Title	Shocks and Shock Absorbers in Japanese Bonds and Banks During the Global Financial Crisis
Author(s)	KIM, Hyonok; WILCOX, James A.; YASUDA, Yukihiro
Citation	
Issue Date	2016-03-15
Type	Technical Report
Text Version	publisher
URL	http://hdl.handle.net/10086/27959
Right	

Shocks and Shock Absorbers in Japanese Bonds and Banks During the Global Financial Crisis

Hyonok Kim
Business Administration
Tokyo Keizai University
1-7-34, Minami-cho, Kokubuji-shi, Tokyo, Japan
e-mail: hokim@tku.ac.jp
Tel: +81-42-328-5940

James A. Wilcox
Haas School of Business
University of California, Berkeley
Berkeley, CA 94720
e-mail: jwilcox@haas.berkeley.edu
Tel: 510.642.2455

and

Yukihiro Yasuda
Graduate School of Commerce and Management
Hitotsubashi University
2-1 Naka Kunitachi, Tokyo Japan
e-mail: y.yasuda@r.hit-u.ac.jp
Tel: +81-42-580-8481

First version March 29, 2015
This version March 15, 2016

Shocks and Shock Absorbers in Japanese Bonds and Banks During the Global Financial Crisis

Hyonok Kim, James A. Wilcox, and Yukihiro Yasuda

Abstract

During the global financial crisis (GFC), Japan and the U.S. differed in at least two important ways: (1) while markets were stable in Japan then, the bubbles in the U.S. housing and financial markets burst and (2) while Japanese banks suffered few losses, huge losses badly weakened U.S. banks.

In addition, and unlike the U.S., Japan requires firms' balance sheets to show, not only their total debt, but also the components of their debt: bonds, loans, and other debt. We used data for listed, non-financial, Japanese firms' bonds, bank loans, and other debt to investigate whether the 2008 "Lehman shock" in the U.S. disrupted Japanese bond markets. The Japanese data allowed us to estimate how much the Lehman shock affected Japanese firms' bonds outstanding and issued and to estimate how much, in turn, the Lehman shock resulted in firms' getting more loans from Japanese banks.

The estimates revealed important cross-currents during the crisis. Our estimates implied that, while the crisis reduced bond issuance, it was accompanied by enough more bank loans to raise total debt. During the crisis, both bonds outstanding and bond issuance responded less to prior bond shortfalls and responded less to their maturing bonds. Second, while it greatly reduced bonds issued and outstanding at smaller, listed firms, the crisis boosted them at the very largest firms. In contrast, bank loans then rose more at smaller firms. Third, bank loans rose more, and bonds outstanding fell more, at firms with greater exposure to foreign sales. Fourth, the crisis led firms, and especially larger firms, to hold more cash and fewer securities and to reduce costs. Fifth, capital expenditures generally declined during the crisis, but declined significantly less at larger firms.

Key words: crisis, bonds, Lehman, bond issuance, Japan, loans, cash, banks
JEL classification: G21; G28

I. Introduction

The global financial crisis first erupted in the United States in the middle of 2007. During 2008, the crisis worsened and spread outside the U.S., especially after Lehman Brothers declared bankruptcy in the middle of September 2008. Repercussions on real sectors, especially in developed countries, were large and painful, but they tended to occur later and less dramatically than the earlier implosions of gigantic financial institutions.

Among the many dramatic events in financial sectors during the crisis were disruptions to bond markets. Pricing and trading proceeded in equity markets without long, obvious interruptions. In contrast, pricing, trading, and issuance in markets for many categories of bonds were so disrupted that bond markets in the U.S. were widely reported to be "frozen."

While the crisis most directly affected the financial and nonfinancial businesses of the U.S., it also hurt many of the world's large internationally-active banks, with European banks being particularly hard hit. Japanese banks were quite healthy before the crisis. But, unlike some large U.S. and European banks, they were only tangentially involved with the assets and activities that were especially hurt during the crisis, such as U.S. mortgage-backed securities. And, unlike U.S. banks, having sustained relatively few crisis-related losses, Japanese banks were perhaps capable of boosting their lending in the event of bond market disruptions.

Here we analyze the differences during the crises in financial and real adjustments at listed Japanese corporations. We turn to Japan for several reasons. First, we wanted to investigate the effects of the crisis, especially of disruptions to bond markets, in the presence of a banking system that unlike that of the U.S. and Western Europe, was healthy. Second, the Japanese economy had few direct connections to the epicenter of the financial crisis, the U.S. housing and

mortgage markets. And, third, unlike the U.S., Japan requires firms' balance sheets to show, not only their total debt, but also the components of their debt: bonds, loans, and other debt. The U.S. requires firms to report components and some details about their total long-term debt in footnotes, but not in balance sheets.[1]

We used data for listed, non-financial, Japanese firms' bonds, bank loans, and other debt to investigate whether the 2008 "Lehman shock" in the U.S. disrupted Japanese bond markets. The Japanese data allowed us to estimate how much the Lehman shock affected Japanese firms' bonds outstanding and issued and to estimate how much, in turn, the Lehman shock resulted in firms' getting more loans from Japanese banks.

Thus, banking conditions and data availability for Japan allowed us to investigate whether its relatively healthy banks were effective shock absorbers by providing more loans, in particular, to the firms that had more pre-determined cash drains, for example due to maturing long-term bonds and long-term loans, when negative shocks struck global bond markets. In addition to the effects of the crisis on firms' bonds and loans outstanding, we estimated how much the crisis affected firms' holdings of cash and of securities, their operating expenses and numbers of employees, and their capital expenditures.

We found several important, crisis-related changes in estimated functions for outcomes. We found that, during the global financial crisis, individual (listed, Japanese) firms that had maturing long-term bonds issued fewer bonds and had larger (net) declines in their bonds outstanding. Firms with maturing loans also issued fewer bonds and had larger declines in their bonds outstanding during the crisis. In that regard, while the global financial crisis originated in U.S., it

[1] Rauh and Sufi (2010) and Colla et al. (2013) collected components of long-term debt from footnotes and by merging data from different sources.

also shocked Japanese bond markets. On the other hand, we also found that firms that had maturing bonds or maturing loans obtained more bank loans during the crisis. That suggests that the healthy Japanese banking system served as a shock absorber for the bond market disruption that flowed from the "Lehman shock."

We also found that the effects of the crisis on listed firms were far from uniform and not always expected. We unexpectedly found that, during the period of bond-market disruption, the very-largest firms actually issued more bonds than we would have otherwise expected. Thus, our estimates imply that the bond market rotated or "pivoted", with the largest firms boosting their bond issuances and bonds outstanding and with smaller (listed) firms significantly reducing theirs. Again, our estimates controlled for several firm-specific characteristics and changes, such as asset sizes, sales, default probabilities, and industry. Thus, while the bond market seems to have pivoted toward the very largest firms, a "flight to size," that pivot was distinct from the effects of changes in the measured "safety" or "quality" of corporate bond issuers. The estimates do point to a separate, additional "flight to quality" in the Japanese corporate bond market. They do not point to a similar flight to quality in bank loans.

The crisis apparently hurt the real (or operational) sides, but helped the financial sides, of a few of the very-largest firms. Our estimates imply that these two effects offset each other on average: The net, total effect during the crisis on bonds outstanding of those few, very-large firms was nearly zero. The financial crisis seems to have hurt the real sides of smaller firms relatively less than it hurt larger firms, and especially larger firms that were in manufacturing. At the same time, the crisis also reduced the demand for the bonds of smaller (listed) firms. With both real and financial conditions having turned against them, smaller firms as a group had significant declines in both their bond issuances and bonds outstanding. Under the circumstances, then, the

relatively-healthy Japanese banks then boosted lending to these smaller (listed) firms in particular.

Our results indicate how a healthy banking sector can help offset disruptions by absorbing some of the shocks to other parts of the financial sector. The results also indicate how financial shocks may affect the very largest of listed firms differently than they affect other large firms.

In the next section, we provide an overview of relevant differences between Japanese and U.S. financial markets and corporate balance sheets around the crisis. Then, Section III discusses some studies that are particularly relevant to our analysis. In Sections Ⅳ and Ⅴ,we describe our perspective, empirical approach, and data. Sections Ⅵ and Ⅶ present our results. In Section Ⅷ, we present our conclusions and caveats and suggest some directions for additional analysis.

II. Cross-Country Differences in Credit Markets during the Crisis

Japanese banks and businesses were notable in their relatively low involvement with the U.S. housing and mortgage markets. Unlike many U.S. and European banks, Japanese banks had few assets or (actual or contingent) liabilities that were closely tied to the U.S. mortgages. Similarly, few exports of Japanese businesses were directly tied to U.S. housing markets. Of course, total Japanese exports were very sensitive to the health of the European and U.S. economies. Thus, while it had important effects on the financial and real sectors of the Japanese economy, the global financial crisis was more exogenous to Japan than it was to the U.S. or to Europe. Indeed, while in the U.S., the crisis sometimes carries the adjectives “subprime” or “housing” and often regarded as having started in mid-2007 or even earlier, in Japan, the problems typically are seen as resulting from the “Lehman shock.”

The global financial crisis had different effects on Japanese corporations' bonds than it had on their loans. Figure 1 shows the annual percent changes in total Japanese (listed, nonfinancial) corporations' bonds and loans outstanding during fiscal years 2006-2008, each of which ended on March 31 of the following calendar year. Figure 1 shows that, in the pre-crisis fiscal years FY2006 and FY2007, loans and bonds both changed by small percentage amounts.

FY2008, which ran from April 1, 2008 through March 31, 2009, started less than two months after Bear, Stearns was subsumed by JPMorganChase and it ended six months after Lehman Brothers went bankrupt and while Japan and the U.S. were in recessions. By the end of the crisis year FY2008, Japanese corporations had fewer bonds outstanding, but had more bank loans outstanding. Figure 1 shows the sharp shift toward loans during FY2008. While corporate bonds outstanding shrank by a small amount, corporations' loan liabilities soared by more than 15 percent.

Figure 1 about here

An example of a corporation shifting from issuing bonds to taking out bank loans was SBI Holdings. Right after the "Lehman shock" (as it has always been called in Japan) in the middle of September 2008, SBI Holdings postponed its previously-planned issuance of 50 billion yen of bonds, which were intended to redeem its maturing bonds. Instead, to redeem its maturing bonds, SBI Holdings took out short-term bank loans. The increase in loans to corporations was so large that loans at the "big 6" Japanese banks rose by more than five percent during FY2008, their largest percentage increase in 18 years.

Figure 2 shows that spreads for U.S. investment-grade bonds began to rise then, flattened out at quite high levels, and then spiked after the "Lehman shock," and then declined through

2009. All these spreads rose during the crisis and spreads of lower-quality, investment-grade bonds rose much more, a common pattern during garden-variety economic downturns.

In Japan, the picture was different. Figure 2 shows that spreads there rose, but the increases were much smaller, happened later, and were more varied. One striking difference in Japan was that the spreads of the two highest-rated groups of bonds, those rated AAA or AA, rose hardly at all. In fact, the AAA spread was generally lower after than it was before the middle of 2007 and before the Lehman shock. The AAA spread was reported to be zero, and even negative, for many months after the September 2008 Lehman shock.

Figure 2 about here

In addition, the effects of the crisis on bond issuance apparently differed by firm characteristics such as bond rating and asset size. Given the changes in bond yield spreads in Figure 2, the Japanese corporate bond issuance patterns in Figures 3 are not surprising. Panel A of figure 3 shows that aggregate issuance of Japanese corporate bonds that were rated A or BBB was somewhat lower during 2008 and 2009. Issuance of higher-rated bonds, in contrast, was considerably higher from early 2008 through early 2009 than it was before or after that span. The relative shift of bond issuance toward higher-rated bonds is shown more clearly in panel B of figure 3, which shows that their shares of total investment-grade issuances of corporate bonds in Japan were about twice as large during that span than they were before or after that span. For example, Toyota Motor and Denso, which were both rated AAA, issued 200 billion and 100 billion yen of bonds in February 2009.

Figure 3 about here

Table 1 shows changes in selected balance sheet items from March 2008 to March 2009. It shows that total bonds outstanding declined, but much less for larger firms, while loans outstanding rose for firms of all sizes.

Table 1 about here

Panel A of Table 1 shows the asset and liability shares (as a percent of each firm's total assets) of Japanese listed firms by firm size. Panel B shows the changes of those shares over fiscal year 2008 (April 1, 2008 – March 31, 2009). Total liabilities declined about 2 percentage points during FY2008 (row 15 in column 1). The declines in total liabilities were not clearly correlated with firm sizes. But, Panel B does show some size-related distinctions. The very largest firms boosted their long-term borrowing by 2.7 percentage points of total assets (row 17 in column 2), which was nearly a 10 percent increase in that group's borrowing as a share of assets (2.7 in row 17 divided by 30.3 in row 8 in column 2). The other firms that were larger than median-size also took on more long-term borrowings (row 17 in column 3). Smaller-than-median firms had almost no change (+0.3) in long-term borrowing (row 17 in column 4). And, while the smaller (listed) firms' bonds outstanding declined by about 15 percent during that one fiscal year (-0.5 in row 18 divided by 3.0 in row 9 in column 4); the largest firms' bonds outstanding declined hardly at all, about one percent (-0.1 in row 18 divided by 14.4 in row 9 in column 2). Loans increased for each size group, particularly the largest firms (row 19 in all columns).

III. Prior Studies of Corporate Credit during the Crisis

Many aspects of credit markets during the global financial crisis have been studied in recent years. Particularly related to our research are crisis-related studies of bond markets and maturing bonds, of repercussions outside the U.S., of banks' lending to businesses, and of the effects of the global financial crisis on the real sectors of economies around the world.

Similar to our analysis here, Almeida, et al. (2009) used the dates and amounts of maturing long-term debt as pre-determined measures of cash drains on businesses. Almeida, et al. (2009) found that individual firms that had larger amounts of long-term debt maturing right after the third quarter of 2007 tended to reduce their investment spending more than otherwise-similar firms whose long-term debts matured after 2008. They also showed that maturing debt amounts had no effect on investment for firms that did not rely on long-term debt as a major source of funding. Flannery, et al. (2013) examined focused on links between banks' financial conditions during the crisis and corporate financing and investment decisions. They found that adverse shocks to the banking system reduced banks' lending to businesses and reduced businesses' real activities.

Some research has examined the repercussions of the global financial crisis outside the U.S. Uchino (2013) analyzed the effects of the crisis on the Japanese bond market. He reported that Japanese firms that had large volumes of bonds maturing during FY2008 (i.e., the 12 months ending March 31, 2009) had larger increases in their bank loans outstanding and did not cut their investment spending relative to firms with smaller volumes of bonds maturing then. Uchino (2013) noted that Japanese firms that had close relationships with their banks tended to add more loans, indicating that Japanese firms shifted from public (bonds) to private (loans) debt as a result of the global financial crisis. His results suggest also that domestic bond markets in Japan,

where the vast majority of Japanese corporate bonds are issued, were importantly disrupted by the crisis, even though Japanese banks, investors, and businesses had scant direct connection to the U.S. housing and mortgage markets.

The bond market study by Gozzi and Levine (2012) is also pertinent, though it was not a study of the global financial crisis. Gozzi and Levine (2012) demonstrated the important differences between bonds issued in domestic bond markets and those issued in international bond markets. They concluded that, rather than being close substitutes, domestic and international bond markets are better regarded as complements that can offer different financing opportunities for businesses that are large and creditworthy enough to participate in them.

Amiti and Weinstein (2011) estimated the effects of the crisis on the financing of international trade, which does more directly involve Japanese banks and businesses. Over 1990 - 2010, when there were wide swings in the health of Japanese banks, they concluded that the exports of individual Japanese firms rose and fell importantly with the health of their banks.

And, a large strand of research addressed the effects of the crisis on real sectors of the U.S. economy. Ivashina and Scharfstein (2010) showed that originations of new loans to large firms during the fourth quarter of 2008 fell by nearly half (47%) from their pace during the prior quarter. They concluded that banks that were subject to "loan runs" in the form of businesses drawing upon their pre-existing lines of credit then greatly reduced their other lending. They also found that the banks that had more access to deposit funding, and thus relied less on open market funds, tended to reduce their non-commitment lending less than other banks. Duchin, et al. (2010) analyzed the effects of the global financial crisis on business investment spending. They found that corporate investment declined during the crisis and that the declines were largest for

firms that had low cash reserves or had high net short-term debt when the crisis erupted. Campello, et al. (2011) focused on businesses' use of credit lines to analyze liquidity effects during the crisis. Their results suggested that having credit lines reduced the effects of the crisis on various business actions, including investment spending.

IV. Specifications of Firms' Financial and Real Adjustments

In this section we describe the regression specifications that we used to estimate the effects of the global financial crisis on the bond and (bank) loan financing of Japanese businesses. Our estimated specifications reflect businesses' choosing, and gradually adjusting toward, their target (or long-run or equilibrium or desired) amounts of debt, loans, and other variables on their balance sheets. Our specifications also allow, but do not require, firms to adjust gradually to deviations from their targets for bonds, loans, and other financial and real variables. Our estimates provide insight about the size and speed of effects on bond issuance, bank lending, and real activities (such as employment, capital expenditures, and so on) at individual Japanese firms of various forces, both before and during the global financial crisis.

A. Firms' Adjustments to Changes in Circumstances

Recent studies note that businesses generally incur considerable costs when they make deliberate adjustments to their target ratios. Consistent with the trade-off theory, empirical evidence from numerous studies suggests significant adjustments, though perhaps at surprisingly slow speeds, by firms of their leverage ratios toward their targets (e.g., Hovakimian et al., 2011, Leary and Roberts, 2005).

In the face of changing circumstances, firms' typically adjust over time many of the balance-sheet items and real-side variables that they have some control over to reduce adjustment costs. Firms incur extra costs if they rapidly change employment, general and administrative costs, longer-term liabilities, capital expenditures, and other items in response to unexpected changes in revenues, costs, or financing conditions. Firms can adjust other financial and real variables more slowly if they have liquid assets or can acquire cash, for example, when revenues are unexpectedly low. Equation (1) specifies that firms' balance-sheet items and real (or operational) variables respond in the following period, $\mathbf{dY}_{i,t+1}$, to changes in firms' characteristics and conditions in the current period, $\mathbf{dZ}_{i,t}$:

(1) $\mathbf{dY}_{i,t+1} = \boldsymbol{\beta} \cdot \mathbf{dZ}_{i,t} + \boldsymbol{e}_{i,t}$

B. Targets for Corporate Liabilities, Assets, and Operations

Many studies have concluded that businesses often act as if they have target leverage ratios and concluded that businesses, however gradually or fitfully, actively rebalance their equity and debt (outstanding) to move themselves toward their target ratios. We build upon prior studies that modeled a firm's optimal capital structure as a function of the firm's other, mostly-nonfinancial characteristics and the institutional arrangements that they faced (e.g., Flannery and Rangan, 2006, Lemmon et al., 2008, and Oztekin and Flannery, 2012).

Equation (2) specifies each firm i, as having targets for financial and real variables that a firm has some control over. When the effects on a firm of external conditions are reflected internally, we can express a firm's targets as functions of a firm's own, internal characteristics and conditions, $\mathbf{X}_{i,t}$ ($\mathbf{X}_{i,t}$: $X_{i,j,t}$; j=1, …, J) at time t:

(2) $\mathbf{Y}_{i,t} = \boldsymbol{\alpha} \cdot \mathbf{X}_{i,t} = \alpha_{0,i} + \alpha_1 X_{i,1,t} + \alpha_2 X_{i,2,t} + \cdots + \alpha_J X_{i,J,t}$

$\mathbf{Y}_{i,t}$ ($\mathbf{Y}_{i,t}$: $Y_{i,k,t}$; k=1, …, K) is a vector of the K targets for each firm i at time t. $\boldsymbol{\alpha}$ is a K x J matrices of a firm's characteristics and conditions and of the associated coefficients. The first row of $\boldsymbol{\alpha}_{i,t}$ allows for firm-specific (fixed) effects. Of the myriad possible elements of $\mathbf{Y}_{i,t}$, we analyzed six of the largest and most important financial and real variables over which individual firms usually can exert considerable control:

1. bonds outstanding (*Bonds*),
2. total bank loans (*BLoans*),
3. total debt (*Debt = Bonds + BLoans + Other Loans*),
4. general and administrative expense (*GACost*),
5. employee headcount (*Employees*), and
6. capital expenditures (*Capex*).

Even though we omitted typically-smaller, unlisted firms, the sizes of listed Japanese firms varied greatly cross-sectionally. For example, the 10 largest firms had as many assets at the end of FY2007 as the 647 smallest firms in our sample of 707 firms that had long-term bonds outstanding. So that the relatively-few, very-much-larger firms didn't dominate the estimates, we divided each of the six outcome variables, $\mathbf{Y}_{i,t}$, for each firm by its total assets as of the end of the current fiscal year, t.[2] In addition, we always controlled for the real possibility of size-related differences across firms by including size variables, such as assets, as explanatory variables in our regressions.

As elements of $\mathbf{X}_{i,t}$, we included several indicators of the characteristics and conditions of individual. While many variables are likely to be in both $\mathbf{X}_{i,t}$ and $\mathbf{Z}_{i,t}$, some may be in $\mathbf{X}_{i,t}$ but

[2] The time variable, t, indicates the fiscal year. For most Japanese listed corporations, fiscal years end on March 31. We restricted our sample to those firms. As is standard practice, we measured stocks as of the end of each fiscal year and flows over the entire fiscal year.

not $\mathbf{Z}_{i,t}$, and vice versa. The first term on the right-hand side of equation (2) for $\mathbf{Y}_{i,t}$ is $\alpha_{0,i}$, a time-invariant amount that varies across firms; that is, a fixed-effect.[3] We also included a separate dummy variable for each year to allow for effects that were common to all firms, such as economy-wide conditions or government policies, but that might vary by year. We also included a dummy variable that indicated whether the firm was registered with the U.S. SEC (SEC_t). We included two variables to allow for any variations across firms that were related to firms' sizes: (a) each firm's total assets in trillions of yen ($Size_t$) and (b) the square of assets ($Size_t * Size_t$).

As indicators of default risks, for each firm we included an estimated probability of default within the next 12 months (PD_t) and its squared value ($PD_t * PD_t$). PD_t is obtained from the Credit Research Initiative (CRI) database. We also included the ratio of the market value of assets to the book value of total assets as a simple measure of q, *q*, as an indicator of perceived growth opportunities; a revenue indicator, which we calculated as total sales divided by total assets ($Sales_t$); and an export-dependency indicator, which we calculated as the ratio of foreign sales to total sales ($Foreign_t$). In effect, each of these three factors, like the elements of $\mathbf{Y}_{i,t}$, was scaled by a measure of firm size. Table 2 has more complete descriptions of each of these variables.

C. Adjustments to Deviations from Firms' Targets

In addition to the adjustments specified in equation (1), we also allowed for separate, less-than-instantaneous adjustments toward each of a firm's targets with a standard, error-correction mechanism (ECM). Our ECM specifies that a firm adjusts each of its balance-sheet items and real (or operational) variables over the upcoming year (and following years) to the current

[3] Note that because equation (1) is first-differenced, fixed effects, $\alpha_{0,i}$ is removed and cannot be estimated.

deviation from the firm's target for that variable, $Y_{i,k,t}$. The deviations from the firm's targets, or errors, at the end of the current year, $\boldsymbol{ECM}_{i,t}$, equal $\hat{\boldsymbol{\varepsilon}}_{i,t} = \mathbf{Y}_{i,t} - \hat{\boldsymbol{\alpha}} \cdot \mathbf{X}_{i,t}$. To allow for firms' adjustments these deviations, we added $\boldsymbol{ECM}_{i,t}$ to equation (1):

(3) $\mathbf{dY}_{i,t+1} = \boldsymbol{\beta_1} \cdot \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta} \cdot \mathbf{dZ}_{i,t} + \boldsymbol{e}_{i,t}$

D. Effects of Maturing Bonds and Loans

We are particularly interested in estimating the effects during the global financial crisis of the cash drains at individual firms that were pre-determined by the maturity schedules of firms' long-term bonds and long-term loans. Disruptions in bond markets that made issuing new, long-term or short-term bonds problematic might have had effects on financial (and perhaps real) variables that were more readily detected for firms that were obligated to make these, pre-determined, often-quite-large repayments—repayments that would drain that much cash from those firms.

Similarly, we are interested in estimating whether, and how much, banks in Japan then acted as shock absorbers when bond markets were disrupted: Did banks tend to increase lending to the firms who needed cash to repay maturing bonds and loans and whom the crisis had reduced, or removed, access to bond financing via new issuances?

In ordinary periods, though repayments of maturing bonds and loans are required, we would expect few repercussions: Firms either replace maturing bonds or loans with new issues of one or the other, or they accumulate liquid assets in advance and then use them to repay maturing debts. In a crisis, however, especially in a crisis that constricted bond issuance, the effects of repayments on bonds, loans, and many other important variables may have been quite different. We investigate if, and how, the recent crisis affected firms' financial and real variables.

To estimate the effects of effectively-pre-determined cash drains, we added two variables, $Matbonds_t^{t+1}$ and $Matloans_t^{t+1}$, to equation (3):

(4) $\mathbf{dY}_{i,t+1} = \boldsymbol{\beta_1} \cdot \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta_2}\, Matbonds_{i,t}^{t+1} + \boldsymbol{\beta_3}\, Matloans_{i,t}^{t+1} + \boldsymbol{\beta} \cdot \mathbf{dZ}_{i,t} + e_{i,t}$

These variables are the amounts in yen of long-term bonds and of long-term loans[4] that were known and shown in firms' financial statements at the end of the current fiscal year, t, to be scheduled to mature during the upcoming fiscal year, t+1.

E. Regression Specification

The regression specification for firms' adjustment functions, which we show in equation (5), includes several variables in addition to those in equation (4).

We are particularly interested in how firms' financial and real adjustments differed as a result of the crisis. To allow estimated adjustments during the crisis to differ in speeds and in magnitudes, in equation (5) we included interaction terms, the products of the dummy variable that took the value of one for fiscal year 2008, *Crisis*, and each of the right-hand-side variables. To allow for the possibility that firms that were more exposed to the economies of the U.S. and Europe, where the crisis was more virulent, we also included the interaction of *Crisis* with *Foreign*.

During ordinary circumstances, larger firms may have adjusted faster or slower than smaller firms adjusted. To allow for these ordinary, size-related differences, we included interactions of *Size* and the several variables on the right-hand side of equation (4). Further, the crisis may have affected larger firms more or less than it affected smaller firms. Larger Japanese firms tend to rely more on bonds, whose markets were presumably more disrupted by the crisis, while

[4] The data for *Matloans* includes loans from banks and from any other lenders.

smaller firms rely more on loans from Japanese banks, which were relatively unscathed by the crisis. To allow for the possibility that firms of different sizes were affected differently by the crisis, we also included in equation (5) the three-way interactions of *Size*, *Crisis*, and several of variables on the right-hand side of equation (4).

We specified these considerations in the adjustment equations implied by equation (4) in equation (5):

$$
\begin{aligned}
(5)\ \boldsymbol{dY}_{i,t+1} = {} & \boldsymbol{\beta_1}\, \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta_2}\, Matbonds_{i,t}{}^{t+1} + \boldsymbol{\beta_3}\, Matloans_{i,t}{}^{t+1} \\
& + \boldsymbol{\beta_4}\, dPD_{i,t} + \boldsymbol{\beta_5}\, dq_{i,t} + \boldsymbol{\beta_6}\, dAssets_{i,t} + \boldsymbol{\beta_7}\, dSales_{i,t} \\
& + \boldsymbol{\beta_8}\, Crisis \\
& + \boldsymbol{\beta_9}\, Crisis * \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta_{10}}\, Crisis * Matbonds_{i,t}{}^{t+1} \\
& + \boldsymbol{\beta_{11}}\, Crisis * Matloans_{i,t}{}^{t+1} + \boldsymbol{\beta_{12}}\, Crisis * dPD_{i,t} \\
& + \boldsymbol{\beta_{13}}\, Crisis * dq_{i,t} + \boldsymbol{\beta_{14}}\, Crisis * dAssets_{i,t} \\
& + \boldsymbol{\beta_{15}}\, Crisis * dSales_{i,t} + \boldsymbol{\beta_{16}}\, Crisis * Foreign_{i,t} \\
& + \boldsymbol{\beta_{17}}\, Crisis * Size_{i,t} \\
& + \boldsymbol{\beta_{18}}\, Size_{i,t} * \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta_{19}}\, Size_{i,t} * Matbonds_{i,t}{}^{t+1} \\
& + \boldsymbol{\beta_{20}}\, Size_{i,t} * Matloans_{i,t}{}^{t+1} + \boldsymbol{\beta_{21}}\, Size_{i,t} * dPD_{i,t} \\
& + \boldsymbol{\beta_{22}}\, Crisis * Size_{i,t} * \boldsymbol{ECM}_{i,t} + \boldsymbol{\beta_{23}}\, Crisis * Size_{i,t} * Matbonds_{i,t}{}^{t+1} \\
& + \boldsymbol{\beta_{24}}\, Crisis * Size_{i,t} * Matloans_{i,t}{}^{t+1} + \boldsymbol{\beta_{25}}\, Crisis * Size_{i,t} * dPD_{i,t} \\
& + \boldsymbol{\beta_{26}}\, Crisis * Size_{i,t} * Foreign_{i,t} \\
& + \boldsymbol{e}_{i,t}
\end{aligned}
$$

V. Data, Sample, and Variables

A. Advantages of Data for Japanese Corporations

For analyzing the repercussions of the global financial crisis, Japanese financial reports offer some real advantages. First, while U.S. and European banks were much involved and damaged in the run-up to the crisis, Japanese banks were neither involved or damaged much before

or during the crisis. In fact, they were quite well capitalized and healthy prior to the crisis. Second, the global financial e crisis erupted in the U.S. and was effectively an exogenous, but important, shock to the Japanese financial markets and real economy. Thus, the global financial crisis was likely to have affected Japanese financial and nonfinancial firms differently than it affected firms in the U.S.

Third, listed Japanese firms are required to report data separately for long-term bonds and for long-term loans; U.S. firms need only report total long-term debt, which consists of bonds, loans, and other debts. The reporting rules in Japan and in the U.S. apply both to the amounts outstanding and to amounts that were long-term at origination but are scheduled to mature within the upcoming year. Therefore, the Japanese data allow us to explore how similarly and how differently bond and loan markets reacted and how nonfinancial firms reacted at the onset of the global financial crisis.

B. Data and Sample

We collected financial-statement data for listed Japanese firms from the databases of Astra Manager, of NEEDS Financial QUEST, and of NEEDS Corporate Governance Evaluation System (NEEDS-Cges), which are standard sources for these data. We obtained estimates for each year for each firm's probability of default (*PD*) from the Credit Research Initiative (CRI) at the Risk Management Institute of the National University of Singapore.

We began with a sample of all listed, nonfinancial firms for the four fiscal years 2005 - 2008. We restricted our sample to listed firms because of their more-extensive, publicly-available financial statements. We excluded financial firms (i.e., banking, securities, insurance and other financial businesses) because their financial statements and behavior are typically quite different than those of nonfinancial firms, especially during financial crises. Restricting the sample

to the period surrounding the Lehman shock in September 2008 reduced the effects on our estimates of any large changes in unmeasured factors that occurred before or after our sample period. For example, Japanese banks began to write off their non-performing (i.e., "bad") loans in earnest soon after the Financial Revitalization Program was introduced in October 2002. However beneficial over a longer run, in the first few years after this program was introduced, write-offs of bad loans seriously reduced Japanese banks' capital and thereby their supplies of credit to firms, and especially firms in distress.

Our sample period ends with fiscal year 2008 at March 31, 2009. By ending the sample period in early 2009, we preserved empirical focus on the repercussions of the Lehman shock. After that, significant government policy and other shocks affected banks and credit markets. To stabilize financial markets and to facilitate corporate funding, in March 2009 the Bank of Japan began purchasing commercial paper and corporate bonds. Ending our sample in early 2009 also excluded the calamitous tsunami and nuclear radiation event that were triggered by the March 2011 Great East Japan Earthquake.

We restricted our sample to firms with bonds outstanding at the end of each fiscal year 2005-2007 and whose fiscal years ended on March 31.[5] We excluded firms whose (total) assets rose (fell) more than 20 percent year over year to reduce the probabilities that financial statements were importantly affected by unmeasured factors. And, some firms were excluded due to missing relevant data. After first-differencing, the sample of 2,246 observations had 1,364 observations.

C. Variables

[5] In our initial sample of listed firms, about 70 percent had fiscal years that ended on March 31.

Our estimates controlled for several, potentially-confounding factors. The financial crisis very quickly reverberated onto firms' real variables. Thus, our estimates attempted to control for each firm's changes in its sales revenue, in its default probability, and for several other factors. We used the changes in firms' conditions and the crisis-related changes in the estimated functions that related firms' financial and real outcomes to the control variables to calculate how much of the observed changes in outcomes were attributable to firms' own conditions and how much were attributable to crisis-related changes in bond and loan market conditions.

Table 2 lists the mnemonics, definitions, and timing of the variables that we used. Table 2 also shows that the right-hand-side variables in our estimating equation (5) were dated at time t or earlier, while the left-hand-side variables reflect changes after time t.

Table 2 about here

The elements of $\mathbf{dY}_{i,t+1}$ that were based directly on individual firms' (long-term) bonds and loans were:

1. the gross flow of bonds issued in fiscal year *t+1* ($Issuance_{t+1}$)[6],
2. the first difference of total debt outstanding ($dDebt_{t+1} = Debt_{t+1} - Debt_t$),
3. the first difference of bonds outstanding ($dBonds_{t+1} = Bonds_{t+1} - Bonds_t$)[7]
4. the first difference of bank loans outstanding ($dBLoans_{t+1} = BLoans_{t+1} - BLoans_t$).

To assess the effects of the financial crisis on firms' other financial and real variables, we also analyzed these elements of $\mathbf{dY}_{i,t+1}$:

1. the change in holdings of cash and cash-equivalents ($dCash_{t+1} = Cash_{t+1} - Cash_t$),

[6] The data for our *Issuance* variable includes both public offerings and private placements corporate bonds.
[7] The data for our *Bonds* variable includes both public offerings and private placements of bonds.

2. net purchases of investment securities in $t+1$ ($SecPurch_{t+1}$),
3. the change in general and administrative costs ($dGACost_{t+1} = GACost_{t+1} - GACost_t$),
4. the change in the number of employees ($dEmployee_{t+1} = Employee_{t+1} - Employee_t$), and
5. the change in capital expenditures ($dCapex_{t+1} = Capex_{t+1} - Capex_t$)[8].

Each element of $\mathbf{dY}_{i,t+1}$ was scaled by a firm's total assets at the end of the prior fiscal year, t.

The coefficient for $\boldsymbol{ECM}_t$, $\boldsymbol{\beta_1}$, indicates the fraction of the deviation from a target that was eliminated over the year following a deviation. A value of $\boldsymbol{\beta_1}$ equal to zero implies no adjustment toward the target. The specification of the ECM and equation (2) imply that the negative of the estimated $\boldsymbol{\beta_1}$ coefficient is the fraction of a deviation that is eliminated over the upcoming year: As estimated $\boldsymbol{\beta_1}$ approaches minus 1.00 (-1.00), the current-year deviation approaches being completely eliminated over the upcoming year.

As we noted above, we included $Matbonds_t^{t+1}$ and $Matloans_t^{t+1}$, which are the amounts of bonds and of loans that were scheduled to mature within next 12 months, each scaled by total assets. PD_t is the probability of default within next 12 months obtained from the Credit Research Initiative (CRI) database. If firm has higher *PD*, then the firm is more likely to default. We use the value as of June, three months after end of fiscal year. q_t is market value of total assets (book value of liabilities plus market value of equity) divided by book value of total assets (book value of liabilities plus book value of equity), so-called simple q. We include changes in these two variables ($dPD_t = PD_t - PD_{t-1}$ and $dq_t = q_t - q_{t-1}$) into our specification. We also add changes in total assets ($dAssets_t = Assets_t - Assets_{t-1}$) and sales divided by total assets ($dSales_t = Sales_t - Sales_{t-1}$) to our regression model.

[8] We calculated *Capex* by purchase of noncurrent assets – proceeds from sales of noncurrent assets.

To allow for any effects of the Lehman shock, we included a dummy, *Crisis*. *Crisis* was set equal to one for fiscal year 2008 (April, 2008 – March, 2009) and zero otherwise. We also included variables that interacted the crisis dummy, *Crisis*, with other, included variables. To estimate whether the adjustments during the crisis, apart from all of the other control variables, differed systematically with firms' characteristics and conditions, we included the interaction of *Crisis* with $Size_{t,}$ and other, included variables.

To estimate the coefficients in equation (5), we applied a generalized-least-squares (GLS) method that is designed for panel datasets. This method corrected coefficients' standard errors for any cross-sectional correlation of the disturbance terms. The first-differenced specification in equation (5) removed both constant terms and fixed-effects from the estimating equations.

D. Descriptive Statistics

Panels A and B of table 3 show descriptive statistics for the variables that we used to estimate firms' target and adjustment functions. Panel A shows that our final sample contained firms that, on average, had considerable amounts of bonds outstanding and even more loans from banks. The firms had an average of about 3,000 employees. Panel A shows that firms' assets varied greatly, with most firms clustered around smaller sizes and the overall distribution of firm sizes much skewed rightward. Both because of the skewed size distribution and because of differences that weren't related to firm size the other variables also have wide ranges. Such differences augur well for detecting adjustments and crisis-related differences in adjustments.

Table 3 about here

Table 4 shows the (simple Pearson) correlations between the variables that we used in regressions to estimate adjustment functions. Given the wide variation in firms' sizes, characteristics, and conditions, it is not surprising that correlations were so low between firms' changes in their financial and real variables in this panel of hundreds of firms over a few years.

Table 4 about here

VI. Estimated Target and Adjustment Functions

A. Targets

Table 5 shows the results of estimating the specification in equation (2) for firms' target functions for firms' total debt, bonds, bank loans, costs, employees, and capital expenditures. Variables that naturally rose with firm size were all scaled by firms' total assets. The target functions and the deviations from those targets were all estimated with data as of March 31, 2008 (end of FY2007), i.e., before the Lehman shock later that year. Like co-integrating or long-run equilibrium equations, the target functions were specified to be contemporaneous. In contrast, adjustment functions all specified changes over the upcoming year as functions only of pre-determined values for all variables. The regressions for these target levels each included a constant term and fixed-effects.[9]

The estimated target functions generally found that the financial and real variables in table 5 were significantly related to default risks, equity market valuations (as measured by q_t),

[9] t-statistics are shown in parentheses under estimated coefficients.

sizes, and sales. The first two rows of table 5 show that firms that had higher risks (PD_t) of default tended to have more bank loans, given the presence of the several other control variables in the rows below. Riskier firms' larger loan liabilities also translated into higher debt levels (relative to assets). But, notably, we detected no connection between probabilities of default, PD_t, and the levels of firms' bonds outstanding: The estimated coefficients in column 2 were far from being statistically significant.

Table 5 about here

Somewhat surprisingly perhaps, rows 4 and 5 of column 3 show a similar lack of connection between firms' sizes and their bank loans (relative to firms' assets). Not surprisingly, however, the significantly positive coefficient on the square of assets in column 2 shows that firms' bonds outstanding tended to rise, and tended to rise more and more, with firms' sizes. Below, we suggest that this rising reliance on bonds at larger and larger firms during ordinary years will be accentuated by the crisis.

B. Adjustments

Table 6 shows estimates for variants of equation (5), which accounts for changes over the upcoming year, t+1, in firms' bonds outstanding, $dBonds_{t+1}$. Column 1 shows estimates when we also included variables that were interacted with $Size_t$ and with $Crisis * Size_t$. Column 2 shows the results of excluding dq_t and $Foreign_t$ and their interactions from the specification used for column 1. Columns 3 and 4 shows the results when we omitted variables that were interacted with $Size_t$ or with $Crisis * Size_t$ from the specifications used for columns 1 and 2. For tables 6-8, we mean-centered each of the variables that were interacted with *Crisis*. Mean-centering allows

us to interpret the estimated coefficients on *Crisis* as the sum of the effects of the crisis due to changes in market conditions. Each of these effects of the crisis is measured by the product of the mean during the crisis of each variable that was interacted with *Crisis* (including *Crisis* itself) and its estimated coefficient.

Table 6 about here

The estimated coefficients for $\boldsymbol{ECM}_t$ in row 1 were significantly negative, hovered around -0.8, and varied little across the specifications in table 6. The estimates suggest that about 80 percent of the deviations from bond targets at the end of a fiscal year were typically made up over the upcoming year. But, row 9 shows that the estimated coefficients for *Crisis* * $\boldsymbol{ECM}_t$ were significantly positive and about the same size as the coefficients in row 1. Thus, adjustments of deviations from bond targets dropped from 80 percent to nearly zero during the crisis, as indicated by the sum of coefficients of $\boldsymbol{ECM}_t$ and *Crisis* * $\boldsymbol{ECM}_t$ being nearly zero.

What about responses to the cash drains dictated by maturing bonds and loans? The coefficient of $Matbonds_t^{t+1}$ in row 2 is -0.49 in column 3 and statistically significant at the 1% level, indicating that one unit of maturing bonds typically led to a decline of 0.49 units in bonds outstanding. Thus, close to ½ of matured bonds were typically replaced with new bond issues. Various other sources of cash covered the other half. Much like the results for the error-correction term, adjustments were very much slower during the crisis. The coefficients on *Crisis* * $Matbonds_t^{t+1}$ in row 10 were about -0.2 and always significant at the 1% level (-0.21 in column 3). These coefficients indicate that many fewer bonds were replaced by new issues of bonds during the crisis.

The adjustments of bonds to maturing loans differed from adjustments to maturing bonds. Neither the coefficients for $Matloans_t{}^{t+1}$ in row 3 nor for $Crisis * Matloans_t{}^{t+1}$ in row 11 were large enough to be regarded as economically significant. Thus, maturing (bank and other) loans had sometimes-significant, positive, but only small, effects on bonds, both before and during the crisis.

The crisis also affected responses to changes in firms' probability of default, PD. Comparisons of the even-numbered with the odd-numbered columns in table 6 reveal that estimates of whether firms added bonds typically (i.e., before the crisis) in response to their having higher PDs were very sensitive to whether *q* and *Foreign* were included. In contrast, during the crisis, the coefficient for dPD_t, as shown in row 12, was much lower. Thus, higher PDs tended to reduce firms' bonds outstanding much more after the Lehman shock than they had previously.

The coefficients of dq_t and $dAssets_t$ in row 5 and 6 are significantly positive and that of $dSales_t$ in row 7 is significantly negative. However, the coefficients of interactions with *Crisis* in row 13, 14, and 15 have signs opposite those in rows 5, 6, and 7. The tendencies of firms were typically to increase their bonds as their equity prices and their asset sizes increase and reduce them as their sales increase. But, each of those tendencies was effectively undone during the crisis. Indicating that the crisis reduced bonds outstanding especially for firms that relied on international trade, the coefficients for $Crisis * Foreign_t$ (row 16) and for $Crisis * Size_t * Foreign_t$ (row 26) were statistically-significantly negative.

C. Cross-currents in Bond Markets

Table 6 also hints that the crisis might have created important cross-currents in bond markets. Note that the estimated coefficients for *Crisis* (row 8) and for $Crisis * Size_t$ (row 17) were significantly positive. Apart from the myriad controls in table 6, these estimates suggest that, in

the unlikely event of having no maturing issues and having no changes in other control variables during the crisis, Japanese firms issued more bonds. And, row 17 implies that bonds outstanding, due to new issues, rose especially for larger firms. Indeed, the magnitudes of these coefficients implied that for the very largest firms, in contrast to the smaller or riskier firms in our sample, the crisis was no hindrance to issuing more bonds, and even seemed to spur more issuance. Thus, Japanese firms that had bonds maturing during the crisis issued fewer bonds than they had typically. But, strikingly, the largest firms apparently seized upon the lower yields and lower spreads above government bond yields to issue more bonds than they typically issued.

D. Adjustments of Bond Issuance, Total Debt, Bonds, and Loans

Table 7 elaborates on the results in table 6 by showing estimated adjustments of (new) bonds issued ($Issuance_{t+1}$), changes in total debt ($dDebt_{t+1}$), bonds outstanding ($dBonds_{t+1}$), and bank loans outstanding ($dBLoans_{t+1}$) . The results for bonds outstanding are simply repeated from column 3 in table 6.

Table 7 about here

Given that we have controlled for bonds maturing, it is not surprising that the results for bonds issued conform to the results for bonds outstanding. Nonetheless, it is striking to see the large, significant, direct effect on bonds issued, both before and during the crisis.

The estimated coefficients for $Matbonds_t^{t+1}$ in columns 1 and 4 and row 2 are 0.51 and 0.30. Thus, if one unit of bonds matured, typically it was replaced by 0.51 of new bonds and 0.30 of additional bank loans. Table 8 below shows that another 0.06 was funded by drawing down cash and cash-equivalents and 0.03 was funded by reducing costs (row 2 of table 8). The results in row 10 in table 7 show that, during the crisis, maturing bonds resulted in fewer issues of new

bonds, but also resulted in a few more bank loans. The estimates indicate that the issuance reduction of 0.18 was accompanied by a partially-offsetting increase in bank loans of 0.05.

In rows 8 and 17 of column 1, the coefficient for *Crisis* is significantly negative, but the coefficient for *Crisis * Size*$_t$ is positive, large, and significant. These coefficient estimates again suggest that, while many of the smaller firms didn't, the much larger firms boosted their bond issuance during the crisis. The result in row 17 in column 4 shows that, in contrast, bank loans during the crisis tended to rise at smaller firms, while falling at larger firms.

E. Adjustments of Liquid Assets and of Real Variables

For table 8, we applied the same specifications to changes in cash and cash-equivalent (*dCash*$_{t+1}$), to net purchases of investment securities (*SecPurch*$_{t+1}$), to changes in general and administrative costs (*dGACost*$_{t+1}$), to changes in the numbers of firms' employees (*dEmployee*$_{t+1}$), and to changes in (net) capital expenditures (*dCapex*$_{t+1}$), each over the upcoming year, t+1.

Table 8 about here

Rows 8 and 17 in column 1 in table 8 show that Japanese firms held more cash during the crisis, but that effect did not differ by firm size. The estimated coefficient for *Crisis* in column 2 indicated that firms tended to sell some of their holdings of investment securities during the crisis. The coefficient on *Crisis * Size*$_t$ in column 2 being negative and statistically significant indicates that larger firms tended to sell more investment securities than smaller firms sold. The estimated coefficient on *Crisis* in column 5 being significantly negative suggests that firms reduced their capital expenditures during the crisis, even while controlling for sales and other variables. However, the estimated coefficient for *Crisis * Size*$_t$ was positive and statistically significant

suggesting that larger firms reduced their capital expenditures less than smaller firms reduced theirs.

VII. Changes in Credit Markets vs. Changes in Firms' Conditions

A. Net Bond Flows, Gross Issuance, and Bonds Maturing

Table 9 shows the changes in bonds, gross bond issuance, and the amounts of maturing bonds during the crisis year FY2008 for the firms in our sample when grouped by their asset sizes as of the end of FY2007 (March 31, 2008): All, very large (the largest 10 percent), large (the largest 10 to 50 percent), and the smallest (the smallest 50 percent) firms. Row 1 of column 1 shows that, during the crisis year, firms' bonds outstanding declined on average by 0.690 percent of their assets.

During the crisis, firms issued bonds equal to 0.983 percent of their assets on average, as shown in column 2, but that gross flow of new issues was considerably lower than the 1.501 percent of assets that matured over that year (column 3). As a result, column 4 shows that difference, one measure of net bond flows, was negative (-0.518). For each size group, column 1 shows that the other measure of net flows of corporate bonds was lower for each group than its flow in column 4. One reason the column 1 flows were smaller, here mostly more negative, than the difference between gross issuance and maturing bonds in column 4 was early redemptions due to bonds being called.

Table 9 about here

Column 1 show that bonds outstanding declined most at the smallest firms and also declined noticeably at large firms. In contrast, bonds outstanding actually rose at the very largest firms. Columns 2 and 3 show that the largest firms issued the most bonds, despite their having the fewest maturing bonds. Despite their having the most bonds maturing, the volume of bonds issued by the smallest firms was about the same as the volume of bonds issued by large firms.

We also calculated a measure of how atypical bond issuance was during the crisis. We wanted to see whether the largest firms' issuing unusually large or small amounts of bonds during the crisis than they typically issued. We also wanted to see if the pattern during the crisis year of the largest firms' issuing more bonds than smaller firms issued was typical. Given our data, we approximated "typical" amounts of bond issuance by the average amount for each size group of its bond issuance over FY2005-2007, the three fiscal years prior to the crisis. Perhaps surprisingly, column 5 shows that bond issuance before the crisis differed little across the firm size groups. Column 6 shows that issuance was nearly ½ percent (of their assets) lower than was typical for all but the very largest firms. Put another way, bond issuance for the smallest 90 percent of our firms was about 1/3 lower than before the crisis. Despite the financial and economic turmoil of the crisis, however, the largest firms issued about their typical amounts of bonds.

B. Allocating Changes in Debt, Bonds, and Loans to Credit Market and to Firms' Conditions

We next attributed, or allocated, the changes in firms' financial and real variables during the crisis to changes in credit market conditions and to changes in in firms' own conditions. Based on the estimates in the tables above, we allocated the changes during the crisis in net bond flows, in bond issuance, in net (bank) flows, and in firms' other financial and real variables to changes in markets and to changes in firms. We used our estimates in Tables 7 and 8 of firms'

financial and real targets and adjustments and the actual changes in those regressions' variables for the crisis year FY2008.

We used a Blinder-Oaxaca (BO) decomposition to allocate the changes in outcomes at firms to changes in credit market conditions or to changes in firms' conditions. To illustrate how a BO decomposition allocates the changes during the crisis, we begin by expressing a regression generically as $y = b \bullet x$. Totally differentiating that expression gives $dy = b \bullet dx + x \bullet db$. Like the total derivative, a BO decomposition allocates the total change in a dependent variable (e.g., in bond issuance, bank loans, cash holdings, employment, capital expenditures, etc.) partly to changes in the estimated coefficients and partly to changes in the independent variables.

For each of our dependent variables, the portion of the change that the BO decomposition allocated to changes in credit market conditions was the sum of the products of the changes in coefficients that were associated with the crisis and the pre-crisis values of the independent variables, i.e., $x \bullet db$. Our estimates of the crisis-related changes in the coefficients (db) are shown in rows 8–18 in Tables 7 and 8.

Equation (6) shows the two parts of the BO decomposition for the total change in the net flow of bonds, $ddBonds_{i,t+1}$. (The change in the flow is the second difference of bonds outstanding.) We calculated $x \bullet db$, the effect of the change in credit markets on $dBonds_{t+1}$, with the coefficients shown in rows 8–18 of column 3 in Table 7 and the pre-crisis values of their associated variables, as shown in the top row of equation (6) below:

(6) $$ddBonds_{i,t+1} = 0.06 + 0.78*ECM_{i,t} - 0.21*Matbonds_{i,t}{}^{t+1} + \ldots -0.16*Size_t*Foreign_t$$
$$-0.80*dECM_{i,t} -0.49*dMatbonds_{i,t}{}^{t+1} + 0.02*dMatloans_{i,t}{}^{t+1} + \ldots + 0.00*ddSales_{i,t}$$

As noted earlier, we mean-centered variables that were interacted with *Crisis*. As in Table 7, the mean during the crisis of each of the variables in the first row of equation (6) is zero, which implies that the total effect of the change in credit markets on $dBonds_{t+1}$ is measured by the estimated coefficient on *Crisis*. That estimate of 0.06, also shown in the first row of equation (6), appears as 0.058 in row 2 of column 2 in Table 10.

The portion of the total change in net bond flows that was due to changes in firms' conditions (e.g., changes in sales, in probabilities of default, in assets, etc.), $b \bullet dx$, was calculated as the sum of the products of the dependent variable's coefficients before the crisis and the changes in the independent variables from t-1 to t (because our estimating equations specify that independent variables are lagged one year). The coefficients that are associated with firms' conditions, *b*, are shown in rows 1–7 of Tables 7 and 8. The portion of the total change in $dBonds_{t+1}$ from the pre-crisis year FY2007 to the crisis year FY2008 that was due to changes in firms' conditions was calculated with the coefficients shown in rows 1–7 of column 3 in Table 7 and the changes in the values of the firms' conditions variables, i.e., *dx*. The elements of their sum are shown in the second row of equation (6).

Table 10 shows for each firm size group the total changes in the net flows of debt, bonds, and (bank) loans during the crisis, as well as the allocations based on the BO decomposition of the total changes to changes in credit market conditions and to changes in firms' conditions. For all firms, on average, row 1 shows that, while total bond flows shrank by 0.188, loan flows expanded by far more (1.886), leading to a total debt flow during the crisis that was larger by 1½ percent of assets. Based on the estimates across all firms, the BO decomposition allocated the small change in bond flows to changes in firms, but allocated the large change in loan flows entirely to changes in credit markets.

Table 10 about here

The changes in flows in Table 10 differ by firm size group and by type of corporate liability, bonds vs. loans. While row 4 shows that the total net flow of bonds outstanding changed little for the very largest firms (0.051), rows 5 and 6 show that the total masked an increase due to credit market conditions that was offset by a decrease due to changed conditions at the very largest firms. Rows 5 and 6 also imply that the very large (2.515) change in the flow of loans was allocated to changes in both credit markets and the very largest firms' conditions.

The decline in bond flows at large firms was also allocated to changes in those firms, with changes in credit markets being estimated to have raised bond flows somewhat and loan flows considerably. In addition, row 9 implies that the reduction (1.012) in loan flows for large firms that were allocated to changes in their conditions were offset by two-thirds by increased loan flows (0.676).

For the other half of firms, the estimates in Table 10 paint a very different picture. Although changes in the conditions in firms below median size warranted an increase (0.404) in the flow of their bond issuance, row 11 shows that about half of that increase was offset by changes in credit markets that reduced the bond flows of the 50 percent of firms in this group. Thus, Table 10 suggests that the crisis turned bond markets against the smallest half of firms, while turning them especially toward the very largest firms. Consistent with the large decline in yield spreads that very large Japanese firms enjoyed after the onset of the crisis, rows 5 and 8 in column 2 show that the change in credit market conditions actually boosted the flows of bonds at the large and at the very largest firms.

C. Changes in Flows of Bond Issuance During the Crisis

Table 11 presents data and estimates for bond issuances during the crisis by firm size group. Columns 1 – 3 show the change in bond issuance, in maturing bonds, and their difference. Column 1 shows that the flow of new issues changed little from the year before the crisis to the year of the crisis (0.050). In line with the changes in net bond flows shown in Table 10, the very largest and the smallest size groups issued more bonds during the crisis year than they did the year before and the group of large firms issued fewer bonds then. The change in the flows of maturing bonds reinforced the pattern across firm sizes in column 1. More bonds maturing during the crisis for large firms led that group to have the largest reduction in the measure of changes in net bond flows used in column 3. By that measure, column 3 also shows that the groups of the very largest firms and of the smallest firms had larger flows of bonds during than the year before the crisis. (For convenience, the data in column 2 of Table 10 are repeated as columns 4 – 6 in Table 1.) The results of the BO decomposition of the more complete measure of the change in net bond flows are shown in columns 4 – 6.

Table 11 about here

Columns 7 – 9 then show the same decompositions for the change in bond issuance that columns 4 – 6 shows for the changes in the net flow of bonds outstanding. (For convenience, column 7 repeats column 1.) For all firms, while row 1 of column 7 shows that the flow of issuances was 0.0500 higher during the crisis, row 1 of column 8 shows that the effect of changes in credit market conditions was to reduce bond issuance during the crisis by 0.085. Column 9

shows that their weaker conditions reduced bond issuance for the very largest and for large firm size groups, in contrast to the changes in conditions and issuance of the smallest firms.

What did affect the smallest ½ of firms, again, was the change in credit market conditions. Column 8 shows that the shortfall of their issuances during the crisis, which column 6 of Table 10 showed that we calculated to be atypically low by 0.471, was allocated by very close to that amount (0.446) to changes in credit market conditions.

Large firms were not calculated to have had their issuance flows slowed by credit market conditions. Instead, their reduced flow of issuances (-0.218) was more than accounted for by changes in large firms' conditions (-0.379).

The nearly unchanged flow of bonds issued by the very largest firms again masks the sizable boost (0.728) to issuance that credit market conditions gave them that was almost entirely offset by the effects of changes in the conditions of the very largest firms (-0.662). Thus, the gross flows of new bond issues were substantially reduced by credit market changes during the crisis at the smallest firms, while those changes boosted bond issuance and net bond flows at the very largest firms. The group in between the smallest and the very largest, i.e., the large firms, were affected by amounts in between.

D. Changes in Cash Holding, Net Purchases of Securities, and Real Variables

Two, rather different ways that firms can adjust to changes in markets and in their own conditions are by changing their holdings of liquid assets, such as cash and securities, and by changing their operations, such as by reducing general and administrative (G&A) costs, employees, or capital expenditures (capex). Using cash or selling securities typically can be done quickly with low or no transactions costs. Changes in firm's operations are typically impose

much higher transactions or adjustment costs. The extra costs can take several forms: There may be explicit costs, say costs of severance packages for employees, or implicit, say costs of management and other employees time or costs attributable to delays or gradual adjustments.

Table 12 shows how the BO decompositions allocated changes in firms' cash and securities holdings, costs, employees, and capital expenditures to changes in markets and in firms. Like Tables 10 and 11, Table 12 shows the actual and allocated changes in the net flows (relative to firms' assets) from the year before to the year of the crisis FY2008.

Table 12 about here

Whether the crisis significantly boosted U.S. corporations' demands for cash has been much discussed but less resolved. In light of the adverse events and increased uncertainties about financial and real markets, increased corporate demand for cash would not be surprising. Assessing whether demand rose is problematic if financial and real events and markets simultaneously made it more difficult to accumulate cash.

Allocating changes in net flows into cash and into securities into the portions attributable to changes in credit market conditions and the portions attributable to changes in firms' conditions may provide some hints, but the allocations to changes in markets and to firms probably need not correspond to allocations to desired and to undesired changes in flows into cash holdings. Changes in credit market conditions, for example, during the crisis might well have simultaneously boosted desired cash and reduced actual cash. In a crisis, firms might encounter credit markets that are suddenly less willing to provide cash, e.g., via bond issuance. In that case, firms that ended up with less bond issuance and resulting cash might be especially eager to hold more

cash to protect themselves from liquidity shortfalls that might arise from credit market disruptions.

The error-correction terms, $\boldsymbol{ECM_{i,t}}$, do provide estimates of the deviations of financial and real variables from each firm's targets. Our estimates of adjustments of financial and real variables were based on firms' responding to prior, and thus pre-crisis, deviations. Nonetheless, the estimated deviations at the end of or during the crisis year from their targets could provide information about how much variables might have fallen short of the amounts that firms desired.

Column 1 of Table 12 shows that firms of all sizes had higher net flows into their cash accounts during the crisis. (Table 12 does not show how much firms boosted their cash holdings, but rather how much their net flows changed.) The smallest firms boosted their flows into cash by the largest amount (1.694), while the very largest firms boosted theirs by the smallest amount (1,191). The large, positive allocations in rows 5, 8, and 11 of column 1 for firms of all size groups imply that faster flows into their cash accounts reflected changes in credit market conditions. In contrast, the allocations imply that changes in firms' conditions were associated with smaller flows during the crisis into cash accounts for the very largest firms, but larger flows for the smallest firms.

Rows 6, 9, and 12 show the changes in the net flows into cash accounts associated with changes in firms' conditions, apart from any changes in coefficients associated with the crisis. These rows reflect the changes in flows accounted for by firms' changes in sales, deviations from targets, default risk, and the explanatory variables for cash. Actual and allocated changes in the other category within liquid assets, securities, are shown in column 2. Again, rather than slowing, firms of all sizes modestly sped up their holdings of liquid assets, here in the form of securities. Minor slowing was allocated to the effects of the changes in credit market conditions, but,

for each firm size group, those reductions were more than offset by increases allocated to changes in firms' conditions.

A second way for firms to adjust was to make changes to their operations. Columns 3 -5 show that, compared with the year before the crisis, during the crisis, the changes in (general and administrative) costs, (the numbers of) employees, and capital expenditures were each negative for each firm size group. (Employee-related costs are a component of G&A.) Not surprisingly, then, each of these real, or operational, categories declined during the crisis. In addition, 16 of the 18 estimated allocations in rows 5 – 12 of columns 3 – 5 were negative. Undoubtedly, several, and maybe most, of those allocations were not negative by statistically significant amounts. Nevertheless, some were notably large.

Although the very largest firms had the largest reductions in costs and in capital expenditures (capex) during the crisis, they also had the smallest reductions in numbers of employees. That relatively small reduction may reflect stronger commitments to continuing employment at the very largest firms in Japan. Perhaps consistent with Japanese firms' commitments to continuing employment, the decompositions in Column 4 show that employment for all firm size groups was reduced less by changes in firms' conditions than by changes in credit market conditions. Instead of cutting employment, G&A costs, perhaps non-employee-related costs in particular, declined considerably, with sizable allocations both to changes in markets and to changes in firms.

In light of their favorable treatment in credit markets, the allocations in rows 5 and 8 of column 3 are surprising. If bond markets hadn't turned against them as much as against the smallest firms, then it is surprising that the very largest and large firms had such large reductions in costs (other than for employees) allocated to changes in credit markets. The results for capex, on the other hand, better fit with our earlier credit market results.

VIII. Conclusion

The turmoil that originated in U.S. mortgage and housing markets in 2007 grew into a global financial crisis and a global output reduction. As it grew, the crisis disrupted bond markets that seemed little connected to U.S. mortgages. Here, we analyzed whether Japanese corporate credit was affected by the "Lehman shock," as it is known in Japan.

For our analysis, Japan offers two important advantages over the U.S.: (1) Japan was barely involved in U.S. mortgage and housing markets and (2) Japanese firms must report data for bonds and for loans separately. These features let us estimate how net and gross bond flows were affected by the Lehman shock generally and by bond maturing and loans maturing during the crisis in particular.

We found the crisis shifted the prior functions for Japanese firms' bond s outstanding and issuance significantly. While new bond issues funded about one-half of repayments of maturing bonds before the crisis, less than one-third were funded with new bond issues during the crisis. The other 20 percent was financed with more bank loans and, to a lesser extent, with reduced cash, costs, and capital expenditures. While new bond issues over the following year typically closed up almost 80 percent of shortfalls from targeted bond amounts, we detected no response of new issues to shortfalls during the crisis.

During the crisis, in Japan, again unlike the U.S., banks suffered few losses and were willing to make business loans. While controlling for firms' sales, default probabilities and other conditions, we found that bonds' maturing during the crisis led to atypically large increases in their firms' bank loans. In that regard, the healthy banking system in Japan served as a shock absorber when the Lehman shock hit Japanese markets and firms.

During the crisis, yields, issuance, and amounts outstanding of Japanese bonds hinted at important cross-currents. In the U.S., yield spreads rose on bonds of all credit ratings. In Japan, however, they rose for most corporate bonds, but yield spreads fell noticeably for bonds of a few of the very-largest, highly-rated firms. Consistent with that disparity, issuance declined noticeably for very many firms, but it rose during the crisis for a few of the very-largest, highest-quality firms. To pursue these differences, we estimated effects by firm size groups.

We also estimated how much of the changes during the crisis of actual flows of bonds, loans, cash, costs, and other variables was associated with damaged markets and how much was associated with damaged firms. Not surprisingly, our estimates differed across firm size group. Our estimates allocated most of the reduction in bond flows to changes in firms' conditions. Our estimates allocated nearly the entire decline in smaller firms' bond issuance to the crisis. In contrast, the crisis boosted bond issuance for larger firms.

At firms of all sizes, the crisis was estimated to have boosted their loans from banks. Thus, when corporate bond market in Japan was hit by the Lehman shock, Japanese banks served as "shock absorbers," not by incurring more actual or expected costs or risks, but by willingly providing more loans to listed, bond-issuing corporations and thereby absorbing the negative shock that would have otherwise hit firms' total credit.

REFERENCES

Almeida, Heitor, Murillo Campello, Bruno Laranjeira, and Scott Weisbenner. 2009. "Corporate Debt Maturity and the Real Effects of the 2007 Credit Risk." National Bureau of Economic Research Working Paper 14990.

Amiti, Mary, and David E. Weinstein. 2011. "Exports and Financial Shocks." *The Quarterly Journal of Economics* 126: 1841-1877.

Amiti, Mary, and David E. Weinstein. 2013. "How Much do Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data." National Bureau of Economic Research Working Paper 18890.

Asia Economic Policy Conference. 2009. "Asia and the global financial crisis." Federal Reserve Bank of San Francisco.

Bliss, Barbara A., Yingmei Cheng, and David J. Denis. 2013. "Corporate Payout, Cash Retention, and the Supply of Credit: Evidence from the 2008-09 Credit Crisis." Unpublished.

Brewer III, Elijah, Hesna Genay, William Curt Hunter, and George G. Kaufman. 2002. "The Value of Banking Relationships During a Financial Crisis: Evidence from Failures of Japanese Banks." Preliminary.

Campello, Murillo, Erasmo Giambona, John R. Graham, and Campbell R. Harvey. 2011. "Liquidity Management and Corporate Investment During Financial Crisis." *The Society for Financial Studies* 24: 1944-1979.

Carbo-Valverde, Santiago, Francisco Rodriguez-Fernandez, and Gregory F. Udell. 2012. "Trade Credit, The Financial Crisis, and Firm Access to Finance." Unpublished.

Chor, Davin, and Kalina Manova. 2011. "Off the Cliff and Back? Credit Conditions and International Trade During the Global Financial Crisis." *Journal of International Economics* 87 (2012): 117-133.

Colla, Paolo, Filippo Ippolito, and Kai Li. 2013. "Debt Specialization." *Journal of Finance* 68: 2117-2141.

Duchin, Ran, Oguzhan Ozbas, and Berk A. Sensoy. 2010. "Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis." *Journal of Financial Economics* 97 (2010): 418-435.

Flannery, Mark J., Emanuela Giacomini, and Xiaohong (Sara) Wang. 2013. "The Effect of Bank Shocks on Corporate Financing and Investment: Evidence from 2007-2009 Financial Crisis." Preliminary.

Flannery, Mark J, and Kasturi Ragan. 2006. "Partial Adjustment toward Target Capital Structures." *Journal of Financial Economics* 9: 469-506.

Gozzi, Juan Carlos, Ross Levine, Maria Soledad Martinez Peria, and Sergio L. Schmukler. 2012. "How Firms Use Domestic and International Corporate Bond Markets." National Bureau of Economic Research Working Paper 17763.

Hovakimian, Armen, and Guangzhong Li. 2011."In Search of Conclusive Evidence: How to Test for Adjustment to Target Capital Structure." *Journal of Corporate Finance* 17: 33-44.

Ivashina, Victoria, and David Scharfstein. 2010. "Bank Lending During the Financial Crisis of 2008." *Journal of Financial Economics* 97 (2010): 319-338.

Japan Securities Dealers Association. 2010. "Toward Vitalization of the Corporate Bond Market." The Study Group to Vitalize the Corporate Bond Market.

Kaya, Orcun, and Thomas Meyer. 2014. “Tight Bank Lending, Lush Bond Market: New Trends in European Corporate Bond Issuance.” Deutsche Bank Research, edited by Jens Dallmeyer, 1-16.

Leary, Mark T., and Michael R. Roberts. 2005. “Do Firms Rebalance their Capital Structures? *Journal of Finance* 60: 2575-2619.

Lemonn, Michel L., Michel R. Roberts, and Jaime F. Zender. 2008. “Back to the Beginning: Persisitence and the Cross-Section of Corporate Capital Structure.” *Journal of Finance* 63: 1575-1608.

Miyakoshi, Tatsuyoshi, Toyoharu Takahashi, Junji Shimada, and Yoshihiko Tsukada. 2014. “The Dynamic Contagion of the Global Financial Crisis into Japanese Markets.” *Japan and the World Economy* 31 (2014): 47-53.

Oztekin Ozde, and Mark J.Flannery. 2012. “Institutional Determinants of Capital Structure Adjustment Speeds.” Journal of Financial Economics 103 (2012), 88-112.

Rauh, Joshua D., and Amir Sufi. 2010. “Capital structure and debt structure.” *Review of Financial Studies* 23: 4242-4280.

Shioji, Etsuro, and Taisuke Uchino. 2012. “External Shocks and the Japanese Business Cycles: Impact of the ‘Great Trade Collapse’ on the Automobile Industry.” Unpublished.

Uchino, Taisuke. 2013. “Bank Dependence and Financial Constraints on Investment: Evidence from the Corporate Bond Market Paralysis in Japan.” *Journal of Japanese and International Economics* 29 (2013): 74-97.

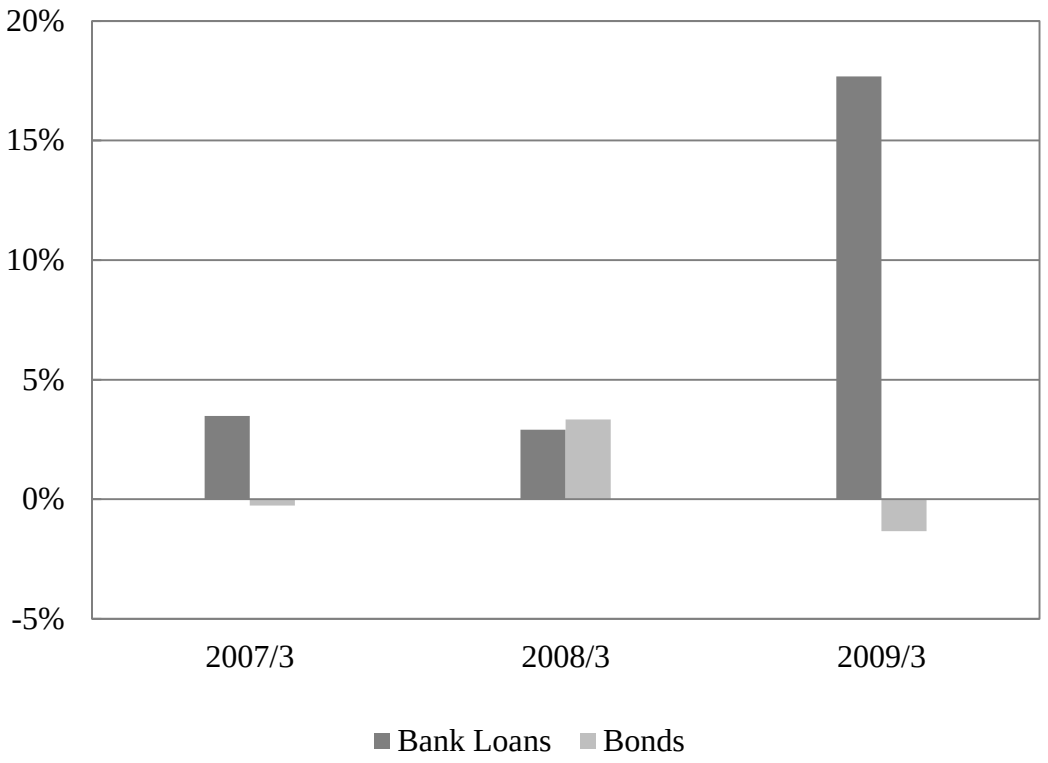

FIGURE 1

GROWTH RATES OF JAPANESE NONFINANCIAL CORPORATE BONDS AND LOANS OUTSTANDING

Notes: Percent change, annually, over fiscal years ending March 31. Listed, nonfinancial, Japanese corporations that had bonds outstanding. Source: Nikkei NEEDS Financial QUEST and authors' calculations.

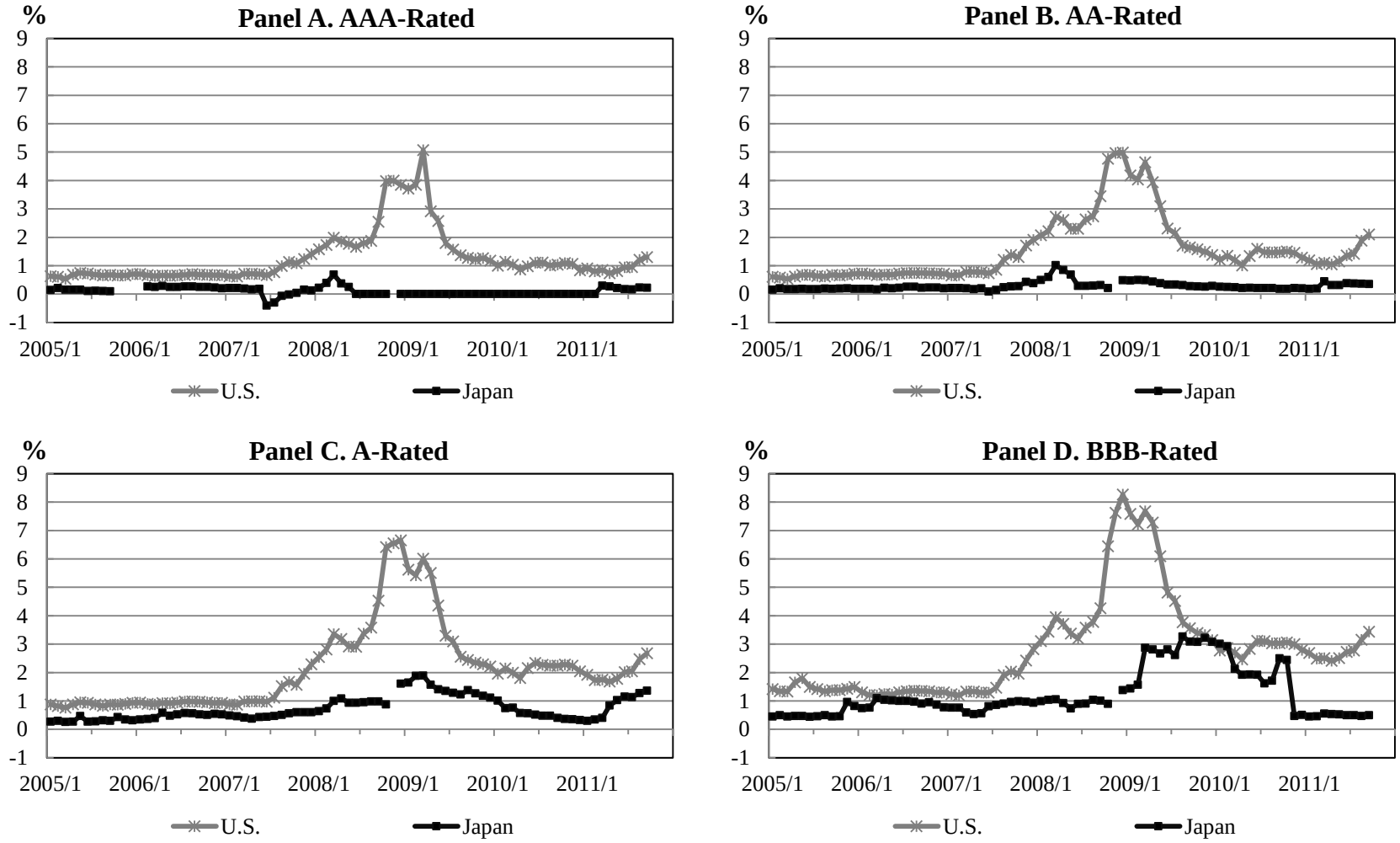

FIGURE 2

SPREADS OF U.S. AND JAPANESE CORPORATE BONDS, BY RATING

Notes: Percent. Spreads over 5-year U.S. Treasury yields and over 5-year Japanese Government bonds, monthly averages, January 2005-Semptember 2011. Source: Bank for International Settlements.

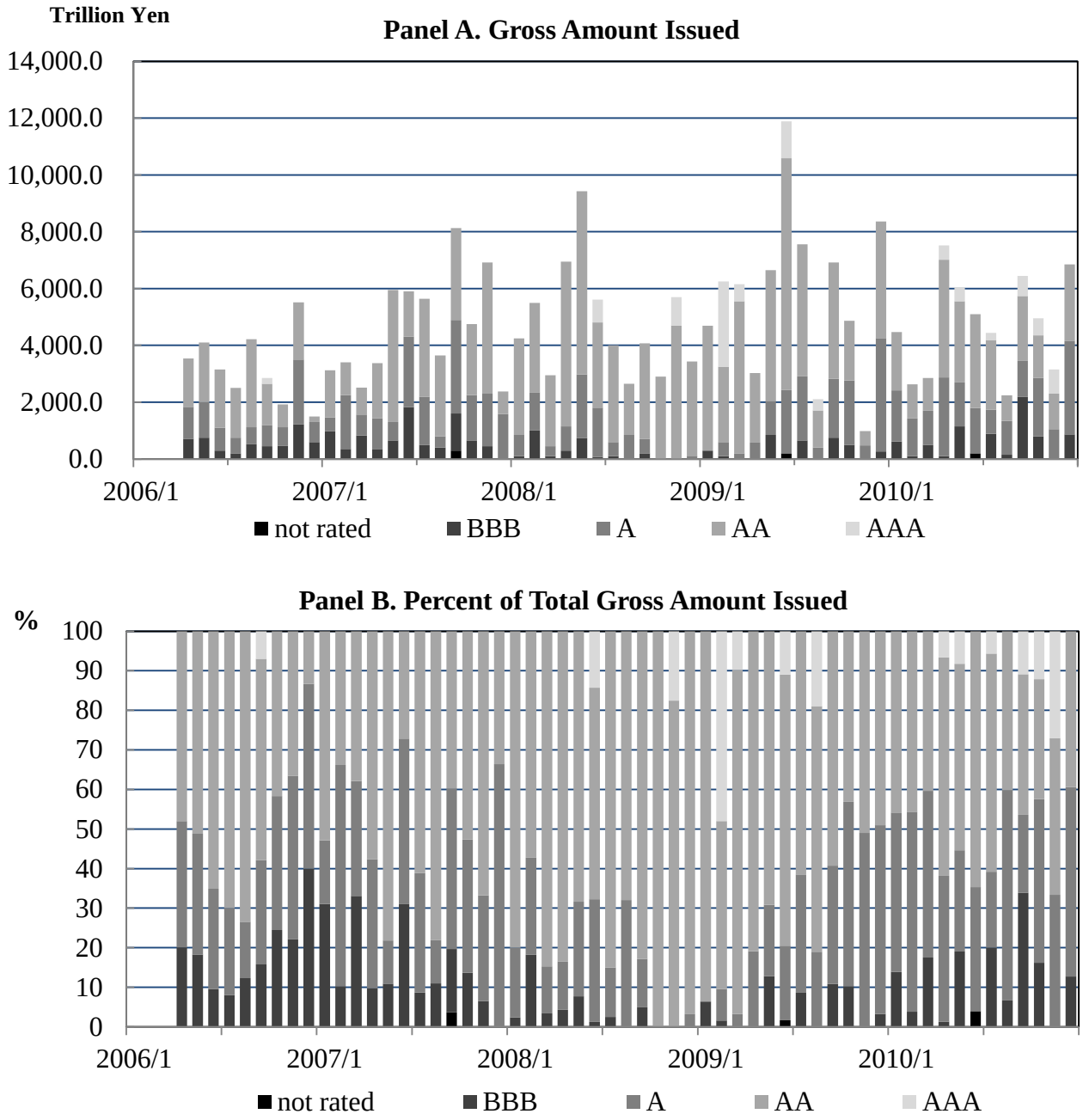

FIGURE 3

GROSS AMOUNTS OF JAPANESE CORPORATE BONDS ISSUED, BY RATING

Notes: Monthly, April 2006-December 2010. Nonfinancial, Japanese corporations. For bonds with split ratings, we used bonds' ratings in this sequence: J&I, JCR, and S&P. Source: Japan Securities Dealers Association and authors' calculations.

TABLE 1

PERCENT AND CHANGES OF SELECTED BALANCE SHEET ITEMS OF NONFINANCIAL, JAPANESE CORPORATIONS, BY ASSET PERCENTILES
(MARCH 2008 TO MARCH 2009)

		Assets Percentile		
	All Firms	>= 99.5%	50.0%>= & <99.5%	< 50%
	(1)	(2)	(3)	(4)
1. Number of firms	898	13	576	309
Panel A. Percent of Total Assets in March 2008:				
2. Total Assets	100	100	100	100
3. Cash	6.3	6.3	6.2	13.2
4. Short-term investments	1.0	0.8	1.0	0.8
5. PP&E	35.4	30.6	37.6	32.1
6. Total Liabilities	66.3	66.9	66.1	59.8
7. Short-term borrowings	11.9	12.8	11.4	16.7
8. Long-term borrowings	24.2	30.3	21.5	13.0
9. Bonds	10.1	14.4	8.2	3.0
10. Loans	14.1	15.9	13.3	10.0
Panel B. Changes as Percent of Total Assets in March 2008:				
11. Total Assets	-6.4	-7.1	-6.0	-6.7
12. Cash	0.6	0.7	0.6	0.1
13. Short-term investment	-0.1	0.0	-0.1	-0.2
14. PP&E	-1.1	-1.0	-1.2	0.4
15. Total Liabilities	-2.1	-2.5	-1.8	-3.1
16. Short-term borrowing	0.7	0.1	1.0	0.3
17. Long-term borrowing	2.0	2.7	1.7	0.3
18. Bonds	-0.2	-0.1	-0.2	-0.5
19. Loans	2.2	2.8	1.9	0.8

Notes: Listed Japanese nonfinancial corporations with bonds outstanding.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 2

MNEMONICS, DEFINITIONS, AND TIMING OF VARIABLES

Mnemonics	Definitions	Timing
Panel A. Dependent variables (each as a percent of *Total Assets*(*t*)):		
1. $Issuance_{t+1}$	(Gross flow of) Bonds issued	*Issuance* (during *t+1*)
2. $dDebt_{t+1}$	Change in total debt outstanding	*Debt*(*t+1*) – *Debt*(*t*)
3. $dBonds_{t+1}$	Change in bonds outstanding	*Bonds*(*t+1*) – *Bonds*(*t*)
4. $dBLoans_{t+1}$	Change in bank loans outstanding	*BLoans*(*t+1*) – *BLoans*(*t*)
5. $dCash_{t+1}$	Change in sum of cash plus deposits	*Cash*(*t+1*) – *Cash*(*t*)
6. $SecPurch_{t+1}$	Net purchases of investment securities	*SecPurch*(during *t+1*)
7. $dGACost_{t+1}$	Change in general & administrative	*GACost*(*t+1*) – *GACost*(*t*)
8. $dEmployees_{t+1}$	Change in number of employees	*Employees*(*t+1*) – E*mployees* (*t*)
9. $dCapex_{t+1}$	Change in capital expenditure	*Capex*(*t+1*) – *Capex*(*t*)
Panel B. Independent variables:		
10. *Crisis*	Equal to one in FY2008 (4/1/2008–3/31/2009), zero otherwise	4/1/2008–3/31/2009
11. $Size_t$	Total Assets in trillion yen	*Size*(*t*)
12. $\boldsymbol{ECM}_t$	Error-correction term based on equation (2) targets	***ECM***(*t*)
13. $Matbonds_t^{t+1}$	Bonds maturing within next 12 months / Total Assets(t)	*Matbonds*(*during t+1*)
14. $Matloans_t^{t+1}$	Long-term loans maturing within next 12 months / Assets(t)	*Matloans*(*during t+1*)
15. dPD_t	Change in probability of default within next 12 months (as of June, three months after end of FY)	*PD*(*t*) – *PD*(*t-1*)
16. dq_t	Change in q, where q = MVA/BVA = (BV Liabilities. + MV Equity) / (BV Liabilities. + BV Equity)	*q*(*t*) – *q*(*t-1*)
17. $dAssets_t$	Change in total assets / Assets(t)	(*Assets*(*t*) –*Assets*(*t-1*)) / *Assets*(*t-1*)
18. $dSales_t$	Change in total sales / Assets(t)	(*Sales*(*t*) –*Sales*(*t-1*)) / *Sales*(*t-1*)
19. $Foreign_t$	Foreign sales / Sales	*Foreign*(*t*) / *Sales*(*t-1*)
20. SEC_t	Equal to one if firm is SEC registrant, zero otherwise	*SEC*(*t*)

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 3

SUMMARY STATISTICS:

REGRESSION VARIABLES FOR TARGET FUNCTIONS AND FOR ADJUSTMENT FUNCTIONS

	Mean	Std. Dev.	10%	Median	90%
Panel A. Target function variables					
1. $Debt_t$	28.431	15.660	9.358	26.536	50.749
2. $Bonds_t$	6.113	6.093	0.615	4.565	13.169
3. $BLoans_t$	16.608	13.333	0.782	13.875	35.050
4. $GACost_t$	20.272	16.960	6.221	15.125	39.766
5. $Employees_t$	3.216	4.166	0.857	2.249	5.984
6. $Capex_t$	3.763	5.503	0.267	3.182	8.582
7. PD_t	0.003	0.004	0.000	0.001	0.006
8. q_t	1.209	0.521	0.841	1.080	1.669
9. $Size_t$	0.527	1.832	0.009	0.068	1.293
10. $Sales_t$	110.37	53.45	58.12	98.36	178.56
11. $Foreign_t$	0.164	0.223	0.000	0.008	0.503
12. SEC_t	0.025	0.157	0.000	0.000	0.000
Panel B. Adjustment function variables					
13. $Issuance_{t+1}$	0.940	2.249	0.000	0.000	3.345
14. $dDebt_{t+1}$	0.915	8.023	-5.532	0.036	8.667
15. $dBonds_{t+1}$	-0.652	2.815	-3.109	-0.240	1.340
16. $dBLoans_{t+1}$	1.562	6.334	-3.466	0.463	8.180
17. $dCash_{t+1}$	0.006	4.356	-4.137	0.000	4.275
18. $SecPurch_{t+1}$	-0.139	1.430	-1.089	-0.045	0.697
19. $dGACost_{t+1}$	0.222	3.543	-1.521	0.087	2.150
20. $dEmployee_{t+1}$	0.079	0.813	-0.188	0.029	0.385
21. $dCapex_{t+1}$	0.062	4.312	-3.606	0.023	3.515
22. *Crisis*	0.502	0.500	0.000	1.000	1.000
23. $Size_t$	0.458	1.356	0.010	0.075	1.203
24. ECM_t	-0.008	1.448	-1.426	0.039	1.413
25. $Matbonds_t^{t+1}$	1.426	2.218	0.000	0.656	3.661
26. $Matloans_t^{t+1}$	3.829	3.829	0.097	2.910	8.403
27. dPD_t	0.001	0.004	-0.001	0.000	0.004
28. dq_t	-0.153	0.297	-0.406	-0.097	0.042
29. $dAssets_t$	0.742	7.553	-8.887	1.235	10.404
30. $dSales_t$	5.818	12.829	-4.803	4.845	18.840
31. $Foreign_t$	0.169	0.225	0.000	0.020	0.503

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. The target function regression variables in rows 1-6 and 9 of panel A were scaled by total assets. For the statistics variables in the target function regression, we have 2,246 observations for fiscal years 2005-2007. For the statistics variables in the adjustment function regression, we have 1,364 observations for fiscal years 2006-2007.

Source: Astra Manager, Nikkei NEEDS Financial QUEST, and Credit Research Initiative (CRI) databases and authors' calculations.

TABLE 4

CORRELATIONS OF VARIABLES USED IN REGRESSIONS TO ESTIMATE FIRMS' ADJUSTMENT FUNCTIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. $Issuance_{t+1}$	1.00																		
2. $dDebt_{t+1}$	0.19	1.00																	
3. $dBonds_{t+1}$	0.50	0.31	1.00																
4. $dBLoans_{t+1}$	-0.01	0.75	-0.09	1.00															
5. $dCash_{t+1}$	0.12	0.21	0.17	0.13	1.00														
6. $SecPurch_{t+1}$	-0.02	-0.12	-0.07	-0.10	0.00	1.00													
7. $dGACost_{t+1}$	0.05	0.23	0.04	0.14	0.08	-0.09	1.00												
8. $dEmployees_{t+1}$	0.02	0.19	0.07	0.12	0.06	-0.07	0.22	1.00											
9. $dCapex_{t+1}$	0.10	0.20	0.08	0.19	-0.21	-0.02	0.02	0.03	1.00										
10. *Crisis*	0.00	0.09	-0.02	0.13	0.17	0.04	-0.17	-0.08	-0.06	1.00									
11. $Size_t$	0.04	0.03	0.07	0.01	0.01	-0.05	-0.03	-0.02	0.00	0.01	1.00								
12. ECM_t	-0.08	0.04	-0.15	0.08	-0.07	-0.04	0.01	-0.01	-0.01	-0.01	0.04	1.00							
13. $Matbonds_t^{t+1}$	0.32	-0.06	-0.53	0.13	-0.04	0.08	-0.01	0.02	0.01	0.03	-0.03	0.06	1.00						
14. $Matloans_t^{t+1}$	0.06	-0.17	-0.01	-0.18	-0.07	0.07	-0.04	-0.01	-0.02	0.02	-0.07	-0.01	0.08	1.00					
15. dPD_t	0.02	-0.19	-0.07	-0.19	0.00	0.01	-0.20	-0.08	-0.03	0.31	0.00	0.04	0.01	0.16	1.00				
16. dq_t	-0.02	0.00	0.12	-0.06	0.08	-0.05	0.14	0.00	0.05	-0.13	0.08	-0.12	-0.05	0.01	-0.18	1.00			
17. $dAssets_t$	0.02	0.12	0.11	0.05	-0.05	-0.12	0.22	0.08	0.02	-0.33	0.08	-0.05	-0.11	-0.07	-0.07	0.03	1.00		
18. $dSales_t$	0.00	0.10	0.07	0.08	-0.03	-0.08	0.09	0.08	0.09	-0.06	0.03	0.01	-0.08	-0.05	-0.07	-0.05	0.36	1.00	
19. $Foreign_t$	-0.02	0.07	0.01	0.08	0.03	-0.03	-0.04	-0.05	0.00	0.03	0.15	0.01	-0.09	-0.20	0.02	0.01	0.17	0.12	1.00

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the correlation variables in the adjustment function regression, we have 1,364 observations for fiscal years 2006-2007.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 5

ESTIMATED TARGET FUNCTIONS:

BONDS, BANK LOANS, COSTS, EMPLOYEES, AND CAPITAL EXPENDITURES

	$Debt_t$ (1)	$Bonds_t$ (2)	$BLoans_t$ (3)	$GACost_t$ (4)	$Employees_t$ (5)	$Capex_t$ (6)
1. PD_t	362.96 ***	12.96	107.79 *	24.06	-8.57	-117.31 *
	(5.69)	(0.39)	(1.84)	(0.77)	(-1.17)	(-1.72)
2. $PD_t * PD_t$	-1,971 *	-845	1,679 *	-129	849	1,1069
	(-1.78)	(-1.46)	(1.66)	(-0.24)	(0.67)	(0.94)
3. q_t	-1.43 ***	0.24	-1.00 ***	-0.58 ***	-0.04	-0.16
	(-3.54)	(1.11)	(-2.71)	(-2.95)	(-0.82)	(-0.36)
4. $Size_t$	1.02	-2.57 ***	-0.37	-0.85	-0.30 **	0.62
	(0.81)	(-3.92)	(-0.32)	(-1.39)	(-2.07)	(0.46)
5. $Size_t * Size_t$	-0.01	0.06 ***	0.01	0.01	0.00	-0.01
	(-0.30)	(3.38)	(0.28)	(0.56)	(1.35)	(-0.41)
6. $Sales_t$	-0.1 ***	-0.02 ***	-0.05 ***	0.12 ***	0.02 ***	-0.02 *
	(-8.09)	(-2.74)	(-4.76)	(20.77)	(11.83)	(-1.76)
7. $Foreign_t$	-0.92	-3.26 *	-0.74	-2.39	1.19 ***	1.17
	(-0.28)	(-1.92)	(-0.25)	(-1.51)	(3.20)	(0.34)
8. SEC_t	4.15	3.51	-1.37	-5.12 **	-0.16	-0.13
	(0.88)	(1.42)	(-0.32)	(-2.22)	(-0.29)	(-0.03)
9. *FY2006*	-1.16 ***	-0.34 ***	-0.52 **	-0.00	-0.01	0.55 **
	(-5.26)	(-2.95)	(-2.55)	(-0.03)	(-0.37)	(2.36)
10. *FY2007*	-1.01 ***	-0.59 ***	0.16	0.12	0.04	0.96 ***
	(-3.44)	(-3.84)	(0.59)	(0.82)	(1.31)	(3.07)
11. *Constant*	40.42 ***	9.96 ***	23.79 ***	8.35 ***	1.41 ***	5.75 ***
	(25.25)	(11.90)	(16.19)	(10.75)	(7.70)	(3.37)
Fixed effect	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	2,278	2,278	2,278	2,251	2,278	2,273
R-squared	0.135	0.076	0.069	0.330	0.156	0.012
Number of firms	941	941	941	932	941	940

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2005-2007.

$Debt_t$ is debt outstanding. $Bonds_t$ and $BLoans_t$ are bonds outstanding and bank loans outstanding, respectively. $GACost_t$, $Employee_t$, and $Capex_t$ are balance of cash plus deposits, number of employees, and capital expenditure expense, respectively. PD_t is probability of default within next 12 months, q_t is market value of total assets (book value of liabilities plus market value of equity) divided by book value of total assets. $Sales_t$, $Foreign_t$, and SEC_t are total sales divided by total assets, the ratio of foreign sales to total sales, and SEC dummy equals one if firm was an SEC registrant and zero otherwise. $Size_t$ is total assets in trillions of yen.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

TABLE 6

ESTIMATED ADJUSTMENT FUNCTIONS:

BONDS

	$dBonds_{t+1}$ (1)	$dBonds_{t+1}$ (2)	$dBonds_{t+1}$ (3)	$dBonds_{t+1}$ (4)
1. ECM_t	-0.80 ***	-0.76 ***	-0.80 ***	-0.78 ***
	(-25.64)	(-20.73)	(-31.07)	(-23.69)
2. $Matbonds_t^{t+1}$	-0.51 ***	-0.57 ***	-0.49 ***	-0.55 ***
	(-37.61)	(-35.97)	(-39.42)	(-37.47)
3. $Matbloans_t^{t+1}$	0.02 ***	0.02 ***	0.02 ***	0.02 ***
	(4.09)	(4.37)	(4.37)	(4.81)
4. dPD_t	17.30 **	0.74	17.28 ***	-1.04
	(2.55)	(0.10)	(2.89)	(-0.14)
5. dq_t	0.87 ***		0.90 ***	
	(9.22)		(9.15)	
6. $dAssets_t$	0.03 ***	0.02 ***	0.03 ***	0.03 ***
	(11.51)	(8.35)	(11.77)	(8.81)
7. $dSales_t$	-0.00 **	-0.01 **	-0.00 **	-0.01 ***
	(-2.42)	(-3.42)	(-2.45)	(-3.46)
8. *Crisis*	0.02	0.04	0.06 *	-0.02
	(0.58)	(0.83)	(1.75)	(-0.66)
9. $Crisis * ECM_t$	0.76 ***	0.77 ***	0.78 ***	0.73 ***
	(20.87)	(18.99)	(27.22)	(20.61)
10. $Crisis * Matbonds_t^{t+1}$	-0.21 ***	-0.11 ***	-0.21 ***	-0.16 ***
	(-8.71)	(-4.39)	(-9.32)	(-7.60)
11. $Crisis * Matbloans_t^{t+1}$	-0.00	0.02 ***	0.00	0.01
	(-0.33)	(4.30)	(0.08)	(1.50)
12. $Crisis * dPD_t$	-76.69 ***	-57.04 ***	-80.76 ***	-44.43 ***
	(-9.47)	(-6.85)	(-11.76)	(-5.42)
13. $Crisis * dq_t$	-1.47 ***		-1.44 ***	
	(-14.56)		(-13.78)	
14. $Crisis * dAssets_t$	-0.03 ***	-0.02 ***	-0.03 ***	-0.03 ***
	(-9.29)	(-5.66)	(-8.95)	(-8.62)
15. $Crisis * dSales_t$	0.01 ***	0.01 ***	0.01 ***	0.01 ***
	(6.07)	(6.29)	(6.09)	(6.25)
16. $Crisis * Foreign_t$	-0.45 ***		-0.43 ***	
	(-8.66)		(-7.29)	
17. $Crisis * Size_t$	0.15 ***	0.21 ***	0.14 ***	0.08 ***
	(3.33)	(5.88)	(5.86)	(7.42)
18. $Size_t * ECM_t$	0.02	0.02		
	(0.57)	(0.65)		
19. $Size_t * Matbonds_t^{t+1}$	0.04 ***	0.04 ***		
	(3.53)	(3.90)		
20. $Size_t * Matloans_t^{t+1}$	0.01 **	0.00		
	(2.18)	(1.64)		
21. $Size_t * dPD_t$	-7.84	-4.44		
	(-0.37)	(-0.24)		
22. $Crisis * Size_t * ECM_t$	0.01	-0.03		
	(0.24)	(-0.87)		
23. $Crisis * Size_t * Matbonds_t^{t+1}$	-0.01	-0.02		
	(-0.70)	(-1.32)		
24. $Crisis * Size_t * Matbloans_t^{t+1}$	-0.02 **	-0.04 ***		
	(-2.02)	(-5.89)		
25. $Crisis * Size_t * dPD_t$	6.90	-7.92		
	(0.32)	(-0.41)		
26. $Crisis * Size_t * Foreign_t$	-0.12 *		-0.16 ***	
	(-1.95)		(-4.11)	
R-squared	0.357	0.348	0.355	0.341
Observations	1,407	1,407	1,407	1,407
Number of firms	814	814	814	814

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007.

$dBonds_{t+1}$ is change in bonds outstanding divided by initial total assets. $\boldsymbol{ECM}_t$ is long-term disequilibrium calculated based on equation (1). $Matbonds_t^{t+1}$ and $Matbloans_t^{t+1}$ are the amount of bond and long-term of bank loans matured within next 12 months deflated by total assets, respectively. dPD_t is change in the probability of default within next 12 months obtained from the Credit Re-search Initiative (CRI) database. dq_t is change in market value of total assets divided by book value of total assets. $dAssets_t$ and $dSales_t$ are change in total assets and total sales divided by initial total assets. *Crisis* is a dummy variable which has one in fiscal year 2008, zero otherwise. $Size_t$ is total assets in trillion yen. $Foreign_t$ is the ratio of foreign sales to total sales.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

*** Significant at the 1 percent level. ** Significant at the 5 percent level.* Significant at the 10 percent level.

TABLE 7

ESTIMATED ADJUSTMENT FUNCTIONS:

BOND ISSUANCE, DEBT, BONDS AND BANK LOANS

	$Issuance_{t+1}$ (1)	$dDebt_{t+1}$ (2)	$dBonds_{t+1}$ (3)	$dBLoans_{t+1}$ (4)
1. ECM_t	-0.74 ***	-1.17 ***	-0.80 ***	-1.17 ***
	(-26.06)	(-38.61)	(-31.07)	(-32.30)
2. $Matbonds_t^{t+1}$	0.51 ***	-0.04 *	-0.49 ***	0.30 ***
	(48.31)	(-1.90)	(-39.42)	(13.45)
3. $Matbloans_t^{t+1}$	0.03 ***	-0.14 ***	0.02 ***	-0.13 ***
	(5.96)	(-10.90)	(4.37)	(-11.61)
4. dPD_t	39.55 ***	-93.19 ***	17.28 ***	-10.59
	(4.80)	(-3.52)	(2.89)	(-0.66)
5. dq_t	-0.14 ***	-0.67 ***	0.90 ***	-1.81 ***
	(-2.59)	(-3.06)	(9.15)	(-21.36)
6. $dAssets_t$	0.02 ***	0.15 ***	0.03 ***	0.06 ***
	(12.22)	(41.96)	(11.77)	(19.20)
7. $dSales_t$	-0.00 *	0.02	0.00 **	0.03 ***
	(-1.74)	(8.47)	(-2.45)	(13.30)
8. *Crisis*	-0.08 **	2.33 ***	0.06 *	1.93 ***
	(-2.52)	(25.34)	(1.72)	(27.72)
9. $Crisis * ECM_t$	0.80 ***	1.14 ***	0.78 ***	0.99 ***
	(26.38)	(24.48)	(27.22)	(25.71)
10. $Crisis * Matbonds_t^{t+1}$	-0.18 ***	-0.18 ***	-0.21 ***	0.05
	(-8.67)	(-4.51)	(-9.32)	(1.37)
11. $Crisis * Matloans_t^{t+1}$	0.00	-0.11 ***	0.00	-0.09 ***
	(0.67)	(-6.08)	(0.08)	(-5.56)
12. $Crisis * dPD_t$	-51.62 ***	-435.08 ***	-80.76 ***	-404.2 ***
	(-6.11)	(-13.17)	(-11.76)	(-17.90)
13. $Crisis * dq_t$	-0.71 ***	1.65 ***	-1.44 ***	2.55 ***
	(-8.36)	(4.05)	(-13.78)	(10.52)
14. $Crisis * dAssets_t$	-0.02 ***	-0.02 **	-0.03 ***	-0.00
	(-5.89)	(-2.55)	(-8.95)	(-0.03)
15. $Crisis * dSales_t$	0.00 ***	-0.01	0.01 ***	-0.01 ***
	(3.43)	(-0.98)	(6.09)	(-2.80)
16. $Crisis * Foreign_t$	0.25 ***	5.59 ***	-0.43 ***	4.31 ***
	(3.80)	(18.29)	(-7.29)	(17.70)
17. $Crisis * Size_t$	0.23 ***	0.11 ***	0.14 ***	-0.11 ***
	(10.78)	(5.48)	(5.86)	(-7.45)
18. $Crisis * Size_t * Foreign_t$	-0.30 ***	-0.40 ***	-0.16 ***	-0.02
	(-12.31)	(-4.86)	(-4.11)	(-0.46)
R-squared	0.184	0.176	0.355	0.229
Observations	1,407	1,407	1,407	1,409
Number of firms	814	814	814	815

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007.

$Issuance_{t+1}$ is gross flow of bond issued in t+1 divided by initial total assets. $dDebt_{t+1}$ is first difference in total debt outstanding divided by initial total assets. $dBonds_{t+1}$ and $dBLoans_{t+1}$ are

changes in bonds and bank loans outstanding divided by initial total assets. $\boldsymbol{ECM}_t$ is the deviation from the prior-year target based on equation (2). $Matbonds_t^{t+1}$ and $Matbloans_t^{t+1}$ are the amount of bond and long-term of bank loans matured within next 12 months deflated by total assets. dPD_t is change in the probability of default within next 12 months obtained from the Credit Research Initiative (CRI) database. dq_t is change in market value of total assets divided by book value of total assets. $dAssets_t$ and $dSales_t$ are change in total assets and total sales divided by initial total assets. *Crisis* is a dummy variable which has one in fiscal year 2008, zero otherwise. $Size_t$ is total assets in trillion yen. $Foreign_t$ is the ratio of foreign sales to total sales.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

TABLE 8

ESTIMATED ADJUSTMENT FUNCTIONS:

CASH, NET SECURITIES PURCHASED, COSTS, EMPLOYEES, AND CAPITAL EXPENDITURES

	$dCash_{t+1}$ (1)	$SecPurch_{t+1}$ (2)	$dGACost_{t+1}$ (3)	$dEmployees_{t+1}$ (4)	$dCapex_{t+1}$ (5)
1. ECM_t	-0.30 ***	-0.07 ***	-0.60 ***	-0.66 ***	-0.42 ***
	(-13.06)	(-13.68)	(-35.03)	(-26.35)	(-18.83)
2. $Matbonds_t^{t+1}$	-0.06 ***	0.01 **	-0.03 ***	-0.00 **	0.04 ***
	(-8.13)	(2.42)	(-3.82)	(-2.45)	(4.21)
3. $Matbloans_t^{t+1}$	-0.04 ***	0.01 ***	0.06 ***	0.01 ***	0.01
	(-7.59)	(12.15)	(12.25)	(11.15)	(1.37)
4. dPD_t	-27.58 *	8.95 ***	-49.21 ***	-8.24 ***	-15.76 ***
	(-1.81)	(3.31)	(-4.91)	(-6.82)	(-2.59)
5. dq_t	1.75 ***	-0.21 ***	-0.04	-0.23 ***	0.61 ***
	(13.31)	(-13.10)	(-0.56)	(-28.89)	(5.54)
6. $dAssets_t$	-0.03 ***	-0.03 ***	0.05 ***	0.00 ***	0.04 ***
	(-5.66)	(-40.52)	(18.68)	(8.08)	(13.93)
7. $dSales_t$	-0.01 **	-0.01 ***	0.05 ***	0.01 ***	0.01 ***
	(-2.45)	(-19.04)	(24.10)	(21.22)	(4.16)
8. *Crisis*	1.38 ***	-0.18 ***	-0.68 ***	-0.08 ***	-0.15 ***
	(22.98)	(-23.07)	(-19.68)	(-19.15)	(-4.70)
9. *Crisis* * ECM_t	0.25 ***	0.05 ***	0.70 ***	0.51 ***	-0.55 ***
	(9.27)	(7.35)	(35.59)	(17.48)	(-17.43)
10. *Crisis* * $Matbonds_t^{t+1}$	-0.01	0.02 ***	0.07 ***	0.02 ***	-0.02
	(-0.86)	(4.63)	(5.64)	(11.88)	(-1.22)
11. *Crisis* * $Matloans_t^{t+1}$	-0.07 ***	0.00 ***	-0.12 ***	-0.01 ***	-0.05 ***
	(-8.03)	(2.75)	(-17.47)	(-11.91)	(-7.41)
12. *Crisis* * dPD_t	10.43	-12.43 ***	-86.18 ***	-1.94	32.12 ***
	(0.56)	(-4.16)	(-7.29)	(-1.40)	(4.27)
13. *Crisis* * dq_t	-1.45 ***	0.03	3.07 ***	0.43 ***	0.41 ***
	(-8.47)	(1.45)	(27.24)	(30.20)	(2.84)
14. *Crisis* * $dAssets_t$	0.06 ***	0.01 ***	0.07 ***	0.00 ***	-0.06 ***
	(9.49)	(12.84)	(21.05)	(10.47)	(-15.15)
15. *Crisis* * $dSales_t$	0.00	0.01 ***	-0.06 ***	-0.01 ***	0.03 ***
	(0.41)	(14.31)	(-27.35)	(-16.36)	(10.74)
16. *Crisis* * $Foreign_t$	-0.34 ***	-0.07 ***	-1.70 ***	-0.15 ***	-0.14 *
	(-2.96)	(-3.17)	(-17.75)	(-13.76)	(-1.86)
17. *Crisis* * $Size_t$	0.01	-0.03 ***	-0.15 ***	-0.00 ***	0.08 ***
	(1.28)	(-4.48)	(-9.30)	(-4.27)	(3.82)
18. *Crisis* * $Size_t$ * $Foreign_t$	0.02	0.04 **	0.24 ***	0.01 ***	-0.17 ***
	(0.38)	(2.30)	(5.66)	(3.42)	(-4.92)
R-squared	0.060	0.026	0.151	0.057	0.151
Observations	1,407	1,384	1,391	1,408	1,405
Number of firms	814	802	806	815	813

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007.

$dCash_{t+1}$ is change in cash and cash equivalent scaled by initial total assets. $SecPurch_{t+1}$ is net purchase of investment securities in t+1. $dGACost_{t+1}$, $dEmployees_{t+1}$ and $dCapex_{t+1}$ are change in general and administrative costs, change in number of employees, and change in capital expenditure expense, respectively. $\boldsymbol{ECM}_t$ is long-term disequilibrium calculated based on equation (2). $Matbonds_t^{t+1}$ and $Matbloans_t^{t+1}$ are the amount of bond and long-term of bank loans matured within next 12 months deflated by total assets. dPD_t is change in the probability of default within next 12 months obtained from the Credit Re-search Initiative (CRI) database. dq_t is change in

market value of total assets divided by book value of total assets. $dAssets_t$ and $dSales_t$ are change in total assets and total sales divided by initial total assets. *Crisis* is a dummy variable which has one in fiscal year 2008, zero otherwise. $Size_t$ is total assets in trillion yen. $Foreign_t$ is the ratio of foreign sales to total sales.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

TABLE 9

BONDS OUTSTANDING, BOND ISSUANCE, AND BONDS MATURING DURING THE CRISIS

	$dBonds_{t+1}$	$Issuance_{t+1}$	$Matbonds_t^{t+1}$	$Issuance_{t+1}$ - $Matbonds_t^{t+1}$ (2) - (3)	*Average of* $Issuance_{t-2 \sim t}$	$Issuance_{t+1}$ - $Issuance_{t-2 \sim t}$ (2) - (5)
	(1)	(2)	(3)	(4)	(5)	(6)
<u>All Firms</u>						
1. Total Change	-0.690	0.983	1.501	-0.518	1.404	-0.421
<u>Largest 10% of Firms</u>						
2. Total Change	0.029	1.419	1.231	0.188	1.377	0.042
<u>Large Firms</u>						
3. Total Change	-0.661	0.931	1.413	-0.482	1.407	-0.476
<u>Smallest 50% of Firms</u>						
4. Total Change	-0.862	0.935	1.629	-0.694	1.406	-0.471

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007. The numbers of observations by group are: all firms (=690), largest 10% of firms (=70), large firms (=280), smallest 50% of firms (=340).

$dBonds_{t+1}$ is change in bonds outstanding divided by initial total assets. $Issuance_{t+1}$ is gross flow of bond issued in t+1 divided by initial total assets. $Matbonds_t^{t+1}$ is the amount of bonds matured within next 12 months deflated by total assets.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 10

CHANGES DURING THE CRISIS DUE TO CREDIT MARKET CONDITIONS AND DUE TO FIRMS' CONDITIONS: TOTAL DEBT, BONDS, AND BANK LOANS

	$ddDebt_{t+1}$ (1)		$ddBonds_{t+1}$ (2)		$ddBLoans_{t+1}$ (3)	
<u>All Firms</u>						
1. Total Change	1.519		-0.188		1.886	
2. due to change in credit market conditions		2.326		0.058		1.929
3. due to change in firms' conditions		-0.806		-0.246		-0.043
<u>Largest 10% of Firms</u>						
4. Total Change	2.825		0.051		2.515	
5. due to change in credit market conditions		2.659		0.607		1.959
6. due to change in firms' conditions		0.166		-0.556		0.556
<u>Large Firms</u>						
7. Total Change	1.911		-0.734		2.794	
8. due to change in credit market conditions		2.936		0.278		2.118
9. due to change in firms' conditions		-1.025		-1.012		0.676
<u>Smallest 50% of Firms</u>						
10. Total Change	1.171		0.202		1.041	
11. due to change in credit market conditions		1.813		-0.229		1.800
12. due to change in firms' conditions		-0.642		0.404		-0.759

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007. The numbers of observations by group are: all firms (=707), largest 10% of firms (=71), large firms (=283), smallest 50% of firms (=353).

$dDebt_{t+1}$ is first difference in total debt outstanding divided by initial total assets. $dBonds_{t+1}$ and $dBLoans_{t+1}$ are change in bonds and bank loans outstanding divided by initial total assets, respectively.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 11

CHANGES DURING THE CRISIS DUE TO CREDIT MARKET CONDITIONS AND DUE TO FIRMS' CONDITIONS:

BOND ISSUANCE

	$dIssuance_{t+1}$	$dMatbonds_t^{t+1}$	$dIssuance_{t+1}$ - $dMatbonds_t^{t+1}$	$ddBonds_{t+1}$			$dIssuance_{t+1}$		
				Total change	Due to change in credit market conditions	Due to change in firms' conditions	Total change	Due to change in credit market conditions	Due to change in firms' conditions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Firms									
1. Total Change	0.050	0.213	-0.163	-0.188	0.058	-0.246	0.050	-0.085	0.135
Largest 10% of Firms									
2. Total Change	0.067	-0.127	0.194	0.051	0.607	-0.556	0.066	0.728	-0.662
Large Firms									
3. Total Change	-0.218	0.526	-0.744	-0.734	0.278	-1.012	-0.218	0.161	-0.379
Smallest 50% of Firms									
4. Total Change	0.261	0.031	0.230	0.202	-0.229	0.431	0.261	-0.446	0.707

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007. The numbers of observations by group are: all firms (=707), largest 10% of firms (=71), large firms (=283), smallest 50% of firms (=353).

$dBonds_{t+1}$ is change in bonds outstanding divided by initial total assets. $Issuance_{t+1}$ is gross flow of bond issued in t+1 divided by initial total assets. $Matbonds_t^{t+1}$ is the amount of bonds matured within next 12 months deflated by total assets.

Source: Astra Manager, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.

TABLE 12

CHANGES DURING THE CRISIS DUE TO CREDIT MARKET CONDITIONS AND DUE TO FIRMS' CONDITIONS:

LIQUID ASSETS, COSTS, EMPLOYEES, AND CAPITAL EXPENDITURES

	$ddCash_{t+1}$ (1)	$ddSecPurch_{t+1}$ (2)	$ddGACost_{t+1}$ (3)	$ddEmployees_{t+1}$ (4)	$ddCapex_{t+1}$ (5)
All Firms					
1. Total Change	1.596	0.188	-1.294	-0.105	-0.578
2. due to change in credit market conditions	1.384	-0.175	-0.680	-0.083	-0.153
3. due to change in firms' conditions	0.211	0.363	-0.614	-0.022	-0.425
Largest 10% of Firms					
4. Total Change	1.191	0.227	-1.730	-0.038	-1.630
5. due to change in credit market conditions	1.675	-0.174	-1.235	-0.114	-0.308
6. due to change in firms' conditions	-0.484	0.401	-0.495	0.076	-1.322
Large Firms					
7. Total Change	1.574	0.251	-1.229	-0.156	-0.093
8. due to change in credit market conditions	1.553	-0.155	-0.850	-0.102	-0.172
9. due to change in firms' conditions	0.022	0.406	-0.379	-0.054	0.079
Smallest 50% of Firms					
10. Total Change	1.694	0.136	-1.066	-0.066	-0.605
11. due to change in credit market conditions	1.190	-0.190	-0.438	-0.060	-0.113
12. due to change in firms' conditions	0.504	0.327	-0.629	-0.005	-0.492

Notes: Listed, Japanese, non-financial corporations with bonds outstanding, annually. For the variables in the target function regression, we have sample period of fiscal years 2006-2007. The number of observations by group are: all firms (=707), largest 10% of firms (=71), large firms (=283), smallest 50% of firms (=353).

$dCash_{t+1}$ is change in cash and cash equivalent scaled by initial total assets. $SecPurch_{t+1}$ is net purchase of investment securities in t+1. $dGACost_{t+1}$, $dEmployees_{t+1}$ and $dCapex_{t+1}$ are change in general and administrative costs, change in number of employees, and change in capital expenditure expense, respectively.

Source: Astra Manger, Nikkei NEEDS Financial QUEST and Credit Research Initiative database and authors' calculations.