pre-crisis period. Only one exception is the loan-to asset ratio, which takes less significant coefficients.

In estimating (5), we implicitly assumed that the disturbances are i.i.d. In reality, however, the disturbances may not be homoscedastic or independent across firms. To correct for the bias to the standard errors caused by these possibilities, we use an estimator that is developed by Sefcik and Thompson (1986) and applied, e.g., by Forbes (2004)¹¹. Table 7 presents the estimation result for the entire window, showing that the most of the results are similar to the baseline result. In particular, the shares of exports to North America and Asia are significantly negative and the Herfindahl Index of the areas to which the firm exports is also significantly negative, though the coefficients on the number of export destination are not monotonic. The share of foreigners is significantly positive as in the baseline estimation result. On the other hand, some variables have weaker marginal significance levels than in the baseline estimation result, including the intersection of the export dummy and the loan-to-asset ratio.

8. Conclusion

We investigate the international transmission of the credit crisis triggered by the Lehman default in September 2008 using Japan's stock market data. Using cumulative return (CR) during the crisis period from the day of Lehman default prior to the day when news on the TARP capital injection was released, we find that CR is negatively correlated with export-to-sales ratio, loan-to-asset ratio, and the share owned by foreign investors. Once we control for the market risk, however, cumulative abnormal returns (CAR) during the same period gives a different picture. CAR is not negatively correlated with the export share or the share owned by foreign investors, which imply that trade channels or portfolio-rebalance by foreigners are not a unique characteristic of the crisis, but can be observed in normal downturns. We find that CAR is negatively correlated with loan-to-asset ratio, suggesting that market participants worried about the credit crunch. We also find that CAR is negatively correlated with the shares of exports to North America and Asia after controlling for total exports, suggesting that the composition of export markets matters rather than the overall export ratio. Finally, we find that the concentration of export destination also matters.

¹¹ In case when the stock return data is missing, we replaced them with the stock return predicted by (2). That is, we assumed that CAR was zero on the day when the data is missing. This treatment is conservative in that it underestimates, if any, the effects of firm characteristics on CAR.

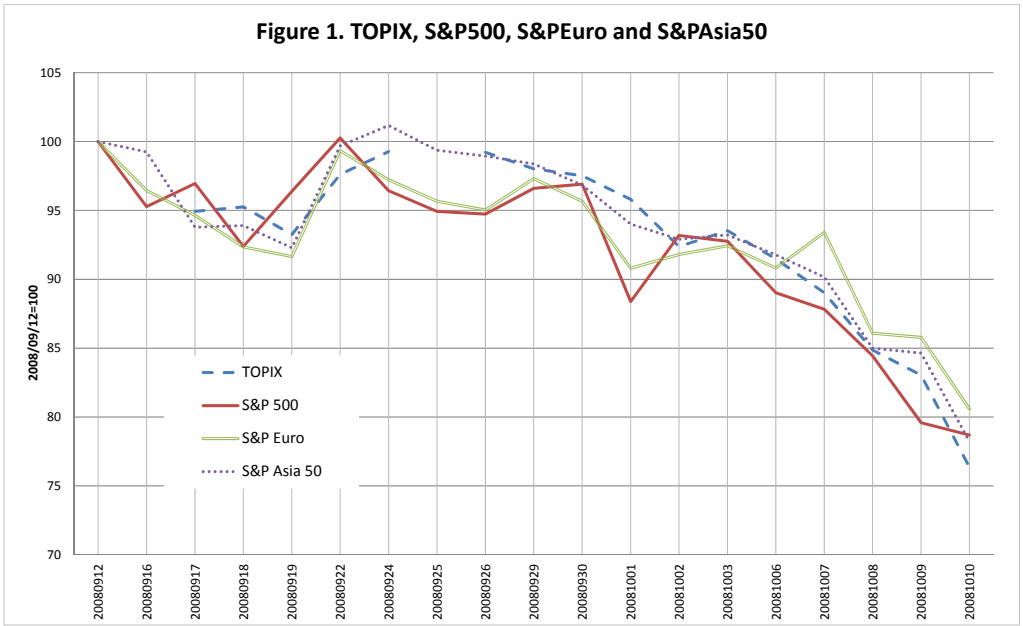
Some important implications can be derived from our empirical results. First, though Japanese economy is susceptible to trade and portfolio-rebalance shocks, those transmission mechanisms were not specific to the crisis. In other words, Japanese economy is likely to be affected by export shocks and portfolio-rebalance shocks at any time once they happen. That is one reason Japan was severely hit by the Lehman default. Second, the shares of exports to some specific markets matter during the crisis. Concentration of export markets may have made Japanese firms vulnerable to the crisis. Third, even though Japanese financial institutions incurred small losses from securitized products, market participants worried about the adverse effects through loans on firm performance. This may suggest that market participants recognized the losses of financial institutions from the stock price declines and their adverse effects on lending. In that case, a fall in stock prices during a crisis is likely to induce their further decline. This may be another reason Japanese stock markets saw large price declines during the crisis.

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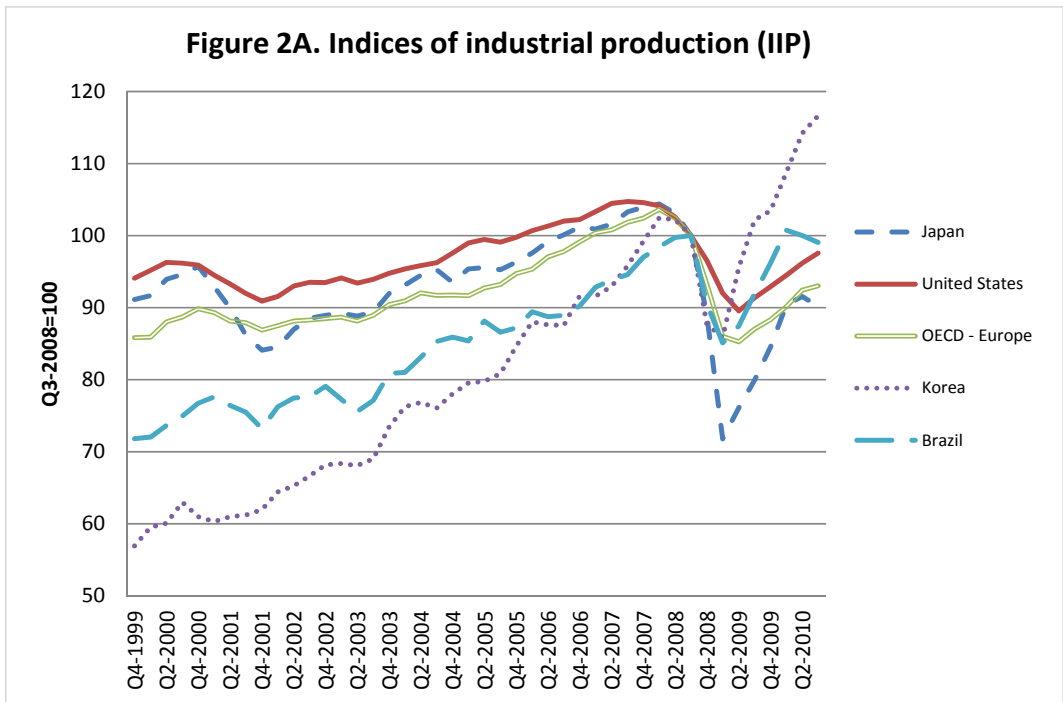
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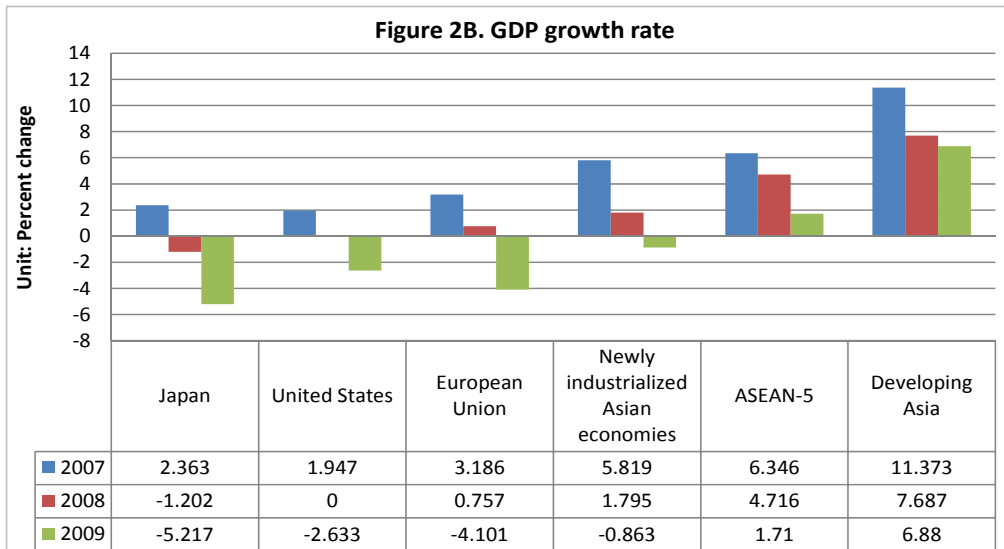
Source: Standard & Poor's

Notes: TOPIX is the Tokyo Stock Price Index, a composite stock price index of all stocks listed on the Tokyo Stock Exchange first section. S&P 500 includes 500 leading companies in leading industries of the U.S. economy, capturing 75% coverage of U.S. equities. S&P Euro represents the Europe region, including constituents from euro zone countries. It provides geographic and economic diversity over industry sectors. S&P Asia 50 represents four major economic sectors of Asia equity markets. It includes highly liquid securities from Hong Kong, Korea, Taiwan and Singapore.



Source: OECD Stat.

Note: Data comprise Indices of industrial production (IIP) for total industry, manufacturing, energy and crude petroleum.



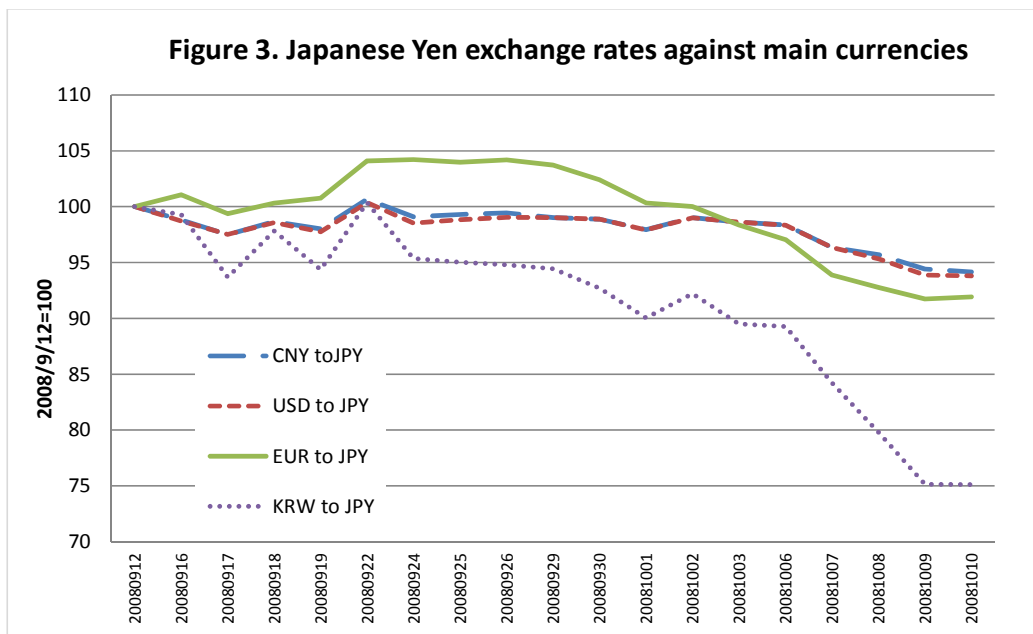
Source: IMF, World Economic Outlook Database, October 2010

Notes: Gross domestic product, constant prices (National currency)

Newly industrialized Asian economies are composed of 4 countries: Hong Kong SAR, Korea, Singapore, and Taiwan Province of China.

ASEAN-5 are composed of 5 countries: Indonesia, Malaysia, Philippines, Thailand, and Vietnam.

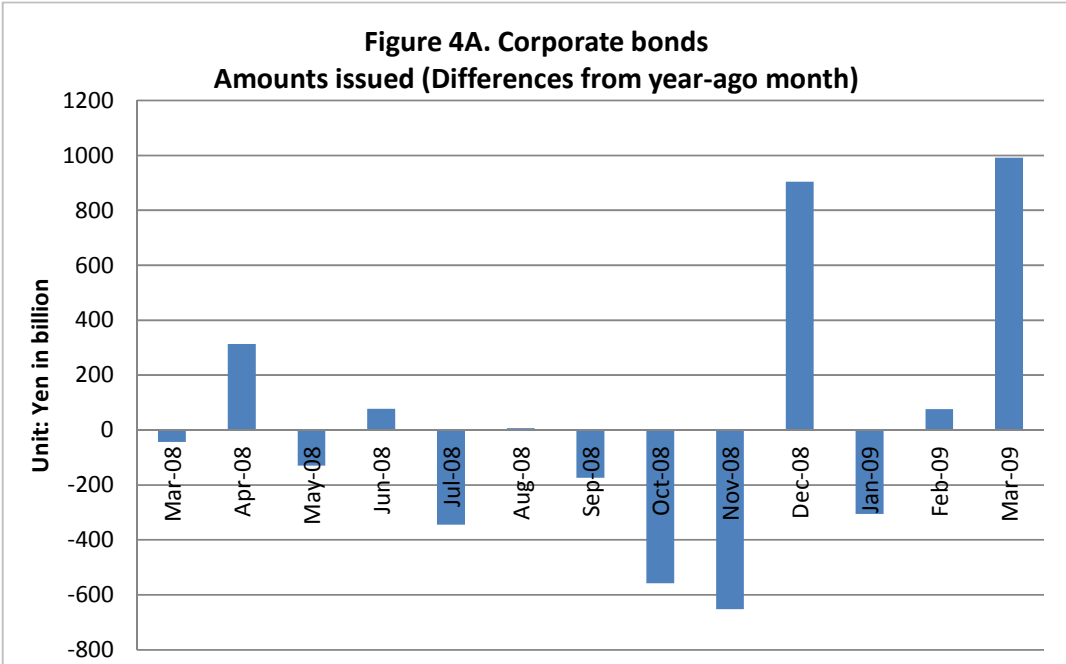
Developing Asia are composed of 26 countries: Republic of Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, India, Indonesia, Kiribati, Lao People's Democratic Republic, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Democratic Republic of Timor-Leste, Tonga, Vanuatu, and Vietnam.



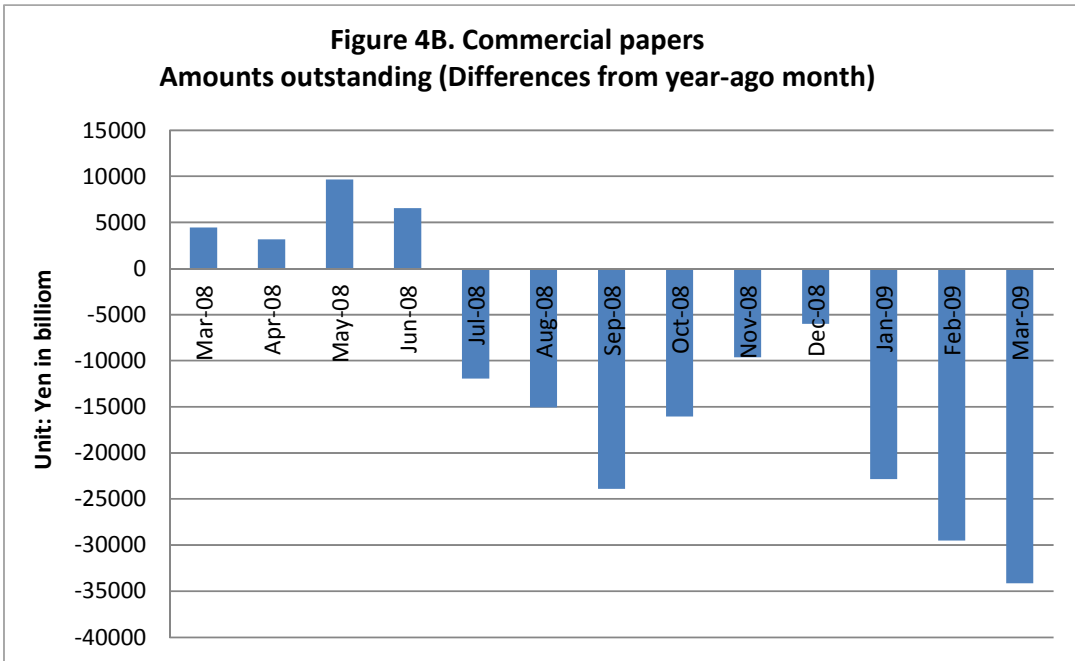
Source: oanda.com

Notes: Rates in home currency (inter-bank rates)

JPY, CNY, USD, EUR and KRW represent Japanese Yen, Chinese Yuan, U.S. Dollar, EURO and South Korean Won, respectively.

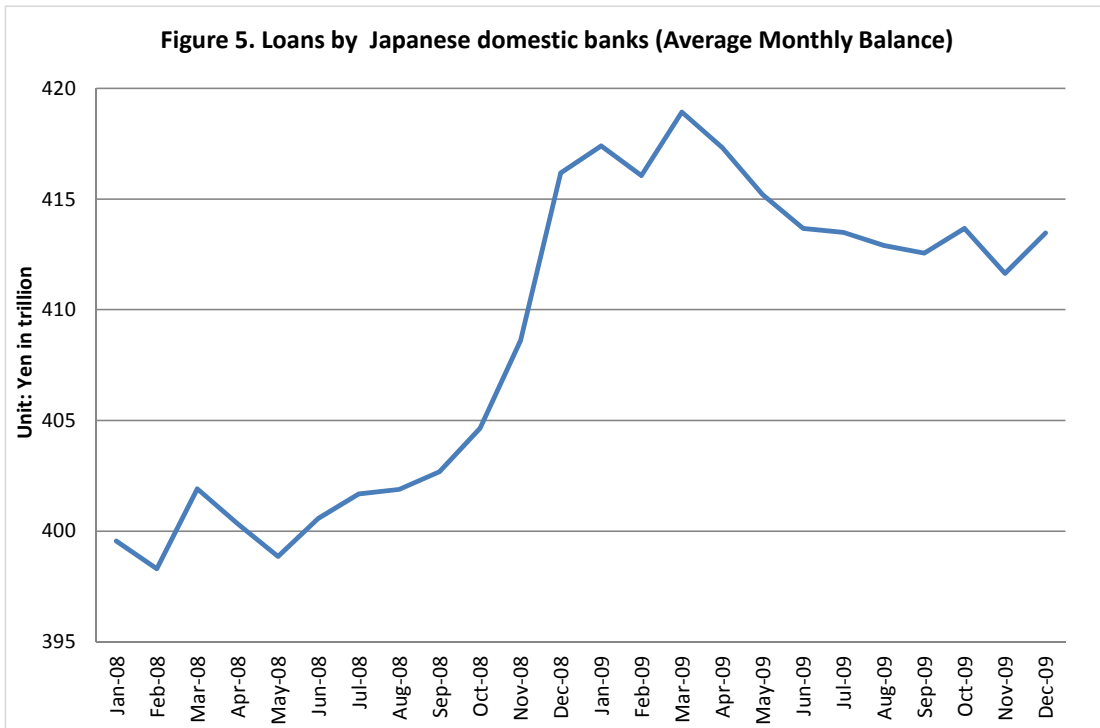


Source: Japan Securities Dealers Association

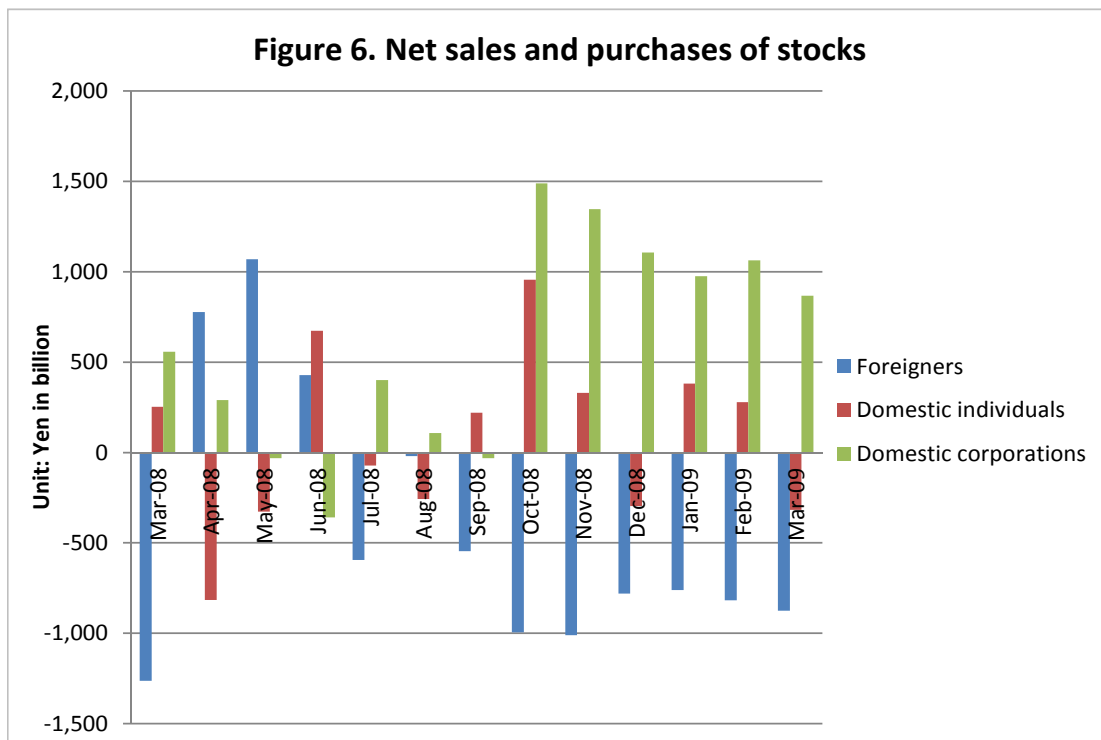


Source: Bank of Japan

Note: Amounts Outstanding of CP Underwritten by Banks



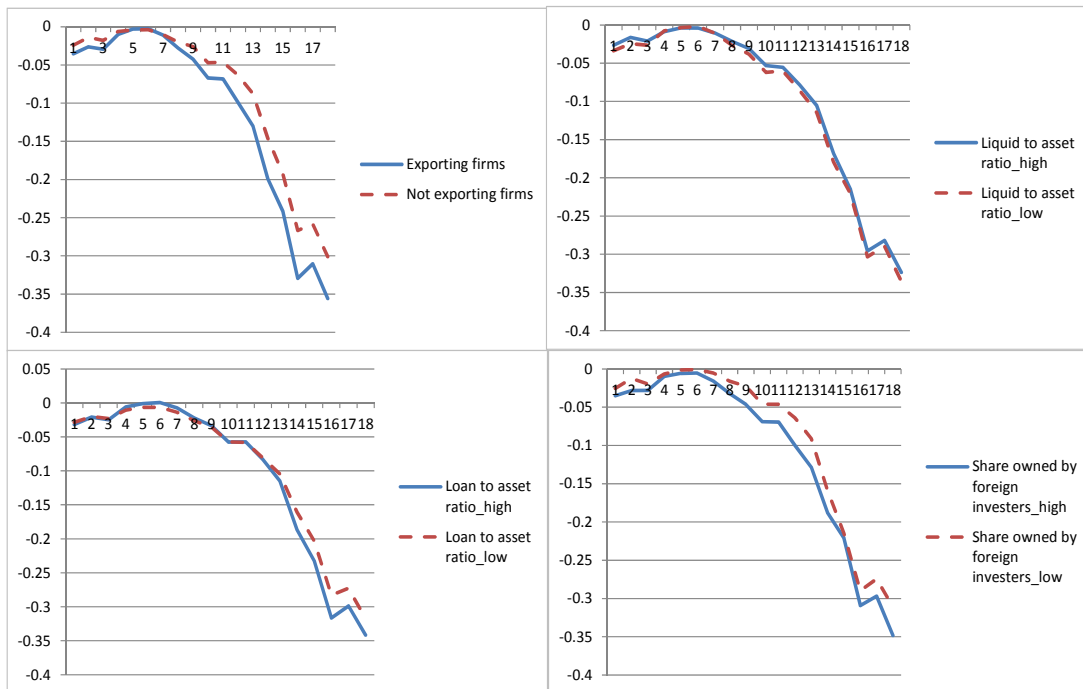
Source: Bank of Japan



Source: Tokyo stock exchange

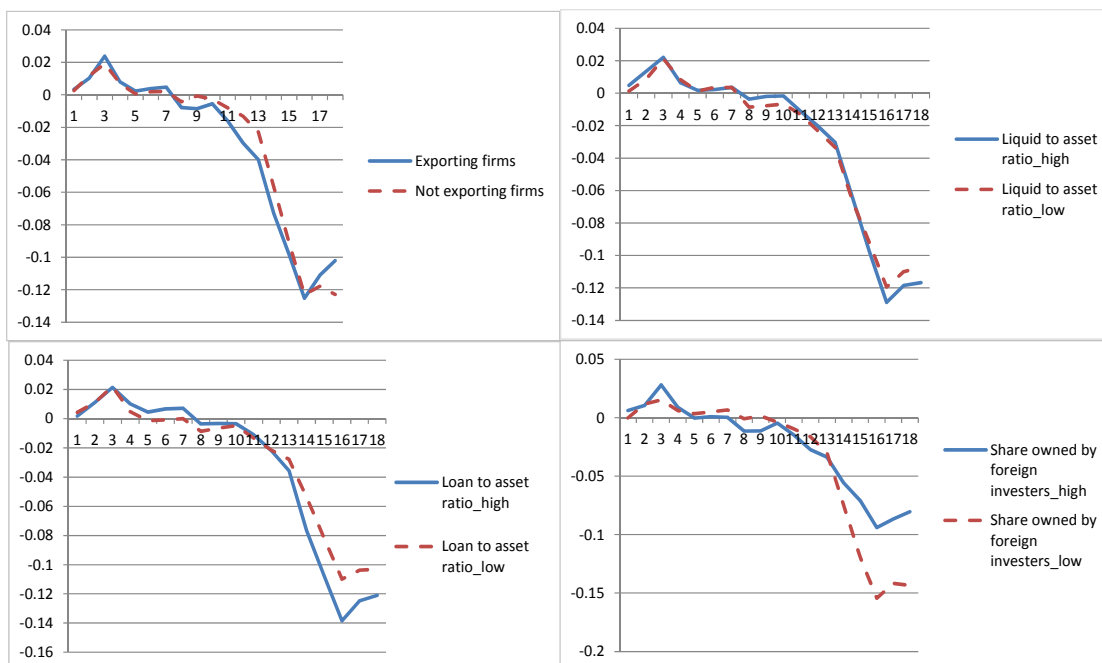
Note: Minus denotes a net sales and plus denotes a net purchase.

Figure 7. Cumulative returns (CR) from September 16, 2008 to October 10, 2008.



Notes: Date 1 denotes September 16, 2008.
 Date 10 denotes September 30, 2008.
 Date 18 denotes October 10, 2008.

Figure 8. Cumulative abnormal returns (CAR) from September 16, 2008 to October 10, 2008.



Notes: Date 1 denotes September 16, 2008.
 Date 10 denotes September 30, 2008.
 Date 18 denotes October 10, 2008.

Table 1. Cumulative returns (CR)

Exporting firms	Not exporting firms	
-0.322	-0.273	***
Liquidity-to-asset ratio_high	Liquidity-to-asset ratio_low	
-0.293	-0.307	
Loan-to-asset ratio_high	Loan-to-asset ratio_low	
-0.312	-0.270	***
Share owned by foreign investors_high	Share owned by foreign investors_low	
-0.311	-0.286	***

Notes: The values in the table indicate median for each of the subgroups for the 18 operating days.

We conduct non-parametric two-sample tests for the median tests.

*, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 2. Cumulative abnormal returns (CAR)

Exporting firms	Not exporting firms	
-0.085	-0.113	***
Liquidity-to-asset ratio_high	Liquidity-to-asset ratio_low	
-0.104	-0.096	
Loan-to-asset ratio_high	Loan-to-asset ratio_low	
-0.104	-0.093	*
Share owned by foreign investors_high	Share owned by foreign investors_low	
-0.071	-0.129	***

Notes: The values in the table indicate median for each of the subgroups for the 18 operating days.

We conduct non-parametric two-sample tests for the median tests.

*, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 3a. Estimation results for CR for the entire window (from September 16, 2008 to October 10, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	-0.041	0.006 ***	-0.041	0.006 ***	-0.031	0.029			-0.034	0.014 **	-0.031	0.007 ***
Liquid Asset Ratio	-0.030	0.025	-0.037	0.026	-0.025	0.025	-0.023	0.025	-0.025	0.025	-0.028	0.025
Loan-to-Asset Ratio	-0.084	0.024 ***	-0.080	0.024 ***	-0.085	0.023 ***	-0.086	0.023 ***	-0.085	0.023 ***	-0.058	0.027 **
Share of Foreigners	-0.063	0.025 **	-0.053	0.026 **	-0.042	0.026	-0.043	0.026 *	-0.040	0.026	-0.068	0.025 ***
Corporate bond dummy			-0.004	0.007								
CP dummy			-0.016	0.014								
Export dummy * share of exports in total sales					-0.073	0.020 ***	-0.073	0.021 ***	-0.069	0.021 ***		
Export dummy * shares of exports in total exports(North America)					-0.007	0.033						
Export dummy * shares of exports in total exports(Europe)					0.016	0.036						
Export dummy * shares of exports in total exports(Asia)					0.003	0.030						
1area Export dummy							-0.029	0.010 ***				
2area Export dummy							-0.025	0.013 *				
3area Export dummy							-0.036	0.010 ***				
Over 4area Export dummy							-0.025	0.009 ***				
Export dummy * Herfindahl Index of Export									0.008	0.016		
Export dummy * short-term loans-to-asset ratio											-0.101	0.048 **
Cons.	-0.245	0.008 ***	-0.244	0.008 ***	-0.248	0.008 ***	-0.248	0.008 ***	-0.248	0.008 ***	-0.249	0.008 ***
	Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1838	
	F(4, 1836) = 17.31		F(6, 1834) = 11.86		F(8, 1832) = 10.46		F(8, 1832) = 10.56		F(6, 1834) = 13.89		F(5, 1832) = 14.91	
	Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000	
	R-squared = 0.0363		R-squared = 0.0373		R-squared = 0.0437		R-squared = 0.0441		R-squared = 0.0435		R-squared = 0.0390	
	Adj R-squared = 0.0342		Adj R-squared = 0.0342		Adj R-squared = 0.0395		Adj R-squared = 0.0399		Adj R-squared = 0.0404		Adj R-squared = 0.0364	
	Root MSE = .12111		Root MSE = .12111		Root MSE = .12078		Root MSE = .12075		Root MSE = .12072		Root MSE = .12097	

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table 3b. Estimation results for CR for the first sub-period (from September 16, 2008 to September 29, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	-0.012	0.004 ***	-0.012	0.004 ***	0.002	0.020			-0.015	0.009	-0.015	0.005 ***
Liquid Asset Ratio	0.033	0.017 *	0.030	0.017 *	0.036	0.017 **	0.037	0.017 **	0.034	0.017 **	0.032	0.017 *
Loan-to-Asset Ratio	0.006	0.016	0.008	0.016	0.005	0.016	0.006	0.016	0.006	0.016	-0.001	0.018
Share of Foreigners	-0.070	0.017 ***	-0.065	0.018 ***	-0.063	0.018 ***	-0.065	0.018 ***	-0.061	0.018 ***	-0.068	0.017 ***
Corporate bond dummy			-0.002	0.004								
CP dummy			-0.009	0.010								
Export dummy * share of exports in total sales					-0.026	0.014 *	-0.028	0.014 *	-0.021	0.014		
Export dummy * shares of exports in total exports(North America)					-0.018	0.022						
Export dummy * shares of exports in total exports(Europe)					-0.005	0.025						
Export dummy * shares of exports in total exports(Asia)					-0.009	0.020						
1area Export dummy							-0.005	0.007				
2area Export dummy							-0.019	0.009 **				
3area Export dummy							-0.013	0.007 *				
Over 4area Export dummy							-0.004	0.006				
Export dummy * Herfindahl Index of Export									0.009	0.011		
Export dummy * short-term loans-to-asset ratio											0.026	0.032
Cons.	-0.028	0.005 ***	-0.027	0.006 ***	-0.029	0.005 ***	-0.029	0.005 ***	-0.029	0.005 ***	-0.027	0.006 ***
	Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1897	
	F(4, 1895) = 10.12		F(6, 1893) = 6.95		F(8, 1891) = 5.62		F(8, 1891) = 5.99		F(6, 1893) = 7.47		F(5, 1891) = 8.17	
	Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000	
	R-squared = 0.0209		R-squared = 0.0216		R-squared = 0.0232		R-squared = 0.0247		R-squared = 0.0231		R-squared = 0.0212	
	Adj R-squared = 0.0188		Adj R-squared = 0.0185		Adj R-squared = 0.0191		Adj R-squared = 0.0206		Adj R-squared = 0.0200		Adj R-squared = 0.0186	
	Root MSE = .0828		Root MSE = .08281		Root MSE = .08278		Root MSE = .08272		Root MSE = .08275		Root MSE = .08282	

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table 3c. Estimation results for CR for the last sub-period (from September 30, 2008 to October 10, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	-0.033	0.005 ***	-0.032	0.005 ***	-0.036	0.025			-0.026	0.012 **	-0.027	0.006 ***
Liquid Asset Ratio	-0.073	0.021 ***	-0.080	0.021 ***	-0.068	0.021 ***	-0.068	0.021 ***	-0.068	0.021 ***	-0.072	0.021 ***
Loan-to-Asset Ratio	-0.098	0.020 ***	-0.091	0.020 ***	-0.098	0.020 ***	-0.099	0.020 ***	-0.098	0.020 ***	-0.082	0.022 ***
Share of Foreigners	-0.023	0.021	-0.013	0.022	-0.005	0.022	-0.005	0.022	-0.005	0.022	-0.027	0.021
Corporate bond dummy			-0.008	0.006								
CP dummy			-0.013	0.012								
Export dummy * share of exports in total sales					-0.060	0.017 ***	-0.058	0.018 ***	-0.059	0.018 ***		
Export dummy * shares of exports in total exports(North America)					0.014	0.028						
Export dummy * shares of exports in total exports(Europe)					0.015	0.031						
Export dummy * shares of exports in total exports(Asia)					0.015	0.026						
1area Export dummy							-0.020	0.008 **				
2area Export dummy							-0.013	0.011				
3area Export dummy							-0.031	0.009 ***				
Over 4area Export dummy							-0.023	0.007 ***				
Export dummy * Herfindahl Index of Export									0.006	0.014		
Export dummy * short-term loans-to-asset ratio											-0.060	0.039
Cons.	-0.215	0.007 ***	-0.214	0.007 ***	-0.218	0.007 ***	-0.218	0.007 ***	-0.218	0.007 ***	-0.218	0.007 ***
	Number of obs = 2013		Number of obs = 2013		Number of obs = 2013		Number of obs = 2013		Number of obs = 2013		Number of obs = 2010	
	F(4, 2008) = 16.62		F(6, 2006) = 11.66		F(8, 2004) = 10.09		F(8, 2004) = 10.31		F(6, 2006) = 13.44		F(5, 2004) = 13.59	
	Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000	
	R-squared = 0.0320		R-squared = 0.0337		R-squared = 0.0387		R-squared = 0.0395		R-squared = 0.0387		R-squared = 0.0328	
	Adj R-squared = 0.0301		Adj R-squared = 0.0308		Adj R-squared = 0.0349		Adj R-squared = 0.0357		Adj R-squared = 0.0358		Adj R-squared = 0.0304	
	Root MSE = .10639		Root MSE = .10635		Root MSE = .10613		Root MSE = .10608		Root MSE = .10608		Root MSE = .10633	

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table 4. Descriptive statistics of β

Exporting firms	Not exporting firms	
0.802	0.490	***
Liquidity-to-asset ratio_high	Liquidity-to-asset ratio_low	
0.580	0.719	***
Loan-to-asset ratio_high	Loan-to-asset ratio_low	
0.644	0.645	
Share owned by foreign investors_high	Share owned by foreign investors_low	
0.848	0.443	***

Notes: The values in the table indicate median for each of the subgroups.

We conduct non-parametric two-sample tests for the median tests.

*, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 5a. Estimation results for CAR for the entire window (from September 16, 2008 to October 10, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	0.010	0.006	0.009	0.006	0.068	0.031 **			0.042	0.015 ***	0.022	0.008 ***
Liquid Asset Ratio	-0.110	0.027 ***	-0.097	0.028 ***	-0.113	0.027 ***	-0.103	0.027 ***	-0.109	0.027 ***	-0.108	0.027 ***
Loan-to-Asset Ratio	-0.051	0.025 **	-0.063	0.026 **	-0.051	0.025 **	-0.051	0.025 **	-0.051	0.025 **	-0.016	0.029
Share of Foreigners	0.276	0.027 ***	0.258	0.028 ***	0.254	0.028 ***	0.243	0.028 ***	0.249	0.028 ***	0.270	0.027 ***
Corporate bond dummy			0.014	0.007 *								
CP dummy			0.023	0.015								
Export dummy * share of exports in total sales					0.053	0.022 **	0.033	0.022	0.040	0.022 *		
Export dummy * shares of exports in total exports (North America)					-0.074	0.035 **						
Export dummy * shares of exports in total exports (Europe)					-0.046	0.039						
Export dummy * shares of exports in total exports (Asia)					-0.076	0.032 **						
1area Export dummy							-0.031	0.011 ***				
2area Export dummy							0.002	0.014				
3area Export dummy							-0.011	0.011				
Over 4area Export dummy							0.024	0.009 ***				
Export dummy * Herfindahl Index of Export									-0.060	0.017 ***		
Export dummy * short-term loans-to-asset ratio											-0.137	0.052 ***
Cons.	-0.115	0.009 ***	-0.118	0.009 ***	-0.113	0.009 ***	-0.113	0.009 ***	-0.113	0.009 ***	-0.120	0.009 ***
	Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1841		Number of obs = 1838	
	F(4, 1836) = 36.79		F(6, 1834) = 25.73		F(8, 1832) = 20.63		F(8, 1832) = 22.97		F(6, 1834) = 28.43		F(5, 1832) = 30.82	
	Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000		Prob > F = 0.0000	
	R-squared = 0.0742		R-squared = 0.0776		R-squared = 0.0826		R-squared = 0.0912		R-squared = 0.0851		R-squared = 0.0776	
	Adj R-squared = 0.0722		Adj R-squared = 0.0746		Adj R-squared = 0.0786		Adj R-squared = 0.0872		Adj R-squared = 0.0821		Adj R-squared = 0.0751	
	Root MSE = .12986		Root MSE = .12969		Root MSE = .1294		Root MSE = .1288		Root MSE = .12916		Root MSE = .12989	

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table 5b. Estimation results for CAR for the first sub-period (from September 16, 2008 to September 29, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	-0.005	0.004	-0.005	0.004	0.017	0.020			-0.005	0.009	-0.008	0.005
Liquid Asset Ratio	0.023	0.017	0.023	0.017	0.024	0.017	0.027	0.017	0.023	0.017	0.022	0.017
Loan-to-Asset Ratio	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016	0.005	0.018
Share of Foreigners	-0.018	0.017	-0.017	0.018	-0.018	0.018	-0.022	0.018	-0.017	0.018	-0.016	0.017
Corporate bond dummy			0.001	0.004								
CP dummy			-0.003	0.010								
Export dummy * share of exports in total sales					-0.006	0.014	-0.011	0.014	-0.003	0.014		
Export dummy * shares of exports in total exports (North America)					-0.029	0.022						
Export dummy * shares of exports in total exports (Europe)					-0.015	0.024						
Export dummy * shares of exports in total exports (Asia)					-0.022	0.020						
1area Export dummy							-0.006	0.007				
2area Export dummy							-0.016	0.009 *				
3area Export dummy							-0.010	0.007				
Over 4area Export dummy							0.003	0.006				
Export dummy * Herfindahl Index of Export									0.000	0.011		
Export dummy * short-term loans-to-asset ratio											0.021	0.032
Cons.	-0.009	0.005 *	-0.009	0.005 *	-0.009	0.005 *	-0.010	0.005 *	-0.009	0.005 *	-0.008	0.006
	Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1900		Number of obs = 1897	
	F(4, 1895) = 1.68		F(6, 1893) = 1.14		F(8, 1891) = 1.08		F(8, 1891) = 1.63		F(6, 1893) = 1.13		F(5, 1891) = 1.41	
	Prob > F = 0.1525		Prob > F = 0.3381		Prob > F = 0.3722		Prob > F = 0.1104		Prob > F = 0.3433		Prob > F = 0.2164	
	R-squared = 0.0035		R-squared = 0.0036		R-squared = 0.0046		R-squared = 0.0069		R-squared = 0.0036		R-squared = 0.0037	
	Adj R-squared = 0.0014		Adj R-squared = 0.0004		Adj R-squared = 0.0003		Adj R-squared = 0.0027		Adj R-squared = 0.0004		Adj R-squared = 0.0011	
	Root MSE = .08214		Root MSE = .08218		Root MSE = .08219		Root MSE = .08209		Root MSE = .08218		Root MSE = .08216	

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table 5c. Estimation results for CAR for the last sub-period (from September 30, 2008 to October 10, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	0.012	0.005 **	0.011	0.005 **	0.062	0.028 **			0.043	0.013 ***	0.024	0.007 ***
Liquid Asset Ratio	-0.142	0.023 ***	-0.130	0.023 ***	-0.146	0.023 ***	-0.138	0.023 ***	-0.142	0.023 ***	-0.140	0.023 ***
Loan-to-Asset Ratio	-0.062	0.021 ***	-0.072	0.022 ***	-0.062	0.021 ***	-0.062	0.021 ***	-0.062	0.021 **	-0.030	0.024
Share of Foreigners	0.296	0.023 ***	0.278	0.024 ***	0.274	0.024 ***	0.266	0.024 ***	0.269	0.024 ***	0.290	0.023 ***
Corporate bond dummy			0.011	0.006 *								
CP dummy			0.028	0.013 **								
Export dummy * share of exports in total sales					0.056	0.019 ***	0.039	0.020 **	0.041	0.019 **		
Export dummy * shares of exports in total exports (North America)					-0.065	0.031 **						
Export dummy * shares of exports in total exports (Europe)					-0.045	0.034						
Export dummy * shares of exports in total exports (Asia)					-0.067	0.028 **						
1area Export dummy							-0.026	0.009 ***				
2area Export dummy							0.011	0.012				
3area Export dummy							-0.007	0.010				
Over 4area Export dummy							0.023	0.008 ***				
Export dummy * Herfindahl Index of Export									-0.059	0.015 ***		
Export dummy * short-term loans-to-asset ratio											-0.124	0.042 ***
Cons.	-0.111	0.007 ***	-0.114	0.007 ***	-0.108	0.007 ***	-0.109	0.007 ***	-0.109	0.007 ***	-0.115	0.008 ***
Number of obs =	2013		2013		2013		2013		2013		2010	
F(4, 2008) =	62.36		F(6, 2006) =	43.15	F(8, 2004) =	33.93	F(8, 2004) =	36.61	F(6, 2006) =	46.91	F(5, 2004) =	51.56
Prob > F =	0.0000		Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000
R-squared =	0.1105		R-squared =	0.1143	R-squared =	0.1193	R-squared =	0.1275	R-squared =	0.1230	R-squared =	0.1140
Adj R-squared =	0.1087		Adj R-squared =	0.1117	Adj R-squared =	0.1158	Adj R-squared =	0.1240	Adj R-squared =	0.1204	Adj R-squared =	0.1118
Root MSE =	.11618		Root MSE =	.11599	Root MSE =	.11572	Root MSE =	.11518	Root MSE =	.11541	Root MSE =	.11597

Note: *, **, *** statistically significant at 10%, 5% and 1%.

**Table 6. Estimation results for CAR for the entire window (from September 16, 2008 to October 10, 2008)
The pre-crisis period as the 2 years before the crisis period**

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	0.004	0.006	0.003	0.006	0.061	0.031 **			0.032	0.014 **	0.016	0.008 **
Liquid Asset Ratio	-0.082	0.027 ***	-0.070	0.027 **	-0.084	0.027 ***	-0.075	0.027 ***	-0.081	0.027 ***	-0.080	0.027 ***
Loan-to-Asset Ratio	-0.035	0.025	-0.046	0.026 *	-0.036	0.025	-0.036	0.025	-0.035	0.025	0.000	0.028
Share of Foreigners	0.237	0.027 ***	0.219	0.028 ***	0.218	0.028 ***	0.207	0.028 ***	0.213	0.028 ***	0.231	0.027 ***
Corporate bond dummy			0.011	0.007								
CP dummy			0.025	0.015								
Export dummy * share of exports in total sales					0.046	0.022 **	0.027	0.022	0.034	0.022		
Export dummy * shares of exports in total exports (North America)					-0.073	0.035 **						
Export dummy * shares of exports in total exports (Europe)					-0.049	0.038						
Export dummy * shares of exports in total exports (Asia)					-0.072	0.031 **						
1area Export dummy							-0.032	0.011 ***				
2area Export dummy							-0.004	0.014				
3area Export dummy							-0.017	0.011				
Over 4area Export dummy							0.019	0.009 **				
Export dummy * Herfindahl Index of Export									-0.053	0.017 ***		
Export dummy * short-term loans-to-asset ratio											-0.138	0.051 ***
Cons.	-0.106	0.009 ***	-0.108	0.009 ***	-0.104	0.009 ***	-0.104	0.009 ***	-0.104	0.009 ***	-0.111	0.009 ***
Number of obs =	1841		1841		1841		1841		1841		1838	
F(4, 1836) =	25.03		F(6, 1834) =	17.67	F(8, 1832) =	14.28	F(8, 1832) =	16.44	F(6, 1834) =	19.66	F(5, 1832) =	21.55
Prob > F =	0.0000		Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000	Prob > F =	0.0000
R-squared =	0.0517		R-squared =	0.0547	R-squared =	0.0587	R-squared =	0.0670	R-squared =	0.0604	R-squared =	0.0555
Adj R-squared =	0.0496		Adj R-squared =	0.0516	Adj R-squared =	0.0546	Adj R-squared =	0.0629	Adj R-squared =	0.0573	Adj R-squared =	0.0529
Root MSE =	.1288		Root MSE =	.12867	Root MSE =	.12846	Root MSE =	.1279	Root MSE =	.12827	Root MSE =	.12858

Note: *, **, *** statistically significant at 10%, 5% and 1%.

Table7. The Impact of the firm characteristics on abnormal returns for the entire window (from September 16, 2008 to October 10, 2008)

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Export dummy	0.000	0.001	0.000	0.001	0.006	0.003 **			0.001	0.001	0.000	0.001
Liquid Asset Ratio	-0.007	0.003 **	-0.006	0.003 *	-0.007	0.003 **	-0.007	0.003 **	-0.007	0.003 **	-0.007	0.003 **
Loan-to-Asset Ratio	-0.003	0.003	-0.003	0.003	-0.003	0.003	-0.003	0.003	-0.003	0.003	-0.002	0.002
Share of Foreigners	0.014	0.005 ***	0.012	0.005 ***	0.012	0.005 **	0.012	0.005 **	0.012	0.005 **	0.013	0.005 ***
Corporate bond dummy			0.001	0.000 **								
CP dummy			0.001	0.001								
Export dummy * share of exports in total sales					0.003	0.003	0.003	0.003	0.003	0.003		
Export dummy * shares of exports in total exports (North America)					-0.008	0.003 ***						
Export dummy * shares of exports in total exports (Europe)					-0.007	0.003 **						
Export dummy * shares of exports in total exports (Asia)					-0.006	0.002 ***						
1area Export dummy							-0.001	0.001 **				
2area Export dummy							0.000	0.001				
3area Export dummy							-0.002	0.001 **				
Over 4area Export dummy							0.000	0.001				
Export dummy * Herfindahl Index of Export									-0.002	0.001 *		
Export dummy * short-term loans-to-asset ratio											-0.003	0.004
Cons.	-0.006	0.002 ***	-0.006	0.002 ***	-0.006	0.002 ***	-0.006	0.002 ***	-0.006	0.002 ***	-0.006	0.002 ***

Notes: We use the estimator developed by Sefcik and Thomason(1986) and Forbes(2004).

*, **, *** statistically significant at 10%, 5% and 1%.

Data Appendix

Variables	Constructions	Sources
Export dummy	Export dummy takes on the value 1 if the firm exports and 0 if the firm doesn't export.	Basic Survey of Japanese Business Structure and Activities (BSJBSA), Ministry of Economy, Trade and Industry
Liquid Asset Ratio	(Cash + Deposits + Securities) / Total Assets	NEEDS-Cges, Nikkei Media Marketing
Loan-to-Asset Ratio	(Short-term Loans + Long-term Loans) / Total Assets	Corporate Financial Databank, Development Bank of Japan
Share of Foreigners	Shareholdings by foreign investors	NEEDS-Cges
Corporate bond dummy	Corporate bond (CB) dummy takes on the value 1 if the firm issues CB and 0 if the firm doesn't issue CB.	BSJBSA
CP dummy	CP dummy takes on the value 1 if the firm issues CP and 0 if the firm doesn't issue CP.	BSJBSA
Share of exports in total sales	Total Exports / Total Sales	BSJBSA
Shares of exports in total exports (North)	Exports to North America / Total Exports	BSJBSA
Shares of exports in total exports (Europe)	Exports to Europe / Total Exports	BSJBSA
Shares of exports in total exports (Asia)	Exports to Asia / Total Exports	BSJBSA
Short-term loan-to-asset ratio	Short-term Loans / Total Assets	Corporate Financial Databank