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Strengthening banks' market discipline and leveling the playing field: Are the two compatible?

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Abstract

This paper examines whether the supervisory objective of strengthening market discipline is compatible with the one of enhancing competitive equality for internationally active banks. This issue is empirically investigated by comparing the determinants of major US and European banks' subordinated notes and debentures (SND) spreads. Three main results emerge. First, the spread/rating relationship is both statistically significant and very similar for US and European banks' bonds. Second, US banks tend to pay a higher average spread on their SND issues because of a poorer average rating. This is due to the presence of European public sector banks, i.e. banks which are either government owned or benefit from explicit government guarantees. In fact, US banks have slightly better Moody's bank financial strength and FitchIBCA individual average ratings, which omit the influence of government and other external support on risk borne by investors. Finally, controlling for the issuing banks' default risk, US banks pay a statistically significant lower average spread on their SND issues. This result is attributed to the higher liquidity of the US market for banks' bonds.

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1. Introduction

During the last 15 years, an increasing attention has been devoted by bank supervisors and regulatory economists to the issue of market discipline. While different

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opinions exist on the best way to achieve it, most observers agree that bank supervisors should increasingly rely on market forces to supplement their traditional supervisory methods. As recently outlined by the General Manager of the Bank of International Settlements and Chairman of the Financial Stability Forum: [1]

> "... the thinking behind prudential policies experienced a paradigm shift. This has been crystallized in increasing efforts to work with, rather than against, the grain of market forces ... As a result, market discipline has come to play a greater role in ensuring financial stability ... more can and should be done to strengthen market discipline."

There are two interdependent reasons for this emphasis on market discipline. First, the activities of major international banks have become increasingly complex. As a consequence, the task of controlling their risk taking behaviors has become an increasingly difficult one. Second, a trend towards a stronger regulatory reliance on banks' own internal risk management systems has emerged. In its 1996 Capital Accord amendment proposal, [2] the Basel Committee on Banking Supervision endorsed the use of banks' own market risks models, contingent on important qualitative and quantitative standards. More recently, in an effort to reduce the incentive for regulatory capital arbitrage transactions, prompted by the widening gap between banks' and regulators' definitions of credit risk capital, the Basel Committee has proposed to introduce an internal ratings based (IRB) approach to capital requirements. [3] This proposal is in turn considered by many as a first step towards the use of full portfolio credit risk models to set regulatory capital. A future capital adequacy regime based on banks' internal risk measurement models poses a major threat for bank supervisors. Given the shareholders' option-like payoff profile, banks experiencing significant unexpected losses and getting closer to their default point could find it convenient to adopt gaming behaviors by artificially reducing the internally produced risk measures while increasing their risk taking activities in an effort to replenish their equity capital. The growing independence of bank management in determining their capital adequacy must therefore be accompanied by an increasing role of market forces in monitoring banks' risk profiles and influencing banks' management decisions.

The relevance of this role to be played by private investors has been recognized by the Basel Committee itself. 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 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 Committee on Banking Supervision, 2001a).

A second relevant feature of the Committee's recent proposals to reform the capital adequacy framework concerns its main objectives. The ostensible purpose of the 1988 Basel Accord was to strengthen the safety and soundness of the international

[1] Crockett (2002).
[2] Basel Committee on Banking Supervision (1996).
[3] Basel Committee on Banking Supervision (2001a).

banking system and enhance competitive equality among internationally active banks by standardizing bank-capital regulations among the 12 leading industrial countries. More specifically, this "leveling the playing field" was mainly aimed at eliminating a funding-cost advantage enjoyed by Japanese banks which operated with significantly lower capital to asset ratios compared to their competitors in other G10 countries [4] (Wagster, 1996). [5]

While officially maintaining the two objectives of promoting safety and soundness in the financial system and enhancing competitive equality, the primary purpose of the new Capital Accord – as outlined in the recent Basel Committee proposals – is that of removing the incentives to "regulatory capital arbitrage" [6] by narrowing the gap between regulatory capital, as measured by minimum capital requirements, and economic capital, as measured by banks' own risk assessment models. As outlined by the Basel Committee itself: [7]

> ". . . The new framework intends to provide approaches that are more sensitive to risks than the 1988 Accord, while maintaining the overall level of regulatory capital. Capital requirements that are more in line with the underlying risks will allow banks to manage their business more efficiently."

This apparent shift of bank regulators' attention from the objective of enhancing competitive equality to the one of improving the risk sensitivity of the capital adequacy framework by aligning minimum capital requirements to banks internal capital allocation criteria while increasingly relying on private investors monitoring of

[4] Pettway et al. (1991) provide an example of the more favorable treatment that Japanese banks received from the Ministry of Finance in terms of capital and financial ratios relative to US banks. Data from Wagster (1996) for a sample of major banks show that pre-Basel-Accord average capital to asset ratio in Japan was 2.11% compared to 3.32% for German banks, 4.90% for US banks, 5.05% for Canadian banks, 5.41% for UK banks and 6.29% for Swiss banks. However, when hidden reserves are taken into account, Japanese average capital-to-asset ratio becomes higher at 12.35%. Recent estimates by De Nederlandsche Bank – reported in Basel Committee on Banking Supervision (1999) – show that in 1988 Japanese banks, with almost 12%, had the highest average risk-weighted capital ratio within G10 countries. This is because the risk-weighted ratio allows for hidden reserves to be partly included in tier 2 capital.

[5] As explicitly stated by the Committee: "Two fundamental objectives lie at the heart of the Committee's work on regulatory convergence. These are, firstly, that the new framework should serve to strengthen the soundness and stability of the international banking system; and secondly that the framework should be in fair and have a high degree of consistency in its application to banks in different countries with a view to diminishing an existing source of competitive inequality among international banks" – Basel Committee on Banking Supervision (1988).

[6] The term "regulatory capital arbitrage" is generally used to indicate those transactions that banks undertake with the main objective of exploiting the differences between the amount of regulatory minimum capital and the amount of economic capital associated to different assets. These transactions include certain types of asset securitizations, whereby the originating bank keeps the most risky portion of the securitized portfolio on its books, the sale of loans to top rated private borrowers which would require 8% regulatory capital despite a significantly lower economic capital, and the acquisition/sale of credit exposures through the use of credit derivatives.

[7] Basel Committee on Banking Supervision (2001b, p. 2).

banks' risk profiles, may potentially undermine the "level the playing field" principle originally set forth by the 1988 Basel Capital Accord.

Different reasons may explain why an increasing reliance of bank supervision on market discipline – to be realized through increased disclosure or other policies such as mandatory subordinated debt [8] – could be in conflict with the objective of enhancing competitive equality.

First, differences in the safety net. If a bank is afforded a stronger protection by its domestic regulators in the form of explicit or conjectural guarantees such as too-big-to-fail (TBTF) ones, then, other things equal, its debtholders and shareholders would be at a lower risk and would be willing to provide financing at a lower cost. More generally, if banks' creditors do not believe to be at risk of loss, they will have no incentive to monitor the bank's true risk profile as reflected in its economic and financial conditions and price its uninsured liabilities accordingly. As the recent proposals of the Basel Committee are based on market discipline (third pillar) and this is in turn considered as a key component of the future capital adequacy framework, then the level playing field would be impaired. Banks enjoying conjectural or explicit government guarantees would not be subject to market discipline even if they disclose more about their economic and financial conditions. This in turn does not mean that the recently proposed new capital ratios would not work for these banks. Rather, it means that market discipline will not be effective for them.

Second, capital markets segmentation. [9] If capital markets are segmented through foreign exchange controls or other forms of constraints to cross-border investments or funding, then banks operating in countries with higher savings ratios or lower investments opportunities may experience a cost of capital advantage. [10] This possibility does not refer to the effects of financial market segmentation on capital requirements, but rather to its effects on market discipline. If capital markets are segmented, then banks with similar risk profiles may be subject to different risk premia in their cost of equity or debt capital. This in turn means that a shift of bank supervision from capital requirements to market discipline, to be achieved through increased disclosure, could result in tougher conditions imposed by private investors to banks operating in countries where capital is a scarcer resource and investors are more risk sensitive. While these kinds of barriers were in place in many European countries in the late 70s and early 80s, they have been progressively dismantled during the late 80s and early 90s.

[8] See Kwast et al. (1999) and Board and Treasury (2000) for a review of proposals to introduce a mandatory subordinated debt policy.

[9] Collin-Dufresne et al. (forthcoming) report empirical findings suggesting that the bond market is a segmented market driven by local supply/demand.

[10] Zimmer and McCauley (1991) found that US, UK and Canadian banks experienced significantly higher cost of equity (measured as real after tax adjusted profit on market price of equity) than their Swiss, German and Japanese counterparts during 1984–1990. The contribution of the Basel Accord to the leveling of the international playing field was also contended by Wagster (1996), who argued that the Accord did not eliminate the pricing advantage of Japanese banks.

Finally, cross-country differences in the depth and liquidity of banks' bond markets could result in competitive inequality if banks have a comparative advantage in issuing debt in their domestic capital markets.

Previous empirical studies on bank market discipline focused on three main questions. [11] First, to which extent private investors can observe and price the risk taken by banks. Statistically significant relationships between subordinated notes and debentures (SND) spreads and various measures of bank risk have been found for both US banks since the late 80s (Flannery and Sorescu, 1996; Jagtiani et al., 1999; Covitz et al., 2000; De Young et al., 2001; Morgan and Stiroh, 2001) and European banks for the 90s (Sironi, 2002).

Second, to which extent private investors can affect banks' management decisions. The existing evidence (Morgan and Stiroh, 2000; Bliss and Flannery, 2001; Covitz et al., 2000) only refers to the US banking system and is based on rather different approaches. The empirical studies on this issue produced diverging results, making a clear conclusion impossible at this time.

Third, to which extent financial markets' prices contain timely and accurate information on the financial condition of the issuing banks that is useful to bank supervisors. The available empirical research for both US and European banks 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 et al., 2000; De Young et al., 2001; Evanoff and Wall, 2001; Gropp et al., 2001).

This study differs from the existing literature in that it examines whether the supervisors' objective to strengthen bank market discipline is compatible with that of enhancing competitive equality for internationally active banks. More precisely, the research question is based on the following arguments: (i) the activities of major international banks have become increasingly complex, (ii) as a consequence, the task of controlling their risk taking behaviors has become an increasingly difficult one, (iii) this explains the growing attention given by bank supervisors to market discipline. Is this implied shift in the control of banks' risk taking activities from regulators to market forces consistent with the objective of enhancing competitive equality between internationally active banks?

This issue is empirically investigated by comparing the determinants of US and European banks' SND spreads. Data on spreads, Moody's and Standard & Poor's (S&P's) ratings, 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, [12] is used for a sample of SND issued by major US and European banks during the 1989–1999 period.

Comparing banks' bond spreads across countries also allows to highlight the potential problems that might arise when trying to compare market indicators of credit

[11] See Flannery (2001) for a careful review of these studies.

[12] See Appendices A and B for a detailed description of these ratings and for rating grades official definitions.

quality such as spreads for supervisory purposes. This appears as a relevant issue given both the recent movement of bank regulators towards a greater reliance on market data as signals of banks' soundness and the numerous proposals to introduce a mandatory subordinated debt policy as an indirect market discipline tool. [13]

Three main results emerge from the empirical analysis. First, the spread/rating relationship is very similar and statistically significant for US and European banks' SND issues. Second, US banks tend to pay a higher average spread on their SND issues because of a poorer average rating. This result is attributed to the significant presence of public sector banks, i.e. banks which are either government owned or benefit from explicit government guarantees, in the European banking system. In fact, US banks have a better MBFS/FII average rating. Finally, controlling for the issuing banks' default risk, US banks pay a statistically significant slightly lower average spread on their SND issues. This result is attributed to the higher liquidity of the US market for banks' bonds. The last two results also highlight that the comparison of credit spreads across European and American banks is a difficult exercise because: (i) some European banks enjoy public support, and (ii) US banks seem to have more liquid debt issues. These difficulties must be taken into account if the recent proposals are to be implemented.

The significant similarities in the determinants of banks' bonds spreads between European and US banks and the relatively minor difference in the absolute level of average spreads per corresponding rating grade (approximately 13 basis points) seem to indicate that the objective of strengthening market discipline does not contrast with the one of enhancing competitive equality, with the relevant exception of European public sector banks. These banks would strongly benefit from a shift from regulatory to market discipline, as this would inevitably increase their unfair funding cost advantage.

This paper proceeds as follows. Section 2 presents the methodology of the empirical analysis. Section 3 describes the data sources and summarizes sample characteristics. Section 4 presents the empirical results. Section 5 concludes.

2. SND spreads and ratings: A cross-country comparison

In order to empirically investigate the question of compatibility between market discipline and "leveling the playing field", the issue of which banks should be taken into consideration must first be addressed. While the focus of the Basel Committee has traditionally been on "internationally active banks", no clear definition has ever been provided by the Committee to identify such banks. More recently, in an attempt to widen the target banks of the capital adequacy framework, the Committee

[13] For a review of these proposals see Kwast et al. (1999). Indirect market discipline is defined as 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 banks' bonds such as SND to be easily observable and comparable between different issuing banks.

has extended its focus to "all significant banks". [14] The empirical analysis presented in this study is restricted to SND issues – for which data are available – completed by US and European banks ranking within the world 100 largest in terms of total assets at the time of issuance. [15] While this size criterion could lead to the inclusion of large banks that are not "internationally active", it can reasonably be assumed that the world largest banks are also the ones competing in international markets.

The choice of SND as the target debt instrument of the empirical analysis is based on the high risk-sensitivity of this form of debt funding. As a consequence, its price should fully and promptly reflect the evolving default-risk profile of the issuing bank. This is why subordinated debt is considered by most observers as an ideal way of strengthening market discipline. Most of the proposals discussed by bank supervisors and regulatory economists are indeed based on the introduction of a mandatory subordinated debt policy which would require banks to issue a minimum amount of SND with a minimum frequency. [16]

To test formally if the spread/rating relationship is the same for US and European banks, regression equations of the following form have been estimated both separately for US banks' SND issues and European banks' ones and for the two samples together:

$$\text{Spread}_{i,t} = \alpha + \sum_{j=2}^{n} \beta_j R_{i,t}^{j} + \sum_{y=1}^{m} \delta_y \text{Cu}_{i,t}^{y} + \sum_{z=1}^{k} \gamma_z \text{Co}_{i,t}^{z} + \phi_i \text{Maturity}_{i,t} + \lambda_i \text{Amount}_{i,t} + \text{Public}_{i,t} + \alpha_t + \varepsilon_i. \quad (1)$$

The dependent variable (spread_i) is the difference in basis points (b.p.) between the yield to maturity at launch of issue i and the yield to maturity of a corresponding currency Treasury security with a comparable maturity. $R_{i,t}^{j}$ is a set of dummy variables [17] indicating the numeric rating assigned to each SND. Each dummy variable is equal to 1 if the issue or issuer has the corresponding grade and zero otherwise. [18]

[14] "Although the new framework's focus is primarily on internationally active banks, its underlying principles are intended to be suitable for application to banks of varying levels of complexity and sophistication. More than 100 countries have adopted the 1988 Accord, and the Committee has consulted with supervisors worldwide in developing the new framework. The goal of this effort has been to ensure that the principles embodied in the three pillars of the new framework are generally suitable to all types of banks around the globe. The Committee therefore expects the New Accord to be adhered to by all significant banks after a certain period of time". Basel Committee, Overview of the New Basel Capital Accord, January 2001, p. 2.

[15] See Appendix D for a list of the sample issuing banks.

[16] The possibility of such a policy has recently been analyzed in a joint report by the US Federal Reserve Board of Governors and the US Department of the Treasury (Board and Treasury, 2000).

[17] These are 10 in the Moody's and S&P's traditional issue ratings based specifications and 6 in the MBFS and FII rating based ones. The rating agencies' letter symbols were converted to numbers as shown in Appendix C. Higher numerical ratings correspond to lower letter grades and higher risk.

[18] One of the possible dummies must be dropped to avoid collinearity in the data. The dropped one is here 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's, Aaa in Moody's, A for both MBFS and FII) issues.

$Cu^{y}_{i,t}$ is a set of dummy variables indicating the currency of denomination of each SND. [19] These should capture the different credit standing and liquidity of the corresponding Treasury securities. $Co^{z}_{i,t}$ is a set of dummy variables indicating the country of the issuing bank. [20] These should capture cross-country differences in safety nets or implicit government guarantees. Maturity_i and Amount_i are the time to maturity (in years) and the log of the US dollar equivalent amount of issue i respectively. A set of dummy variables for the quarter and year of issue is also included to control for variations in bond markets' conditions (α_t). Following Sironi (2002), a dummy variable ('Public') equal to 1 if the issuing bank is a public sector one and to zero if a private sector one has been included. The former is defined as either a government owned bank or a bank that benefits from explicit government guarantees.

Two alternative specifications of Eq. (1) are employed. The first one is based on Moody's and S&P's issue ratings. [21] 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. However, 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, a second specification based on MBFS and FII ratings is employed. These ratings differ from traditional ones in that they focus on bank's economic and financial conditions and do not take into account any external support from bank owners, state authorities or other official institutions. [22]

For both Moody's/S&P's and MBFS/FII specifications, regressions based on OLS and with the inclusion of fixed effects are estimated. Comparing the fixed effects and

[19] Each dummy variable is equal to 1 if the issue is denominated in the corresponding currency and zero otherwise.

[20] These are only relevant for European banks' SND issues as US banks' ones are all US dollar denominated and issued by US banks. Each dummy is equal to 1 if the SND issue has been completed by a bank of the corresponding country and zero otherwise. Multicollinearity problems between country and currency dummies are not present as over 60% of European banks' SND issues are denominated in foreign currencies.

[21] Empirical results are based on the average numerical value of the ratings assigned by S&P's and Moody's (rating scales are presented in Appendix C). When this average value is not an integer number, rounding off to the lower (less risky) value has been applied.

[22] Standard FitchIBCA ratings, which also include the eventual support of third parties, were not used in the empirical analysis. This is for two main reasons. First, FitchIBCA ratings were only available in the form of "issuer" ratings rather than "issue" ones. Issuer ratings, while strictly related to issue ones, are often "obsolete" as they are not updated at each issue and are therefore less "fresh" than issue ratings. In addition to that, issuer ratings do not reflect the seniority and security of the specific bond issue, which in turn affect its spread. Second, FitchIBCA issuer ratings were only available for a limited number of the sample issuing banks. This is particularly true for European banks. In fact, FitchIBCA issuer ratings at the time of issue were available for 250 of the 257 SND issues by US banks (92.75% of the sample), but only for 75 of the 229 SND issues by European banks (32.75% of the sample).

OLS estimates reveals whether variation in the independent variables *within* a bank affects the spreads differently than *between* issuers.

Here ratings are used as determinants of banks' bond spreads, the ultimate objective is to test if the spread/rating relationship is the same for European and US banks. This raises some issues concerning the relationship between bond spreads and ratings that have implications for the empirical findings of this study.

First, rating dummies are here used as proxies of default risk. This does not mean that default risk is the only or main determinant of bond spreads. Recent empirical studies indicate that a significant part of the spread between corporate and Treasury bonds cannot be explained by default premium and should be attributed to a risk premium (Elton et al., 2001; Collin-Dufresne et al., forthcoming). A common systematic factor is found by these studies to be a major determinant of corporate bond spread changes. This study does not investigate whether statistically significant differences between European and US banks' SND exist as far as such a systematic risk premium is concerned. However, as this systematic influence is driven by the common dependence of bond and stock markets to changes in the compensation for risk required by capital market investors, its effect on SND spreads is partly captured in this study by the year and quarter dummies used to control for the evolution of bond markets' conditions.

Second, recent empirical studies indicate that several characteristics of corporate bonds beyond the simple rating categories convey information about their pricing (Elton et al., 2000). These include maturity, coupon, time from issuance, trading volumes and face value. The empirical results presented in this paper are based on cross-sectional regressions where the SND issuance spread is used as the dependent variable and both maturity and face value are used as independent variables. This means that all the above mentioned factors, with the only exception of coupon and trading volumes, are taken into consideration. [23]

Third, ratings have been shown to present relevant limitations as leading indicators of credit quality. Using equity and liability data for US firms, Delianedis and Geske (1998) construct alternative credit risk measures and compare their forecasting performance to that of ratings. They find these accounting based measures to increase well in advance of ratings downgrades and conclude that ratings are slow in reacting to new evidence. Comparing actual market values and ratings for a large number of dollar-denominated international bonds, Perraudin and Taylor (1999) report highly persistent inconsistencies between ratings and prices. [24] While these limitations of ratings are relevant per se, they do not affect the interpretation of the empirical findings of this paper, which is aimed at investigating if significant differences in the spread/rating relationship exist between European and US banks. Any limitation concerning ratings as proxies of default risk should indeed equally affect both sample of banks.

[23] Time from issuance is equal to zero for all banks' bonds. Trading volumes are not available when issuance spreads are used instead of secondary market ones.

[24] A bond price is defined as inconsistent with its rating if it is above (below) the price it would have if it were valued using yields corresponding to a higher (lower) rating category.

It seems implausible that rating agencies perform their evaluation task differently across countries.

3. Data sources and sample characteristics

Data on issuers, call option-adjusted spreads, maturity, face value and Moody's ratings for US banks' SND issues completed during the 1989–1997 period have been kindly provided by Covitz et al. (2000). Of the 402 SND issues completed between 1989 and 1997, only 257 have been taken into consideration. Three selection criteria have been applied. First, only SND issues completed by US banks ranking in the largest 100 world banks in terms of total assets at the time of issuance have been selected (325 issues). Second, only SND issues completed by US banks for which a MBFS or FII was available have been considered (276 issues). Third, as SND are mostly issued by US bank holding companies (BHC), when a MBFS or FII rating was only available for the corresponding bank, a minimum 90% ratio of the bank total assets to the BHC total assets criterion has been applied.

Data on issuers, nationality, spreads, currency, maturity and face value for European banks' SND issues are from Sironi (2002). They have been collected from Capital Data BondWare, a database reporting information on the major debt and equity issues worldwide. Spreads at issuance for all European bank issues of fixed rate, non-convertible, non-perpetual and non-callable SND during 1991–1999 were collected. [25] The resulting sample has 407 fixed rate subordinated bonds, of which 92 are perpetual. Of the remaining 315, 5 are callable issues and 20 are either convertibles or hybrid issues, leaving a total of 290 fixed rate, non-callable, non-convertible, straight maturity subordinated coupon notes and debentures. This sample has been further reduced to 229 SND issues by taking into consideration only those issues completed by banks ranking within the 100 world largest banks at the time of issuance.

By focusing on large banks' SND issues only, the empirical sample is inevitably based on a small number of issuing banks. While the number of SND issues used in the analysis is relatively large (486), the number of the issuing banks is indeed small (49), with an average number of approximately 10 SND issues per issuing bank. This apparent weakness of the empirical analysis has two main consequences. On one side, given the objective to compare the determinants of SND spreads across banks of different countries, the small number of issuing banks might lead to empirical results that emphasize the determinants of spread changes *within* a bank rather than *between* issuers of different countries. This problem has been addressed by estimating regressions with the inclusion of fixed effects. Comparing the fixed effects

[25] The different time period of US banks' SND issues (1989–1997) and European banks' ones (1991–1999) is justified by the different available evidence. While empirical studies on US banks indicate that market discipline has been effective since the late 80s (Flannery and Sorescu, 1996), the existing evidence on European banks indicates that market discipline has been effective and strengthening during the 90s (Sironi, 2002).

and OLS estimates should indeed reveal whether variation in the independent variables *within* a bank affects the spreads differently than *between* issuers. On the other side, despite the cross-sectional nature of the empirical analysis, the relatively large number of issues per bank allows some temporal variation to be present in the regressions. This is simply because most banks issued SND more than once over the sample period.

Table 1
Sample summary statistics
Panel A: Spread, ratings and control variables

	Spread[a]	M–S&P[b]	MBFS–FII[c]	Maturity[d]	Amount[e]
USA					
Mean	83.36	6.07	2.92	12.80	107.33
Median	80.97	6.00	3.00	12.00	60.00
Min	−25.04	3.00	1.00	5.00	1.46
Max	219.93	10.00	4.00	101.00	500.00
Std. dev.	34.00	1.10	0.72	7.00	110.24
Europe					
Mean	72.72	3.88	3.01	12.64	299.94
Median	65.00	4.00	3.00	10.00	240.38
Min	1.00	1.00	1.00	2.08	52.06
Max	223.00	8.00	6.00	100.00	1255.81
Std. dev.	36.88	1.61	1.12	7.98	197.20

Panel B: Number of issues and issuing banks

	Number of SND issues		Country	Number of SND issues	Number of issuing banks
	USA	Europe			
1989	6	0	Austria	3	1
1990	5	0	Belgium	4	1
1991	16	3	France	22	5
1992	19	9	Germany	65	13
1993	12	28	Netherlands	28	2
1994	17	14	Spain	19	4
1995	70	32	Switzerland	29	2
1996	65	38	UK	59	8
1997	47	38			
1998	0	23			
1999	0	44			
Total	257 (no. of issuing banks = 13)	229 (no. of issuing banks = 36)			

[a] The difference between the SND yield (at issuance) and that of a Treasury security of comparable maturity denominated in the same currency.

[b] The average Moody's and S&P's rating of the SND issue. If the average is not an integer number, rounding to the lower value (higher quality) has been applied.

[c] The average Moody's bank financial strength and FitchIBCA individual rating of the issuing bank. If the average is not an integer number, rounding to the lower value (higher quality) has been applied.

[d] The time to maturity (in years) of the issue.

[e] The natural log of the US dollar-equivalent amount of the issue.

Table 2
Sample descriptive statistics

	Rating class	USA			Europe		
		No. of issues	Spread (b.p.)		No. of issues	Spread (b.p.)	
			Average	Std. dev.		Average	Std. dev.
Panel A: Moody's/S&P's issue ratings at launch							
1	AAA/Aaa	0	NA	NA	16	42.59	22.94
2	AA+/Aa1	0	NA	NA	38	43.84	22.80
3	AA/Aa2	5	12.45	31.35	41	65.10	28.39
4	AA−/Aa3	12	73.44	24.86	64	84.58	36.05
5	A+/A1	41	76.61	40.31	33	77.95	26.72
6	A/A2	130	83.78	25.41	21	99.10	50.17
7	A−/A3	50	93.71	34.84	15	95.33	27.35
8	BBB+/Baa1	14	78.67	36.02	1	140.00	0.00
9	BBB/Baa2	1	62.84	0.00	0	NA	NA
10	BBB−Baa3	4	149.66	54.05	0	NA	NA
	Total	257			229		
Panel B: Moody's financial strength/FitchIBCA individual issuer ratings at launch							
1	A	16	51.28	35.61	23	60.04	28.01
2	B+, A/B	30	73.88	45.65	75	71.92	34.11
3	B	169	84.47	27.14	72	79.61	36.21
4	C+, B/C	42	97.89	39.67	39	56.90	33.10
5	C	0	NA	NA	14	104.50	50.28
6	D+, C/D	0	NA	NA	6	77.33	40.10
	Total	257			229		

Moody's and S&P's ratings at issuance for these 229 issues are from Capital Data BondWare or from the Moody's January 2000 release of Moody's Corporate Default Database. The latter is a complete history of Moody's long-term rating assignments for both US and non-US 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.

MBFS and FII ratings for both US and European SND issuing banks are collected from two sources: FitchIBCA Bank Scope and Moody's Mergent Bond Record. The former is a database with information on financial statements, ratings, shareholders and subsidiaries of over 10,000 banks worldwide. The latter is a monthly publication of all Moody's updated corporate, convertibles, governments, and municipals ratings. [26]

Detailed information on sample characteristics is provided in Tables 1 and 2. The average maturity of the SND issues is approximately 13 years for both US and Eu-

[26] MBFS ratings are not present in the Moody's Corporate Default Database. They were collected from the Mergent Bond Record publication for the month preceding the corresponding SND issue.

ropean banks' SNDs. The average amount is of US$ 300m and US$ 107m for European and US banks respectively. This difference is the consequence of the more recent European banks' issues and of the lower frequency of issuance of European banks. [27]

Data on the sample issuing banks (name, country, total assets, country rank, and public vs. private sector ones) are provided in Appendix D.

4. Empirical results

Tables 1 and 2 report data on SND primary market spreads for the two samples of US and European banks' SND issues. The average spread with respect to the corresponding Treasury security is relatively lower for European banks' issues (73 b.p.) than for US banks' ones (83 b.p.). This is mostly the consequence of a better average rating at issue: 3.88 (approximately equivalent to AA−/Aa3), versus 6.07 (approximately equivalent to A/A2). Indeed, European banks SND issues sold at a higher average spread than the US corresponding rating ones (Table 1 and Fig. 1).

The better average rating of European banks' issues can in turn be attributed to the public sector banks' issues in the sample. [28] These banks are either government owned or benefit from explicit government guarantees (Sironi, 2002). These guarantees give public sector banks a top-notch credit rating which in turn allows them to raise funds at cheaper rates than private sector competitors. Indeed, the average MBFS–FII rating for the European issuing banks's issues is similar to the US banks' (3.01 versus 2.92). The same approximate equivalence between US and European banks applies to the average spread at issuance per MBFS–FII rating grade (Fig. 2).

Table 3 reports results obtained by running separate regressions for US and European banks' SND issues. Results for the Moody's and S&P's issue ratings based specifications (columns 1 and 2) show that rating dummies' coefficients are all statistically significant for both European and US banks. The monotonic patterns of dummy coefficients also indicate that spreads rise when ratings worsen. [29] Adjusted R^2 values of 0.749 and 0.736 respectively indicate that ratings and control variables [30] explain a significant and very similar portion of the cross-sectional variability of European and US banks' SND spreads. F-statistics for tests whether rating coefficients are jointly different from zero (F_b) are statistically significant for both samples.

The only statistically significant currency dummy variables are STG and USD, indicating that pound sterling and US dollar denominated SND issues pay on average

[27] See Sironi (2001) for an analysis of the operational and institutional features of the European banks' SND primary and secondary markets.

[28] There are 41 public sector banks SND issues in the empirical sample.

[29] Note that no SND issue with rating numeric values of 9 and 10 is present in the European banks' sample. The same applies to the US banks' sample for rating values 2 and 6.

[30] These include maturity, amount, year and quarter dummies, currency and country dummies, and the public dummy.

Table 3
Linear regressions of spread on rating dummy variables

	OLS				Fixed effects			
	M–S&P ratings		MBFS–FII ratings		M–S&P ratings		MBFS–FII ratings	
	Europe (1)	USA (2)	Europe (3)	USA (4)	Europe (5)	USA (6)	Europe (7)	USA (8)
Rating = 2	11.689*	–	3.045	7.299	27.398	–	10.881	7.404
	(6.669)		(5.249)	(7.510)	(17.317)		(5.408)	(9.048)
Rating = 3	14.053*	−43.119***	8.977*	28.038***	29.919*	−48.524*	21.196***	38.389***
	(7.608)	(9.531)	(5.386)	(6.198)	(17.500)	(26.889)	(7.551)	(6.775)
Rating = 4	17.816**	−11.489*	29.824***	25.783***	33.170*	−11.297	31.569***	50.317***
	(8.122)	(6.028)	(6.299)	(6.778)	(18.302)	(25.155)	(8.573)	(12.766)
Rating = 5	27.576***	−10.158**	36.931***	–	39.096**	5.739	37.581***	–
	(8.943)	(4.217)	(7.553)		(19.087)	(7.813)	(10.493)	
Rating = 6	35.999***	–	37.029***	–	36.949*	–	41.680***	–
	(9.498)		(11.995)		(19.149)		(15.358)	
Rating = 7	48.859***	12.742***	–	–	60.313***	18.786***	–	–
	(10.002)	(3.631)			(20.383)	(5.075)		
Rating = 8	78.327***	21.830***	–	–	78.192***	21.584**	–	–
	(21.032)	(6.783)			(24.871)	(9.566)		
Rating = 9	–	46.176**	–	–	–	34.565*	–	–
		(19.652)				(19.620)		
Rating = 10	–	94.211***	–	–	–	80.695***	–	–
		(10.314)				(11.129)		
Maturity	0.971***	−0.205	0.795***	−0.056	0.901***	−0.058	0.789***	−0.031
	(0.185)	(0.181)	(0.177)	(0.225)	(0.174)	(0.191)	(0.173)	(0.224)
Amount	2.730	−2.731***	0.091	−1.175	−0.096	−0.263	−1.986	2.668*
	(3.199)	(0.988)	(2.998)	(1.154)	(3.209)	(1.327)	(3.005)	(1.511)

Public	−13.358**	–	−40.687***	–	−5.165	–	−39.64***	–
	(5.883)		(5.530)		(9.046)		(11.361)	
STG	20.099*	–	25.891**	–	26.566***	–	25.025**	–
	(10.702)		(10.396)		(9.924)		(9.934)	
USD	20.889*	–	29.416***	–	36.664***	–	33.464***	–
	(10.774)		(10.301)		(10.225)		(10.182)	
Constant	0.617	35.122***	27.465	7.117	16.124	30.513***	47.397*	−11.951
	(21.619)	(9.978)	(18.745)	(12.986)	(34.912)	(10.318)	(25.093)	(13.799)
N	229	257	229	257	229	257	229	257
R^2	0.809	0.778	0.817	0.671	0.887	0.803	0.885	0.721
Adjusted R^2	0.749	0.736	0.762	0.614	0.817	0.752	0.816	0.656
F	13.401***	18.395***	14.814***	11.716***	12.574***	15.670***	12.783***	11.197***
F_b	11.976***	7.560***	5.291***	8.894***	11.976***	7.560***	5.291***	8.894***

Reported are regression coefficients and standard errors (in parentheses). The dependent variable is the spread (in basis points) 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: (i) the SND Moody's and S&P's (M–S&P) average rating (columns 1, 2, 5, and 6), (ii) the SND issuing bank Moody's financial strength (MBFS) and FitchIBCA individual (FII) average rating (columns 3, 4, 7, and 8) matches the corresponding rating numerical value (see Appendix C), 0 if not. Equations are estimated by OLS and with inclusion of fixed effects (columns 5, 6, 7, and 8). F denotes the standard F-statistic. F_b 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:

• EURO, STG, FFR, DEM, DFL, USD – Currency dummies equal to 1 if the SND issue is denominated in the corresponding currency, 0 if not. Only the statistically significant ones are reported.

• GER, FRA, NET, SPA, SWI, UK – Country dummies equal to 1 if the issuing bank is from the corresponding country, 0 if not. Only the statistically significant ones are reported.

• Public – A dummy variable that equals 1 if the issuing bank is a public sector one and 0 if not.

• QTRI-89, QTRII-89, QTRIII-89, . . . , QTRIV-99 – Year and quarter dummy variables. Not reported for space reasons. Most coefficients are statistically significant.

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

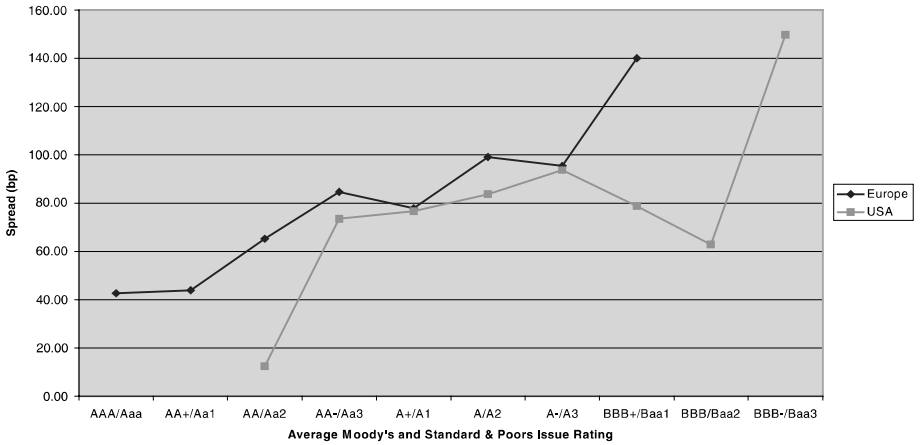

Fig. 1. Plot of mean SND spreads relative to average rating. Spread (b.p.) is measured as the difference between the SND yield to maturity and the yield of a Treasury bond of comparable maturity denominated in the same currency. Average rating is the mean of the numeric ratings given by Moody's and S&P's as defined in Appendix C. Includes 257 SNDs issued between 1989 and 1997 by US banks and 229 SNDs issued between 1991 and 1999 by European banks.

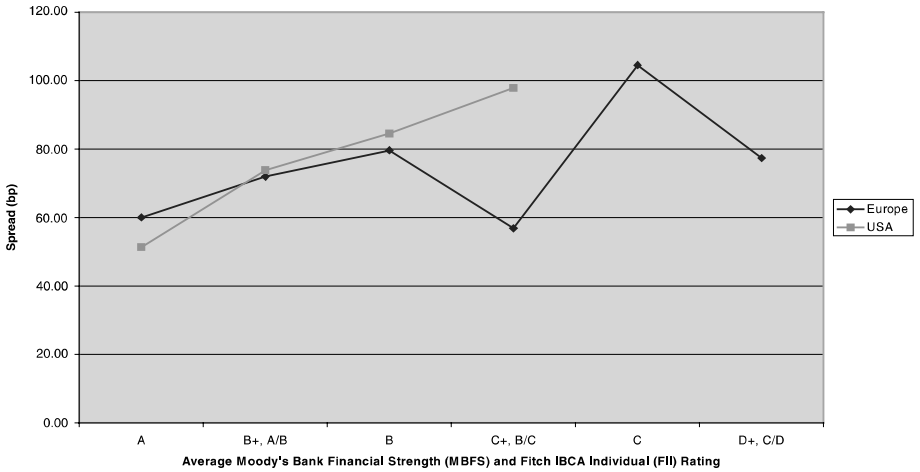

Fig. 2. Plot of mean SND spreads relative to average rating. Spread (b.p.) is measured as the difference between the SND yield to maturity and the yield of a Treasury bond of comparable maturity denominated in the same currency. Average rating is the mean of the numeric value of the issuing bank Moody's bank financial strength rating and FitchIBCA individual rating as defined in Appendix C. Includes 257 SNDs issued between 1989 and 1997 by US banks and 229 SNDs issued between 1991 and 1999 by European banks.

a higher spread than other currencies denominated ones. This is the consequence of the higher liquidity and better credit quality of the corresponding Treasury securities

(Sironi, 2002). [31] No country dummy variable is statistically significant while most time (year and quarter) dummy variables – not reported – are statistically significant, indicating that bond market conditions represent a relevant determinant of SND issuance spreads.

Three main differences emerge from the empirical analysis. First, 'Maturity' is not statistically significant for US banks' issues. This result contrasts both the finance theory (Merton, 1974) and the previous empirical evidence (Flannery and Sorescu, 1996; Morgan and Stiroh, 2001). A possible explanation is based on the adopted sample selection criteria. The US sample only includes SND issues completed by major banks whose credit quality is generally very high. [32] The term structure of credit spreads is relatively flat for low default risk issuers and becomes steeper as the degree of default risk increases.

Second, 'Amount' has a statistically significant coefficient for US banks' SND issues only. This result can be attributed to three different factors: (i) the liquidity of European banks' SNDs secondary market is not significantly affected by the size of the issues, [33] (ii) European banks' SND investors tend to hold these securities to maturity and are therefore indifferent to their secondary market liquidity, and (iii) European banks' small size SND issues are sold through the banks' own distribution networks to retail clients in a quasi-monopolistic market which in turn allows banks to price them at lower spreads (Sironi, 2002).

Finally, US banks pay on average slightly lower spreads than their European counterparts. [34] Fig. 3 shows that European and US banks' SND spreads are very similar, with US banks paying on average only 5 to 20 b.p. less than European ones. This result can be attributed to three different factors: (i) the higher liquidity of US banks' SNDs primary and secondary markets, (ii) the more favorable average conditions of the US bond markets during the sample period, and (iii) the better average US macroeconomic prospects during the sample period. [35] Given the relatively large time period of both empirical samples (11 years), which covers at least one full US

[31] The spread of an SND issue is computed as the difference between the SND yield to maturity and the equivalent Treasury one. As a consequence, it is both a direct function of the SND market liquidity and credit quality and an indirect function of the corresponding Treasury security credit quality and market liquidity. A US 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 US'.

[32] While previous empirical studies on US banks' bonds spreads (Flannery and Sorescu, 1996; Morgan and Stiroh, 2001) included both investment grade (these are bonds with a Moody's or S&P's rating equivalent to or above Baa3 or BBB− respectively) and speculative grade (these are bonds with a Moody's or S&P's rating below Baa3 or BBB− respectively) securities, our empirical sample only includes investment grade ones.

[33] See Sironi (2001) for an analysis of the poor liquidity of European banks' SNDs secondary market.

[34] Note that the intercept of the regression is significantly higher for the US banks' SND sample.

[35] Macroeconomic conditions should already be captured by ratings. However, rating agencies tend to evaluate issuers according to worst case economic scenarios ("through the cycle") as opposed to expected ones ("point in time") (Carey and Treacy, 2000) while financial markets are forward looking and tend to price bonds according to the expected financial and economic conditions of the issuers. More favorable expected conditions of the US economy could therefore explain the lower US banks' SND spreads.

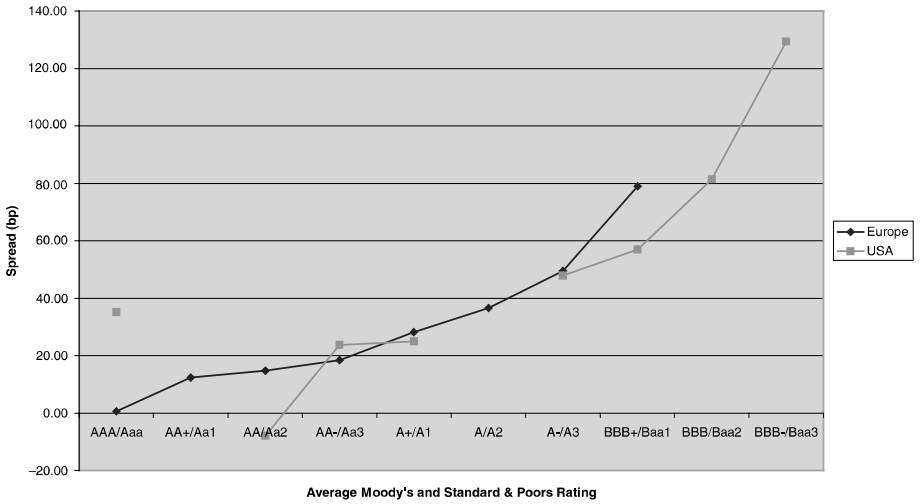

Fig. 3. Plot of OLS regression coefficients of spread on rating dummy variables (each coefficient includes the regression intercept) to rating values. Spread (b.p.) is measured as the difference between the SND yield to maturity and the yield of a Treasury bond of comparable maturity denominated in the same currency. Rating values are the numeric values of the ratings given by Moody's and S&P's as defined in Appendix C. Includes 257 SNDs issued between 1989 and 1997 by US banks and 229 SNDs issued between 1991 and 1999 by European banks.

and European credit and economic cycles, the first explanation is considered to be most likely.

Results for the MBFS–FII ratings based specifications (columns 3 and 4 of Table 3) are similar to the ones obtained for the Moody's and S&P's. Most rating dummies are statistically significant with expected relative values. US banks pay on average lower spreads for each rating grade than their European counterparts (Fig. 4). The 'Public' dummy is strongly statistically significant, indicating that public sector banks pay a lower average spread on their SND issues than their private sector counterparts, and has a higher coefficient than the one obtained for the Moody's and S&P's ratings based specification. This is because part of the public sector banks' subsidy is already captured by traditional Moody's and S&P's ratings (Sironi, 2002).

Results also show a lower adjusted R^2 for US banks' SND issues compared to the European banks' one (0.614 versus 0.762). This might reflect a higher degree of disclosure on the part of US banks, which allows capital market investors to independently evaluate the risk profile of the issuing banks without entirely relying on rating agencies' synthetic judgments. This result is consistent with the ones concerning the explanatory power of ratings versus accounting risk measures obtained by Flannery and Sorescu (1996). [36]

[36] They concluded that " . . . results suggest that, in determining the required SND spread, investors relied more heavily on bond ratings prior to 1990. During the last two years (1990 and 1991), bond ratings provide no additional information beyond that already contained in the accounting risk measures".

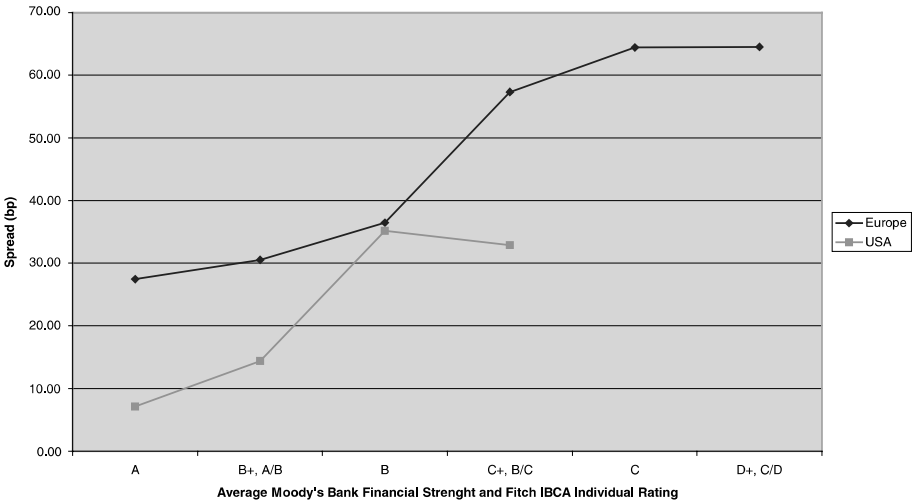

Fig. 4. Plot of OLS regression coefficients of spread on rating dummy variables (each coefficient includes the regression intercept) to rating values. Spread (b.p.) is measured as the difference between the SND yield to maturity and the yield of a Treasury bond of comparable maturity denominated in the same currency. Rating values are the numeric values of the Moody's bank financial strength and FitchIBCA individual ratings as defined in Appendix C. Includes 257 SNDs issued between 1989 and 1997 by US banks and 229 SNDs issued between 1991 and 1999 by European banks.

Regression results obtained with the inclusion of fixed effects (columns 5–8 of Table 3) are very similar to the ones produced by standard OLS regressions, indicating that variations in the independent variables – such as rating dummies – that are statistically significant in affecting the spreads *between* issuers remain such *within* a bank.

Table 4 reports regression results for the joint sample of US and European banks' SND issues. Most rating dummies are statistically significant with expected relative values for both Moody's–S&P's and MBFS–FII ratings based specifications. 'Maturity', 'Amount' and 'Public' are all strongly statistically significant with expected signs.

USA is the only statistically significant country dummy, indicating that US banks pay a lower average spread, of approximately 13 b.p., [37] on their SND issues than their European counterparts. This result is consistent with the empirical evidence discussed above and is most likely the consequence of the higher liquidity of US banks' SNDs secondary market.

Regression results obtained with the inclusion of fixed effects (columns 3 and 4 of Table 4) are similar to the ones obtained with standard OLS with two main exceptions: the two 'Public' and USA dummy variables are not statistically significant as they were in the standard OLS regressions. This difference can be attributed to the

[37] The result obtained in the MBFS–FII specification is considered to be the correct one as this controls for the true stand-alone risk profiles of the issuing banks.

Table 4
Linear regressions of spread on rating dummy variables

	OLS		Fixed effects	
	M–S&P ratings (1)	MBFS–FII ratings (2)	M–S&P ratings (3)	MBFS–FII ratings (4)
Rating = 2	13.168*	7.295	28.250	14.273**
	(7.138)	(4.575)	(19.720)	(6.674)
Rating = 3	12.311	20.288***	29.942	24.718***
	(7.882)	(4.283)	(19.795)	(8.594)
Rating = 4	24.797***	27.538***	48.957**	36.383***
	(8.215)	(5.003)	(20.479)	(9.895)
Rating = 5	25.203***	43.872***	46.584**	46.483***
	(8.265)	(7.754)	(21.136)	(12.600)
Rating = 6	39.639***	50.223***	47.982**	58.358***
	(8.346)	(11.048)	(21.286)	(18.331)
Rating = 7	49.323***	–	66.185***	–
	(8.464)		(21.539)	
Rating = 8	50.672***	–	58.519***	–
	(10.171)		(22.124)	
Rating = 9	51.995*	–	49.506	–
	(27.476)		(32.082)	
Rating = 10	123.330***	–	116.326***	–
	(13.625)		(23.231)	
Maturity	0.539***	0.492***	0.540***	0.559***
	(0.142)	(0.150)	(0.141)	(0.151)
Amount	−4.659***	−3.104***	−1.490	1.038
	(1.016)	(1.050)	(1.365)	(1.332)
Public	−12.924**	−43.256***	8.579	−16.181
	(5.791)	(4.879)	(16.765)	(17.810)
STG	40.380***	40.868***	33.707***	29.604**
	(10.776)	(11.475)	(11.316)	(11.950)
USD	38.488***	37.217***	45.508***	37.274***
	(10.616)	(11.319)	(11.234)	(11.748)
USA	−28.569***	−13.210***	−2.259	19.110
	(3.929)	(4.016)	(13.463)	(18.299)
Constant	28.886*	31.893**	−18.705	−12.185
	(14.144)	(13.371)	(29.530)	(22.892)
N	486	486	486	486
R^2	0.696	0.650	0.776	0.744
Adjusted R^2	0.652	0.604	0.709	0.671
F	16.188***	14.250***	11.585***	10.154***
F_b	13.964***	7.080***	13.964***	7.080***

Reported are regression coefficients and standard errors (in parentheses). 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: (i) the SND issue M–S&P average rating (columns 1 and 3), (ii) the SND issuing bank Moody's financial strength (MBFS) and FitchIBCA individual (FII) average rating (columns 2 and 4) matches the corresponding rating numerical value (see Appendix C), 0 if not. Equations are estimated by OLS and with inclusion of fixed effects (columns 3 and 4). F denotes the standard F-statistic. F_b 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 the same as in Table 3.

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

stability of these variables *within* the issuing banks. Indeed, the lower average spread paid by public sector and US banks is captured by the statistically significant coefficients of these banks' dummy variables negative coefficients used in the fixed effects regressions.

It is important to highlight that the above mentioned empirical results have been based on data concerning SND issues completed by large banks, included in the world's 100 largest in terms of total assets at the time of issuance. It is therefore likely that many of these banks benefit from implicit government guarantees such as TBTF ones. This issue has not been explicitly addressed by this study. However, the available empirical evidence indicate that implicit government guarantees such as TBTF ones gradually disappeared during the last two decades both in Europe and in the US. As far as the US banking system is concerned, early empirical work based on data from the early and mid 1980s did not find any statistically significant relationship between SND spreads and bank risk (Avery et al., 1988; Gorton and Santomero, 1990) and concluded in favour of such kinds of guarantees. More recent studies based on data for longer and more recent time periods, while confirming the previous results for the mid 80s, found statistically significant relationships between SND spreads and various measures of bank risk (Flannery and Sorescu, 1996; De Young et al., 2001; Jagtiani et al., 1999; Covitz et al., 2000). These diverging results have been explained by the significant change in US regulatory treatment of bank SND investors over the period between the early 80s and the early 90s, with the apparent lack of market discipline of the early and mid 80s attributed to the presence of implicit government guarantees. As far as the European banking system is concerned, Sironi (2002) found that the perception of implicit government guarantees, in the form of TBTF policies, by banks' bond investors, gradually disappeared during the 90s. This change in regime has been attributed to the combined effect of (i) the loss of monetary policy that continental European countries' central banks suffered as a consequence of the EMU, and (ii) the stringent national budget constraints imposed by the convergence criteria originally set forth by the 1989 Delors plan. 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).

5. Conclusions

Three main results emerge from the empirical analysis presented in this study. First, the spread/rating relationship is very similar and statistically significant for US and European banks' SND issues. Second, US banks tend to pay a higher average spread on their bonds because of a poorer average rating. This result is attributed to the significant presence of public sector banks, i.e. banks which are either government owned or benefit from explicit government guarantees, in the European banking system. In fact, US banks have better MBFS and FII average ratings, which omit the influence of government and other external support on risk borne by investors. Finally, controlling for the issuing banks' risk profiles, US banks pay a statistically significant

slightly lower average spread on their SND issues. This result is attributed to the higher liquidity of the US secondary market for banks' bonds.

The significant similarities in the determinants of banks' bonds spreads between European and US banks and the relatively minor difference in the absolute level of average spreads per corresponding rating grade (approximately 13 b.p.) seem to indicate that the objective of strengthening market discipline does not contrast the one of enhancing competitive equality, with the relevant exception of European public sector banks. These banks would strongly benefit from a shift from regulatory to market discipline, as this would inevitably increase their funding cost advantage. As recently outlined by Greenspan (2001, p. 11),

> " . . . Expanded disclosure will be critical to enhanced market discipline, but the additional information will be irrelevant unless counterparties believe that they are, in fact, at risk. That is why the second prerequisite to effective market discipline is the belief by uninsured creditors that at least they may be at risk of loss."

The result concerning European public sector banks has important implications not only for the effectiveness of market discipline but also for capital regulation. Under the current capital adequacy framework SND are forms of indebtedness that may qualify as tier 2 capital when the instrument has a maturity of at least five years. [38] The government subsidy enjoyed by European public sector banks therefore represents a violation of the "level playing field" principle originally set forth by the Basel Committee 1988 Capital Accord.

On the other side, the result indicating that US banks pay a statistically significant lower spread on their SND issues than European banks because of the higher liquidity of the US capital markets for banks' bonds has important policy implications for the European banking system. An internationally coordinated policy aimed at strengthening market discipline – such as the one suggested by many observers and implicit in the third pillar of the recent Basel Committee proposals to reform the capital adequacy framework – should be seen by internationally active European banks and European bank supervisors as a further incentive to promote the depth and liquidity of the European banks' bond markets.

Finally, the two above mentioned empirical results highlighted the potential problems that the comparison of credit spreads across European and US banks might encounter when a minority of these banks benefit from explicit government guarantees or significant differences in the liquidity of national capital markets exist.

Appendix A. Moody's bank financial strength definitions

According to Moody's, "Bank financial strength ratings represent Moody's opinion of a bank's intrinsic safety and soundness and, as such, exclude certain

[38] A maturity of at least two years is allowed for tier 3 capital, which only qualifies for market risk capital requirement purposes.

credit risks and credit support elements which are addressed by Moody's traditional debt and deposit ratings. Unlike Moody's traditional debt ratings, BFSR do not address the probability of timely payment. Instead, BFSR can be understood as a measure of the likelihood that a bank will require assistance from third parties such as its owners, its industry groups, or official institutions. BFSR do not take into account the probability that the bank will receive such external support, nor do they address risks arising from sovereign actions which may interfere with a bank's ability to honor its domestic or foreign currency obligations. Factors considered in the assignment of BFSR include bank-specific elements such as financial fundamentals, franchise value, and business and asset diversification. Although BFSR exclude the external factors specified above, they do take into account other risk factors in the bank's operating environment, including the strength and prospective performance of the economy, as well as the structure and relative fragility of the financial system, and the quality of banking regulation and supervision''.

Rating class	Definition
A	Banks with exceptional financial strength. Typically, they will be major institutions with highly valuable and defensible business franchises, strong financial fundamentals, and a very attractive and stable operating environment.
B	Banks with strong intrinsic financial strength. Typically, they will be important institutions with valuable and defensible business franchises, good financial fundamentals, and an attractive and stable operating environment.
C	Banks with good financial strength. Typically, they will be institutions with valuable and defensible business franchises. These banks will demonstrate either acceptable financial fundamentals within a stable operating environment or better than average financial fundamentals with an unstable operating environment.
D	Banks that possess adequate financial strength, but may be limited by one or more of the following factors: a vulnerable or developing business franchise; weak financial fundamentals; or an unstable operating environment.
E	Banks with very weak intrinsic financial strength, requiring periodic outside support or suggesting an eventual need for outside assistance. Such institutions may be limited by one or more of the following factors: a business franchise of questionable value; financial fundamentals that are seriously deficient in one or more respects; or a highly unstable operating environment.

In addition, four more gradations (notches) among these five main rating classes are used by Moody's: B+, C+, D+, E+.

Appendix B. FitchIBCA individual rating definitions

According to FitchIBCA, the "Individual rating attempts to assess how a bank would be viewed if it were entirely independent and could not rely on support from state authorities or its owners. Thus, the individual rating permits an evaluation divorced entirely from consideration of support".

Rating class	Definition
A	A bank of impeccable financial condition. With a consistent record of above average performance.
B	A bank with a sound risk profile and without significant problems. The bank's performance has generally been in line with or better than its peers.
C	A bank which has an adequate risk profile but possesses one or more troublesome aspects, giving rise to the possibility of risk developing, or which has generally failed to perform in line with its peers.
D	A bank which is currently underperforming in some notable manner. Its financial condition is likely to be below average and its profitability poor. The bank has the capability to recover using its own resources, but this is likely to take some time.
E	A bank with very serious problems which either requires or is likely to require external support.

In addition, four more gradations (notches) among these five main rating classes are used by FitchIBCA: A/B, B/C, C/D, D/E.

Appendix C. Rating scales

Rating type	Number									
	1	2	3	4	5	6	7	8	9	10
Moody's	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3
S&P's	AAA	AA+	AA	AA−	A+	A	A−	BBB+	BBB	BBB−
MBFS	A	B+	B	C+	C	D+	D	E+	E	–
FII	A	A/B	B	B/C	C	C/D	D	D/E	E	–

Appendix D. Sample issuing banks

Country	Issuing bank	Total assets (US$ m as at 1998 year end)	Country rank
Austria	**Bank Austria AG**	**139,276**	1
Belgium	Fortis Banque	277,297	1
Germany	Bayerische Hypo-und Vereinsbank	445,946	2
	Bayerische Landesbank Girozentrale	**225,216**	7
	Bankgesellschaft Berling AG	**186,292**	8
	Commerzbank AG	320,683	5
	Deutsche Bank	603,945	1
	Deutsche Siedlungs und Landesren.	**70,872**	19
	Dresdner Bank AG	363,216	3
	Landesbank Hessen-Thuringen Gir.	**97,240**	16
	Landesbank Schleswig-Holstein Gir.	**97,445**	15
	Landesbank Baden-Wuerttemberg	**85,341**	17
	Norddeutsche Landesbank Girozen.	**144,655**	11
	Sudwestdeutsche Landesbank Giroz.	**112,875**	12
	Westdeutsche Landesbank Giroz.	**345,484**	4
France	Banque Nationale de Paris	324,826	4
	Banque Paribas	290,793	5
	Credit Agricole	**390,642**	1
	Credit Lyonnais SA	**208,878**	6
	Societe Generale	383,533	2
Netherlands	ABN AMRO Bank	504,121	1
	ING Bank	280,112	3
Switzerland	Credit Suisse	475,017	2
	UBS – Union Bank of Switzerland	704,979	1
Great Britain	Abbey National plc	273,491	4
	Bank of Scotland	89,944	12
	Barclays Bank plc	353,295	2
	HSBC Holdings plc	475,546	1
	Lloyds Bank plc	213,614	5
	National Westminster Bank	285,979	3
	Royal Bank of Scotland plc	133,724	9
	Midland Bank plc	169,968	8
Spain	Argentaria, Caja Postal y B.	79,846	4
	Banco Central Hispanoam.	93,575	3
	BBV—Banco Bilbao Vizcaya	151,917	2
	Banco Santander	176,848	1

(*continued on next page*)

Country	Issuing bank	Total assets (US$ m as at 1998 year end)	Country rank
USA	Bank One Corp.	261,496	6
	Bank of New York	74,756	22
	Bank of America	257,479	6
	Bankers Trust Co.	104,908	16
	Chase Manhattan Bank	296,717	5
	Citibank	343,620	3
	First Union National Bank	253,024	8
	JP Morgan & Co.	261,067	7
	KeyBank NA	79,966	21
	NationsBank	317,127	2
	Suntrust Bank	93,169	18
	US Bancorp	97,456	17
	Wells Fargo Bank	87,262	19

Entries given in bold indicate public sector banks. These are either government owned banks or banks benefiting from explicit government guarantees.

References

Avery, R.B., Belton, T.M., Goldberg, M.A., 1988. Market discipline in regulating bank risk: New evidence from the capital markets. Journal of Money, Credit, and Banking 20, 597–610.

Basel Committee on Banking Supervision, 1988. International convergence of capital measurement and capital standards, July.

Basel Committee on Banking Supervision, 1996. Amendment to the Capital Accord to incorporate market risks. Consultative Paper No. 24, January.

Basel Committee on Banking Supervision, 1999. Capital requirements and bank behavior: The impact of the Basel Accord, by a working group led by Patricia Jackson. Working Paper No. 1, April.

Basel Committee on Banking Supervision, 2001a. The new Basel Capital Accord. Consultative Document, January.

Basel Committee on Banking Supervision, 2001b. The new Basel Capital Accord: An explanatory note, January.

Berger, A.N., Davies, S.M., Flannery, M.J., 2000. Comparing market and supervisory assessments of bank performance: Who knows what and when? Journal of Money, Credit, and Banking 32 (3, Part II), 641–667.

Bliss, R.R., Flannery, M.J., 2001. Market discipline in governance of US bank holding companies: Monitoring versus influencing. In: F.S. Mishkin (Ed.), Prudential Supervision: What Works and What Doesn't. National Bureau of Economic Research, University of Chicago Press, Chicago, IL, pp. 107–143.

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.

Carey, M., Treacy, W.F., 2000. Credit risk ratings at large U.S. banks. Journal of Banking and Finance 24, 167–201.

Collin-Dufresne, P., Goldstein, R.S., Martin, J.S., forthcoming. The determinants of credit spread changes. The Journal of Finance.

Covitz, D.M., Hancock, D., Kwast, M., 2000. Mandatory subordinated debt: Would banks face more market discipline? Mimeo., Board of Governors of the Federal Reserve System.

Crockett, A., 2002. Market discipline and financial stability. Journal of Banking and Finance 26, this issue.

Delianedis, G., Geske, R., 1998. Credit risk and risk neutral default probabilities: Information about ratings migrations and defaults, Working Paper. Anderson School, UCLA, Los Angeles.

De Young, R., Flannery, M., Lang, W.W., Sorescu, S.M., 2001. The information content of bank exam ratings and subordinated debt prices. Journal of Money, Credit, and Banking 33 (4), 900–925.

Elton, J.E., Gruber, M.J., Agrawal, D., Mann, C., 2000. Factors affecting the valuation of corporate bonds. Mimeo., October.

Elton, J.E., Gruber, M.J., Agrawal, D., Mann, C., 2001. Explaining the rate spread on corporate bonds. The Journal of Finance LVI (1), 247–277.

Evanoff, D.D., Wall, L.D., 2001. Sub-debt yield spreads as bank risk measures. Journal of Financial Services Research 20 (2/3), 121–145.

Flannery, M.J., Sorescu, S.M., 1996. Evidence of bank market discipline in subordinated debenture yields: 1983–1991. Journal of Finance 51, 1347–1377.

Flannery, M.J., 2001. The faces of market discipline. Journal of Financial Services Research 20 (2/3), 107–119.

Gorton, G., Santomero, A., 1990. Market discipline and bank subordinated debt. Journal of Money, Credit and Banking 22, 203–212.

Greenspan, A., 2001. Remarks Before the 37th Annual Conference on Bank Structure and Competition of the Federal Reserve Bank of Chicago, Chicago, May 10.

Gropp, R., Vesala, J., Vulpes, G., 2001. Equity and bond market signals as leading indicators of bank fragility in Europe. European Central Bank, Mimeo.

Jagtiani, J., Kaufman, G., Lemieux, C., 1999. Do markets discipline banks and bank holding companies? Evidence from debt pricing, Working Paper. Emerging Issues Series, Federal Reserve Bank of Chicago.

Kwast, M.L., et al., 1999. Using subordinated debt as an instrument of market discipline. Report of a Study Group on Subordinated Notes and Debentures, Board of Governors of the Federal Reserve System, Staff Study #172, December.

Merton, R.C., 1974. On the pricing of corporate debt: The risk structure of interest rates. Journal of Finance 29, 449–470.

Morgan, D.P., Stiroh, K.J., 2000. Bond market discipline of banks: Is the market tough enough? Federal Reserve Bank of New York Staff Report No. 95.

Morgan, D.P., Stiroh, K.J., 2001. Market discipline of banks: The asset test. Journal of Financial Services Research 20, 195–208.

Perraudin, W., Taylor, A., 1999. On the consistency of ratings and bond market yields. Mimeo., November.

Pettway, R.H., Kanedo, T., Young, M.T., 1991. International bank capital standards and the costs of issuing capital securities by Japanese banks. Journal of Banking & Finance 15, 559–580.

Sironi, A., 2001. An analysis of European banks subordinated debt issues and its implications for a mandatory subordinated debt policy. Journal of Financial Services Research 20 (2/3), 233–266.

Sironi A. 2002. Testing for market discipline in the European banking industry: Evidence from subordinated debt issues. Journal of Money, Credit, and Banking, forthcoming.

Wagster, J.D., 1996. Impact of the 1988 Basel Accord on international banks. Journal of Finance 51, 1321–1346.

Zimmer, S.A., McCauley, R.N., 1991. Bank cost of capital and international competition. Federal Reserve Bank of New York Quarterly Review (Winter), 33–59.