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Do banks time bond issuance to trigger disclosure, due diligence, and investor scrutiny? ☆

Daniel M. Covitz* and Paul Harrison

Board of Governors of the Federal Reserve System, Washington, DC 20551, USA

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Abstract

This paper tests a new hypothesis that bank managers issue public debt, at least in part, to convey positive, private information and refrain from issuance to hide negative, private information. This “positive selection” hypothesis is tested against the traditional “adverse selection” hypothesis. We find evidence for “positive selection,” using ratings migrations, equity returns, bond issuance, and balance sheet data for US bank holding companies. The results add to our understanding of “market discipline” in monitoring bank holding companies and also inform upon how proposed regulatory requirements that banking organizations frequently issue public debt might augment “market discipline.”

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1. Introduction

Banking research indicates that bank managers have substantial private information about their firm’s credit quality, presumably because banks have assets and off-balance-sheet exposures that are difficult to value.¹ Other research has shown that firms tend to convey private information to the market during the issuance of public securities, as a re-

☆ This paper reflects the views of the authors only and not necessarily those of the Board of Governors, other members of its staff, or the Federal Reserve System.

* Corresponding author: Mail Stop 89, Federal Reserve Board, 20th and C Sts. NW, Washington, DC 20551, USA.

E-mail address: dcovitz@frb.gov (D.M. Covitz).

sult of disclosures by the firm and scrutiny by underwriters, investors, and rating agencies.² Taken together, these findings suggest a new hypothesis of “positive selection,” with the testable implication that the sample of banks issuing public debt should be skewed towards those with positive, private information. In this paper, we test the positive selection hypothesis against the traditional hypothesis of adverse selection, which generates the opposite prediction that issuers have negative, private information (as in Myers and Majluf, 1984).

The existing evidence on selection in public debt issuance offers modest support towards the adverse selection hypothesis. Studies of short-run equity returns after announcements of public debt issuance find mostly insignificant effects.³ Recent studies of *long-run* performance after debt issuance do find evidence of adverse selection, such as Spiess and Affleck-Graves (1999) using equity returns and Covitz and Harrison (2000) using ratings migrations. Notably, all previous studies consider only non-financial firms.

We focus instead on banks because the incentives behind the positive selection hypothesis may be particularly strong for banks. The primary incentive for firms with positive, private information to issue public debt, and for firms with negative, private information to refrain from issuance is that firms’ overall funding costs may depend materially on information revealed in the disclosure/due-diligence process. This is very likely to be the case for banks, mainly because they raise substantial amounts of funds in the short-term debt markets. On any given day during the past year banks had over \$50 billion in outstanding commercial paper, and probably an order of magnitude more in short-term Fed Funds and LIBOR/Eurodollar borrowing.⁴ Short-term debt issuance by itself is not likely to trigger a high degree of market scrutiny, since default risk is low over short horizons. However, the cost of short-term debt issuance is likely to be sensitive to an observable credit quality change, particularly if the debt is unsecured. Banks may be particularly sensitive to information revelation that leads to rating changes because they tend to use swap agreements and derivative contracts to manage portfolio risk, which typically contain triggers that are tied to credit ratings (see Moody’s, 2002).⁵

Moreover, the relative opacity of banks (see Morgan 2002 for evidence) may create more scope for disclosure/due-diligence to reveal private information at banks than at non-financial firms. In addition, supervision by bank regulators, as well as the production of

¹ Morgan (2002) and Mercer (1992) discuss the opaqueness of banks. Berger and Davies (1998), Berger et al. (2000a), and DeYoung et al. (2001) show that regulatory bank examinations contain private information.

² Lang and Lundholm (1993) and Healy et al. (1999), and Healy and Palepu (2001) find evidence for greater disclosure around public security issuance. SEC registration rules require the disclosure of previously private “material” information. Blackwell et al. (1990), Bloch (1989), Eccles and Crane (1988), and Auerbach and Hayes (1986) discuss the importance of underwriter due diligence. Sherman (1999) and Blackwell et al. (1990) show that due diligence proxies are priced by the market. Ederington and Yawitz (1987) and Moody’s (2000) discuss how bond issuance focuses the attention of ratings agencies.

³ See Smith (1986) for a summary of early research, and Shyam-Sunder (1991) for a more recent empirical investigation. James (1987) finds insignificant returns for public debt offerings, in general, and negative returns when the proceeds from the offerings are earmarked to pay down bank loans.

⁴ Fed Funds and RP liabilities plus other borrowed liabilities, which include term Fed Funds (non-overnight), totaled over \$1 trillion in 2001.

⁵ No doubt, there are other penalties associated with a ratings downgrade, such as a decline in stock price. Goh and Ederington, 1993 and Hand et al., 1992 show that rating downgrades are associated with stock price declines.

publicly-available risk-based capital ratios, may induce market participants to monitor banks infrequently between bond issues. With less continuous monitoring, private information may build up, again creating greater scope for disclosure/due-diligence to reveal information at banks than at non-financial firms.

We test for selection by analyzing ratings migration patterns of banks after they issue public debt relative to non-issuing banks. To attribute links between debt issuance decisions and subsequent ratings migrations to the revelation of private information, our tests contain firm-level and macro-level controls for publicly-available information. For robustness along this dimension, we also test for selection (measured with ratings changes) using the component of debt issuance decisions that is orthogonal to public information. For additional robustness, we measure selection with abnormal equity returns. Overall, our empirical investigation yields substantial evidence consistent with “positive” selection.

We also find that positive selection manifests in ratings migrations in the quarter of and the quarter after bond issuance. This helps discern the mechanism behind positive selection by suggesting that substantial private information is revealed around the time when banks issue public debt. The finding also suggests that the information revealed is more than a signal sent by security choice (as in Noe, 1988 and Choe et al., 1993), since one would not expect credit ratings to respond to such signals.

Other results also help characterize the mechanism for positive selection. We find that positive selection is strongest around subordinated debt issuance, relatively large debt issuance, and debt issuance by relatively risky firms. This may reflect the greater disclosure/due-diligence that one would expect around these types of debt issues.

Overall, our analysis supports the possibility that bank managers use bond issuance to manage the flow of private information between banks and the market. Our findings, therefore, break new ground in understanding the bond-issuance decision among banks by focusing on the information-revelation motive. Covitz et al. (2001) show that relatively risky bank holding companies tend to refrain from issuing subordinated debt during periods of banking and financial turbulence. Billett et al. (1998) find that banks tend to shift funding away from risk-sensitive securities and into deposits when they become relatively risky. Those papers establish that the financing of banks, presumably through the cost-of-funds, depends on observable risk. Our results indicate that it is not only observable risk, but also unobservable risk that shapes the bond issuance decision. Furthermore, our results suggest that the revelation of changes in risk is, at least in part, endogenous.

Our results may also elucidate the role of “market discipline” in monitoring banking organizations. A number of papers (see, for instance, Billett et al., 1998; Flannery and Sorescu, 1996; Evanoff and Wall, 2001; Jagtiani et al., 2002; Covitz et al., 2001) find that the bond market, particularly over the 1990s, has been sensitive to the credit risk of banks. Our findings suggest that disclosure, investor scrutiny, and information revelation are an additional mechanism of market discipline. Our results also suggest that regulations requiring banks to frequently issue subordinated debt (see Kwast et al., 1999, for a summary of proposed regulations involving debt issuance requirements) would increase the transparency of bank holding companies by limiting the extent to which they could hide negative private information.

The remainder of this paper proceeds as follows. In Section 2, we discuss how private information can be revealed during the public debt issuance process. Section 3 presents our

primary empirical methodology, which uses ratings migrations to measure selection. The data are described in [Section 4](#), and the main empirical results are presented in [Section 5](#). The robustness of our findings to additional controls and to alternative methodologies (including our analysis of abnormal equity returns) is considered in [Section 6](#). We conclude briefly in [Section 7](#).

2. Information revelation during public debt issuance

This section discusses information revelation during public debt issuance, a necessary condition for positive selection. However, information revelation only implies a reduction in private information, not necessarily the removal of all private information. Indeed, an additional implication of banks' opaqueness is that private information may not be extinguished by the information revelation associated with public debt issuance. With residual private information, standard adverse selection problems could still arise.

One mechanism for conveying information during the issuance of public securities is through voluntary and involuntary disclosures. The accounting literature (see, for instance, [Lang and Lundholm, 1993](#)) has established that firms tend to increase voluntary disclosures, such as earnings announcements, in advance of issuance. Involuntary disclosure is mandated by SEC registration rules. Information revelation is likely to be triggered by public debt issuance, in general, because of voluntary and involuntary disclosures by the firm and heightened scrutiny by market participants.

The Securities Act of 1933 requires the disclosure of material business and financial information including up-to-date balance-sheet and profit-and-loss information and, particularly relevant for banks, detailed information “to the latest practicable date” on charges against reserves, on the “practice of the issuer” regarding charges, and on nonrecurring income items. The Act also requires the disclosure of other previously-undisclosed information regarding recent sales of unregistered securities, new undertakings, material contracts, acquisitions, and the use of proceeds. Because the Act prohibits “deceit, misrepresentations, and other fraud in the sale of securities” it opens the issuer to liability for failing to provide adequate disclosure of any “material events or corporate changes.”⁶ This means that items that otherwise might go undisclosed should be revealed, such as the existence of a preliminary investigation by bank regulators, securities regulators, or prosecutors, the hiring of bankruptcy lawyers, a pending acquisition or significant sale of assets or liabilities, and, almost certainly, the booking of reserves for losses known at the time of the registration.

More important than these disclosures, no doubt, are the scrutiny of underwriters, rating agencies, and investors. The underwriter has a fiduciary responsibility and concomitant liability, as well as substantial reputational capital at risk, to investigate the issuer to ensure that bond investors are not immediately subjected to a foreseeable adverse credit shock. Section 11 of the Securities Act holds underwriters liable for material misstatements in and omissions from the registration statement, unless they can estab-

⁶ See the “Securities Act of 1933” at <http://www.sec.gov/about/laws.shtml> and SEC Form 8-K.

lish having conducted a “reasonable” inquiry such as would be performed by a “prudent man in the management of his own property.”⁷ This so-called “due diligence investigation” increases disclosure by pitting the underwriter against the issuer. “Underwriters gather information about the firm through personal interviews, inquiries of independent sources, and other means. In brief, the due diligence investigation represents the investment bankers’ effort to discover any potentially adverse inside information about the issuing firm” (Blackwell et al., 1990, p. 247; see also Bloch, 1989; Eccles and Crane, 1988; Auerbach and Hayes, 1986). The actual extent of due diligence is, of course, unobserved. Nonetheless, lawsuits under Section 11 have established that underwriters, to avoid liability, must go beyond merely accepting the statements of corporate officers as accurate and truthful (Blackwell et al., 1990, p. 248).

Rating agencies are also likely to pay more attention to firms at issuance (see, for instance, Ederington and Yawitz, 1987, and Moody’s, 2000). Not only could this closer scrutiny provide a more recent and thorough reading of the credit worthiness of the issuer from available public information, but rating agencies can receive private information from the issuer, such as acquisition plans and business strategies, detailed forward-looking projections including financial and operational variables broken down by unit, as well as information about litigation and investigations underway. Investors, many of whom have extensive expertise in credit analysis, are also likely to perform their own due diligence by conducting an independent credit investigation before adding the security to their portfolio.

3. Empirical methodology

In order to test for selection, we measure good news with ratings upgrades and bad news with ratings downgrades. Rating migrations reflect changes in credit quality and changes in credit quality are what bondholders care about.⁸ Rating migrations are also the logical outcome measure because they indicate credit quality changes that are likely to be substantial enough to move short-term financing costs, especially if those markets rely on credit ratings. An alternative (but analogous) strategy would be to examine changes in bond prices around bond issuance.⁹

Our primary methodology—alternative methodologies are discussed and implemented in the robustness section—is to test whether the probability of a firm being upgraded, downgraded, or having no change in rating is related to recent bond issuance. The basic model specification is presented in Eq. (1) and estimated as an ordered-logit model at a

⁷ Section 11 of the Securities Act of 1933.

⁸ By assuming that the private information is about changes in credit quality, we are allowing the private information to effectively be either about firm value or firm volatility.

⁹ Bond prices would reflect market expectations, but are noisy measures of credit risk due to market factors and may also respond to a signal sent by security choice, while rating changes are only likely to respond to actual concrete, discrete, changes in credit quality. Rating migrations have been shown to be informative for market prices in a number of studies (see, for instance, Goh and Ederington, 1993 or Hand et al., 1992) and have been used as outcome measures (Simkins, 1999; Covitz and Harrison, 2000).

quarterly frequency:

$$\begin{aligned} \Pr(\text{Down/No/Up})_t = & \alpha + \beta_1 \text{Bond}_{\text{lag}} + \beta_2 \text{Rating}_{t-2} + \beta_3 \Delta \text{Rating}_{t-4} \text{less}_{t-1} \\ & + \beta_4 \text{ROA}_t + \beta_5 \text{ROA}_{t-1} + \beta_6 \text{Conditions}_t \\ & + \beta_7 \text{Conditions}_{t-1} + \varepsilon_t. \end{aligned} \quad (1)$$

Bond_{lag} is the key explanatory variable indicating whether a firm has issued a public bond in some prior quarter, usually the previous one. The other independent variables are straightforward. Rating_{t-2} is Moody's rating of the firm's senior debt, lagged twice to avoid constructing a correlation with the dependent variable, where an Aaa-rating is coded as 1, Aa1 as 2, and so forth to C as 21. Robustness to a richer specification using a series of dummy variables for each rating category is discussed later. ROA is the bank holding company's return on assets. We include it to control for the impact of easily observable information on ratings migrations since it would be difficult to believe that a bank would need to issue debt to make investors pay attention to its profitability. Conditions denotes a variable that controls for macroeconomic conditions. Contemporaneous measures of this variable control for aggregate migration patterns over time, while lagged measures control for the confounding hypothesis that both bond issuance and upgrades are responding to past macro conditions. We consider three alternative proxies for macroeconomic conditions, using either the Merrill Lynch BBB-rated corporate bond index yield, an NBER dummy variable that equals one if the quarter is part of a recession, and a full set of year dummies. The twice lagged Rating variable controls for differences in migration tendencies between higher- and lower-rated bank-holding companies. ΔRating , constructed so that an upgrade is positive, controls for potential serial correlation in ratings (e.g., downward ratings spirals).

It is useful to note that, conditional upon our hypothesized mechanism, the estimated equation omits the true variable of interest and so bond issuance lumps together the effect of the bond issuance itself with the unobservable information revelation that occurs with bond issuance. We are testing the joint hypothesis that bond issuance causes information to be revealed and that firms react strategically.¹⁰ This also must be distinguished from any unrelated positive correlation between issuance and migrations. Our strategy is, therefore, to control for observable firm (and macroeconomic) characteristics that might link bond issuance with migrations and attribute the remaining effect to the unobservable information revelation (also see the two-step procedure below). The estimation is not the sample equivalent of the effect from a random assignment of bond issuance. Rather, it is the effect of strategic issuance, meaning that the β_1 coefficient is, of course, a biased estimate of the random issuance effect, but not of what we want—the strategic issuance effect.

The error term, ε_t , is assumed to be independently and logistically distributed across observations. The extensive control variables support the independence assumption. Across-firm correlations in migration tendencies are controlled for by the level and lagged change

¹⁰ This is not a case where we would want to control for sample selection since we are, in fact, testing a hypothesis of sample selection on an unobservable—issuers self-select to reveal private information—versus a null of no conditional effect.

in the firm's ratings, as well as by the firm's return on assets. Fixed effects are not useful in this context because the mean migration probabilities are close to zero (between 4 and 5 percent for both upgrades and downgrades). Including them, therefore, has little effect on the estimated subordinated-debt coefficient and their inclusion is strongly rejected. Across-year correlations in migration tendencies are controlled for by the macroeconomic conditions variable.

4. Data

Rating migrations and bond issuance data are from Moody's Credit Risk Management Services database, which includes ratings from 1980 to 1998 inclusive. Ratings changes are measured at the firm level using Moody's estimated senior unsecured debt ratings.¹¹ This rating is a summary measure of the firm's credit quality, rather than of any one bond, and is constructed to be comparable across firms. Although this rating will be above the bank's subordinated-debt rating, given Moody's practice of notching subordinated debt below senior debt, the cross-sectional differences are equivalent. Moreover, *changes* in this rating, which we use as our outcome measure, will reflect changes in the firm's credit quality and show up as rating changes for both their senior and subordinated debt and thus in their cost of funds.

The Moody's ratings database provided ratings for 171 bank holding companies. The bond issuance variables were constructed only from bonds issued in the US, excluding bonds for which there were indications that the bond's value was not closely tied to the issuer's credit quality. That is, we excluded bonds with third-party credit enhancements and limited our sample to straight debt issues—the main effect of which is to eliminate asset-backed issuance.

Balance sheet data were obtained from Federal Reserve Y-9 reports (FR Y-9C, FR Y-9LP, and FR Y-9SP) and are available on the Chicago Federal Reserve's website. Linking the Y-9 data with the migrations and bond issuance data required matching each holding company in the Moody's database with a call report identifier number. We could link up Moody's and Y-9 data for 136 bank holding companies, keeping only top-level holding companies. Banks were dropped from the sample when acquired. We also restricted our sample to observations from 1990–1998 (our ratings database ended in 1998), as research has shown that prior to the 1990s, implicit government guarantees made bank bonds insensitive to bank risk (see [Flannery and Sorescu, 1996](#)), yielding 2494 quarterly observations.

The ratings and issuance data are summarized by year in [Table 1](#). The first column shows the number of quarterly, bank observations. The sample contains 300 observations in 1990, but due to the consolidation of the industry, declines to 245 by 1998. Upgrades and downgrades were fairly cyclical, as shown in the second and third columns, with downgrades dominating in 1990 and 1991 and upgrades more prominent in the rest of the sample. Public debt issuance by banks was also somewhat cyclical, weak in 1990 and stronger from

¹¹ Despite Moody's practice of rating bond issues, the fundamental credit quality analysis is typically done at the issuer level. See [Moody's \(1999a, 1999b\)](#).

Table 1
Upgrades, downgrades, and debt issuance by year

Year	No. of firm- quarter observations	No. of firm-quarters with upgrades	No. of firm-quarters with downgrades	No. of firm-quarters with subordinated debt issue(s)	No. of firm-quarters with senior debt issue(s)
1990	300	3	60	6	3
1991	304	3	24	15	5
1992	295	17	5	26	10
1993	279	25	2	24	8
1994	292	25	0	22	2
1995	287	8	4	22	4
1996	251	9	0	31	6
1997	241	9	2	16	3
1998	245	10	4	8	2

1991 to 1996, before falling by about half in the last two years of our sample, even as economic expansion continued. About 4/5 of the public bond issues in our sample are subordinated.

Daily equity price data used in our analysis of abnormal returns were obtained from CRSP. We merged the stock data with straight-bond issuance dates, obtained from Securities Data Company, for bank holding companies from 1993–2000. Returns are calculated around the issue date and compared to returns over the same time period for the Dow Jones Bank Index.

5. Empirical results

5.1. Positive selection after subordinated debt issuance

Panel A of Table 2 displays results for three specifications of our basic model, estimated as an ordered logit. The results for the stripped-down, unconditional, specification (columns 1–3) show that the coefficient on the variable indicating whether subordinated debt was issued in the previous quarter is significantly greater than zero at the 5% error level. The marginal effects (columns 2 and 3) indicate that bank holding companies that issued subordinated debt in the prior quarter were 3.2 percent more likely to be upgraded and 2.9 percent less likely to be downgraded than other bank holding companies.

The second set of results (shown in columns 4–6) establish the robustness of the unconditional results to controls for lagged rating level, lagged change in rating, lagged and contemporaneous return on assets, and lagged and contemporaneous Merrill Lynch index of BBB corporate bond yields. The coefficients on the control variables, discussed in detail below, are almost all significant. The estimation result for the key subordinated debt issuance variable shows that the marginal effects are reduced a bit. When we use year dummies in place of the BBB (columns 7–9), the issuance effects are again a bit weaker, but still significant, and the results are a bit stronger when we replace the BBB with an

Table 2
Positive selection after subordinated debt issuance: ordered and unordered logits
Panel A. Ordered logits, dependent variable = Rating migration (t)

	Coeff. (1)	Marginal effects		Coeff. (4)	Marginal effects		Coeff. (7)	Marginal effects		Coeff. (10)	Marginal effects		Coeff. (13)	Marginal effects	
		Up (2)	Down (3)		Up (5)	Down (6)		Up (8)	Down (9)		Up (11)	Down (12)		Up (14)	Down (15)
Sub. debt ($t - 1$)	0.36** (0.14)	3.2	−2.9	0.77** (0.29)	2.2	−1.5	0.73** (0.30)	1.7	−1.0	0.91** (0.29)	2.9	−2.4	0.60** (0.29)	1.7	−1.2
Rating ($t - 2$)				0.18** (0.03)	0.5	−0.3	0.15** (0.04)	0.4	−0.2	0.17** (0.03)	0.6	−0.5			
Δ Rating ($t - 4$ less $t - 1$)				0.38** (0.07)	1.0	−0.7	0.27** (0.08)	0.6	−0.4	0.41** (0.07)	1.3	−1.1	0.39** (0.07)	1.1	−0.8
ROA (t)				0.51** (0.09)	1.3	−0.9	0.49** (0.09)	1.1	−0.7	0.58** (0.09)	1.8	−1.5	0.40** (0.10)	1.1	−0.8
ROA ($t - 1$)				0.41** (0.14)	1.0	−0.7	0.51** (0.14)	1.2	−0.7	0.51** (0.12)	1.0	−0.8	0.07 (0.16)	0.2	−0.2
BBB rate (t)				−0.14 (0.17)	−0.3	0.2							−0.28* (0.17)	−0.8	0.6
BBB rate ($t - 1$)				−0.53** (0.18)	−1.3	0.9							−0.40** (0.18)	−1.1	0.8
Year dummies							**								
NBER dummy										−1.36** (0.24)	−4.0	3.3			
Rating dummies													**		
Log-likelihood	−830.71			−710.93			−690.65			−731.31			−751.32		
Significance level	0.01			0.00			0.00			0.00			0.00		
# Obs.	2494			2494			2494			2494			2494		

(continued on next page)

Table 2 (continued)

Panel B: Unordered logits (marginal effects)

Dependent variable = Rating migration (<i>t</i>)	Down (1)	No (2)	Up (3)	Down (4)	No (5)	Up (6)
Sub. debt (<i>t</i> – 1)	–4.3*	1.6	2.7**	–1.0	–1.7	2.6**
Rating (<i>t</i> – 2)				–0.2**	–0.3**	0.6**
ΔRating (<i>t</i> – 4 less <i>t</i> – 1)				–0.5**	–0.0	0.5
ROA (<i>t</i>)				–0.8**	0.1	0.9
ROA (<i>t</i> – 1)				–0.8**	0.9	–0.2
BBB (<i>t</i>)				0.5	–1.2**	0.8
BBB (<i>t</i> – 1)				0.6*	1.6*	–2.2**
Log-likelihood	–830.47			–697.69		
Significance level	0.00			0.00		
# Obs.	2494			2494		

Notes. The dependent variable is rating migrations ordered as downgrade (–1), no change (0), upgrade (+1). The sample period is from 1990 to 1998. *Sub. debt* indicates subordinated debt issuance. *Rating* is Moody's issuer rating, with Aaa coded as 1, Aa1 as 2, and so forth to C = 21. *ROA* is the bank's return on assets. *BBB* is the Merrill Lynch BBB corporate bond index yield. *NBER dummy* equals one if the quarter is part of a recession. *Rating dummies* are indicators for Aaa, Aa, Baa, and so forth. Joint significance for the year and rating dummies use a likelihood ratio test with only the significance reported. A constant term is significant, but not reported. Marginal effects are in percent. Standard errors are below coefficient estimates in parentheses.

* Significant at the 10% level.

** Idem., 5%.

NBER recession indicator (columns 10–12).^{12,13} Replacing the linear ratings control variable with dummy variables for each rating group (Aaa, Aa, A, Baa and so on) also reduces the marginal effects from subordinated debt issuance a bit, but they are still significant (columns 13–15).

Overall, we take this as strong evidence that a “positive selection” effect is discernible, since even conditioning upon firm and economic conditions does not eliminate the effect. Positive selection appears to be an important economic effect. The marginal effect of subordinated debt issuance on an upgrade, for instance, is 2.2 percent (column 5). The unconditional effect in the population is about 4.3 percent. This implies that the marginal effect is important—over 50 percent of the unconditional. The total effect, however, is small since subordinated debt issuance is relatively infrequent—only about 7 percent of observations.

The marginal effects for the lagged ratings variable and the change in ratings variable provide interesting insights into the migration tendencies for bank holding companies in the 1990s. The marginal effects for the lagged rating variable indicate that riskier (higher ratings notch in our ordering) holding companies are more likely to be upgraded and less likely to be downgraded.¹⁴ Examination of the actual ratings distribution over time reveals that the result reflects mostly risky bank holding companies being upgraded. As a result, the

¹² For the remainder of the specifications, we use the BBB bond yield as our macroeconomic control variable, although the results are robust to this choice.

¹³ When the model is estimated with quarter dummies, the likelihood function does not converge.

¹⁴ This is consistent with the non-linear specification too.

ratings distribution of bank holding companies narrowed over the 1990s, with the standard deviation of ratings falling steadily from its peak of 3.4 in 1991 to 1.8 in 1998.

One possible explanation for the narrowing of the ratings distribution over the 1990s is that prompt corrective action, instituted in 1991, induced relatively risky holding companies to move away from the 8% risk-based capital ratio threshold that triggers the first round of regulatory punishments.¹⁵ This could muddle the interpretation of our results if banks both issued a lot of subordinated debt and simultaneously cleaned up their balance sheets in the early 1990s to please the regulators. We split our sample in half and find (but do not report) that the evidence for our effect is consistent across the two time periods but *stronger* in the second time period which is evidence that this “regulator” explanation for issuance and migrations is not the driving factor (later we directly assess the role of subordinated debt as a regulatory cushion).

The marginal effects for the lagged ratings *change* variable (which is constructed so that a one-notch upgrade equals +1) indicate that recently-upgraded firms are more likely to be upgraded, while recently-downgraded firms are more likely to be downgraded. Thus, rating migrations occur in strings, probably because performance is serially correlated, and also perhaps because ratings migrations cause changes in credit quality.¹⁶ Another possible explanation is that rating agencies are slow to fully adjust to substantial changes in credit quality, perhaps because they do not wish to signal that they made a big mistake.

Panel B of Table 2 presents marginal effects for the probability of a downgrade, the probability of no migration, and the probability of an upgrade when the equations are estimated as *unordered* logits. Ratings migrations are a natural choice for an ordered model, which should be more efficiently estimated. Nonetheless, we run the unordered logits to test the restrictiveness of these assumptions on the estimated effects. The results (shown in columns 1–3) for the stripped-down, unconditional, specification including the one-quarter lag of the subordinated debt issuance dummy as the only independent variable, indicate that bank holding companies are 4.3 percent less likely to be downgraded and 2.7 percent more likely to be upgraded in the quarter after they issue subordinated debt. These results are statistically significant at the 10 and 5 percent error levels, respectively.

After adding the control variables (columns 4–6) the results still completely support the findings from the ordered model in Panel A—in fact, the marginal effects are surprisingly similar—but differ in that the marginal impact of debt issuance on the likelihood of a downgrade is now statistically indistinguishable from zero. Again, our basic conclusion from Table 2 is that bond issuance by bank holding companies is associated with positive selection.¹⁷

¹⁵ Another explanation is that the generally favorable economic environment of the 1990s benefitted risky bank holding companies more than safe ones (Berger et al., 2000b, provide evidence that risky banks tended to perform consistently in the upper-end of the performance distribution in the 1990s).

¹⁶ For example, downgrades may lead to higher funding costs and possibly limit a bank’s ability to participate as a counter-party in derivatives transactions.

¹⁷ The results in Table 2 are similar when estimated as a probit.

5.2. Positive selection manifests near subordinated debt issuance

The first set of results presented in Table 3 is from a specification that includes, in addition to the usual control variables, five different issuance dummy variables, each indicating subordinated debt issuance in a different quarter, ranging from the current quarter to 4 quarters prior to the current quarter. The results (columns 1–3) indicate that the coefficients on the one-quarter lag and current quarter of the issuance dummy are the only significant issuance coefficients. In the specification using only the current-quarter issuance dummy along with the usual controls (columns 4–6), the coefficients and marginal effects are very similar to those from the basic specification reported in Table 2.

These results are important because they indicate that information is being generated around the time when firms issue subordinated debt and not later. This lends credence to the idea that information about credit-quality is being *revealed* at issuance and makes a signaling alternative less likely than the information-based explanation since ratings are likely to respond to concrete new information but not to a signal. In addition, because we control for firm- and market-level information that is public prior to issuance, as well as for observable performance between the issuance and the rating change, the significant findings suggest that issuance reveals new private information, rather than simply following

Table 3
Positive selection manifests near subordinated debt issuance: ordered logits

Dependent variable = Rating migration (<i>t</i>)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects	
		Up (2)	Down (3)		Up (5)	Down (6)
	(1)			(4)		
Sub. debt (<i>t</i>)	0.60** (0.28)	1.3	−1.0	0.82** (0.27)	2.1	−1.6
Sub. debt (<i>t</i> − 1)	0.66** (0.32)	1.7	−1.3			
Sub. debt (<i>t</i> − 2)	0.26 (0.34)	0.5	−0.4			
Sub. debt (<i>t</i> − 3)	0.24 (0.39)	0.3	−0.2			
Sub. debt (<i>t</i> − 4)	−0.03 (0.36)	0.3	−0.2			
Other control variables, as in Table 2	Jointly significant at the 5 percent level			Jointly significant at the 5 percent level		
Log-likelihood		−707.75			−739.38	
Significance level		0.00			0.00	
# Obs.		2494			2494	

Notes. The dependent variable is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). The sample period is quarterly from 1990 to 1998. *Sub. debt* indicates subordinated debt issuance. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent. Constant term and other control variables from Table 1 are individually and jointly significant in the estimation but are not reported.

** Significant at the 5% level.

past performance.¹⁸ It is important to note that the finding of positive selection does not appear to be driven by the fact that the outcome is measured with rating changes but rather by the fact that the issuers are banks. Using a similar methodology, Covitz and Harrison (2000) show that debt issuance by investment-grade non-financial firms is characterized by adverse selection that manifests in downgrades subsequent to bond issuance.

Although rating changes appear to often lag bond issuance, this does not suggest that the market is inefficient or that investors are “fooled.” Rather, we assume that the market uncovers the issuer’s information at issuance and rating agencies are simply lagging. This is consistent with the limited empirical research on the reaction of rating agencies. Holthausen and Leftwich (1985) find that rating changes lag the stock market by at least 60 days and Ederington and Goh (1998) find that rating changes lag analyst revisions by at least a quarter. This lag could be explained by a number of factors. It may be that rating agencies wait to “validate” the new information learned at issuance. Thus, the lag could reflect that the type of information being revealed is diffuse or ambiguous since a significant and unambiguous information event such as a merger or exogenous demand shock (for instance the effect of the 9/11 terrorist attack on the airlines) results in a rating lag often numbered in days rather than weeks. It may simply be that the rating process itself takes time and so naturally occurs with a lag.

The significant current-quarter results are also consistent with the hypothesis of information revelation at issuance. However, to avoid the possibility of reverse causality, we conservatively focus on the lagged-quarter results since, in that case, we can be sure that the information revelation *precedes* the rating change. The timing of the two events within the same current quarter is unknown. Of course, the current-quarter findings are completely complementary with the lagged-quarter results, since the positive selection hypothesis asserts that information revelation leads issuance. Regardless, our use of only the one-quarter lagged issuance dummy should only make it *more difficult* to observe the predicted effect.

5.3. Bond size and positive selection after subordinated debt issuance

To test whether positive selection is stronger for larger issues, we add a variable that measures the size of the subordinated debt issue in the prior quarter. This is effectively an interaction variable between issue size with whether subordinated debt was issued. The results are presented in the first three columns of Table 4. Since issuance equals zero for the large majority of observations, the size interaction is very highly correlated ($\rho = 0.89$) with the issuance dummy variable. This inflates the standard errors on the two coefficient point estimates. However, as expected, they are jointly significant. Interpreting the point estimates implies that about half of the effect from issuance on migrations comes through the act of issuing and about half through the size of the issue. For every extra \$100 million of issue size (the variable is in units of \$10 million) the probability of an upgrade increases by 0.5 percent—meaning that large bonds are almost 2 percent more likely to be upgraded than small bonds.

¹⁸ We consider this alternative explanation for positive selection again later.

Table 4
Bond size and positive selection after subordinated debt issuance

	Ordered logit—full sample			Binomial logit—issuers only sample		
Dependent variable = Rating migration (<i>t</i>)	Coefficient (Std. error)	Marginal effects		Marginal effects		
		Up (2)	Down (3)	Up (4)	Up (5)	Up (6)
	(1)	(2)	(3)	(4)	(5)	(6)
Sub. debt size (<i>t</i> − 1)	0.02 ^a (0.02)	0.05	−0.04			
Sub. debt issuance (<i>t</i> − 1)	0.41 ^a (0.59)	1.0	−0.7			
Big issue (<i>t</i> − 1)				9.0 ^{**}		7.7 ^{**}
Upper quartile (<i>t</i> − 1)					6.3 [*]	3.0
Rating (<i>t</i> − 2)	0.18 ^{**} (0.03)	0.5	−0.3	1.4 ^{**}	1.7 ^{**}	1.5 ^{**}
Other control variables, as in Table 1	Jointly significant at the 5 percent level					
Log-likelihood		−710.53		−39.08	−40.58	−38.50
Significance level		0.00		0.00	0.00	0.00
# Obs.		2494		167	167	167

Notes. The dependent variable is rating migrations ordered as downgrade (–1), no change (0), upgrade (+1). The sample period is from 1990 to 1998. *Sub. debt size* indicates the dollar value of the subordinated debt issue (measured in units of \$10 million), *Big issue* is a dummy variable that equals 1 if the sub debt issue is above the median for that year, and *Upper quartile* is a dummy variable that equals 1 if the firm's total assets are in the upper quartile of the size distribution for that year. Other variables defined as previous. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

^a Indicates jointly significant at the 5 percent error level.

* Significant at the 10% level.

** Idem., 5%.

Another way to examine this issue is to estimate the effect of size on the upgrade probability, conditional on issuance. This is shown in column 4, indicating that big bonds (bonds greater than median issue size) are significantly more likely to be upgraded than small bonds. The marginal effect estimated here implies that large bonds are 9 percent more likely to be upgraded than small bonds. One might be concerned that the relationship between the size variable and the tendency towards upgrades spuriously reflects the fact that the average size of subordinated debt issues and the frequency of upgrades both increase over the 1990s. For this reason the dummy variable is constructed relative to issue sizes for each year, and not for the entire sample. Moreover, if we replace the BBB interest rate with year dummies, the coefficient on the size variable is still significant at the 5 percent level (not shown).

Column 5 shows the results when the issue size dummy is replaced with a dummy for firm size, as proxied by total assets, constructed relative to the median total assets in each year. Firm size is less significant, but indicates that large issuers are still 6 percent more likely to be upgraded than small issuers. Of course, large issuers are those most likely to

Table 5
Bank risk and positive selection after subordinated debt issuance

Dependent variable = Rating migration (t)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects	
		Up	Down		Up	Down		Up	Down
		(2)	(3)		(5)	(6)		(8)	(9)
Sub. debt ($t - 1$)	0.58 ^a (0.99)	2.1	−0.4	1.07 ^a (0.50)	3.8	−0.7	0.82 ^a (0.34)	2.1	−2.6
Sub. debt * Securities ($t - 1$)	1.10 ^a (6.28)	4.0	−0.8						
Securities ($t - 1$)	−2.10 (1.75)	−7.6	1.5						
Sub. debt * Trading assets ($t - 1$)				0.99 ^a (2.92)	3.5	−0.7			
Trading assets ($t - 1$)				−4.93 ^{**} (1.71)	−17.5	3.2			
Sub. debt * Rating Dummy ($t - 1$)							0.22 ^a (0.60)	0.6	−0.4
Other controls, as in Table 1	Jointly significant at the 5 percent level			Jointly significant at the 5 percent level			Jointly significant at the 5 percent level		
Log-likelihood	−266.27			−263.99			−738.80		
Significance level	0.00			0.00			0.00		
# Obs.	1243			1243			2494		

Notes. The dependent variable is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). The sample period is quarterly from 1990 to 1998. *Sub. debt* indicates subordinated debt issuance. *Securities* is the bank's investment in securities, *Trading assets* is the bank's trading assets, and *Rating dummy* is an indicator that takes on the value of 1 if the bank's $t - 1$ rating is below the mean. The standard control variables are included but not reported to simplify the presentation. The constant term is significant but not reported. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

^a Indicates jointly significant at the 5 percent error level.

^{**} Significant at the 5% level.

issue the larger bonds. The final column shows that, when both are included, the effect appears to come through *issue* and not *issuer* size.

5.4. Bank risk and positive selection after subordinated debt issuance

It is plausible that positive selection is more prevalent among riskier banks because they may have more scope for information revelation. To test this, we estimate three new specifications, each of which augments our basic specification with a variable that proxies for bank risk and its interaction with bond issuance. As shown in Table 5, we consider three risk variables: “securities” which measures the share of total assets in securities, “trading assets” which measures the share of assets in trading activities, and “rating dummy” which is a dummy variable for whether the bank is risky (defined relative to the median rating each year) or safe. Each variable is estimated to have a negative effect on upgrades, although the

effect from securities is weak. Due to the high degree of collinearity between the interaction terms and the issuance variable, it is difficult to assess the effects independently. However, taken together the two variables are jointly significant and the coefficients on the interaction terms are positive, indicating positive selection is stronger for riskier firms. This appears to bolster our proposed mechanism.

5.5. Positive selection around senior debt issuance

We also test for selection after senior debt issuance, though the investigation is hampered by the high degree of correlation between the senior debt issuance variable and the constant. Only 1.5 percent of the observations in our sample contain a senior debt issue. We report results in Table 6 using our standard control variables and a variable for senior debt issuance in period t or $t - 1$. The issuance variable is positive in both models but only significant in the first, suggesting that senior debt issuance is a weak trigger of positive selection. This weaker effect may owe to less market scrutiny of senior debt issuance, since

Table 6
Positive selection around senior debt issuance

Dependent variable = Rating migration (t)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects	
		Up	Down		Up	Down
	(1)	(2)	(3)	(4)	(5)	(6)
Senior debt (t)	1.28** (0.51)	3.2	−2.3			
Senior debt ($t - 1$)				0.74 (0.54)	1.9	−1.3
Rating ($t - 2$)	0.17** (0.03)	0.4	−0.3	0.17** (0.03)	0.4	−0.3
Δ Rating ($t - 4$ less $t - 1$)	0.39** (0.07)	1.0	−0.7	0.38** (0.07)	1.0	−0.7
ROA (t)	0.50** (0.10)	1.3	−0.9	0.49** (0.10)	1.2	−0.9
ROA ($t - 1$)	0.41* (0.14)	1.0	−0.7	0.41** (0.14)	1.0	−0.7
BBB (t)	−0.10 (0.17)	−0.3	0.2	−0.11 (0.18)	−0.3	0.2
BBB ($t - 1$)	−0.57** (0.18)	−1.4	1.0	−0.55** (0.18)	−1.4	1.0
Log-likelihood		−712.27			−714.15	
Significance level		0.00			0.00	
# Obs.		2494			2494	

Notes. Ordered Logit regressions where the dependent variable is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). Sample period is quarterly from 1990–1998. *Senior debt* indicates senior debt issuance. Other variables as defined previously. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

* Significant at the 10% level.

** Idem., 5%.

it is less credit sensitive than junior debt (as in Flannery and Sorescu, 1996). If true, our hypothesis is more valid for subordinated debt issuance, which triggers more scrutiny.¹⁹ Or, it might be that we simply do not have enough data to estimate the positive selection effect precisely.

6. Robustness

6.1. Controlling for “capital cushion” effects

One alternative explanation for the positive selection found around subordinated debt issuance is that it reflects a “capital cushion” effect. Since subordinated debt counts as tier 2 regulatory capital (up to 50 percent of the holding company’s tier 1 level) its issuance may be viewed positively by regulators, rating agencies, and the market, inducing a direct mechanical relation between issuance and upgrades. We control for this possibility by adding measures of regulatory capital changes to the model. We first add the change in the bank holding company’s tier 2 regulatory capital ratio from period $t - 2$ to $t - 1$, and then include the similar change in their tier 1 ratio. A related measure—the amount of subordinated debt issued in period $t - 1$ relative to the bank holding company’s total assets in period $t - 1$ —is also included as a proxy for the potential relative cushion size (a large relative debt issue could have a large cushioning effect).²⁰

Due to the limited availability of regulatory capital information, the sample used in the analysis of the capital cushion effect contains only 1811 observations, instead of 2494 for the other models (the data does not exist for 1990 and 1991, and is unavailable for some firms at other times). Columns 1–3 of Table 7 therefore present results from our “basic” specification estimated on the smaller sample. Despite the smaller sample size, subordinated debt issuance in the prior quarter is still significantly, at the 5 percent error level, related to a tendency towards upgrades and away from downgrades—with issuing firms 3.7 percent more likely to be upgraded and 0.6 percent less likely to be downgraded. Including the change in tier 2 capital over the same period has scant effect on the coefficients (columns 4–6) and the tier 2 variable is insignificant. This finding is perhaps surprising given the regulatory focus on capital, but could be due to the greater apparent role played by tier 1 capital.

Results from the next specification (shown in columns 7–9) demonstrate that positive selection is robust to controls for both changes in the bank’s tier 1 and tier 2 capital ratios. The coefficient on the tier 1 capital ratio change is, as expected, significant, while the coefficient on the tier 2 capital ratio change remains insignificant. Taken together, these

¹⁹ Moreover, testing the implications of our hypothesis on subordinated debt by itself allows us to directly comment on proposals for augmenting “market discipline” that would require bank holding companies to frequently issue subordinated debt.

²⁰ This last variable could proxy for non-regulatory cushion effects too. For instance, if newly issued subordinated debt replaces senior debt in the capital structure it could, by nature of its junior priority status in bankruptcy, reduce expected losses to senior debt claimants. Rating agencies might upgrade firms that modified their capital structure in this way since the issuer rating is defined as a firm’s ability to meet the obligations of its senior unsecured debt holders.

Table 7
Robustness to controls for “capital cushion” effect: ordered logits

Dependent variable = Rating migration (t)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects	
		Up	Down		Up	Down		Up	Down
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sub. debt ($t - 1$)	0.82** (0.31)	3.8	−0.6	0.82** (0.32)	3.7	−0.6	0.68** (0.33)	3.0	−0.5
Δ Tier2 ($t - 2$ to $t - 1$)				0.02 (0.43)	0.1	−0.0	0.07 (0.46)	−0.3	0.1
Δ Tier1 ($t - 2$ to $t - 1$)							0.32** (0.10)	1.4	−0.2
Total sub./TA ($t - 1$)							4.89 (3.36)	21.8	−3.5
Rating ($t - 2$)	0.17** (0.04)	0.8	−0.1	0.17** (0.04)	0.8	−0.1	0.15** (0.04)	0.7	−0.1
Δ Rating ($t - 4$ less $t - 1$)	0.09 (0.14)	0.4	−0.1	0.09 (0.14)	0.4	−0.1	0.10 (0.15)	0.4	−0.1
ROA (t)	0.54** (0.21)	2.5	−0.4	0.54** (0.22)	2.5	−0.4	0.58** (0.22)	2.6	−0.4
ROA ($t - 1$)	0.00 (0.26)	0.0	−0.0	0.00 (0.26)	−0.0	0.0	−0.02 (0.27)	−0.1	−0.0
BBB (t)	0.39* (0.23)	1.8	−0.3	0.39* (0.23)	1.8	−0.3	0.40* (0.23)	1.8	−0.3
BBB ($t - 1$)	−0.50** (0.22)	−2.3	0.4	−0.50** (0.22)	−2.3	0.4	−0.52** (0.23)	−2.3	0.4
Log-likelihood	−451.63			−451.62			−447.72		
Significance level	0.00			0.00			0.00		
# Obs.	1811			1811			1811		

Notes. The dependent variable is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). The sample period is quarterly from 1992 to 1998. *Sub. debt* indicates subordinated debt issuance. *Tier1* and *Tier2* refer to the bank's tier 1 and tier 2 risk-based capital ratios. *Total sub./TA* is the total subordinated debt issued relative to total assets. The other variables are defined as before. The constant term is significant but not reported. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

* Significant at the 10% level.

** Idem., 5%.

results indicate quite strongly that changes in regulatory capital due to subordinated debt issuance do not drive our results, although changes in tier 1 capital do matter importantly for credit quality. Results from the last specification further demonstrate the robustness of positive selection to controls for changes in the relative quantity of subordinated debt issued by the bank holding company in the prior quarter. The coefficient on this measure is not significant.

6.2. Controlling for the effects of merger activity and bank size

Table 8 includes results for our “basic” specification augmented by a control for merger activity. It is difficult to imagine how merger activity could confound our relation, es-

Table 8
Robustness to controls for bank mergers and firm size

Dependent variable = Rating migration (t)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Marginal effects	
		Up	Down		Up	Down
	(1)	(2)	(3)	(4)	(5)	(6)
Sub. debt ($t - 1$)	0.86** (0.29)	2.1	−1.5	0.68** (0.29)	1.6	−1.2
Rating ($t - 2$)	0.18** (0.03)	0.5	−0.3	0.23** (0.03)	0.6	−0.4
Δ Rating ($t - 4$ less $t - 1$)	0.38** (0.07)	1.0	−0.7	0.39** (0.07)	1.0	−0.7
ROA (t)	0.51** (0.09)	1.3	−0.9	0.52** (0.09)	1.3	−0.9
ROA ($t - 1$)	0.41** (0.14)	1.0	−0.7	0.44** (0.13)	1.1	−0.8
BBB (t)	−0.14 (0.18)	−0.4	0.3	−0.12 (0.17)	−0.3	0.2
BBB ($t - 1$)	−0.51** (0.18)	−1.3	0.9	−0.53** (0.18)	−1.3	0.9
Merger (t)	0.32 (0.30)	0.8	−0.6			
Log(Total assets) (t)				0.20** (0.06)	0.5	−0.3
Log-likelihood		−710.27			−906.61	
Significance level		0.00			0.00	
# Obs.		2494			2494	

Notes. Ordered logit regressions where the dependent variable is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). Sample period is quarterly from 1990–1998. *Merger* is a dummy variable that takes the value of one if the bank acquired another bank during the quarter. *Log(Total assets)* is the log of the bank's total assets and is a proxy for bank size. Other variables as defined previously. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

** Significant at the 5% level.

pecially since bank takeovers typically use equity and so are unlikely to correlate with subordinated debt issuance. Furthermore, the ex ante expectation for credit quality from a takeover is that the better credit acquires the lower credit, suggesting that mergers should, on average, worsen the acquirer's credit quality. Regardless, merger activity is an important feature of the banking landscape during the 1990s and might be correlated with some unobserved performance variable. The merger control is an indicator taking the value of 1 if the bank holding company acquired another bank during the quarter and 0 otherwise.²¹ As can be seen in columns 1 to 3, the coefficient on the merger variable has a nearly significant positive effect on migrations, but does not alter the coefficient on the subordinated debt issuance variable. This provides some evidence that improving banks do engage in acqui-

²¹ Recall that banks that are acquired are dropped out of the sample.

sitions, but is not an explanation for our finding of positive selection around subordinated debt issuance.

Firm size might be another proxy for unobservable bank characteristics which correlate with success, although it too is difficult to argue that size should correlate with the timing relationship we find between issuance and migrations. Nonetheless, bank size, as shown in columns 4 to 6, is a significant factor for rating migrations—large banks are more likely to be upgraded—and does indeed weaken the issuance effect a bit. Part of this weakening could be attributable to the issuance size effect, which is correlated with bank size, as documented in Table 4.

6.3. Using the orthogonal component of the bond issuance decision

We also test for selection with the part of the bond issuance variable that is orthogonal to prior performance and macro conditions. We do so by first estimating a logistic model of lagged bond issuance with performance and macro conditions as explanatory variables, and then substitute the residuals from this model for the bond issuance variable in our usual model of ratings migrations. This procedure purges from the bond issuance variable all of its correlation with the performance and conditions variables. One way to view the estimation is that bond issuance is a proxy variable for information revelation; this proxy may be more reasonable if it is uncorrelated with the other right-hand side variables, as in this two-step construction. The basic specification for this two-step model is presented in Eqs. (2a) and (2b):

$$\begin{aligned} \Pr(\text{Bond})_{t-1} = & \alpha^0 + \beta_1^0 \text{Rating}_{t-2} + \beta_2^0 \Delta \text{Rating}_{t-4 \text{ less } t-1} + \beta_3^0 \Delta \text{ROA}_{t-1} \\ & + \beta_4^0 \text{Conditions}_{t-1} + \phi_{t-1}, \end{aligned} \quad (2a)$$

$$\begin{aligned} \Pr(\text{Down/No/Up})_t = & \alpha^1 + \beta_1^1 \phi_{t-1} + \beta_2^1 \text{Rating}_{t-2} + \beta_3^1 \Delta \text{Rating}_{t-4 \text{ less } t-1} \\ & + \beta_4^1 \text{ROA}_t + \beta_5^1 \Delta \text{ROA}_{t-1} + \beta_6^1 \text{Conditions}_t \\ & + \beta_7^1 \text{Conditions}_{t-1} + \varepsilon_t. \end{aligned} \quad (2b)$$

We report two specifications of this two-step model. The first specification includes essentially the same set of performance and macro variables in the first and second steps (in the first step we drop the contemporaneous BBB yield and ROA). The results are identical in a second specification which, in the first step, replaces the ratings change from $t - 4$ to $t - 1$ with a dummy variable for whether the firm has been upgraded over that time period. By construction, the control variables in the second step are uncorrelated with the expected issuance variable and are only left in the equation because they affect the migration probability and improve the estimated standard errors—excluding them does not alter the findings.

The results indicate that our finding of positive selection is robust to this two-step approach. Note that this is only another control for past performance; we are not using instruments. But, it gets at the question of expected versus unexpected issuance. Issuance that is *unexpected* based on past performance is associated with more upgrades, while unexpected non-issuance is associated with more downgrades. This is consistent with the idea of the unexpected issuance being a proxy variable for the unobserved omitted variable.

Table 9

Robustness to using the orthogonal component of bond issuance: two-stage ordered logits

Dependent variable →	Step-1		Step-2		Step-1		Step-2	
	Sub. debt ($t - 1$)		Migration (t)		Sub. debt ($t - 1$)		Migration (t)	
	Coefficient (Std. error)	Coefficient (Std. error)	Marginal effects		Coefficient (Std. error)	Coefficient (Std. error)	Marginal effects	
			Up	Down			Up	Down
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Residual from step 1 ($t - 1$)		0.96** (0.29)	2.4	−1.9		0.95** (0.29)	2.4	−1.9
Rating ($t - 2$)	−0.34** (0.05)	0.17** (0.03)	0.4	−0.3	0.34** (0.05)	0.17** (0.03)	0.4	−0.3
Δ Rating ($t - 4$ less $t - 1$)	0.29** (0.14)	0.39** (0.07)	1.0	−0.8		0.39** (0.07)	1.0	−0.7
Upgrade in ($t - 4$ through $t - 1$)					0.47** (0.21)			
ROA (t)		0.59** (0.10)	1.5	−1.2		0.59** (0.10)	1.5	−1.2
ROA ($t - 1$)	−0.24 (0.19)	0.25* (0.15)	0.6	−0.5	−0.23 (0.19)	0.25* (0.15)	0.6	−0.5
BBB (t)		−0.28** (0.16)	−0.7	0.6		−0.28** (0.16)	−0.7	0.6
BBB ($t - 1$)	−0.25** (0.08)	−0.40** (0.17)	−1.0	0.8	−0.27** (0.08)	−0.40** (0.17)	−1.0	0.8
Log-likelihood	−578.23	−738.02			−578.07	−738.08		
Significance level	0.00	0.00			0.00	0.00		
# Obs.	2494	2494			2494	2494		

Notes. The step-1 dependent variable *Sub. debt* is whether a firm issued subordinated debt. The step-2 dependent variable *Migration* is rating migrations ordered as downgrade (−1), no change (0), upgrade (+1). The sample period is quarterly from 1990 to 1998. *Rating* is Moody's issuer rating, where Aaa is coded as 1, Aa1 as 2, and so forth to C = 21. *Upgrade* is a dummy variable for a ratings upgrade. *ROA* is the bank's return on assets. *BBB* is the Merrill Lynch index for BBB-rated corporate bonds. The constant term is included and significant but not reported. Significance levels reported below the log-likelihood values are that for a Wald test of the hypothesis that all coefficients other than the constant are zero. Marginal effects are in percent.

* Significant at the 10% level.

** Idem., 5%.

As shown in Table 9, columns 3–4 and 7–8, the marginal effects on the first-stage residuals are similar to the issuance effects in our basic specification. Moreover, the coefficients on the residuals, displayed in columns 2 and 5, are significant at the 5 percent level. Since these residuals are “generated regressors” the standard errors should be interpreted with caution, but the t -test that the coefficient on the residual equals zero is fine (see Wooldridge, 2002). Augmenting the first stage regression with the bank size (log of total assets) improves the first-stage fit, but does not much change the second stage regression.

6.4. Robustness to using abnormal equity returns to measure selection

We also test for selection with abnormal equity returns after bond issuance. While equity returns are not ideal measures of credit quality, they are less likely than ratings to reflect

Table 10

Robustness to using abnormal equity returns to measure selection (1993–2000)

Excess returns around debt issuance	From $t - 1$ days to $t + 90$ days		From $t - 2$ days to $t + 2$ days	
	Senior issue (# = 80)	Sub. issue (# = 155)	Senior issue (# = 80)	Sub. issue (# = 155)
No. outperforming	32 (40.0%)	81 (52.3%)	38 (47.5%)	83 (53.5%)
No. under-performing	48 (60.0%)	74 (47.7%)	42 (52.5%)	72 (46.5%)
Median excess return (%)	−0.83*	+0.56	−0.23	+0.15
(Sign t -test for median $\neq 0$)	(1.83)	(0.57)	(0.45)	(0.88)
Difference in two sample proportions (t -test)	1.83*		0.89	
	Small issue (# = 51)	Large issue (# = 58)	Small issue (# = 51)	Large issue (# = 58)
No. outperforming	21 (41.2%)	34 (58.6%)	24 (47.1%)	33 (56.9%)
No. under-performing	30 (58.8%)	24 (41.4%)	27 (52.9%)	25 (43.1%)
Median excess return (%)	−2.85	+1.02	−0.17	+0.05
(Sign t -test for median $\neq 0$)	(1.28)	(1.43)	(0.41)	(1.06)
Difference in two sample proportions (t -test)	1.87*		1.03	

Notes. Straight-debt issuance by bank holding companies from 1993–2000 from SDC are merged with CRSP stock price data around the issuance event. Multiple issues in the same quarter are excluded. Returns are calculated from the time just before the issue to 90 days after the issue—the median return is 3.52 percent. The benchmark return is calculated over the same period using the Dow Jones Bank Index. (The results using the S&P Bank Index are qualitatively similar.) Excess returns are then computed relative to the benchmark return. The median excess return and the number of issues for which the excess return exceeds the benchmark are reported below. *Large* debt issues are those in the top quartile (greater than \$250 million), *small* are those in the bottom quartile (less than \$100 million).

* Significant at the 10% level.

news prior to debt issuance and thus any positive selection that we observe is less likely to be confounded by alternatives that assert the positive selection reflects *past* information.

Table 10 displays abnormal equity returns (defined relative to the Dow Jones Bank Index) for the window from 1 day before to 90 days after the issuance date (to correspond to the first quarter after issuance as in the migrations analysis) as well as for the window from 2 days before to 2 days after issuance (since equity returns should respond rapidly to new information). Subordinated debt issuance tends to be followed by positive excess returns and senior debt by negative excess returns. However, the results are not very strong. The median excess return following a subordinated debt issue (column two of the upper panel) is +0.56 percent (or, +2.24 percent on an annual basis) for the 90 day window and +0.15 percent for the 4 day window, but neither is statistically significant. The dichotomy between issue types, as measured by the difference between the two sample proportions, is significant for the longer window.

In order to analyze abnormal returns by size of issue, we define “large” debt issues as those in the top quartile (greater than \$250 million), and “small” as those in the bottom quartile (less than \$100 million). While, the median abnormal returns after small issues is negative and after large issues is positive, none are significantly different from zero. The differential response for these two types is significant at the 5 percent level only for the longer window.

These results are consistent with, but much weaker than, our rating migration analysis. One explanation is that equity returns may not always benefit from a reduction in risk. So, if firms issue debt to convey a decline in risk, the equity market may not respond positively. Given that the risk-reduction would eventually become public regardless, issuance could still be an optimal decision for managers acting in the interest of shareholders because the bank lowers its cost of funds immediately, increasing potential future pay-outs to equity and generating a positive effect to offset the “negative” decline in option value due to reduced risk. The equity return analysis might also be confounded by the diffuse nature of the bond issuance event. Even though the issuance date is known with certainty, the information revelation varies and could occur weeks before the issuance.²²

That we observe greater abnormal equity returns after subordinated debt issuance than after senior debt issuance, and greater abnormal equity returns after large debt issuance than after small debt issuance, provides additional marginal evidence that positive selection may be related to scrutiny and risk. While any issue could reveal information, it may be that investors provide significantly more scrutiny for riskier issues (such as larger and subordinated bonds).

7. Conclusion

This paper tests for selection in public debt issuance by banks. We find evidence for positive selection and against adverse selection. In addition, we find that positive selection manifests near issuance, and that positive selection may be stronger after larger, subordinated, and riskier issues. These results are consistent with firms issuing public debt, at least in part, to convey positive, private information and refraining from issuance to hide negative, private information. The results have implications for understanding the role of “market discipline” in monitoring bank holding companies and also add to our understanding of how potential regulatory requirements that such organizations frequently issue public bonds might augment “market discipline.”

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²² The qualitative results are robust to extending the window used to compute the excess returns—neither starting from 30 days before nor ending 150 days after the issue alters the conclusions. The results are very similar (not reported) if only done for the 1993–1998 time period.

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