Testing for Market Discipline in the European Banking Industry: Evidence from Subordinated Debt Issues

Author(s): Andrea Sironi

Source: *Journal of Money, Credit and Banking*, Jun., 2003, Vol. 35, No. 3 (Jun., 2003), pp. 443-472

Published by: Ohio State University Press

Stable URL: https://www.jstor.org/stable/3649840

ANDREA SIRONI

Testing for Market Discipline in the European Banking Industry: Evidence from Subordinated Debt Issues

The question of whether private investors can discriminate between the risk taken by banks is empirically investigated by testing the risk sensitivity of European banks' subordinated notes and debentures (SND) spreads. A unique dataset of spreads, ratings, and accounting measures of bank risk is used for a sample of SND issued during the 1991–2000:Q1 period. Moody's Bank Financial Strength (MBFS) and FitchIBCA Individual (FII) ratings, which omit the influence of government and other external support on risk borne by investors, are used as bank risk proxies together with accounting variables to explain the variability of spreads. Empirical results support the hypothesis that SND investors are sensitive to bank risk, with the exception of SND issued by public sector banks, i.e., government owned or guaranteed institutions. Results also show that the sensitivity of SND spreads to measures of stand-alone risk (i.e., measures that do not incorporate external guarantees) has been increasing from the first to the second part of the 1990s, with the perception of too-big-to-fail type guarantees by private investors gradually disappearing. This result can be attributed to the joint effect of the loss of monetary policy by national central banks and the public budget constraints imposed by the European Monetary Union (EMU).

THE ABILITY of financial markets to discipline bank behavior by pricing their uninsured debt according to their risk profile has recently gathered significant attention as numerous academic and regulatory economists have suggested that bank supervisors should rely on market discipline to supplement their traditional supervisory methods. The relevance of this role to be played by private investors has also been recognized by the Basel Committee on Banking Supervision. The Committee's recent proposals to reform capital adequacy are based on three main "pillars". While the first two pillars focus on credit risk capital requirements

ANDREA SIRONI *is Professor of Financial Markets and Institutions, Università Commerciale Luigi Bocconi, Milano, Italy. Tel:* +39-02-58365912. *E-mail:* andrea.sironi@uni-bocconi.it

Journal of Money, Credit, and Banking, Vol. 35, No. 3 (June 2003)

and on the future role of national supervisors, the third pillar is aimed at strengthening the role of market discipline through an improvement in banks' disclosure (Basel 2001).

The objective to enhance market discipline also underlies the numerous proposals to introduce a mandatory subordinated debt policy that has been drafted and critically discussed during the last 15 years. These proposals, carefully reviewed by Kwast et al. (1999), generally require banks to issue a minimum amount of subordinated notes and debentures (SND) which would not be covered by guarantees explicit or conjectural. In a recent joint report, the Board of Governors of the Federal Reserve System and the Secretary of the U.S. Department of the Treasury, while recognizing "...that existing evidence supports efforts to use subordinated debt as a way to encourage market discipline..." concluded "...in favor of continuing research and supervisory analysis of voluntary subordinated debt issuance and deferring any recommendation of a mandatory subordinated debt policy" (Board and Treasury 2000).

Two key issues characterize the debate about bank market discipline. The first one concerns the extent to which private investors can observe and price the risk taken by banks and, ultimately, affect banks' management decisions. The second one concerns the extent to which financial markets' prices contain timely and accurate information on the financial condition of the issuing banks that is useful to bank supervisors.

As far as the first issue is concerned, a relevant distinction is the one between market monitoring and market influence (Bliss and Flannery 2001). Market monitoring is the process whereby investors correctly understand changes in a firm's risk profile and incorporate those assessments into the firm's security prices. On the other hand, market influence is the process by which a security price change engenders firm (managers) responses to counteract adverse changes in firm condition. Following a second distinction, market influence can in turn be distinguished between direct market discipline and indirect market discipline (Kwast et al. 1999). Direct market discipline is the process whereby the expected cost of a bank's funds is a direct function of its risk profile. On the other hand, indirect market discipline is the process whereby the yields of a bank's risk-sensitive source of funds are used as a means for bank supervisors to improve their risk monitoring and controlling tasks. Indirect market discipline therefore requires the yield of SNDs to be easily observable and comparable between different issuing banks.

Following the distinction between market monitoring and market influence, two generations of empirical studies on the role of SNDs in market discipline can be identified. The first generation was aimed at testing whether private sector investors can rationally differentiate among the risks taken by banks. Such studies investigated the relationship between SND spreads and bank risk, the latter measured by both market and accounting variables. The existence of a statistically significant relationship was considered as a necessary, although not sufficient, condition for market discipline to be effective. Early empirical work of this kind, based on U.S. bank holding company data from the early and mid-1980s, did not find any statistically

significant relationship between SND spreads and bank risk (Avery, Belton, and Goldberg, 1988, Gorton and Santomero, 1990). However, more recent studies based on data for longer and more recent time periods, while confirming the previous results for the mid-1980s, found statistically significant relationships between SND spreads and various measures of bank risk (Flannery and Sorescu, 1996, De Young et al., 2001, Jagtiani, Kaufman, and Lemieux, 1999, Covitz, Hancock, and Kwast, 2000).

These diverging results have been explained by the significant change in U.S. regulatory treatment of bank SND investors over the period between the early 1980s and the early 1990s, with the apparent lack of market discipline of the early and mid-1980s attributed to the presence of implicit government guarantees. Such guarantees were reinforced by the 1984 Continental Illinois bailout, during which no SND holder suffered any loss. The formalization of a too-big-to-fail (TBTF) policy by the Comptroller of the Currency several months later went even further in extending the safety net to uninsured bank creditors. This policy changed significantly in the late 1980s, when many bank debenture holders suffered losses, and was reversed with the 1991 Federal Deposit Insurance Corporation Improvement Act (FDICIA). Thus, conventional wisdom holds that investors in SNDs became more sensitive to the risk of the issuing U.S. banking organizations beginning in the late 1980s. This risk sensitivity became stronger as regulators reduced the protection afforded to bank holding companies by the safety net.[1]

The second generation studies addressed: (1) the "sufficiency question" of whether the risk sensitivity of spreads is strong enough for direct market discipline to be effective, or (2) the "who knows what and when question" of whether financial markets signals add new, accurate, and relevant information about future banks' safety and soundness to supervisory assessments.

These two questions have been investigated using rather differing approaches and led to mixed results. As far as the first question is concerned, Morgan and Stiroh (2000) compared the risk sensitivity of U.S. banks' bond spreads at issuance during the 1993–1998 period with that of U.S. non-financial companies using traditional Moody's and Standard & Poors issue ratings. They found that the spread/rating relationship is the same for bank issues as for non-bank issues and concluded that the bond market prices bank risk efficiently. Bliss and Flannery (2000) investigated whether the risk sensitivity of spreads is strong enough to affect bank management decisions such as reductions in leverage, dividend cuts, sale of new stock, or changes in uninsured liabilities. They found that abnormal bond and stock returns are not typically followed by such actions and concluded that financial market signals are not strong enough to significantly affect managerial behavior. Covitz, Hancock, and Kwast (2000) investigated whether a BHC decision to issue SNDs is affected by its stand-alone risk profile. They found that riskier banks are less likely to issue SNDs during times of banking sector stress or relatively volatile bond market conditions. Using data on nearly 500 bank bonds issued between 1993 and 1998, Morgan and Stiroh (2001) investigated the effect of a bank's asset portfolio composition on the issuance spread required by investors. They found that bond spreads

reflect the overall mix of banks' assets at the time of issuance and concluded that banks contemplating a shift into riskier activities like trading can expect to pay higher spreads as a result.

As far as the second question ("who knows what and when?") is concerned, the available empirical research on the U.S. banking industry indicates that financial markets participants and bank supervisors both produce value-relevant information about the future soundness of banks and that neither the market nor supervisors possess clearly superior quality information (Berger, Davies, and Flannery, 2000, De Young et al., 2001, and Evanoff and Wall, 2001). Rather, it seems likely that investors have a comparative advantage in monitoring due to their flexibility in evaluating any new information and in changing their analytical methods whenever needed, while supervisors have a comparative advantage in influencing due to their capacity to access *all* relevant information and to legally restrict the activities of financially weak banks (De Young et al., 2001, Flannery, 2001).

Berger, Davies, and Flannery (2000) compared the timeliness and accuracy of government supervisors versus market participants in assessing the condition of large U.S. bank holding companies. They found that while supervisors and bond rating agencies both have some prior information that is useful to the other, supervisory assessments are much less accurate overall than both bond and equity markets assessments in predicting future changes in banks' performance. De Young et al. (2001) compared national banks supervisory ratings with the information content of subordinated debt risk spreads for their parent holding companies. They found that government exams produce significant new information that is not fully reflected into debenture pricing until several quarters after an exam. However, they did not find any clear evidence that government supervisors possess an informational advantage over the bond market. Evanoff and Wall (2001) compared the ability of four alternative capital adequacy measures and subordinated debt spreads at predicting future supervisory ratings (BOPEC for BHCs and CAMEL for banks) and found that SND yield spreads do as well or better than any of the capitalization ratios. Allen, Jagtiani, and Moser (2001) investigated the relationship between supervisors' announcements and BHC equity prices. They found that stock prices rise when the market learns that a bank management team has been judged weak and interpret this result as a confirmation that supervisors are expected to influence managerial performance.

This paper focuses on bank market monitoring and is in the spirit of the first generation studies, in that it investigates the risk sensitivity of SND spreads by examining whether private investors price European banks' SND issues according to the risk profile of the issuer. This is done by testing the statistical relationship between the primary market spreads of a sample of SNDs issued during 1991–2000 and alternative measures of bank risk.

The study extends the existing literature in three directions. First, it analyzes the European banking industry.[2] This is done through an empirical analysis of the risk-sensitivity of European banks' SND issuance spreads during 1991–2000. Testing for bank market monitoring in Europe is important because of some peculiarities of the European banking industry. Major banking crises in continental European

countries never gave rise to creditors' direct losses. Rather, they have been solved either through government bailout policies or through bank mergers led by government supervisors, with financially sound banks being "morally persuaded" to acquire insolvent ones. In addition to that, many European banks are either government-owned or benefit from explicit government guarantees. These guarantees significantly reduce the risk of default and virtually eliminate the incentive for private investors to monitor. One would therefore expect weaker market discipline in Europe compared to that prevailing in the US after the 1991 FDICIA.

Second, the empirical analysis makes use of Moody's Banks Financial Strength (MBFS) and FitchIBCA Individual (FII) ratings as measures of bank risk. These ratings differ from traditional ones in that they focus on banks economic and financial conditions and do not take into account any external support from banks' owners, state authorities, or other official institutions. As such, they represent ideal candidates for the cross-country comparison of banks' risk profiles as many of the accounting variables shown by previous empirical studies to be statistically significant in explaining spread differences are either unavailable or are measured differently across European countries.

Third, an analysis of the average interest rate government subsidy received by European public sector banks is performed. Testing for the existence of statistically significant differences in the risk sensitivity of SND spreads between private sector and public sector banks is of particular interest because of the attention that the subject of government aid has recently received in Europe.[3] While this kind of direct support is easy to identify and quantify, indirect aid in the form of government guarantees has received less attention.[4]

Four main results emerge from the empirical analysis: (1) SND spreads are monotonically related to measures of bank default risk, (2) bank accounting variables, while relatively poor in explaining the cross-sectional variability of SND spreads when used alone as explanatory variables, perform much better when interacted with country dummies, (3) SND spreads, controlling for measures of *stand-alone* risk (i.e., measures that do not incorporate external guarantees), are about 40 basis points lower for European public sector banks, (4) SND spreads' sensitivity to measures of *stand-alone* risk has been increasing over the 1990s, with the perception of TBTF type guarantees by SND investors gradually disappearing during the decade.

The interpretation of the first three results is that investors impose market discipline on European banks, and impose less discipline on banks with external subsidies. These public sector banks benefit from a significant government subsidy, in the form of a lower cost of SND issues, the value of which has been increasing over time. The interpretation of the fourth result is based on the joint effect of the loss of monetary policy by national central banks and the rigid public sector budget constraints imposed by the European Monetary Union (EMU).

This paper proceeds as follows. Section 1 presents the methodology of the empirical analysis. Section 2 describes the data sources and summarizes sample characteristics. Section 3 presents the empirical results. The conclusions are given in Section 4.

1. RESEARCH METHODOLOGY

Banks' SND issuance spreads over the corresponding maturity Treasury bonds reflect investors' perception of the credit risk of the issuer. As such, they are a function of six main factors: (1) the economic and financial condition of the issuing bank, (2) the time to maturity of the issue, as this affects its default risk premium (Merton 1974), (3) the issue amount, as this in turn is believed to affect secondary market liquidity, (4) any explicit or implicit government guarantees perceived by market investors, (5) the currency of denomination,[5] and (6) the time of the issue, as bond market conditions change over time. Following this reasoning, the empirical analysis involves regressions[6] of the form:

$$\text{SPREAD}_i = f(\text{RISK}_i, \text{MATU}_i, \text{AMOUNT}_i, \text{COUNTRY}_i, \text{CURR}_i, \text{YEAR}_i) + \varepsilon_i , \quad (1)$$

where:

SPREAD_i	=	the difference between the yield to maturity at launch of issue i and the yield to maturity of a corresponding currency Treasury security[7] with a similar maturity;
RISK_i	=	alternative measures of the default risk of the issuing bank;
MATU_i	=	the time to maturity (in years) of issue i;
AMOUNT_i	=	the log of the U.S. dollar equivalent amount of issue i;
COUNTRY_i	=	the country where the issuing bank is registered;
CURR_i	=	the currency of denomination of issue i;
YEAR_i	=	the year of issuance.

Note that, in contrast to most of the studies on market discipline conducted using U.S. banks' SND data, this study is based on primary market spreads. The use of secondary market spreads is avoided because of the poor liquidity of the secondary market for European banks' SND issues.[8] In addition to that, yields on new issues reflect actual transaction prices rather than brokers' "indicative prices," estimates derived from pricing matrices or dealers' quotes. As such, they provide a more accurate measure of the actual cost of subordinated debt for banks and of the risk premium demanded by investors. Using primary market spreads also permits use of "fresher" ratings, because ratings of new issues reflect the raters' assessment near the time of issuance.[9]

Four alternative specifications of Equation (1) are employed, each using different risk proxies. The first one is based on Moody's and Standard & Poors *issue* ratings.[10] These are ratings assigned by one or both rating agencies to the single issue at the time of issuance. As such, they reflect both the issuing bank default risk and the facility seniority and security structure.

A second specification based on Moody's and Standard & Poors *issuer* ratings has been tested in order to focus on the role of the issuing banks' default risk. These are the prevailing senior debt ratings, at the time of the issue, assigned by one or

both the rating agencies to the issuing bank. While these ratings are good proxies for the issuing bank "creditworthiness" or "ability to meet its financial obligations," they do not necessarily represent good proxies for a bank's stand-alone risk profile. The creditworthiness or future ability to make timely payments of an obligor could be excellent even if its economic and financial conditions are poor when an explicit or implicit government guarantee exists. This is particularly true for continental Europe, where many banks are government (either national or local) owned and troubled banks' uninsured creditors have often been bailed out by national authorities. Because of this problem, the rating agencies themselves have introduced new bank ratings that focus on the economic and financial soundness of the bank, without taking into consideration any external support from State authorities or its owners. Two main types of ratings are currently available: Moody's Bank Financial Strength (MBFS) and Fitch IBCA Individual (FII).[11] FII ratings were introduced in the late 1980s and are therefore available for most of the SND issues used in the empirical analysis. MBFS ratings were introduced more recently and are therefore available for a smaller subset of issues. MBFS and FII ratings are used in the third specification of Equation (1).

In all three ratings-based specifications, ratings are represented by dummy variables.[12] Each dummy variable is equal to 1 if the issue or issuer has the corresponding grade and zero otherwise. Dummy variables allow more flexibility than would result from imposing a linear specification.

Finally, a fourth specification based on bank accounting measures of bank risk has been employed. Selected balance-sheet variables that previous authors have found to be important in predicting the likelihood of bank failure are used as predictors of spreads. The model employed in this final specification closely resembles those used in earlier studies and is based on the following simplified representation of bank risk:[13]

$$\text{BANKRISK} = f(\text{LEVERAGE,PROFITABILITY,} \\ \text{ASSETQUALITY,LIQUIDITY}) . \qquad (2)$$

The following bank-specific accounting variables are employed:[14]

LEV — the ratio of total (book) liabilities to the book value of equity. Higher leverage indicates higher default risk.

ROA — the ratio of annual net income to the average of the preceding and current year-end total assets. Higher profitability generally signals greater efficiency. As profitability tends to be serially correlated, a higher value of this variable should indicate lower default risk. However, a higher value might also indicate compensation for higher risk-taking and therefore be positively correlated with SPREAD (Flannery and Sorescu 1996, p. 1358).

NLTA — the ratio of net loans to total assets. This variable should positively affect spreads if loans are riskier than other assets or if their risk is simply more difficult to assess.

EITA the ratio of equity investments to total assets. This variable should positively affect spreads if equity investments are riskier than other assets. However, a negative correlation with SPREAD might also arise if hidden reserves associated to unrealized gains on equity investments are perceived by SND investors to represent an implied equity cushion. This variable also represents a proxy of the relative incidence of investment banking within a bank's portfolio of activities.

LIQ the ratio of liquid assets to customers' deposits and short term funding. This variable should negatively affect spreads if higher liquidity improves a bank's creditworthiness.

LLRGL the ratio of loan loss reserves to total loans. This variable should positively affect SPREAD as higher reserves indicate, ceteris paribus, higher expected losses. However, a higher value of LLRGL might also be perceived by SND investors as a larger cushion against unexpected losses. A negative relationship between SPREAD and LLRGL would result in this case.

Following previous studies, two interactive variables are also included in order to capture nonlinear risk relationships.

ROALEV the product of ROA and LEV. This variable should negatively affect SPREAD as profitability becomes more important for more leveraged banks.

LLRLEV the product of LLRGL and LEV. This variable should positively affect SPREAD as higher credit risk becomes more relevant for more leveraged banks.

Control variables used in the four alternative specifications include:

MATU the time to maturity (in years) of the issue.

AMOUNT the log of the U.S. dollar-equivalent amount of the issue.

D91, D92, ..., D00 year dummies. These should capture the variations in bond market conditions.

DEM, DFL, EURO, FFR, STG, USD, OTHERCUR currency dummies. These should capture both the different credit standing and liquidity of the different national Treasury securities and SND investors' currency preferences.

GER, FRA, NET, SPA, SWI, UK, OTHERCOU country dummies. These should capture both differences in macroeconomic conditions and cross-country differences in safety nets or implicit government guarantees.[15]

PUBLIC a dummy variable that equals 1 if the issuing bank is a public sector one and zero if it is a private sector one. The former is here defined as either a government (national or local) owned bank or a bank that benefits from explicit government guarantees.

TA a control variable for the size of the issuing bank. It is computed as the ratio of the bank total assets to the total assets of the largest bank in the sample for the year of the observation.[16] This variable should

negatively affect SPREAD as larger banks tend to have more diversified portfolios and eventually benefit from TBTF guarantees.

For all the specifications both regressions based on OLS and with the inclusion of fixed effects are estimated. Comparison of the fixed effects with the OLS estimates reveals whether variation in the independent variables *within* a bank affects the spreads differently than *between* issuers.

2. DATA SOURCES AND SAMPLE CHARACTERISTICS

The data are from five main sources: (1) Capital Data BondWare, (2) Moody's Corporate Default, (3) FitchIBCA BankScope, (4) Moody's Mergent Bond Record, and (5) WorldScope. Capital Data reports information on the major debt and equity issues worldwide. As far as bonds are concerned, Capital Data Bondware provides information on both issuers (nationality, Moody's and Standard & Poors current ratings, industry, etc.) and issues (currency, maturity date, years to maturity, spread at issuance, issue type, face value, and coupon). Spreads at issuance for all European bank issues of fixed rate, non-convertible, non-perpetual, and non-callable SNDs during the 1991–2000:Q1 were collected. This sample has 407 fixed rate subordinated bonds, of which 92 are perpetual. Of the remaining 315, five are callable issues and 20 are either convertibles or hybrid issues, leaving a total of 290 fixed rate, non-callable, non-convertible, non-perpetual SNDs.

The resulting sample of 290 SND issues suffers from two potential selection biases. First, a relatively larger number of issues has been completed during the second part of the 1990s than during the first part. This is partly the consequence of a general increase in the average number of European banks' SND issues, and partly the consequence of the availability of Moodys Financial Strength (MBFS) and FII ratings. These have been introduced in the mid-1990s and late 1980s, respectively, and are therefore more easily available for more recent issues. Second, European banks tend to issue SNDs when the market is more receptive. The total number of sample issues is particularly low in the third and fourth quarter of 1998 (4 and 2, respectively), when the Russian crisis occurred, and particularly high during the first three quarters of 1999 (19, 12, and 12, respectively), during a low interest rate environment. However, these biases should not limit the adequacy of the empirical sample as a basis for answering the key question of this study. If the risk profile of European banks appears to be monitored by private investors, this conclusion would presumably be strengthened were the second selection bias not present.

Moody's and S&P ratings at issuance for these 290 issues are either from Capital Data BondWare (154 issues) or from the Moody's January, 2000 release of Moody's Corporate Default Database (136 issues). The latter is a complete history of Moody's long-term rating assignments for both U.S. and non-U.S. corporations and sovereigns. Both ratings on individual bonds and issuer ratings are included, as are some bond and obligor characteristics such as borrower names, locations, CUSIP identifiers, ultimate parent companies, bond issuance dates, original maturity dates,

seniority, and coupon. Because Capital Data Bondware only provides information on issuers' current Moody's and S&P ratings, issuer ratings at the time of sample SND issuance have been collected from either the Moody's Corporate Default database or the FitchIBCA BankScope one. The latter is a database with information on financial statements, ratings, shareholders, and subsidiaries of over 10,000 banks worldwide. This database is also the source of our balance sheet data and accounting ratios. MBFS and FII ratings are collected from two sources: FitchIBCA Bank Scope and Moody's Mergent Bond Record. The latter is a monthly publication of all Moody's updated corporate, convertibles, governments, and municipals ratings.[17]

European banks issue SND either directly or through wholly owned subsidiaries located in tax havens such as Luxembourg, the Cayman Islands, the Bahamas, and Jersey. Of the 290 SNDs in the sample, 52 were issued through such subsidiaries. Information on the parent company for these issues is from Moody's Corporate Default and FitchIBCA Bankscope. Finally, WorldScope provides information on both balance sheet and stock market data for major banks worldwide. This database is the source of stock market capitalization data for market leverage computation purposes. Detailed information on sample characteristics is provided in Tables 1–3.

TABLE 1

SAMPLE DESCRIPTIVE STATISTICS – DISTRIBUTION BY RATING CLASSES

			Spread (b.p.)					Amount (USND m)	
	Rating Class	N. of issues	Mean	Median	Minimum	Maximum	Std. Dev.	Total	Average
A. Moody's/Standard & Poor's issue ratings at launch									
1	AAA/Aaa	17	43.56	42.00	17.00	102.00	22.56	4,569	269
2	AA+/Aa1	40	43.65	39.00	1.00	125.00	22.93	9,870	247
3	AA/Aa2	45	63.84	60.00	15.00	175.00	29.49	13,605	302
4	AA−/Aa3	73	81.98	85.00	20.00	185.00	36.45	23,459	321
5	A+/A1	43	82.57	86.00	13.80	146.00	27.26	11,069	257
6	A/A2	34	94.87	92.00	31.00	223.00	44.47	8,745	257
7	A−/A3	34	96.03	93.50	45.00	280.00	44.93	5,716	168
8	BBB+/Baa1	4	76.25	60.00	45.00	140.00	43.09	522	131
	Total	290	74.79	69.50	1.00	280.00	38.46	77,555	267
B. Moody's/Standard & Poor's issuer ratings at launch									
1	AAA/Aaa	36	44.71	43.50	15.00	105.00	21.02	9,113	253
2	AA+/Aa1	68	60.94	54.00	1.00	175.00	32.38	19,834	292
3	AA/Aa2	69	72.61	67.00	15.00	185.00	35.54	22,829	331
4	AA−/Aa3	62	90.20	91.25	13.80	161.00	30.57	15,196	245
5	A+/A1	16	103.00	103.50	43.00	158.00	34.33	3,734	233
6	A/A2	38	95.46	89.00	42.00	280.00	49.65	6,764	178
7	A−/A3	1	59.00	59.00	59.00	59.00	0.00	84	84
	Total	290	74.79	69.50	1.00	280.00	38.46	77,555	267
C. Moody's Financial Strength/Fitch IBCA individual issuer ratings at launch									
1	A	27	60.96	48.00	15.00	152.00	33.64	8,692	322
2	B+, A/B	83	69.70	60.00	1.00	175.00	33.86	27,731	334
3	B	85	83.96	89.00	13.80	185.00	37.73	23,170	273
4	C+, B/C	47	63.64	50.00	19.00	168.00	34.73	9,656	205
5	C	41	87.87	77.00	38.00	280.00	48.33	6,319	154
6	D+, C/D	7	75.57	89.00	17.00	125.00	36.90	1,987	284
	Total	290	74.79	69.50	1.00	280.00	38.46	77,555	279

TABLE 2

SAMPLE DESCRIPTIVE STATISTICS – DISTRIBUTION BY YEAR AND COUNTRY

Panel A: Distribution by year

Year	N. of issues	Average rating at launch: Moody's/S&P issue	Moody's/S&P issuer	MBFS/FII issuer	Spread (b.p.): Mean	Std. Dev.	Amount (USND m): Total	Avg.
1991	4	4.1	2.8	2.8	162.8	22.1	735	184
1992	10	3.4	2.6	3.8	57.5	52.5	1,478	148
1993	31	3.3	2.6	3.1	68.6	42.2	7,627	246
1994	18	4.3	3.6	3.4	73.9	33.0	4,085	227
1995	37	4.5	3.4	2.9	69.3	22.1	9,096	246
1996	46	4.6	3.6	3.1	64.1	25.0	12,619	274
1997	46	3.7	3.0	3.0	45.6	15.4	11,229	244
1998	27	4.7	3.6	3.3	68.4	29.2	6,830	253
1999	52	4.4	3.8	3.3	109.7	41.6	19,097	367
2000:Q1	19	4.7	4.1	4.1	97.4	20.4	4,759	250
Total	290	4.2	3.3	3.2	74.8	38.46	77,555	267

Panel B: Distribution by country

Country	N. of issues	Issues by public sector banks: Number	%	Average rating at launch: Moody's-S&P issue	Moody's-S&P issuer	MBFS/FII issuer	Spread (b.p.): Mean	Std. Dev.	Amount (USND m): Total	Avg.
Austria	6	5	83.3%	3.4	2.6	4.8	63.3	29.4	1,348	225
Belgium	12	1	8.3%	4.2	3.4	2.9	54.1	38.3	1,348	112
Denmark	4	0	0.0%	6.5	4.3	3.0	103.8	10.3	1,000	250
Finland	3	0	0.0%	7.0	6.0	5.7	104.3	26.6	800	267
France	36	6	16.7%	5.6	4.8	4.1	58.4	33.2	6,608	184
Germany	75	38	50.7%	2.8	2.4	3.6	60.4	38.1	16,239	217
Great Br.	63	0	0.0%	4.8	3.5	2.6	107.5	38.3	24,037	382
Ireland	2	0	0.0%	5.5	4.8	3.0	95.0	0.0	746	373
Italy	3	0	0.0%	6.2	5.5	4.2	116.0	4.6	1,145	382
Lux.	1	0	0.0%	5.0	4.0	3.0	83.0	0.0	51	51
Neth.	32	0	0.0%	4.0	3.3	2.7	62.2	22.5	10,341	323
Spain	21	0	0.0%	5.1	4.2	3.1	86.7	25.2	5,831	278
Sweden	2	0	0.0%	6.0	6.0	4.5	90.0	25.5	368	184
Switz.	30	0	0.0%	3.8	2.6	2.7	64.0	24.0	7,692	256
Total	290	50	17.2%	4.2	3.4	3.2	74.8	38.5	77,555	267

3. EMPIRICAL RESULTS

3.1 The Impact of Traditional Moody's and S&P Ratings on SND Spreads

Columns 1 and 2 of Table 5 report estimates when conventional issue and issuer ratings (Table 4) are used as proxies for RISK in Equation (1). F statistics for tests whether rating coefficients are jointly different from zero as well as adjusted R^2 are reported at the bottom of Table 5. All rating dummies are statistically significant at the 1% level with the exception of Rating = 2 in the issuer specification (Aaa/AAA is the omitted rating category). The monotonic pattern of dummy coefficients indicates that spreads rise when ratings worsen. Adjusted R^2 of 0.688 and 0.686, respectively, indicate that ratings and control variables explain a significant portion of SND spreads' cross-sectional variability. Results are quite similar for issue and issuer ratings, perhaps because issue and issuer ratings are highly correlated, with

TABLE 3

SAMPLE SUMMARY STATISTICS

Variable name	*N*	Mean	Median	Max	Min	Standard deviation
SPREAD	290	74,79	69,50	280,00	1,00	38,46
MATU	290	12,24	10,00	100,00	2,08	7,26
AMOUNT	290	5,34	5,38	7,14	3,11	0,73
TA	290	0,41	0,38	1,00	0,02	0,26
LEV	285	26,45	24,10	77,08	9,07	10,13
ROA (%)	285	0,45	0,40	1,63	−0,33	0,32
NLTA	285	0,53	0,53	0,84	0,05	0,14
EITA (%)	177	0,78	0,40	5,57	0,00	0,96
LIQ (%)	208	27,55	25,53	63,69	5,06	12,18
LLRGL (%)	188	0,04	0,03	0,10	0,00	0,02
ROALEV (%)	285	10,20	9,33	34,78	−13,93	6,63
LLRLEV (%)	188	0,86	0,84	3,71	0,08	0,58

SPREAD	the difference between the SND yield (at issuance) and that of a Treasury security of comparable maturity denominated in the same currency.
MATU	the time to maturity (in years) of the issue.
AMOUNT	the natural log of the U.S. dollar-equivalent amount of the issue.
LEV	the ratio of total (book) liabilities to the book value of equity. Higher leverage indicates higher default risk.
ROA	the ratio of annual net income to the average of the preceding and current year-end total assets. Higher profitability generally signals greater efficiency. However, a higher value might also indicate compensation for higher risk-taking and therefore be positively correlated with SPREAD.
NLTA	the ratio of net loans to total assets. This variable should positively affect spreads if loans are riskier than other assets.
EITA	the ratio of equity investments to total assets. This variable should positively affect spreads if equity investments are riskier than other assets.
LIQ	the ratio of liquid assets to customers' deposits and short term funding. This variable should negatively affect spreads as a higher liquidity – ceteris paribus – improves the issuing bank creditworthiness.
LLRGL	the ratio of loan loss reserves to total loans. This variable should positively affect SPREAD as higher reserves indicate, ceteris paribus, higher expected losses. However, a higher value of LLRGL might also be perceived by SND investors as a larger cushion against unexpected losses.
ROALEV	the product of ROA and LEV. This variable should negatively affect SPREAD as profitability becomes more important for leveraged banks.
LLRLEV	the product of LLRGL and LEV. This variable should positively affect SPREAD as higher credit risk becomes more relevant for leveraged banks.
TA	a control variable for the size of the issuing bank. It is computed as the ratio of the issuing bank's total assets to the total assets of the largest bank in the sample in the year of the observation.

issuer ratings being on average 0.9 notch higher (4.2 versus 3.3) than issue ratings[18] (see Table 2, Panels A and B).

MATU has a positive coefficient as expected and is statistically significant at the 1% level. Quite surprisingly, AMOUNT has a positive and statistically significant coefficient in both alternative specifications. One possible explanation for this result is based on the different investors to which SND issues are usually targeted. European banks raise subordinated debt capital in two main ways (Sironi 2001): (1) through their own distribution networks, with private placements mainly targeted at retail clients, and (2) through public issues mainly targeted to institutional investors. The retail issues have a smaller average size than the wholesale ones and are targeted to investors with less bargaining power. European banks may be able to pay lower spreads on retail issues than on institutional ones. An alternative explanation is based on the concept of "scarcity value." Smaller issues are usually issued by smaller banks, which in turn raise funds in the capital markets less frequently than larger banks. Investors might therefore associate a higher portfolio diversification value to smaller size SND issues and price them accordingly.

TABLE 4
RATINGS SCALES

Rating type \ Number	1	2	3	4	5	6	7	8	9	10
Moody's Issue and Issuer	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3
Standard & Poors Issue and Issuer	AAA	AA+	AA	AA−	A+	A	A−	BBB+	BBB	BBB−
Moody's Financial Strength (MBFS)	A	B+	B	C+	C	D+	D	E+	E	—
Fitch IBCA Individual (FII)	A	A/B	B	B/C	C	C/D	D	D/E	E	—

STG (British pound) and USD (U.S. dollar) are the only statistically significant currency dummy variables. Both have positive coefficients, indicating that pound sterling and U.S. dollar denominated SND issues have higher spreads than other currencies denominated ones. This result flows from the relatively higher than average credit standing and liquidity of the Treasury issues of those countries. Because spreads are computed by subtracting such Treasury yields from SND yields, SND spreads tend to be higher for dollar and sterling denominated issues.

No country dummy variable is statistically significant with the exception of the UK in the issuer ratings specification, implying that British banks pay above European average spreads on their SND issues. One possible explanation is that UK banks, contrary to continental European ones, did not benefit from TBTF type of conjectural guarantees. Finally, year dummies (not reported) are all statistically significant at the 1% level.

3.2 Do SND Investors Price European Banks' Stand-alone Risk Profile?

While the relationship between spreads and traditional Moody's and S&P ratings provides strong evidence that SND investors are sensitive to default risk, it does not necessarily imply that they are sensitive to the issuing banks' risk profiles. These might differ from banks' default risk or the risk of loss by investors if any explicit or implicit government guarantee is in place.[19]

The third specification of Equation (1) uses MBFS and FII ratings to test for investors' sensitivity to stand-alone risk. Results are much weaker than the previous ones (Table 5, column 3). Only one rating dummy is statistically significant and the coefficients do not rise monotonically as rating worsens. The adjusted R^2 (0.569) is significantly lower than for previous specifications (0.692 and 0.688). In addition, the GER country dummy variable becomes statistically significant at the 1% level with a negative coefficient. These results seem to indicate that SND investors do not price the true stand-alone risk profile of the issuing banks and that German banks benefit from lower spreads relative to their European competitors. A significant fraction of the sample German issuing banks are public sector ones. Columns 4–6 of Table 5 report results of a modified version of the ratings based specifications that include a dummy variable for public sector banks.

TABLE 5

LINEAR REGRESSIONS OF SPREAD ON RATING DUMMY VARIABLES

	Standard OLS Without PUBLIC dummy			*Standard OLS* With PUBLIC dummy			*Fixed effects* With PUBLIC dummy		
	M-S&P issue (1)	M-S&P issuer (2)	MBFS-FII issuer (3)	M-S&P issue (4)	M-S&P issuer (5)	MBFS-FII issuer (6)	M-S&P issue (7)	M-S&P issuer (8)	MBFS-FII issuer (9)
Rating = 2	18.839***	6.973	−4.968	16.446**	6.141	1.509	10.417	3.261	18.674***
	(6.830)	(4.863)	(5.918)	(6.880)	(4.820)	(5.480)	(20.001)	(7.137)	(6.996)
Rating = 3	28.665***	17.895***	7.337	22.600***	13.586**	12.432**	18.775	11.769	22.868**
	(7.210)	(5.184)	(6.078)	(7.723)	(5.392)	(5.623)	(19.980)	(8.363)	(9.294)
Rating = 4	37.980***	34.317***	8.279	30.306***	28.309***	27.067***	24.235	32.901***	38.326***
	(6.931)	(5.684)	(6.337)	(7.795)	(6.083)	(6.544)	(20.326)	(10.240)	(10.468)
Rating = 5	50.040***	47.329***	27.074***	40.945***	41.490***	34.504***	32.134	44.536***	49.216***
	(7.690)	(7.391)	(7.057)	(8.782)	(7.652)	(7.138)	(21.208)	(13.170)	(11.062)
Rating = 6	54.087***	59.742***	11.781	44.851***	51.428***	24.894***	30.699	65.796***	45.321***
	(7.738)	(6.618)	(11.315)	(8.856)	(7.294)	(10.894)	(21.629)	(14.611)	(16.503)
Rating = 7	73.649***	62.794***	—	63.990***	52.683**	—	54.256**	80.176***	—
	(7.783)	(23.129)		(8.997)	(23.208)		(21.961)	(26.041)	
Rating = 8	74.917***	—	—	64.948***	—	—	61.958**	—	—
	(13.551)			(14.273)			(24.221)		
AMOUNT	5.734***	5.085**	1.001	5.601**	4.986**	3.196	1.4587	0.600	0.305
	(2.457)	(2.448)	(2.580)	(2.441)	(2.421)	(2.445)	(3.108)	(3.011)	(3.027)
MATU	0.985***	1.092***	0.916***	0.964***	1.028***	0.898***	0.918***	0.989***	0.899***
	(0.197)	(0.196)	(0.221)	(0.195)	(0.195)	(0.200)	(0.204)	(0.199)	(0.204)
STG	27.193**	28.370***	40.415***	26.975**	28.208***	32.949***	30.596**	−34.588	30.363**
	(10.496)	(10.542)	(10.875)	(10.426)	(10.427)	(10.083)	(12.619)	(31.916)	(12.644)
USD	25.457**	28.913***	27.201**	25.678**	28.736***	35.315***	32.108**	38.914***	31.419**
	(10.311)	(10.345)	(11.875)	(10.242)	(10.232)	(9.760)	(12.865)	(12.769)	(12.816)
PUBLIC	—	—	—	−11.634**	−13.410**	−40.310***	20.233	24.803	27.936
				(5.541)	(5.192)	(5.033)	(24.269)	(24.493)	(24.545)
TA	−0.608	9.708	23.017*	−6.660	1.512	−10.684	9.379	7.382	25.044
	(7.098)	(7.109)	(11.741)	(7.617)	(7.714)	(7.6349)	(12.343)	(11.985)	(12.904)
GER	6.812	0.997	−14.131**	8.686	4.619	0.007	−14.002	9.134	10.992
	(5.452)	(5.383)	(6.091)	(5.489)	(5.505)	(5.734)	(24.061)	(26.417)	(42.755)

UK	9.083	13.166**	19.129***	8.361	11.219*	13.804**	−5.156	41.698*	20.405
	(5.850)	(5.784)	(6.684)	(5.821)	(5.77)	(6.023)	(23.237)	(25.188)	(43.594)
Constant	43.797**	55.980***	86.075***	55.935***	66.588***	80.389***	85.518**	52.397	58.401
	(18.533)	(17.965)	(20.817)	(19.297)	(18.237)	(19.144)	(38.876)	(33.467)	(51.838)
N	290	290	290	290	290	290	290	290	290
R^2	0.722	0.719	0.635	0.726	0.727	0.706	0.797	0.804	0.801
Adjusted R^2	0.688	0.686	0.569	0.692	0.693	0.672	0.714	0.723	0.719
F	21.250***	21.804***	15.622***	21.000***	21.785***	20.419***	9.594***	9.964***	9.800***
Fb	12.121***	13.066***	3.877***	12.121***	13.066***	4.003***	12.121***	13.066***	4.307***

Reported are regression coefficients and standard errors (in parenthesis). The dependent variable is the spread between yields (at issuance) on the SND and a Treasury security of comparable maturity denominated in the same currency. Each rating dummy variable equals 1 if: (1) the SND Issue Moodys and Standard & Poors (M-S&P) average rating (columns 1, 4, and 7), (2) the SND issuing bank Moody's and Standard & Poors (M-S&P) Issuer average rating (columns 2, 5, and 8), (3) the SND issuing bank MBFS and FitchIBCA Individual (FII) average rating (columns 3, 6, 5, and 9), matches the corresponding rating numerical value (see Table 4), 0 if not. Equations are estimated by OLS and with inclusion of fixed effects (columns 7–9). F denotes the standard F-statistic. Fb denotes the calculated F-statistic for the null hypothesis that the coefficients on the subset of rating dummy variables jointly equal zero.

Explanatory variables are defined as follows:

MATU	the time to maturity (in years) of the issue.
AMOUNT	the natural log of the U.S. dollar-equivalent amount of the issue.
EURO, STG, FFR, DEM, DFL, USD, OTHERCUR	currency dummies: equal to 1 if the SND issue is denominated in the corresponding currency, 0 if not. Only the statistically significant coefficient ones have been reported.
GER, FRA, NET, SPA, SWI, UK, OTHERCOU	country dummies equal to 1 if the issuing bank is headquartered in the corresponding country, 0 if not. Only the statistically significant coefficient ones have been reported.
PUBLIC	a dummy variable that equals 1 if the issuing bank is a public sector one and 0 if it is a private sector one.
TA	a control variable for the size of the issuing bank. It is computed as the ratio of the issuing bank's total assets to the total assets of the largest bank in the sample in the year of the observation.

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

Two interesting results emerge. First, all MBFS-FII rating dummies except for rating = 2 are statistically significant at the 1% level. Their signs and relative values are again as expected (the only exception is rating = 6, the coefficient of which is lower than expected). The adjusted R^2 for the MBFS-FII ratings based specification is significantly higher than the one obtained without the PUBLIC dummy (0.672 versus 0.569). These results support the hypothesis that SND investors are sensitive to private sector banks' financial soundness as reflected by MBFS-FII ratings.

Second, the PUBLIC dummy variable is strongly statistically significant with a relatively high negative coefficient in the MBFS-FII ratings based specification (−40.31). This suggests that European public sector banks pay approximately 40 basis points less on SND than their stand-alone risk profile would imply.[20] Results for the Moody's and S&P traditional ratings based specifications (columns 4 and 5) do not significantly change from the ones obtained without the PUBLIC dummy variable. Rating dummies coefficients are still statistically significant and monotonically increasing. The PUBLIC dummy is statistically significant at the 5% level, although its coefficient is significantly lower than the one obtained in the MBFS-FII specification (column 6). This is because part of the advantage enjoyed by public sector banks is already reflected in their conventional Moody's and S&P ratings.

Columns 7, 8, and 9 of Table 5 also report empirical results obtained with the inclusion of fixed effects. Results are similar to the ones obtained with standard OLS with two main exceptions. First, most of the rating dummies coefficients in the Moody's and S&P issue ratings based specification (column 7) are not statistically significant as they were in the standard OLS one. Second, the PUBLIC dummy and TA variables are not statistically significant. The relative stability of these variables *within* the issuing banks could explain these empirical differences.[21]

3.3 Do Accounting Measures of Bank Risk Explain the Variability of SND Spreads?

When comparing banks from different countries, two problems arise. First, the definition of certain variables may differ across countries. For example, the accounting for loan loss reserves is not uniform across European countries. Because of this first problem, accounting variables are used in the regressions both independently and interacted with country dummies. Second, many of the balance-sheet variables used to proxy for bank risk are not available for all the SND issuing banks in the sample. This problem is particularly severe for credit risk proxies such as LLRGL and for equity investments. Because of this second problem, three samples – A, B, and C – of different sizes (285, 169, and 111 observations, respectively) are used in the regression analysis reported in Table 6. Sample C includes SND issues completed by banks for which all the accounting variables of Equation (2) were available. Sample B includes issues completed by banks for which the LLRGL variable was not available. Sample A includes issues completed by banks for which LLRGL, EITA, or LIQ was not available. Finally, regressions with the inclusion of fixed effects are also estimated for the accounting variables based specifications. This

could prove useful if differences in accounting variables between banks are less informative than differences over time within banks.

Five important results emerge. First, accounting proxies of bank risk appear as relatively poor explanatory variables of European banks' SND spreads variability when included in the regressions as stand-alone measures of risk (columns 1–3 of Table 6), with variables' coefficients seldom statistically significant. LEV always has a positive coefficient but is statistically significant only for sample C. Quite surprisingly, ROA has a positive coefficient in samples B and C, although it is statistically significant only for sample C. A statistically significant (at the 5% level) negative coefficient for the interactive variable ROALEV also appears in samples B and C, suggesting that an increase in ROA reduces spreads only for less-capitalized institutions. NLTA, EITA, LIQ, and LLRGL never present statistically significant coefficients, apparently suggesting that SND investors do not consider these variables to be key predictors of bank risk.

Second, accounting variables joint explanatory power significantly improves when interacted with country dummy variables (columns 4–6 of Table 6), with the adjusted R^2 increasing for all three samples. The following results emerge as far as specific accounting variables are concerned:[22] (1) ROA has a negative sign coefficient as expected for most countries and is often statistically significant, (2) LEV has a positive sign coefficient as expected for most countries and is often statistically significant, (3) both ROALEV and EITA coefficients' signs are not as expected, although rarely statistically significant, (4) LIQ, LLRGL, and LLRLEV are almost never statistically significant. These results confirm the interpretation that accounting measures are country-specific and tend to loose part of their explanatory power when used for banks from different countries.

Third, contrary to the results obtained with the stand-alone risk rating dummies based specifications (columns 6 and 9 of Table 5), the TA control variable is always statistically significant at the 1% level with the expected negative sign. This result suggests two important conclusions: (1) size is one of the key factors that both SND investors and rating agencies take into consideration in evaluating a bank's financial soundness, and (2) no TBTF type implicit guarantees are perceived by SND investors. The following reasoning justifies the second conclusion. Large banks can be perceived as less risky by private sector investors for two main reasons: (1) economic advantages, such as higher portfolio diversification, economies of scale, or access to activities with monopolistic rents, and (2) regulatory advantages, namely TBTF guarantees. As MBFS and FII ratings capture economic advantages only, any residual size effect should be attributed to TBTF conjectural guarantees. If investors did perceive TBTF guarantees to exist, TA would probably be significant in the MBFS-FII rating based specifications, as these ratings explicitly avoid taking into consideration any kind of external support.

Fourth, results for the accounting variables alone specifications with the inclusion of fixed effects, not reported, are still relatively poor in explaining the variability of SND spreads, with only ROALEV presenting a statistically significant coefficient. The PUBLIC dummy and TA variables are not statistically significant. When fixed

TABLE 6

LINEAR REGRESSIONS OF SPREAD ON BANK ACCOUNTING VARIABLES

	Sample A	Sample B	Sample C	Sample A	Sample B	Sample C	Sample A	Sample B	Sample C
	Standard OLS						Fixed effects		
	Accounting variables alone			Accounting variables interacted with country dummies					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ROA	−8.113	37.680**	7.388	—	—	—	—	—	—
	(16.653)	(17.435)	(78.988)						
LEV	0.188	0.524	2.035***	—	—	—	—	—	—
	(0.297)	(0.383)	(0.767)						
ROALEV	−1.167	−1.722**	−2.498**	—	—	—	—	—	—
	(0.721)	(0.755)	(1.199)						
NLTA	0.223	1.354	−6.881	—	—	—	—	—	—
	(0.160)	(24.682)	(35.241)						
EITA	—	2.338	0.437	—	—	—	—	—	—
		(2.197)	(3.005)						
LIQ	—	0.187	0.185	—	—	—	—	—	—
		(0.199)	(0.327)						
LLRGL	—	—	160.409	—	—	—	—	—	—
			(143.158)						
LLRLEV	—	—	47.172	—	—	—	—	—	—
			(85.079)						
GER-ROA	—	—	—	—	−122.726**	—	—	—	−740.46***
					(53.601)				(235.869)
FRA-ROA	—	—	—	—	−92.670**	−172.036**	492.775*	573.632**	1052.681**
					(44.572)	(69.136)	(275.742)	(264.045)	(414.100)
SPA-ROA	—	—	—	—	−123.288*	—	—	−565.059**	−655.11***
					(79.138)			(271.867)	(223.364)
GB-ROA	—	—	—	—	−37.913***	—	—	—	—
					(10.900)				
GER-LEV	—	—	—	—	0.356**	—	—	−5.000*	−30.081***
					(0.165)			(2.698)	(9.403)
FRA-LEV	—	—	—	—	0.517**	—	—	5.623**	7.875**
					(0.259)			(2.697)	(3.185)
SPA-LEV	—	—	—	—	—	—	—	−16.920*	−45.542**
								(9.077)	(17.097)
GB-LEV	—	—	—	—	0.600*	—	—	—	—
					(0.318)				

SWI-LEV	—	—	—	—	—	—	—	−2.745***	—
								(0.984)	
FRA-ROALEV	—	—	—		2.943*	5.853**	−16.329*	−18.859**	−35.473**
					(1.612)	(2.318)	(8.342)	(7.760)	(14.496)
SPA-ROALEV	—	—	—	—	—	—	—	24.892*	30.662**
								(14.487)	(11.918)
SWI-ROALEV	—	—	—	−4.605*	3.014*	—	—	9.471**	12.980***
				(2.446)	(1.638)			(4.592)	(5.121)
GB-ROALEV	—	—	—		1.603***	—	—	—	—
					(0.534)				
GER-NLTA	—	—	—	—	—	—	—	−1051.1***	1274.35***
								(285.296)	(469.027)
FRA-NLTA	—	—	—	—	—	—	—	−523.041**	—
								(217.559)	
GB-NLTA	—	—	—		−22.598**	—	—	—	—
					(9.407)				
SWI-NLTA	—	—	—	—	—	—	−131.294**	—	—
							(52.472)		
SPA-EITA	—	—	—	—	—	—	—	39.671**	30.548**
								(15.401)	(13.481)
FRA-EITA	—	—	—	—	−9.044**	−13.066**	—	—	76.229*
					(4.060)	(4.712)			(45.125)
SWI-EITA	—	—	—	—	−102.13***	—	—	−169.806**	−188.137**
					(30.490)			(83.357)	(80.472)
GER-LIQ	—	—	—	—	—	—	—	—	−3.019**
									(1.466)
SPA-LIQ	—	—	—	—	—	—	—	−2.071*	−2.587*
								(1.163)	(1.455)
UK-LIQ	—	—	—	—	—	—	—	0.619	1.111**
								(0.469)	(0.503)
GER-LLR	—	—	—	—	—	—	—	—	8948.369**
									(2634.224)
SPA-LLRLEV	—	—	—	—	—	−12.574***	—	—	—
						(3.635)			
AMOUNT	0.118	3.191	−0.323	1.222	1.938**	1.251	−0.499	−4.329	−5.166
	(2.624)	(2.892)	(3.856)	(2.526)	(0.927)	(1.336)	(3.322)	(3.176)	(3.874)

(*Continued on next page*)

TABLE 6

LINEAR REGRESSIONS OF SPREAD ON BANK ACCOUNTING VARIABLES

	Sample A	Sample B	Sample C	Sample A	Sample B	Sample C	Sample A	Sample B	Sample C
	Standard OLS						Fixed effects		
	Accounting variables alone			Accounting variables interacted with country dummies					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MATU	0.773***	0.620***	1.613***	0.4708*	−0.196	0.072	0.949***	0.392**	0.893**
	(0.207)	(0.188)	(0.413)	(0.247)	(0.135)	(0.199)	(0.222)	(0.185)	(0.392)
PUBLIC	−31.538***	−44.037***	−64.443***	−33.425***	−3.696**	−1.586	77.954	−125.648*	−43.058**
	(5.259)	(8.239)	(13.343)	(5.892)	(1.815)	(3.549)	(49.714)	(68.804)	(17.413)
TA	−25.840***	−23.881**	15.867	−25.840***	−8.360***	−3.793	10.813	39.360	−34.899
	(8.460)	(10.717)	(13.620)	(8.460)	(2.853)	(3.814)	(13.327)	(24.172)	(37.287)
Constant	94.721***	72.810***	65.176*	98.270***	37.604***	42.621***	116.083***	120.744***	145.527***
	(24.877)	(25.741)	(35.474)	(17.897)	(5.364)	(7.774)	(28.107)	(23.165)	(25.210)
N	285	169	111	285	169	111	285	169	111
R^2	0.675	0.796	0.824	0.743	0.940	0.980	0.812	0.920	0.953
Adjusted R^2	0.636	0.752	0.755	0.689	0.908	0.918	0.709	0.845	0.881
F	17.337***	17.982***	11.926***	13.608***	30.040***	15.912***	7.903***	12.420***	13.144***
Fb	12.928***	7.199***	6.078***	9.177***	40.127***	33.528***	5.655***	4.407***	3.391***

Reported are regression coefficients and standard errors (in parenthesis). The dependent variable is the spread between yields (at issuance) on the SND and a Treasury security of comparable maturity denominated in the same currency. Equations are estimated by OLS. F denotes the standard F-statistic. Fb denotes the calculated F-statistic for the null hypothesis that the coefficients on the subset of: (1) accounting variables (columns 1–3), or (2) accounting variables interacted with country dummies (columns 4–9), jointly equal zero.

Accounting variables are used both alone (columns 1–3) and in interaction with country dummy variables (columns 4–9). Interacted variables' coefficients are reported only when statistically significant in at least one regression. Three different samples (A–C) of different sizes (285, 169, and 111 observations, respectively) are used according to the availability of accounting variables. Sample A only includes LEV, ROA, ROALEV, and NLTA. Sample B also includes EITA and LIQ. Sample C includes all accounting variables of Equation (2). Control variables used in the regressions include year, currency, and country dummies. These variables' coefficients are not reported.

Explanatory variables are defined as follows:

MATU the time to maturity (in years) of the issue.
AMOUNT the natural log of the U.S. dollar-equivalent amount of the issue.
LEV the ratio of total (book) liabilities to the book value of equity.according to the availability of accounting variables. Sample A only includes LEV, ROA, ROALEV, and NLTA. Sample B also includes EITA and LIQ. Sample C includes all accounting variables of Equation (2).
ROA the ratio of annual net income to the average of the preceding and current year-end total assets.
NLTA the ratio of net loans to total assets.
EITA the ratio of equity investments to total assets.
LIQ the ratio of liquid assets to customers' deposits and short term funding.
LLRGL the ratio of loan loss reserves to total loans.
ROALEV the product of ROA and LEV.
LLRLEV the product of LLRGL and LEV.

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

effects are included in the accounting variables interacted with country dummies regressions, results tend to be less sensible than the ones obtained with standard OLS. The joint explanatory power of these measures of bank risk is still very good, with the adjusted R^2 slightly above the ones obtained without fixed effects. However, individual explanatory variables generally present coefficient signs which are not as expected. These results might be attributed to the heterogeneous nature of the empirical sample of SND issues. The sample includes 290 issues completed by 65 European banks, for an average number of issues per bank of 4.46. However, of the total 65 banks, 18 only issued once, while 33 banks issued less than four times during the 10 year period.

Finally, the PUBLIC dummy variable is always statistically significant, either at the 5% or at the 1% level, with a negative coefficient for all three samples. This is not the case for sample C, which only includes two public sector banks SND issues.

3.4 Did Market Monitoring of European Banks Strengthen Over Time?

The same kind of cross-sectional regressions based on MBFS and FII ratings are estimated for two sub-samples of approximately the same size (1991–1996: 146 observations, and 1997–2000:Q1: 144 observations) in order to check whether any significant change in the risk sensitivity of SND spreads occurred during the 1990s. Results are reported in columns 1 and 2 of Table 7.[23]

While the adjusted R^2 values are similar for the two sub-samples, four major differences emerge. First, no rating dummy variable is statistically significant in the 1991–1996 sub-sample, suggesting that SND investors were not sensitive to the issuing banks' stand-alone risk profiles during the first half of the decade. The opposite occurs for the 1997–2000:Q1 sub-sample, where most rating dummies are strongly statistically significant with the expected signs and relative values. Similarly, the F-test for the joint significance of the subset of rating dummies is statistically significant for the 1997–2000:Q1 sub-sample only.

Second, TA has a negative and statistically significant (at the 5% level) coefficient in the 1991–1996 sub-sample but is insignificant for the later period. This suggests that TBTF type guarantees, perceived by SND investors to be in place in the first half of the decade, gradually vanished in the second half.

Third, the UK dummy has a positive and statistically significant (at the 5% level) coefficient for the 1991–1996 sub-sample, but not for the later period. This implicitly confirms the aforementioned explanation to the UK dummy statistically significant coefficient: if UK banks have never been perceived by SND investors to benefit from TBTF guarantees, and such guarantees gradually diminished in continental European countries, then UK banks gradually lost their relative interest rate disadvantage.

Finally, the PUBLIC dummy variable is strongly statistically significant in both sub-samples and has a negative coefficient that is larger for the later sample, suggesting that the implicit interest rate government subsidy has increased from the first to the second half of the decade. This result is consistent with the evidence of

TABLE 7

LINEAR REGRESSIONS OF SPREAD ON MBFS-FII RATING DUMMIES

	1991–1996 Total sample (1)	1997–2000:Q1 Total sample (2)	1991–1996 EMU countries banks (3)	1997–2000:Q1 EMU countries banks (4)	1991–1996 Non-EMU countries' banks (5)	1997–2000:Q1 Non-EMU countries' banks (6)	1991–1996 Same banks only (7)	1997–2000:Q1 Same banks only (8)
Rating = 2	−19.658	11.606	−29.534***	14.722	0.172	−0.002	−16.719*	10.934
	(7.255)	(8.343)	(9.688)	(15.651)	(11.094)	(7.227)	(9.007)	(8.318)
Rating = 3	−6.972	21.484**	−16.573*	26.657*	16.267	14.056**	−5.941	16.851*
	(7.108)	(8.607)	(9.243)	(15.818)	(13.491)	(6.231)	(9.518)	(9.134)
Ratingt= 4	8.287	39.000***	−0.552	35.937**	43.724***	56.066***	7.585	39.160***
	(8.567)	(9.961)	(10.743)	(16.315)	(15.889)	(10.149)	(10.966)	(13.499)
Rating = 5	9.986	51.386***	2.579	47.050***	11.487	86.097***	2.705	60.248***
	(9.332)	(10.456)	(11.450)	(17.359)	(18.380)	(12.788)	(13.641)	(12.330)
Rating = 6	0.497	46.676**	−2.567	43.970*	—	—	9.949	51.921**
	(12.619)	(19.489)	(13.249)	(25.672)			(16.476)	(20.831)
AMOUNT	−7.044*	8.599***	0.294	7.156*	−13.048*	21.021***	−5.125	5.591
	(3.980)	(3.137)	(3.862)	(4.147)	−(7.400)	(5.313)	(4.336)	(3.742)
MATU	0.583***	2.047***	0.315*	2.427	1.673***	1.595***	0.525***	2.112***
	(0.192)	(0.586)	(0.179)	(1.633)	(0.358)	(0.464)	(0.198)	(0.665)
PUBLIC	−36.098***	−49.351***	−23.686***	−45.896***	—	—	−41.306***	−64.311***
	(8.239)	(6.95)	(6.860)	(8.300)			(9.204)	(10.665)
TA	−24.255**	1.640	−23.943**	−3.520	−18.394	29.238*	−32.798**	23.842
	(10.613)	(11.914)	(11.301)	(15.520)	(15.314)	(16.453)	(12.711)	(15.673)

UK	19.150**	3.815	—	—	−15.661	−17.620	18.589*	7.915
	(9.217)	(7.915)			(12.618)	(11.630)	(10.274)	(11.075)
Constant	153.176***	6.327	55.832**	4.665	215.601***	−68.588*	151.118***	7.932
	(28.842)	(21.794)	(24.695)	(32.226)	(43.777)	(34.724)	(31.245)	(26.993)
N	146	144	89	102	57	42	133	108
R^2	0.764	0.755	0.795	0.693	0.865	0.939	0.754	0.781
Adj. R^2	0.712	0.705	0.722	0.604	0.812	0.904	0.694	0.718
Fa	14.676***	14.937***	10.823***	7.809***	16.101***	26.996***	12.508***	12.357***
Fb	1.868	2.952**	1.620	3.992***	6.095***	2.648**	2.170*	2.845**

Reported are regression coefficients and standard errors (in parenthesis). The dependent variable is the spread between yields (at issuance) on the SND and a treasury security of comparable maturity denominated in the same currency. Each rating dummy variable equals 1 if the SND issuing bank MBFS and FitchIBCA Individual average rating matches the corresponding rating numerical value (see Table 4), 0 if not. Equations were estimated by OLS for the 1991–1996 and 1997–2000:Q1 samples, both with all the available SND issues (columns 1 and 2) and for the SND issues completed by banks that issued in both tim periors (columns 3 and 4). In addition, results are also reported for the 1991–1997 and 1998–2000:Q1 samples, both for all SND issues (columns 5 and 6) and for issues completed by EMU countries' banks (columns 7 and 8) and non-EMU countries' banks (columns 9 and 10). F denotes the standard F-statistic. Fb denotes the calculated F-statistic for the null hypothesis that the coefficients on the subset of rating dummy variables equal zero. Explanatory variables are defined as follows:

MATU	the time to maturity (in years) of the issue.
AMOUNT	the natural log of the U.S. dollar-equivalent amount of the issue.
D91, D92, ..., D00	year dummies. Not reported. The D91 dummy variable has been dropped in the 1991–1996 samples (columns 1, 3, 5, and 7) to avoid collinearity in the data. D00 is the droppend one for 1997–2000:Q1 samples (columns 2, 4, 6, and 8).
EURO, STG, FFR, DEM, DFL, USD, OTHERCUR	currency dummies. not reported.
GER, FRA, UK, NET, SPA, SWI, OTHERCOU	country dummies. Reported is the only statistically significant one (UK).
PUBLIC	a dummy variable that equals 1 if the issuing bank is a public sector one and 0 if it is a private sector one.
TA	a control variable for the size of the issuing bank. It is computed as the ratio of the issuing bank's total assets to the total assets of the largest bank in the sample in the year of the observation.

***, **, and * indicate statistical significance at the 1, 5, and 10% level, respectively. Standard errors in parenthsis.

an increasing risk-sensitivity of SND investors (with reduced implicit guarantees of private sector banks).

As far as the interpretation of these findings is concerned, no clear event such as the 1991 U.S. FDICIA can be found in the European banking industry as a "turning point" in the market perception of the supervisory authorities attitude towards bail out policies. This change-in-regime could be attributed to the combined effect of: (1) the loss of monetary policy that continental European countries' central banks suffered as a consequence of the EMU, and (2) the stringent national budget constraints imposed by the convergence criteria originally set forth by the 1989 Delors plan.[24] Monetary policy is often used to counteract the effect of financial crises. With the prospect of a lower degree of freedom in fiscal policy and a transfer of monetary policy to the European Central Bank (ECB), those banks that were previously perceived by SND investors as TBTF probably became perceived as "too-big-to-rescue" (TBTR).

While the official turning point is represented by 1998[25] – when the participating EMU countries were identified by the European Council, the ECB Governor has been appointed, the first phase of EMU was launched, and the official exchange rates between European currencies were fixed – the capital markets most likely anticipated those events in 1997.[26] Before 1997, the EMU project was still uncertain both in terms of the joining countries and of its general feasibility.

In order to check for this interpretation, separate regressions for SND issues completed by banks of EMU participating countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, and Spain), and EMU non-participating countries (Denmark, Sweden, Switzerland, and the UK) have been tested. Results – reported in columns 3–6 of Table 7 – show that such a change in regime, while confirmed for EMU countries, did not occur for non-EMU countries.[27] First, TBTF guarantees, as measured by TA, were not present before 1997 (TA is not statistically significant) for non-EMU countries. Second, the *F*-test used to determine if rating coefficients are jointly different from zero (Fb), while statistically significant only in the 1997–2000:Q1 sub-sample for EMU countries, is statistically significant in both sub-samples for non-EMU countries. Third, stand-alone risk rating dummies are monotonically increasing for both the 1991–1996 and 1997–2000:Q1 non-EMU countries sub-samples.

3.5 Robustness Checks

Variations of the specifications reported in Tables 5–7 were estimated in order to assess the robustness of the conclusions concerning the risk sensitivity of SND spreads, its evolution over time and the explanatory power of MBFS-FII ratings and bank accounting variables.

Separate regressions using MBFS ratings only (219 observations) and FII ratings only (236 observations) were estimated as a check on the use of average ratings. Using the average numerical value of ratings coming from two different sources could produce misleading results if the two agencies adopt significantly different criteria in evaluating banks' economic and financial conditions. Results – not reported – do

not show any significant difference between the two. Most rating dummies are statistically significant with the expected sign for both sub-samples. TA and UK control dummies are not statistically significant in the MBFS sub-sample, while AMOUNT is not statistically significant in the FII sub-sample. These differences are most likely the consequence of the MBFS sub-sample being concentrated in the second half of the decade (these ratings were originally introduced by Moody's in 1995). In addition to that, results based on the 165 SND issues for which both FII and MBFS ratings are available show that all differences disappear once the analysis is focused on the same time period.

Two checks of robustness regarding the explanatory power of the accounting variables alone are conducted. First, alternative measures of bank leverage are used. LEV is replaced with three different variables: (1) MKTLEV, the ratio between total (book) liabilities and market capitalization, (2) BISTOT, the BIS total capital ratio, and (3) TIER1, the BIS tier 1 capital ratio.[28] The latter two variables can differ from the reciprocal of LEV if the ratio between risk-weighted assets and total assets is different across banks or across time. Results, not reported, are similar to those obtained with LEV. The adjusted R^2 of the different regressions do not change in any material way. Second, alternative measures of bank profitability are also used. ROA is replaced with two different variables: ROE, the ratio of net income to average equity, and PTOITA, the ratio of Pre-Tax Operating Income to Total Assets. The latter could add explanatory power if SND investors concentrate on operating profit as a better proxy of long-run sustainable profitability. Results are similar for the two alternative measures of bank profitability. PTOITA has a negative coefficient in all three sub-samples (A, B, and C) but is never statistically significant. ROE has a negative and statistically significant coefficient in all three samples but its use has little effect on the adjusted R^2.

Three robustness checks focus on the temporal evolution of European banks SND spreads risk-sensitivity. First, regressions for the 1991–1996 and 1997–2000 sub-samples were estimated using traditional Moody's and S&P issue ratings rather than the MBFS-FII ones. As the traditional ratings incorporate both economic and financial conditions of the issuing banks and government explicit or conjectural guarantees, one would expect the empirical results for the two sub-samples not to show any significant difference. Results, not reported, show that most rating dummies are statistically significant with expected signs and with similar patterns of coefficient values in both sub-samples. F tests are also strongly statistically significant in both sub-samples.

Second, estimation samples were restricted to those SND issues made by banks that issued in both periods. This was aimed at testing whether the improvement in the risk-sensitivity was simply due to a change over time in the identity of the issuing banks. Results, reported in columns 7 and 8 of Table 7, reject this hypothesis and confirm the basic findings. Only one MBFS-FII rating dummy is statistically significant (at the 10% level) in the 1991–1996 sub-sample, and the relative values of coefficients are not as expected. In contrast, most of the rating dummies are statistically significant, with the expected signs and relative values, in the

1997–2000:Q1 sub-sample. The statistical significance of the F test used to determine if rating coefficients are jointly different from zero (Fb) also improves in the 1997–2000:Q1 sub-sample.

Third, an alternative measure of size, based on the ratio between the issuing bank TA and its country's banks average TA has been used in the MBFS-FII ratings based specifications for the two 1991–1996 and 1997–2000:Q1 sub-samples. As TBTF policies are country specific, the issuing bank size relative to the average size of banks in the same country could represent a better variable to test for the market perception of these type of guarantees. Results, not reported, are almost identical to the ones obtained with TA: size is statistically significant in the first part of the 1990s but not in the second one, confirming the conclusion that SND investors perceived TBTF policies to be present only in the first part of the decade.

Finally, year and quarter dummies were used as an alternative to year dummies for both the MBFS-FII ratings based and bank accounting variables based specifications. Results – not reported – are almost identical to the ones obtained with year dummies. Using year and quarter dummies generally leads to a slight increase in the adjusted R^2 for the stand-alone risk rating dummies based specifications and to a slight decrease for the accounting variables based ones.

4. CONCLUSIONS

Three major conclusions stand out from the empirical work presented in this paper. First, SND investors appear to rationally discriminate between the different stand-alone risk profiles of European banks. Second, the risk sensitivity of SND spreads has been increasing over time, suggesting that implicit guarantees such as TBTF policies were present in the first half of the 1990s and became weaker or vanished during the second part of the decade. Third, European public sector banks benefit from a significant government subsidy in the form of a lower cost of SND issues, the value of which has been increasing over time.

These conclusions have important policy implications for any future mandatory subordinated debt policy. Requiring banks to issue a minimum amount of SND would, in light of the first two conclusions, likely enhance market discipline of banks and supplement prudential regulatory discipline. It is also reasonable to believe that this study underestimated the extent of market discipline that would be associated with such a policy, because it ignored European banks that did not issue SND. For some such banks, their stand-alone risk profile would have made SND very expensive. In addition to that, introducing a minimum frequency of issuance would presumably impose banks to issue also during adverse market conditions.

Further research is needed before a clear conclusion on the net benefit of a mandatory subordinated debt policy can be reached. Three conditions are necessary for market discipline to be effective: (1) complete and timely information on banks stand-alone risk profiles must be available, (2) no bailout must be anticipated and banks' creditors must consider themselves at risk in the event of default, and (3) banks

must react to market signals. Condition 1 can be undermined by a lack of disclosure and, more generally, by the increasing complexity of banks' risks coming from both the banking and the trading book. Condition 2 can be violated by TBTF policies or other forms of implicit government guarantees that exist if the safety net is extended beyond its de-jure boundaries to protect uninsured bank creditors. Finally, condition 3 can be violated either if private investors' risk aversion is not strong enough or if the borrowing bank has no clear incentive to maximize risk-adjusted profitability. This in turn may occur because of government direct ownership or management-shareholders agency type problems. Empirically testing the risk sensitivity of SND spreads using publicly available information such as stand alone risk ratings and accounting variables represents a test of condition 2. As such, it is a test of just one of the necessary conditions for market discipline to be effective. The fact that private investors can discriminate between different banks does not necessarily mean that they can discipline their risk taking behavior.

Finally, the result concerning European public sector banks' lower SND spreads indicates that a mandatory subordinated debt policy would not be effective in improving market discipline for these kind of banks.

NOTES

1. For a careful review of "first generation" studies, see Flannery (1998).

2. I am aware of two empirical studies based on European banks SND data. Bruni and Paternò (1995) analyzed the statistical relationship between secondary market spreads, Moody's ratings, and accounting variables as proxies of bank risk and concluded in favor of the risk sensitivity of SND spreads. However, their analysis is limited to a sample of 28 SND issues for which one single day secondary market spreads were collected, and two accounting variables (leverage and return on assets). Gropp, Vesala, and Vulpes (2001) compared the effectiveness of equity market-based distances-to-default and secondary market SND spreads as indicators of a material weakening in a bank financial condition. They found that both indicators perform well as signals of bank fragility, reflecting relevant information of default risk.

3. The 12 German Landesbank have been involved in a dispute with the European Commission because of illegal government aid received in the form of capital from local governments at below market rates (The Economist 2000).

4. German Lander (states) hold direct stakes in the Landesbanks and provide them with a state guarantee. This gives the Landesbanks a top-notch credit rating, allowing them to raise funds at cheaper rates than private sector competitors.

5. The latter is a relevant factor because of the different credit standing and liquidity of Treasury securities. The spread of an SND issue is computed as the difference between the SND yield to maturity and the equivalent Treasury one. A U.S. dollar denominated SND issue could, other things being equal, have a higher spread than an Italian lira denominated one simply because the Italian Treasury security has a lower credit quality and liquidity than the U.S. one.

6. Despite the cross-sectional nature of the empirical analysis, some temporal variation is present as many banks issued SND more than once over the sample period. Regressions with the inclusion of fixed effects are also estimated.

7. Interpolated yield curves are used when no Treasury security of similar maturity is available. Spreads for Euro denominated issues are computed using either the French OAT or the German Bund yield curve, depending on the closest available maturity.

8. See Sironi (2001) for empirical evidence on this point and on the main institutional characteristics of the primary and secondary markets for European banks' subordinated debt. Hancock and Kwast (2001) found that subordinated debt spreads are most consistent across sources for the most liquid bond issues. These are in turn found to be the ones that have a relatively large issuance size, have a relatively young age, have been issued by a relatively large banking organization, and are traded in a relatively robust overall bond market.

9. Kwast et al. (1999) observed that "market participants generally believed that changes in rating agencies opinions tended to lag information revealed in secondary market prices".

10. Empirical results are based on the average numerical value of the ratings assigned by S&P and Moody's (rating scales are presented in Table 4). When this average value is not an integer number, rounding to the lower (less risky) value has been applied. An alternative based on the higher integer value has been tested and found to produce similar results.

11. Rating scales are presented in Table 4. The two ratings are both based on a 9 notches scale and on very similar definitions. The two systems also tend to rate banks in a similar way. Indeed, differences higher than 1 notch only occur in 6.67% of the 165 cases when both ratings were available for the empirical sample.

12. One of the possible dummies must be dropped to avoid collinearity in the data. The dropped one here is the top quality one so that each dummy j coefficient can be interpreted as the average spread between rating j issues and the top notch rating (AAA in S&P, Aaa in Moody's, A for both MBFS and FII) issues.

13. Without any compelling theory suggesting otherwise, a linear specification has been used for this accounting based specification of Equation (1).

14. For each SND issue, the variables refer to the year preceding the date of the issue.

15. The D91, OTHERCUR, and OTHERCOU dummy variables have been dropped to avoid collinearity in the data.

16. As SND issues are completed in different years, using the log of total assets would have led to higher values for more recent issues. Adjusting for inflation would not eliminate this bias because of the real growth of banks' total assets. An alternative specification based on the ratio between the issuing bank total assets and the corresponding year sample banks average total assets has also been tested and found to produce nearly identical results. The one employed here has been chosen because the resulting value is confined between zero and 1.

17. MBFS ratings are not present in the Moody's Corporate Default database. They were collected from the Mergent Bond Record publication of the month preceding the correspondent SND issue.

18. Rating agencies tend to rate subordinated issues one notch below the corresponding issuer senior debt rating if the latter is investment grade and two notches below if it is speculative grade. All banks in the sample are rated investment grade by both Moody's and Standard & Poors.

19. An intuitive proxy for this difference between banks' stand-alone risk profile and default risk is represented by (the complement to one of) the correlation between traditional Moody's and S&P issuer ratings and MBFS and FII ones. While the average sample correlation between Moody's and S&P issuer and issue ratings is very high (0.918), the correlation coefficient between traditional issuer ratings and MBFS-FII ones is much lower (0.437).

20. Note that the GER country variable is not statistically significant once the PUBLIC dummy variable is included.

21. In addition to that, the TA and PUBLIC dummy variables' effects tend to be incorporated in the negative and statistically significant coefficients of the public sector and large banks dummies used in the fixed effects regressions.

22. To save space, results are reported for statistically significant coefficients only.

23. To save space, results are reported only for statistically significant control variables (MATU, PUBLIC, TA, and UK).

24. These include: (1) limit annual budget deficits to 3% of GDP, (2) limit total public debt to 60% of GDP, (3) establish consumer price inflation within 1.5% of the inflation of the three lowest countries, and (4) establish long-term government bond yields to within 2% points of the three low-inflation countries.

25. While the convergence criteria were originally set forth by the Delors plan back in 1989, the whole plan lost credibility in the early 1990s and its original timetable was breached.

26. This may not be the case for some countries such as Italy and Belgium, which were far from the convergence criteria targets. However, SND issues completed by banks from these countries are almost absent in the empirical sample.

27. No SND issue with an MBFS-FII rating equivalent to a numerical value of 6 (MBFS: C/D, FII: D+) is present in the non-EMU countries SND issues sub-sample. In addition to that, no non-EMU countries' bank is a public sector one.

28. These variables were available for 215, 270, and 261 observations, respectively.

LITERATURE CITED

Allen Linda, Julapa Jagtiani, and James T. Moser (2001). "Further Evidence on the Information Content of Bank Examination Ratings: A Study of BHC-to-FHC Conversion Applications." *Journal of Financial Services Research* 19, 213–232.

Avery, Robert B., Terrence M. Belton, and Michael A. Goldberg (1988). "Market Discipline in Regulating Bank Risk: New Evidence from the Capital Markets." *Journal of Money, Credit and Banking* 20, 597–610.

Basel (Basel Committee on Banking Supervision) (2001). "The New Basel Capital Accord." Consultative document (January 2001).

Berger Allen N., Sally M. Davies, and Mark J. Flannery (2000). "Comparing Market and Supervisory Assessments of Bank Performance: Who Knows What and When?" *Journal of Money, Credit, and Banking* 32, 641–667.

Bliss, Robert R., and Mark J. Flannery (2000). "Market Discipline in the Governance of U.S. Bank Holding Companies: Monitoring vs. Influencing." In *Prudential Supervision: What Works and What Doesn't*, edited by Frederic S. Mishkin, National Bureau of Economic Research, University of Chicago Press, forthcoming.

Board and Treasury (2000). "The Feasibility and Desirability of Mandatory Subordinated Debt", a Report by the Board of Governors of the Federal Reserve System and the Secretary of the U.S. Department of the Treasury, (December 2000).

Bruni, Franco, and Francesco Paternò (1995). "Market Discipline of Banks' Riskiness: A Study of Selected Issues." *Journal of Financial Services Research* (December 1995), 303–325.

Covitz, Daniel M., Diana Hancock, and Myron Kwast (2000). "*Mandatory Subordinated Debt: Would Banks Face More Market Discipline*?" mimeo, Board of Governors of the Federal Reserve System.

De Young, Robert, Mark Flannery, William Lang, and Sorin Sorescu (2001). "The Information Content of Bank Exam Ratings and Subordinated Debt Prices." *Journal of Money, Credit and Banking*, forthcoming.

Evanoff Douglas D., and Larry D. Wall (2001). "Sub-debt Yield Spreads as Bank Risk Measures." *Journal of Financial Services Research* 20, 121–145.

Flannery, Mark J. (1998). "Using Market Information in prudential Bank Supervision: a Review of the U.S. Empirical Evidence." *Journal of Money, Credit and Banking* 30, 273–305.

Flannery, Mark J. (2001). "The Faces of Market Discipline." *Journal of Financial Services Research* 20, 107–119.

Flannery Mark J., and Sorin M. Sorescu (1996). "Evidence of Bank Market Discipline in Subordinated Debenture Yields: 1983–1991." *The Journal of Finance* 51, 1347–1377.

Gorton, Gary, and Anthony Santomero (1990). "Market Discipline and Bank Subordinated Debt." *Journal of Money, Credit and Banking* 22, 203–212.

Gropp, Reint, Jukka Vesala, and Giuseppe Vulpes (2001). "Equity and Bond Market Signals as Leading Indicators of Bank Fragility in Europe", mimeo. European Central Bank.

Hancock Diana, and Myron Kwast (2001). "Using Subordinated Debt to Monitor Bank Holding Companies: Is it Feasible?" *Journal of Financial Services Research* 20, 147–187.

Jagtiani, Julapa, George Kaufman, and Catharine Lemieux (1999). "Do Markets Discipline Banks and Bank Holding Companies? Evidence from Debt Pricing", Working paper #S& R-99-3R, Emerging Issues Series, Federal Reserve Bank of Chicago, (June 1999).

Kwast, Myron L., et al. (1999). "Using Subordinated Debt as an Instrument of Market Discipline". Report of a Study Group on Subordinated Notes and Debentures, M. Kwast, Chair. Board of Governors of the Federal Reserve System, Staff Study #172, (December 1999).

Merton, Robert C. (1974). "On the pricing of corporate debt: The risk structure of interest rates." *Journal of Finance* 29, 449–470.

Morgan, Donald P., and Kevin J. Stiroh (2000). "Bond Market Discipline of Banks: Is the Market Tough Enough?" Federal Reserve Bank of New York Staff Report, No. 95.

Morgan, Donald P., and Kevin J. Stiroh (2001). "Market Discipline of Banks: the Asset Test." *Journal of Financial Services Research* 20, 195–208.

Sironi, Andrea (2001). "An Analysis of European Banks Subordinated Debt Issues and Its Implications for a Mandatory Subordinated Debt Policy." *Journal of Financial Services Research* 20, 233–266.

The Economist (2000). *Public sector-sector banks: To court*, April 15th, 80–81.