BANK UNDERWRITING OF CORPORATE BONDS: EVIDENCE FROM JAPAN AFTER THE FINANCIAL SYSTEM REFORM OF 1993*

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Yasushi Hamao
Marshall School of Business
University of Southern California
hamao@usc.edu
213-740-0822
310-450-5875 fax

and

Takeo Hoshi
Graduate School of International Relations and Pacific Studies
University of California, San Diego
thoshi@ucsd.edu
858-534-5018
858-534-3939 fax

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ABSTRACT

In 1993, the corporate bond primary market in Japan underwent a major change. The Financial System Reform Act allowed banks to enter the underwriting business by setting up securities subsidiaries. This paper analyzes yield differentials between issues underwritten by bank subsidiaries and those underwritten by securities houses. By estimating a regression model with correction for self-selection bias, we can distinguish between several hypotheses concerning the effect of bank underwriting of corporate bonds on their yields. We show that investors discount corporate bonds underwritten by bank-owned subsidiaries because they suspect conflict of interest. Bank-owned subsidiaries, on the other hand, try to avoid this conflict by underwriting bonds intended for institutional investors and bonds issued by firms with weak main bank ties. While investors' suspicions of conflict of interest may put bank-owned subsidiaries at a disadvantage with respect to incumbent security houses, this study suggests that an aggressive entry strategy on the part of bank-owned subsidiaries has offset the disadvantage so far. In light of the recent repeal of the Glass Steagall Act, these findings will be of particular interest to observers of the changing nature of the securities business in the United States.

I. Introduction

Recent passage of the Financial Modernization Bill by the U.S. Congress marks formally the end of the Glass-Steagall Act of 1933, which separated commercial banking, investment banking, and insurance. Although we have already witnessed some evidence of consolidation and diversification in the financial industry over the last few years, this trend toward "universal banking" will undoubtedly accelerate in the near future.

One controversy surrounding financial modernization is the concern that large, consolidated financial institutions will have access to too much information about client firms and consumers. Specifically with respect to the issue of banks' engaging in corporate bond underwriting—an activity traditionally prohibited by the Glass-Steagall Act—some observers are concerned that commercial banks will use the private information they have about bond issuers to benefit themselves (i.e., conflict of interest between underwriter and investors). On the other hand, some argue that banks in fact use their information to signal the quality of bonds to investors (i.e., certification).

Examining data from the pre-Glass-Steagall era, Kroszner and Rajan (1994) found that investors well understood the potential conflict of interest and effectively forced banks to underwrite only high quality issues. Puri (1996) also examined data from the pre-Glass-Steagall period. She found that the conflict of interest effect was in fact completely dominated by the certification effect, and that investors were willing to pay even higher prices for bank-underwritten securities.

Another pre-Glass-Steagall-era study examined the relation between the involvement of banks in the securities business and their probability of failure. White (1986) found the

probability of failure was actually lower for those banks that were actively involved in the securities business. Hoshi (1996) found in his study of pre-war Japanese corporate finance that bank failures during both the financial depression in 1927 and the depression after Japan's return to the gold standard (1930) were unrelated to their active involvement in the securities business.

In 1987, the interpretation of the Glass-Steagall Act was relaxed to allow some U.S. banks to set up securities subsidiaries ("Section 20 subsidiaries"). Gande, Puri, Saunders, and Walter (1997) found significant certification effects by banks whose Section 20 subsidiaries were engaged in corporate bond underwriting. More recent work by Gande, Puri, and Saunders (1999) has shown that bank entry into the corporate bond underwriting market has had pro-competitive effects.

This paper is the first to examine the evidence of bond underwriting by bank-owned security subsidiaries in Japan, which started in the mid 1990s. Similar to studies by Puri (1996) and Gande, Puri, Saunders, and Walter (1997) for the United States, we analyze the yield differentials between straight corporate bonds underwritten by incumbent securities firms and those underwritten by bank-owned subsidiary securities firms in the Japanese market.

An examination of the Japanese case should be useful in two regards. First, since the Japanese main bank system operates on a tradition of close bank-firm ties (see for example, Aoki and Patrick, 1995), we would expect evidence of conflict of interest (or certification) to be stronger in Japan than in the United States. If there is conflict of interest, rational investors will require higher yields on securities underwritten by bank subsidiaries. And if the underwriter's parent bank is the main bank of the issuing firm, this effect may be stronger. For similar reasons, the certification effect should also be stronger in Japan.

A second reason for our interest in the Japanese experience is that it permits an examination of the phenomenon of economic significance. In comparison with their U.S. Section 20 counterparts, bank subsidiaries in Japan have penetrated the underwriting market with much greater speed and now operate as major market players. With the repeal of the Glass-Steagall Act and the decreased cost of consolidation in U.S. financial markets, bank-securities companies in the United States can be expected to underwrite more corporate securities. In this regard, the Japanese experience in the corporate bond underwriting market can serve as an important indicator of the future of the U.S. market.

This paper also shows importance of explicitly incorporating a correction for self-selection bias in the regression analysis. Since bond issuers can choose which underwriters to use, the ordinary least square (OLS) of the regressions of yield difference on firm characteristics and the underwriter choice variable would give us inconsistent estimates. In order to correct for such a self-selection bias, we use a two-stage regression methodology, originally developed by Heckman (1979), Greene (1981) and Barnow, Cain, and Goldberger (1981) among others. This methodology also allows us to test additional hypotheses about underwriter's pricing policies, such as raising the yield because of distribution disadvantages the underwriter faces, or lowering the yield for the sake of attracting new business.

The paper is organized as follows. In the next section, we stipulate four possible hypotheses for yield differences between bonds underwritten by bank-subsidiaries and those by traditional investment banks. Section III describes the data used to test those hypotheses. In section IV, we take a preliminary look at the data and summary statistics. Section V describes the econometric method that enables us to distinguish the four hypotheses in section II. Section VI reports empirical findings. Section VII concludes.

II. Background and the Hypotheses

Like the Glass-Steagall Act in the United States, Article 65 of the Securities and Exchange Act of 1948 in Japan prohibited banks from underwriting securities. With the gradual deregulation of the Japanese financial system that started in the late 1970s, the separation between banking and securities came under increased scrutiny. In an effort "to promote the healthy development of financial markets through effective and proper competition and to give incentives to financial institutions to better serve their clients through the introduction of a variety of new products" (Ministry of Finance, 1994), the Financial System Reform Act went into effect on April 1, 1993. One of the major changes under the new law was the lowering of the traditional wall between banks and securities firms, allowing banks (securities firms) to set up their own security firm (trust bank) subsidiaries. The first banks to receive licenses to establish security subsidiaries were the Industrial Bank of Japan, the Long-Term Credit Bank of Japan, and Norinchukin Bank. These three banks established their subsidiaries on July 26, 1993. City banks, trust banks, and regional banks followed, with the last subsidiary opening its doors in April 1996 (see Table 1).

During a short period of time, bank-owned security subsidiaries aggressively increased their share of the corporate bond underwriting business in Japan. Table 2 shows the number and amount of domestic straight bond issues by Japanese corporations from the first quarter of 1994 to the fourth quarter of 1997. The table also shows the number and amount of bonds for which bank-owned subsidiaries were the leading underwriters. Soon after November 1994, when all of Japan's major banks had established their securities subsidiaries (see Table 1), their share in

lead-underwriting jumped to 34% in value and 42% in number (1st quarter of 1995). Bank subsidiaries continued to increase their influence, and by the end of our sample period (4th quarter of 1997), partially aided by the major scandals at big securities houses, their share had reached 82% in value and 85% in number.[1] Thus, in about four years from their initial establishment, bank subsidiary securities firms had become the dominant players in the Japanese corporate bond underwriting market.

A comparison with underwriting by Section 20 subsidiaries in the United States reveals the economic significance of corporate bond issues and bank underwriting in Japan. In a sample period from January 1993 to March 1995, Gande, Puri, Saunders and Walter (1997) report a total of 670 corporate bond issues (amounting to $120 billion) by the U.S. corporations, of which only 80 ($8.6 billion) are underwritten by bank subsidiaries. According to Gande, Puri, and Saunders (1999), the market share of bank underwriting of corporate bonds increased from 4.4% in 1991 to 16.28% in 1996. In Japan, in the four years from 1994 to 1997, there are a total of 898 corporate bond issues (approximately $100 billion), of which 445 (approximately $41 billion) bonds were underwritten by bank subsidiaries.

In 1998 and 1999, as a result of economic troubles at parent banks and intense competition in the underwriting business, many bank-owned subsidiaries were liquidated or acquired by other security firms.[2] The number of bank-owned security subsidiaries declined from 19 in the beginning of 1998 to 10 by the summer of 1999. The remaining subsidiaries, however, continue to be major players in the underwriting market.

The remarkable growth of bank subsidiary securities firms in Japan may be less surprising when one considers the close relationship between Japanese banks and firms nurtured through the Japan's traditional main bank system. Even before the passage of the Financial

Reform Act of 1993, Japanese banks, playing the role of trustees for their customers, placed corporate bonds in the domestic market. When Japanese corporations issued bonds abroad, Japanese banks often served as guarantors and sometimes co-underwrote bonds with Japanese securities houses. As Campbell and Hamao (1995) have shown, the trustees of domestic bonds and guarantors of foreign bonds were most likely to be the main banks of corporations.

The main bank relationship naturally extends to the relationship between bank-owned security subsidiaries and bank clients. Thus, when a company uses a bank-owned subsidiary to underwrite its bonds, one may expect the company to use the securities subsidiary owned by its main bank. Our data show, however, this was not necessarily the case, especially after late 1995. When a company used a bank subsidiary as the lead-underwriter, that subsidiary was owned by the company's main bank in 62% of the cases. If we focus only on those firms with a main bank that has a securities subsidiary, the proportion increases to 70%. But, we also find a sharp decline in the proportion of main bank subsidiary underwriting in the total underwriting by bank subsidiaries. In 1994, for instance, bank subsidiaries only underwrote bonds issued by the customers of their parent banks. Until the end of 1995, the proportion of main bank underwriting remained above 80% (calculated in terms of the number of issues). In the last quarter of 1995, the ratio dropped to around 50%, where it remained throughout 1996 and 1997. In other words, bank-owned security subsidiaries began underwriting the bonds of corporations that do not have their parent banks as their main banks (or do not have any main bank).

Thus, the growth of underwriting by bank-owned security subsidiaries appears to be expanding beyond the traditional boundaries of main bank ties. This development would not have serious economic implications if it were just like underwriting by established securities houses. But, there are some reasons to suspect that underwriting by bank-owned security

subsidiaries may be different from underwriting by security houses. For example, a bank-owned subsidiary may collude with the bank and underwrite bonds issued by a poorly performing customer, so that the customer can pay back its loans to the bank with proceeds from the bond issue. In fact, the prevention of such conflict of interest was an important economic rationale behind the Glass-Steagall Act. In the remainder of this section, we present four hypotheses that predict important differences between the bonds underwritten by bank-owned security subsidiaries and those underwritten by securities houses. We will test these hypotheses in later sections using data from Japan.

The first hypothesis is that of conflict of interest. In making and monitoring loans, commercial banks acquire private information about a firm that is not available to general investors in the securities market. Thus, if banks are allowed (maybe through subsidiaries) to underwrite corporate securities, a conflict of interest can develop. As previously mentioned, banks can underwrite corporate bonds issued by a firm they privately know to be unsound and then require that firm to use the proceeds to repay loans, thus transferring their risk to general public investors. To compensate for this possible conflict of interest, investors should require higher returns for bonds underwritten by banks than those underwritten by security houses. Thus, the conflict of interest hypothesis implies higher yields for bonds underwritten by bank-owned security subsidiaries.

On the other hand, underwriters can certify the value of the new issue. Having more information about a firm, banks would have greater ability to certify than do their counterpart securities firms. Correct certification by underwriters would improve their own reputation, thereby encouraging banks to continue to do so. Thus the certification hypothesis implies a lower yield for bonds underwritten by bank subsidiaries.

Another possibility is that securities firms will have an advantage over newly established banking subsidiaries in placing corporate bonds due to their greater skills in bond pricing and distribution. This would lower yields on bonds underwritten by existing securities firms compared to those underwritten by bank subsidiaries.[3] This "distribution (dis)advantage" is our third hypothesis for yield differentials.

Yet another possibility is that newly established bank subsidiaries have aggressively expanded their shares by offering very attractive bond pricing. There were even rumors suggesting that bank subsidiaries have underwritten bonds at a loss (*harakiri*). Even if they did not go as far as making a loss, as long as their pricing was more aggressive than the incumbent securities houses, we would find that bonds underwritten by bank subsidiaries will have lower yields. This is our fourth hypothesis that we examine.

To test a similar hypothesis of competitive behavior by Section 20 companies in the United States, Gande, Puri, and Saunders (1999) examined underwriter spreads, or differences in the underwriting fees that underwriters charge issuers. In Japan, however, underwriting fees for corporate bond issues of the same maturity were fixed across underwriters until the beginning of 1998 (see Nikkei Financial, February 3, 1998). Therefore underwriters could only undercut the market by promising higher prices to the issuers. Thus, we focus on the differences in the subscribers' yields.

III. Data

To test the above four hypotheses, we examine data for domestic corporate straight bond issues from February 25, 1994 (first occurrence of bank subsidiary's underwriting) to December

31, 1997. The original data are collected from Nikkei NEEDS "Corporate Action" magnetic tapes, which record all changes in corporate financing through financial markets (new issues of debt, equity or convertible securities, retirement of securities, conversion of convertible securities, etc.). We chose only domestic public issues because in this data set underwriters' identities are not available for Euro and privately placed issues. Only straight bonds are considered since (1) they have become a major financing tool for Japanese corporations during the time period we examine, and (2) we would like to have a direct comparison with traditional bank loans. We also exclude from the analysis bonds issued by NTT and electricity power utilities. The attributes we use in this data set are: date of issue, identity of issuers, industry code, issue amount, maturity, coupon rate, issue price, and lead underwriter of issues.

We also use data on the Japanese Government Bonds (JGBs) as a basis to compute yield spread at the time of the issue. The JGB yield with a matching maturity to a new corporate bond issue is computed by interpolating yields of two bonds with the closest maturities. For example, suppose a corporate bond is issued on May 20 with 4 years of maturity. Then two JGBs are searched; one with a maturity just short of, but closest to 4 years (e.g., 3 years and 350 days) and another with a maturity just over, but closest to 4 years (e.g., 4 years and 10 days), as of May 20. The yield to maturity of these two JGBs are averaged and used as a benchmark for this corporate bond issue. We only use the JGB yields with maturities up to 10 years, and hence exclude the "super-long" JGB with 20 years of maturity. This is because super-long JGBs are issued only sporadically and the quality of yield data is often problematic. The yield spread is defined as yield to maturity of corporate bond minus its benchmark JGB yield to maturity. The JGB yield history data are provided by Goldman Sachs.

Additional data on characteristics of the issuing firms are obtained from NEEDS financial statement data and Hamao (1991) monthly stock returns data. The items we use are: market value of outstanding equity, total debt, and total loan. They are used to compute the size of the firm, market debt-to-capital (debt plus market value of equity) ratio, and bank loan-to-total debt ratio. The data are as of the end of the most recent accounting year.

Finally, data on the main bank relationship are taken from *Kigyo Keiretsu Soran*. For each listed firm, the main bank is identified as the lender with the largest share, and the ratio of loans by the main bank to total debt is computed. When a company has no bank loan outstanding, we interpret that as the company having no main bank.

IV. Preliminary Analysis and Summary Statistics

Panel A in Table 3 reports the means of the major variables in our database. As discussed in the last section, the JGB yields used in calculating the spread are for bonds with maturity up to 10 years. Consequently, we dropped from our sample issues with maturity longer than 10 years. (There are 60 of them.) For eleven cases, we could not calculate the loan-to-debt ratio of issuing firms since they do not have debt outstanding at the end of most recent accounting period. In one case, the market value of equity was not available at the end of the most recent accounting period. Sixteen issues with floating coupons were also dropped. Eliminating these cases leaves 810 issues out of the original 898 issues.

The means for the entire sample of 810 are reported in the first column. The second column reports the means for the cases where the lead underwriter is a bank subsidiary (401 observations).

The table reveals several interesting differences between the issues underwritten by bank subsidiaries and those underwritten by securities houses. First, the issue size is substantially (and statistically significantly) smaller for the issues underwritten by bank subsidiaries. This is what we would expect from Table 2, which showed the share of bank subsidiaries to be larger when it is calculated using the number of issues. Thus, compared with securities houses, bank subsidiaries seem to bring more small issues to the market. But, more direct measures of firm size, such as capitalization and total assets, do not show much difference between the issues underwritten by bank subsidiaries and those underwritten by securities houses.

Second, the spread is slightly higher for issues underwritten by bank subsidiaries, and the difference is marginally significant. The comparison, however, does not control for other factors that might influence the spread. We examine the effects of underwriters' identity on the spread in more detail below by estimating a regression model with a correction for self-selection bias. Finally, the companies that use bank subsidiaries for underwriting their bonds tend to have higher loan-to-debt ratios.

Panel B of Table 3 reports distribution of maturity of corporate bonds. Five years is the most commonly used maturity of bonds. When we compare maturities of those issues underwritten by banks with the entire sample, we find a slightly higher concentration of maturities in five and six years for the bank underwritten issues.

V. Econometric Method

To examine the effect of bank underwriting on the corporate bond yield, we estimate the following regression model.

$$(1) \quad y = \beta' X + \alpha z + \varepsilon,$$

where y is the yield spread on corporate bonds, z is a 0-1 variable that takes 1 when the lead-underwriter is a bank-owned security subsidiary and 0 otherwise, and X is a vector of the other variables that influence the yield. The distribution of disturbance ε is assumed to be normal. The parameter α measures the effect of having bank-owned subsidiaries as the underwriter on the bond yield. The vector of the coefficients on X is denoted by β.

We note that a decision to use a bank-owned security subsidiary as the lead underwriter is a result of a conscious calculation on the part of an issuing firm. Thus, the value of z in (1) may reflect self-selection and may cause the parameter estimates to be inconsistent. To correct for possible self-selection, we first consider the choice of underwriter explicitly. Assume that there exists an unobservable factor z^* that drives the choice of the underwriter. We model z^* as a function of a vector of variables W, which may have some elements in X. A firm is assumed to choose a bank-owned security subsidiary as the underwriter when and only when z^* is greater than zero. Thus, our selection model is given by:

$$(2) \quad z = \begin{cases} 1 & \text{if } z^* > 0 \\ 0 & \text{if } z^* \le 0 \end{cases} \text{ and}$$

$$(3) \quad z^* = \gamma' W + u,$$

where γ is a vector of coefficients on W, and u and ε have bivariate normal distribution with means zero and the covariance matrix:

$$\begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix}$$

Given the specification of the selection model, one can show that:[4]

$$(4) \quad E[\varepsilon \mid z = 1] = \frac{\rho\sigma\phi(\gamma' W)}{\Phi(\gamma' W)} \qquad \text{and}$$

$$(5) \quad E[\varepsilon \mid z = 0] = \frac{-\rho\sigma\phi(\gamma' W)}{1 - \Phi(\gamma' W)},$$

where $\phi()$ and $\Phi()$ are the probability density function and the cumulative distribution function respectively of the standard normal distribution. We can combine (4) and (5) to get an expression for $E[\varepsilon|z]$.

$$(6) \quad E[\varepsilon \mid z] = \rho\sigma\left\{z\,\frac{\phi(\gamma' W)}{\Phi(\gamma' W)} - (1 - z)\frac{\phi(\gamma' W)}{1 - \Phi(\gamma' W)}\right\}$$

$$= \rho\sigma\,\frac{\phi(\gamma' W)\{z - \Phi(\gamma' W)\}}{\Phi(\gamma' W)\{1 - \Phi(\gamma' W)\}} \equiv \rho\sigma \cdot h(z, W; \gamma)$$

The conditional variance of ε is given by:

(7) $Var[\varepsilon \mid z] = \sigma^2\left[1 - \rho^2\delta(z, w; \gamma)\right]$, where

(8) $\delta(z, w; \gamma) = h(z, w; \gamma)[h(z, w; \gamma) + \gamma' w]$.

To estimate the parameters in (1) consistently, we first estimate the probit model given by (2) and (3), and calculate $h(z,W;\gamma)$ for each observation using the estimate for γ. Let $\hat{h} = h(z, w; \hat{\gamma})$ be such estimates. Consistent estimates of α and β are obtained by estimating:

(9) $y = \beta' X + \alpha z + \beta_h \hat{h} + e$

by OLS. The new disturbance term e is given by ε-$E[\varepsilon|z]$ and hence uncorrelated with z. The OLS estimate of β_h gives a consistent estimate of $\rho\sigma$.

Note that we can distinguish two ways that the yield on a corporate bond underwritten by a bank-owned subsidiary may differ from that on a similar bond underwritten by an independent security house. First, the decision to use a bank-owned subsidiary as the lead-underwriter provides some new information that influences the yield. This is captured by the correlation (ρ) between u and ε in this model. The existence of this process can be examined by testing whether β_h is zero or not. Second, even when the decision to use a bank-owned subsidiary does not provide any new information, the yield may be influenced as long as α is not zero.

In Section 2, we identified four potential effects of bank underwriting on the yield of corporate bonds. The first two effects, the conflict of interest and the certification effect can be

examined by looking at the estimate of β_h in (9), because both effects result from some new information provided by the decision to use a bank-owned security subsidiary as the underwriter. In the conflict of interest case, bank underwriting suggests that the bank may be trying to dump poor quality bonds to investors. If that is the case, bank underwriting that is not obvious from the observable variable (*W*), which is associated with high *u* in this model, is likely to increase the spread. Thus, we would expect ρ to be positive and hence β_h to be positive, too. If there is a certification effect, new information revealed by bank underwriting tends to reduce the yield on the bond. Thus, we would expect ρ and hence β_h to be negative. By looking at the estimate of β_h, then, we can examine which of the two effects is more important.

The last two effects that we discussed in Section 2, the distribution disadvantage and the aggressive entry strategy, would be observed even if the decision to use a bank-owned security subsidiary as the underwriter did not reveal any new information. If the bank-owned security subsidiaries are at a disadvantage in distributing bonds to investors, and if the cost of this disadvantage is partially shouldered by the issuers, the yield on bonds underwritten by bank-owned subsidiaries will be higher than the yield on bonds underwritten by incumbent securities houses. This will hold even if the decision to use bank-owned subsidiaries as underwriters does not reveal any relevant information (i.e., $\rho = 0$). Thus, we would expect to find a positive α. If the bank-owned security subsidiaries offered aggressively high bond prices to increase their market shares quickly, then we would expect the yields on the bonds they underwrote to be lower even if the decision of bank underwriting itself does not reveal any new information. In this case, we would expect a negative α.

Thus, correcting for the potential self-selection bias allows us to identify the two types of influences of bank underwriting on the bond yields and helps us distinguish among the four

hypotheses discussed in Section 2. Table 4 summarizes the above discussion and lists the major implications of the four hypotheses on the parameters in the regression (9).

Although the OLS estimates of (9) are consistent, their standard errors are not. This is because (i) e is heteroskedastic and (ii) we use an estimated h instead of its true value. Following Greene (1981), we calculate a consistent estimate of the covariance matrix of the coefficients in (9) as follows. First, using the coefficient estimates of the selection model, we can form an estimate for δ given by (8). Let $\hat{\bar{\delta}}$ denote the sample average of the estimate. Then, form estimates of σ and ρ as:

$$(10) \quad \hat{\sigma}^2 = \frac{1}{n}\sum e^2 + \hat{\bar{\delta}}\hat{\beta}_\lambda^2$$

$$(11) \quad \hat{\rho}^2 = \frac{\hat{\beta}_\lambda^2}{\hat{\sigma}^2}$$

Let X* be a matrix that contains an observation for $(x, z, \hat{h})$ as each row. Let $\hat{\Delta}$ be a diagonal matrix of $\hat{\delta}$. Then, a consistent estimate of covariance matrix of the OLS estimators in (9) can be given by:

$$(12) \quad \hat{V}(\hat{\beta}, \hat{\alpha}, \hat{\beta}_\lambda) = \hat{\sigma}^2[X^{*\prime} X^*]^{-1}\left[X^{*\prime}\left(I - \hat{\rho}^2\hat{\Delta}\right)X^* + Q\right][X^{*\prime} X^*]^{-1},$$

where Q is given by:

$$(13) \quad Q = \hat{\rho}^2\left(X^{*\prime}\hat{\Delta}W\right)\hat{V}(\hat{\gamma})\left(W^{\prime}\hat{\Delta}X^*\right)$$

and $\hat{v}$ denotes a consistent estimate of the variance.

VI. Estimation Results

We first estimate a probit model that describes how a bond issue is underwritten by a bank-owned subsidiary rather than by a security house. The model considers six factors that influence the identity of the bond underwriter. The first factor is the size of issue. Table 3 suggests that bank-owned subsidiaries are more likely to underwrite smaller issues. Thus, we include the issue size as an explanatory variable for the probit model.

The next two factors are characteristics of the capital structure of the issuing firm. The debt-capital ratio is measured as the book value of debt divided by the market value of equity plus the book value of debt. The loan-debt ratio is calculated by dividing the book value of bank loans by the book value of total debt. We allow both of these variables to influence the choice between different types of underwriters.

We also consider the extent of the relationship between the corporation and its main bank as another factor that may influence the choice of the lead-underwriter. We measure the extent of relationship by the ratio of loans from the main bank to total bank loans.

The maturity of issue is another factor that may influence the choice. As we observed in Panel B of Table 3, bank-owned subsidiaries have a tendency to underwrite bonds with medium maturity (5 or 6 years). The probit model takes this into account by including a dummy variable that takes one when the maturity is 5 or 6 years.

Finally, we include a dummy variable that takes one for issues with a minimum face value greater than ¥100 million. An issue with a minimum face value exceeding ¥100 million is usually considered to be bought primarily by institutional investors, and is exempt from designating a bond management company, which for reasons of investor protection the Commercial Code otherwise requires. Since a bond management company is almost always a bank, it is conceivable that when a bank can collect those fees as a bond management company, it does not try hard to let its security subsidiary obtain the lead-underwriter position. Alternatively, bank-owned securities subsidiaries may in fact try to underwrite those bonds, because the institutional investors would be relatively more informed. Compared with uninformed investors, the fear of conflict of interest may be less serious.

Table 5 shows the results of our probit estimation. The first specification includes 30 industry dummies. Because a Wald test does not reject the hypothesis that all the 30 coefficients on industry dummies are equal, we drop the industry dummies in the second specification. In both specifications, we include 15 quarterly dummy variables. The coefficient estimates on both sets of dummy variables are not reported in the table. The size of the issue enters the model significantly with a negative coefficient. When the size of the issue is small, it is more likely to be underwritten by a bank subsidiary. This result is consistent with the observation we made in Table 3. The effect of debt to capital ratio is not statistically significant, although the point estimate of the coefficient suggests a company with high dependence on debt is more likely to use a bank-owned subsidiary for the lead-underwriter. A similar finding is made for the loan to debt ratio. A company with high dependence on bank loans is more likely to use a bank-owned security subsidiary, and the effect is statistically significant in the specification without industry dummies.

The main bank loan to total loan ratio has a significant impact on the underwriting decision. The coefficient estimate is negative, implying that an issuer that does not depend on the main bank so much in terms of bank loans is more likely to use bank subsidiaries for bond underwriting. Thus, bank subsidiaries seem to have been targeting firms that have loosened their ties to main banks, rather than pursuing those firms with strong main bank ties. This can also be interpreted as the result of an effort on the part of bank-owned subsidiaries to avoid possible conflict of interest. Kroszner and Rajan (1994) uncovered a similar effort on the part of U.S. securities affiliates of commercial banks in pre Glass-Steagall United States. These affiliates tended to underwrite securities issued by large and well-known firms and shied away from underwriting securities of small firms, where the conflict of interest would be more serious.

The dummy variable for medium maturity (5 or 6 years) enters the model with a positive and significant coefficient, suggesting the bank-owned subsidiaries were more likely to underwrite bonds with medium maturities. This is consistent with what we would expect from Panel B of Table 3.

Finally the dummy variable for bonds with minimum face value exceeding ¥100 million enters the model with a positive sign. The statistical significance is marginal in the first specification, but is reasonably high in the second specification. This suggests that bank-owned security subsidiaries are more likely to underwrite bond issues aimed at institutional investors. Since institutional investors are probably more informed than are small individual investors, the result is again consistent with the idea that banks try to avoid the problem of conflict of interest.

We use the estimation results of the probit model to form estimates of the *h* function defined in (6). These estimates are employed to correct for a possible self-selection bias in the regression of yield spreads. Table 6 shows the estimation results of the yield spread regression.

The regression model considers three variables on corporate characteristics that would influence the yield spread: the amount of total assets (in log), the debt to capital ratio, and the loan to debt ratio. Two dummy variables are included to control for the effect of maturity on the spread. The first dummy variable (maturity ≤ 5 years) takes value one if the maturity of the bond is relatively short (3, 4, or 5 years) and zero if the maturity is long (6, 7, 8, or 10 years). We also include a dummy variable for bonds with 7 years of maturity since an anomaly in the JGB market during the sample period makes a 7 year JGB relatively cheap (higher yield) in comparison with the fitted term structure model.[5] The model also includes 15 quarterly dummies to control for any time specific effects and 30 industry dummies to control for industry specific effects (coefficient estimates are not reported in the table).

The last two variables in the regression relate to the effects of bank underwriting on yield spreads. "Bank Subsidiary" is a dummy variable that takes one when the lead underwriter of the issue is a bank-owned security subsidiary. As we discussed in Table 4, the coefficient estimate of this variable can be used to test the distribution advantage hypothesis and the aggressive entry strategy hypothesis. The variable $\hat{h}$ is the estimate of the h function. In the first specification, $\hat{h}$ is generated using the coefficient estimate from the probit model with industry dummies. In the second specification, the probit estimation without industry dummies is used to estimate h. As discussed in Table 4, we can test the conflict of interest hypothesis and the bank certification hypothesis by examining the coefficient on $\hat{h}$.

In both specifications, we find that size, measured by the log of total assets, is an important determinant of the yield spread. A larger corporation enjoys lower spread. The existence of debt, and especially bank debt, increases the spread, although the coefficient on the loan to debt ratio is not statistically significant. The coefficient estimate on the short maturity

dummy suggests that the spread tends to be higher for bonds with relatively short maturity. Since the yield curve was upward sloping for the sample period, this implies that the yield curve for corporate bonds at the time of issue was flatter than that for government bonds. The coefficient estimates on the 7 year maturity dummy confirm the existence of an anomaly in the JGB yield curve. The yield on the 7 year JGB is abnormally high, which reduces the spread.

The coefficient on $\hat{h}$ is positive. It is statistically significant in the second specification and significant at 5.3% level in the first specification. This suggests that the disturbance in the selection model and the disturbance in the yield spread regression are positively correlated. Thus, the information revealed by the fact that the issue is underwritten by a bank subsidiary tends to increase the yield spread. This result is consistent with the existence of conflict of interest.

The coefficient on the bank underwriting dummy is negative and statistically significant in both specifications. This result suggests that an issue underwritten by a bank-owned subsidiary tends to have a lower spread. The coefficient is significant not only in a statistical sense but also in an economic sense. These results suggest bank underwriting tends to reduce the spread by 60 to 90 basis points. Compared to the sample mean of the spread (34 basis points) and the sample standard deviation (36 basis points), this is a huge effect. This is consistent with the hypothesis of aggressive entry strategy on the part of bank-owned security subsidiaries.

Thus, we find evidence that conflict of interest tends to increase the yield spread for issues underwritten by bank-owned subsidiaries, and aggressive entry strategy tends to reduce the yield spread. Since these two effects tend to offset each other, a simple OLS estimation of the yield regression is not likely to provide conclusive evidence for either hypothesis. In an earlier work (Hamao and Hoshi, 2000), we in fact find that an OLS estimation reveals a very

small effect of bank underwriting on corporate bond yields. Controlling for the possible self-self-selection bias enables us to detect two different effects of bank underwriting.

VII. Conclusion

This paper investigates a major change in corporate financing in Japan. Following legislative reform in 1993, the corporate bond market in Japan expanded dramatically. At the same time, newly established bank-owned securities houses began underwriting a very high proportion of these corporate bond issues.

We analyze the yields on corporate bonds at the time of issue to look for evidence of (1) conflict of interest, (2) bank certification, (3) distribution advantage, or (4) aggressive entry strategy by bank-owned security subsidiaries. Our econometric specification corrects for possible self-selection bias and enables us to distinguish among the above four hypotheses. We find that bank subsidiaries have been cultivating new clients with weakening main bank ties, rather than serving firms for which the parent banks are the main banks. We also find that bank subsidiaries focus on bond issues aimed mainly at institutional investors. We find evidence for both conflict of interest and aggressive entry strategy.

In conclusion, investors discount the corporate bonds underwritten by bank-owned security subsidiaries because they suspect conflict of interest. Bank-owned subsidiaries, on the

other hand, try to avoid such conflict of interest by underwriting bonds intended for institutional investors and bonds issued by firms that do not have a main bank relationship with their parent banks, as our probit estimation suggests. These findings are similar to the results obtained by Kroszner and Rajan (1994) for pre-Glass-Steagall United States. Investors' suspicions of conflict of interest put bank-owned subsidiaries at a disadvantage vis-a-vis the incumbent security houses. Our study suggests that the bank-owned subsidiaries successfully increased their shares in the underwriting market despite this disadvantage by pursuing the aggressive entry strategy of promising higher issue prices than security houses do. However, the recent exit of many security subsidiaries suggests that such an aggressive strategy is not likely to be sustainable. It remains to be seen whether bank subsidiaries can build a new advantage to offset the disadvantage of apparent conflict of interest.

Endnotes

[1]The share of lead-underwriting of bank subsidiary securities firms is larger when it is calculated for number than when calculated for value. This implies that bank subsidiaries tend to be the lead-underwriter for smaller issues.

[2]For problems in the Japanese banking sector in the late 1990s, see, for example, Hoshi and Kashyap (1999) and Hoshi and Patrick (2000).

[3]For certain investors, however, one might argue that bank subsidiaries have a distribution advantage over securities firms. For example, many regional banks in Japan maintain close relationships with some city banks since city banks are often large shareholders of regional banks. If regional banks, rather than individual investors, are dominant buyers of corporate bonds, bank subsidiaries have a distribution advantage over existing securities firms. Unfortunately, we cannot find detailed data on distribution channels of corporate bonds and cannot examine how likely this case may be.

[4]See Barnow, Cain and Goldberger (1981), Greene (1981, 2000).

[5]Because of accounting and tax reasons, investors in the JGB market use futures as a hedging tool, which makes the futures relatively inexpensive. Since 7 year JGB is usually the cheapest to deliver against JGB futures contract with delivery options, low pricing in the future market carries over to the 7 year JGB. See, for example, Kikugawa (1995).

TABLE 1. Bank Subsidiary Securities Firms

Date of Establishment	Name
July 1993	IBJ Securities Norinchukin Securities LTCB Securities (Acquired by Warburg DR Securities in March 1999)
November 1993	Sumitomo Trust Securities Mitsubishi Trust Securities (Closed in July 1999: Business transferred to Tokyo-Mitsubishi Securities)
July 1994	Yasuda Trust Securities (Liquidated in March 1998) Asahi Securities (Liquidated in July 1999)
November 1994	Sumitomo Capital Securities (Acquired by Daiwa SBCM in March 1999) DKB Securities Fuji Securities Sakura Securities Sanwa Securities BOT Securities Mitsubishi Diamond Securities (BOT Securities and Mitsubishi Diamond Securities merged to become Tokyo-Mitsubishi Securities in April 1996)
March 1995	Tokai International Securities
May 1995	Mitsui Trust Securities (Liquidated in March 1999) Hokkaido Takushoku Securities (Liquidated in March 1998)
November 1995	Toyo Trust Securities (Liquidated in March 1999)
April 1996	Shinkin Securities Yokohama City Securities (Liquidated in March 1999)

Source: *Kin'yu Business*, March 1997, p. 92, *Ministry of Finance Securities Bureau Annual Report*, 1997, *Kin'yu Business Special Issue*, September 15, 1999.

TABLE 2. Bank Subsidiary Underwriting of Corporate Straight Bonds: 94Q1 - 97Q4

	Number of Issues		Amount of Issues (Billion Yen)	
Quarter	Total	Bank Subsidiary Underwritten	Total	Bank Subsidiary Underwritten
94:1	11	1	270	20
94:2	18	1	520	10
94:3	12	3	250	30
94:4	11	0	275	0
95:1	33	14	532	183
95:2	30	8	580	100
95:3	65	25	1,010	316
95:4	71	29	983	383
96:1	58	27	1,200	320
96:2	65	33	829	375
96:3	84	46	1,075	522
96:4	88	43	1,171	538
97:1	71	38	880	400
97:2	108	55	1,590	782
97:3	98	58	1,178	635
97:4	75	64	955	783
Total	898	445	13,300	5,396

Source: Nikkei NEEDS database. Calculation by the authors.

TABLE 3. Characteristics of Bonds Underwritten by Bank Subsidiaries:
February 25, 1994 - December 31, 1997

PANEL A Cross-sectional means

	Entire Sample	Bank Underwriting
Number of Observations	810	401
Amount of Issue (Billion Yen)	14.505	12.202***
Yield Spread (Percentage Points)	0.343	0.363*
Debt/Capital (Market)	0.318	0.327*
Loan/Debt	0.479	0.497**
Market Capitalization (Billion Yen)	557.695	545.422
Total Assets (Billion Yen)	1,120.213	1,130.731
Main Bank Loan/Total Debt	0.150	0.146

PANEL B Distribution of maturity

	Entire Sample		Bank Underwriting	
Maturity (years)	Number of Issue	Percentage out of Total Number of Issues	Number of Issue	Percentage out of Total Number of Issues
3	32	3.95	11	2.74
4	99	12.22	43	10.72
5	236	29.14	128	31.92
6	157	19.38	91	22.69
7	173	21.36	77	19.20
8	16	1.98	4	1.00
9	1	0.12	1	0.25
10	96	11.85	46	11.47
Total	810	100.00	401	100.00

Note: Panel A reports cross-sectional means of various characteristics. Yield Spread is the difference between corporate bond yield at issue and corresponding JGB yield. (See text for the exact computation of JGB portfolio yield.) Debt/Capital (Market) is book debt (interest bearing liabilities) divided by market value of equity plus book value of debt. Loan/Debt and Main Bank Loan/Total Debt are computed

using book value of loan and debt. Market Capitalization is number of shares outstanding times price per share. Total Assets is the size of balance sheet (in book). A *, **, and *** indicate significant differences from their complements at 10%, 5%, and 1% levels, respectively. Panel B reports distribution of maturities of corporate bond issues.

TABLE 4. Hypotheses and their Implications for Regression Coefficients

Hypothesis	Implication
1. Conflict of Interest	$\beta_h > 0$
2. Certification	$\beta_h < 0$
3. Distribution Disadvantage	$\alpha > 0$
4. Aggressive Entry Strategy	$\alpha < 0$

Note: The coefficients are from the equation (9) $y = \beta' X + \alpha z + \beta_h \hat{h} + e$. See text for notations.

TABLE 5. Estimation of Selection Models

	With Industry Dummies	Without Industry Dummies
Log (Issue Size)	-0.558 (-5.55)	-0.481 (-5.45)
Debt/Capital (Market)	0.280 (0.59)	0.072 (0.19)
Loan/Debt	0.343 (1.37)	0.483 (2.14)
Main Bank Loan/ Total Loan	-1.325 (-2.28)	-1.213 (-2.34)
Maturity = 5 or 6 years	0.359 (3.62)	0.357 (3.76)
Minimum Face Value ≥ 100 million yen	0.256 (1.79)	0.314 (2.58)
Number of Obs.	810	810

Note: The table reports coefficients estimate from probit estimation. The dependent variable is Bank Subsidiary which is a dummy variable that takes value one when the bond is underwritten by bank subsidiaries and zero otherwise. Issue Size is the amount of bond issues. Debt/Capital (Market) is book debt (interest bearing liabilities) divided by market value of equity plus book value of debt. Loan/Debt

and Main Bank Loan/Total Loan are computed using book value of loan and debt. Main Bank Loan/Total Loan is a ratio of loans from the main bank to total loans. "Maturity = 5 or 6 years" takes one only for the issues with maturity of 5 or 6 years. "Minimum Face Value ≥ 100 million yen" takes one when the minimum face value of the bond issue exceeds 100 million yen, which allows the issuing firm to have no bond management company. Numbers in parentheses are t-statistics. Both specifications include 15 quarterly time dummies, whose coefficient estimates are not reported. The first specification includes 30 industry dummies, but those coefficient estimates are not reported.

TABLE 6. Regressions of Yield Spread

	Selection Model with Industry Dummies	Selection Model without Industry Dummies
Log (Total Assets)	-0.132 (-9.68)	-0.132 (-9.10)
Debt/Capital (Market)	0.536 (3.71)	0.524 (3.45)
Loan/Debt	0.122 (1.50)	0.149 (1.59)
Maturity ≤ 5 years	0.111 (4.84)	0.112 (4.93)
Maturity = 7 years	-0.057 (-1.91)	-0.063 (-2.03)
Bank Subsidiary	-0.684 (-2.00)	-0.914 (-2.24)
$\hat{h}$	0.403 (1.94)	0.544 (2.19)
Number of obs	810	810
Adjusted R^2	0.411	0.415

Note: The table reports estimated coefficients from regression of yield spread (the difference between corporate bond yield at issue and corresponding JGB yield) on various firm and bond characteristics correcting for self-selection bias using the probit estimation in Table 5. The specification also includes 15 quarterly time dummies and 30 industry dummies, whose coefficients are not reported. Total Assets is the size of balance sheet (in book). Debt/Capital (Market) is book debt (interest bearing liabilities) divided by market value of equity plus book value of debt. Loan/Debt is computed using book value of loan and debt. Maturity ≤ 5 years is a dummy variable that takes the value one if the maturity of the corporate bond is relatively short (3, 4, or 5 years) and zero if the maturity is long (6, 7, 8, or 10 years). Maturity = 7 years is a dummy variable that takes the value one if the maturity of the corporate bond is 7 years and zero otherwise. Bank Subsidiary is a dummy variable that takes value one when the bond is underwritten by a bank subsidiary and zero otherwise. $\hat{h}$ is the estimate of h defined in (6). Numbers in parentheses are t-statistics. The two models differ in the specifications of the selection model used to generate $\hat{h}$. The first model uses the specification with industry dummies and the second model uses the specification without industry dummies.

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