Quantity Effects in the Market Discipline Transmission Mechanism

Adrian Pop*

-- Preliminary & incomplete draft --

Abstract: *A straightforward method to enhance market discipline in banking is the mandatory Sub-Debt Policy (SDP), i.e. a requirement by which some large banks are forced to regularly issue a certain minimum amount of subordinated and non-guaranteed debt. If the decision of issuing sub-debt is endogenous and/or subordinated creditors are really able to influence bank managers' behavior, we should be able to detect empirically a positive correlation between the amount of sub-debt held in bank balance sheets and banking performance. By conducting statistical tests on a panel dataset comprising the largest European banks, we find that: (i) the sub-debt issues are made generally by the most profitable banking organizations; (ii) voluntary sub-debt issues allow banks to reduce their Tier 1 ratios, while improving their overall capitalization (Tier 1 + Tier 2 ratios); (iii) as far as the risk profile is concerned, the amount of sub-debt held in bank balance sheet is negatively correlated with the quality of credit portfolio, but positively correlated with the ratio of loan loss reserve to total (gross) loans. These results arouse several reflections about the virtues and limitations of market discipline in banking in the absence of a formal SDP.*

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*University of Nantes, *Laboratoire d'Economie de Nantes* (LEN), Chemin de la Censive du Tertre, BP 52231, 44322 Nantes, Cedex 3, France, Tel.: +33-2-40141654; fax: +33-2-40141650. E-mail: adrian.pop@univ-nantes.fr

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"*An invasion of armies can be resisted, but not an idea whose time has come.*"

V. Hugo

1. Introduction

Although the first reform proposals aiming to strengthen the role of market forces in banking regulation emerged in the early 1980s, the literature on market discipline has been developed very recently. Two main factors contributed to the renewal of interest for market discipline in the academic research field, as well as in the public policy arena. The first one is related to the pragmatic debate within the banking industry initiated by the Basel Committee on its first attempt to reform the Cooke ratio. The 3rd Pillar of the new capital adequacy accord (Basel II) recognizes the importance of market discipline in promoting a safe and sound banking environment (BIS, 2004). The second factor is connected with the US law on financial modernization (the Gramm-Leach-Bliley Act of 1998), which asks for a study on the feasibility and desirability of a mandatory Subordinated Debt Policy (henceforth SDP) for systemically important banking organizations.[1] Such a policy requires that certain large banking organizations regularly issue a minimum amount of subordinated and non-guaranteed debt. The underlying idea in SDP proposals is to improve the corporate governance of "too big to fail" institutions and hence to protect the financial system and deposit insurance funds against their potential failure.

The heuristical value of such stimulating interactions between banking industry, regulators, and academics is far from being negligible. From the beginning of 2000s, a vast research field has been developing around market discipline and subordinated debt in order to answer this new challenge of economic policy. Despite the impressive number of studies – both theoretical and empirical –, very few research papers attempted to legitimate the *mandatory* attribute of a SDP. Most defenders of market discipline through a mandatory subordinated debt requirement focus their persuasive essays on arguments that amount to no more than... "common sense": improving the informational content of market signals by boosting liquidity in the secondary sub-debt market; drawing more attention to individual bank issuers; standardizing the characteristics of sub-debt instruments in order to facilitate the price formation process; highlighting the similar incentives of sub-debt holders and bank supervisor to monitor and limit bank risk-taking etc. To our knowledge, there is no rigorous

[1] This study, elaborated following a fruitful collaboration between the Board of Governors of the Federal Reserve System and the US Treasury, was achieved one year later, in December 2000 (see BGFRS&DT, 2000). Even though immediate implementation of a SDP is not *highly* recommended in the conclusion of this study, the interest for such a policy is plainly acknowledged: "*The Board* [of Governors of the Federal Reserve System] *and the Secretary* [of the Treasury] *believe that existing evidence supports efforts to use subordinated debt as a way to encourage market discipline.* [...] *A policy of mandatory subordinated debt issuance may potentially enhance market discipline and safety and soundness. Nonetheless, the Board and the Secretary believe that additional evidence must be gathered before they can support a request for legislative authority to impose a requirement that large insured depository institutions or they holding companies maintain some portion of their capital in the form of subordinated debt.*" (BGFRS&DT, 2000, pp. *iv*, 56-57)

analysis up to date demonstrating the necessity of forcing banks to regularly issue minimum amounts of subordinate debt. To fill this important gap in the literature, this article brings into discussion some interesting elements justifying the mandatory character of SDP. In particular, we attempt to prove that forcing large banks to regularly issue sub-debt instruments represents by itself an essential condition for effective market discipline.

Under certain circumstances, the *raison d'être* of a mandatory SDP seems to be all the more problematic. First of all, it is worth emphasizing an interesting stylized fact regarding the existing sub-debt markets. The largest banking organizations headquartered in most developed countries have already issued significant amounts of subordinated and other non-guaranteed debt securities in the last decade or so (BIS, 2003). Secondly, financial markets behave according to the principles defended by the proponents of market discipline: (*i*) prices reflect the risk profiles of bank issuers reasonably well; and (*ii*) high-risk banks decide to postpone the precise moment of their intervention in the primary market (or alternatively these banks are simply rationed). Finally, as emphasized by certain authors (see e.g. the comments of Myron L. Kwast on Calomiris and Litan, 2000), a mandatory SDP could have at least two major drawbacks. On the one hand, a mandatory SDP is likely to generate excessive costs for banks subject to such a policy. These costs would depend on the design features of the adopted SDP, the intrinsic characteristics of each banking organization, the phase of the business cycle and... the "animal spirit"[2] of financial markets. On the other hand, the adoption of a formal SDP could limit the capacity of certain banks to manage their capital structures in an effective way, by introducing additional rigidity into the internal decision-making process.

If financial markets already exercise a reasonable degree of discipline,[3] why should regulators interfere, in a more or less aggressive way, in banks' financing policies? At first sight, an ordinary answer consists in underlying the superfluous nature of a mandatory SDP. However, as we argue in Section 2, this kind of answer is overall simplistic and a mandatory SDP may even be justifiable on fairly sound economic grounds. The intuition behind our approach runs as follows. Within the current regulatory framework — that is, in the absence of a formal SDP — market discipline can be easily alleviated because, as banks' conditions deteriorate, the funding managers shift toward insured deposits as a primary source of funding and reduce their reliance on market-sensitive debt instruments. A mandatory SDP eliminates this perverse *quid pro quo* by forcing banks to regularly tap the primary market even when their financial conditions are weak. In this way, the market forces are "active" at the very junctures when bank regulators need them, *viz.* when the risk profile starts to deteriorate.

Section 3 lends empirical support to that intuition. The dataset on which our empirical

[2] See also Covitz et al. (2000). This expression, belonging to J.M. Keynes (see notably ch. XII of his *General Theory*, "*The state of long-term expectation*", §VII, pp.161-162), points to the herding behavior of investors likely to disrupt the market during periods of stress ("*a spontaneous urge to action rather than inaction*" or "*waves of irrational psychology*").

[3] For comprehensive reviews of the empirical literature on market discipline in banking, the reader can refer to Flannery (1998), Evanoff and Wall (2000b), and Flannery and Nikolova (2004).

analysis is based includes more than 500 large European banking organizations, for which annual financial reports from 1996 through 2003 are available in the *Fitch-IBCA BankScope* database. Our strategy consists in comparing the characteristics of two distinct sub-samples: (*i*) banks exhibiting relatively low ratios of subordinated debt to total assets (sample A) and (*ii*) banks reporting very important amounts of subordinated debt on the right side of their balance sheets (sample B). The bivariate comparisons are realized along three essential dimensions of banking activity: profitability, capitalization, and risk profile. If the decision of issuing sub-debt is *endogenous* and/or subordinated creditors are really able to *influence* bank managers' decisions, we should find, *ceteris paribus*: (*i*) a better profitability; (*ii*) larger capital adequacy ratios; and (*iii*) a less deteriorated risk profile for the banks included in sample B.

Our main empirical findings can be summarized as follows. First, the sub-debt issues are generally made by the most profitable banking organizations. Second, voluntary sub-debt issues allow banks to reduce their Tier 1 ratios, while improving their overall capitalization (Tier 1 + Tier 2 ratios). Third, as far as the risk profile is concerned, the amount of sub-debt held in bank balance sheets is negatively correlated with the quality of credit portfolios, but positively correlated with the ratio of loan loss reserve to total (gross) loans. These results arouse serious reflections about the virtues and limitations of market discipline in banking in the absence of a formal mandatory SDP.

Finally, Section 4 concludes.

2. Why should a SDP be mandatory? A simple model of the banking firm

`{Section in progress}`

3. The "strong form" of market discipline: a bivariate analysis on European data

The objective of this section is to provide some empirical support for our theoretical intuition. The focus on European bank-level data is not fortuitous: the literature on the effectiveness of market discipline in the European banking sector is scarce when compared with the empirical research carried out on the US markets for bank securities (see e.g. BIS, 2003).

The empirical strategy adopted in this study finds its roots in three strands of the literature on market discipline in banking:

- studies addressing the question of whether there is any correlation between the ability of banks to attract non-guaranteed sources of funding and their risk profile (*supply-side quantity effects*);
- empirical research on the sensitivity of the decision to issue subordinated debt to the risk profile of bank issuers (*demand-side quantity effects*);

- recent contributions on the ability of market forces to influence bank management behavior.

The question addressed in the analyses on supply-side quantity effects is whether a significant deterioration in the financial condition has any effect on the ability (or willingness) of banks to collect large uninsured deposits or other sensitive sources of market funding. Berger (1991, p.427) also stressed the importance of this issue by asserting that price-effects could be insignificant in the particular case of the under-capitalized banks. Park and Peristiani (1998), Jagtiani and Lemieux (2000), Hall et al. (2002) document significant quantity-effects inherent to the market discipline transmission mechanism:[4] (*i*) the deterioration of the bank risk profile leads to a decline in the proportion of uninsured deposits; (*ii*) sound banks are able to collect more uninsured deposits relative to their riskier competitors; (*iii*) the default probability has a significant negative impact on the amount of uninsured deposits likely to be raised. Goldberg and Hudgins (2002) and Maechler and McDill (2003) take into account both type of effects (i.e. price- and quantity-effects) by investigating the dynamics of depositors and banks' behavior. While offering more attractive interest rates is generally a necessary condition to avoid massive withdrawals of uninsured deposits, the net effect of the simultaneous variation in the supply and demand imply an effective exercise of market discipline: the amount of uninsured deposits decreases despite the higher remunerations offered by highly risk banks.

Several studies reveal the existence of substitution effects between insured deposits and large certificates of deposit (so called Jumbo CDs). Such effects take place either after a rating downgrade (Billet et al., 1998) or several quarters before the actual bank failure (Marino and Bennett, 1999, Jordan, 2000, Goldberg and Hudgins, 2002). Jagtiani and Lemieux (2000) show that far before their failure (8-10 quarters), bank funding managers avoid market discipline by substantially increasing (by 80%) their use of insured deposits.

The second strand of the literature (see e.g. BGFRS, 1999, Covitz et al., 2000, 2004, Covitz and Harison, 2004, Evanoff and Jagtiani, 2004) concludes that the decision to issue new subordinated debt instruments is *endogenous*, i.e. riskier bank issuers prefer not to tap the primary market.

Finally, as far as the influencing issue is concerned, the findings of Bliss and Flannery (2002) and more recently Kwan (2004ab) and Krishnan et al. (2005) are not indicative of the ability of market forces to effectively constrain bank risk-taking. Consequently, these authors recommend that the supervisor must retain the entire responsibility to assure the difficult task of influencing the bank management behavior.

[4] However, Crabbe and Post (1994) finds that rating downgrades have no significant impact on the amount of CDs issued by large US BHCs. They explain this result by the presence of implicit governmental guarantees before the adoption of the FDICIA in 1991. Conversely, the decline in the amount of commercial papers is much more important several weeks after the rating downgrade. Gilbert and Vaughan (2001) also reveal apathic reactions of the uninsured depositors to changes in the bank risk profile and various US legislative reforms during the last decade.

Our study is similar in spirit to Kwan (2004a).[5] His methodology consists in comparing the performance of two distinct populations of banking organizations: (*i*) publicly owned BHCs having issued securities traded on the secondary market, more likely to be constrained by market discipline; and (*ii*) privately held BHCs, for which there is no public signal about their soundness. If market discipline is effective, the presence of a publicly observable market signal should, *ceteris paribus*, give incentives to publicly traded banks to adopt more prudent behavior than their privately held competitors. However, in contrast with Kwan (2004a), we place more emphasis on the market discipline theory rather than on agency theory (e.g. the impact of the ownership structure on banking performance). More precisely, we are interested in a particular instrument for promoting market discipline in banking: *subordinated debt*. Consequently, our own bivariate comparisons are performed on two different kinds of sub-samples:

- sample A, which includes banks having issued insignificant amounts of subordinated debt;
- sample B, which consists of those banks exhibiting relatively high ratios of subordinated debt to total assets.

By definition, the "strong form"[6] of market discipline is valid if the banks included in sample B exhibit, in a systematic manner, better performance and less deteriorated risk profiles than those being part of sample A.

3.1. *Data and methodology*

3.1.1. Sample selection criteria. The final sample was constructed using a three-step selection procedure. First, from the overall banking organizations headquartered in Europe, we selected those having available accounting information in the *Fitch-IBCA BankScope* database over the 1996-2003 period. Second, in order to assure a minimum degree of homogeneity in data, we excluded all the investment banks and bank holding companies. According to an additional size criterion, we selected only the banks whose total assets at the end of 2003 exceeded USD 1 billion. For the selected banks, we computed the performance measures based on the consolidated financial statements. The final sample consists of 560 banks from 16 countries: Germany (54), Austria (32), Belgium (13), Denmark (16), Spain (67), Finland (7), France (124), Ireland (16), Italy (52), Luxemburg (9), Norway (16), the Netherlands (22), Portugal (14), the United Kingdom (73), Sweden (18) and Switzerland (27). Among these banks, 130 are publicly listed and the rest represents

[5] Our choices in terms of empirical strategy were considerably restricted because of the (annual) frequency of available data, missing data relative to certain bank liabilities (e.g. the amount of total (un)insured deposits), and the extremely reduced number of bank failures in Europe.

[6] We borrowed this term from Kwan (2004b). It is worth noting that the "*strong form*" of market discipline is a diametrically opposite concept to our "*sine qua non*" hypothesis defined in Pop (2004), in the sense that it addresses the *sufficiency* question.

privately held banks (22 banks were delisted between 1996 and 2003). Most of the banks in our final sample (95%) disclose information to their customers/investors through their own websites.

As not all banks regularly report the amount of outstanding subordinated debt over the analyzed period, the total number of observations varies between 505 (at the end of 2003) and 309 (at the end of 1996). The total assets at the end of 2003 amount on average to USD 68 billion on average, between a minimum of USD 1 billion and a maximum of USD 11,000 billion.

3.1.2. Empirical design. The assignment of banks to one of the two sub-samples is realized with respect to the ratio of subordinated debt to total assets ($SDTA$), computed at the end of each year. All banks for which this ratio is inferior to the lower quartile (Q_1) are assigned to sample A, while those exhibiting $SDTA$ ratios superior to the upper quartile (Q3) are included in sample B. As a robustness check, the overall sample was also partitioned according to the median (Q_2) of the $SDTA$ ratio, i.e. $SDTA < Q_2$ (A) and $SDTA > Q_2$ (B), respectively. Table 4 reports the various quartiles of the distribution by year of the $SDTA$ ratio.

{Table 4}

The $SDTA$ ratio is equal to 1.93% on average over the entire period, the standard deviation being equal to 1.91%. Table 5 presents additional descriptive statistics relative to the two sub-samples.

{Table 5}

As revealed by the data, in 2003 the amount of subordinated debt was, on average, significantly lower in sample A than in sample B. Bearing in mind that large banks have in general larger and more frequent issues of subordinated debt, one could expect the existence of significant size effects between the two sub-samples. However, these effects are less important than those documented by Kwan (2004a).[7] According to the total assets variable, the two sub-samples are comparable on average, especially when the partition criterion is the median value of the $SDTA$ ratio (USD 64 billion against USD 71 billion, see Table 5). At the end of 2003, the portion of total assets financed by deposits is equal to 68% on average (min. 1.8%; max. 97.8%), while market funding amounts to 18.9% of total assets on average (min. 0%; max. 94.2%).

The three main dimensions of banking performance, namely, profitability, bank capitalization, and risk profile, are measured by using accounting data. The profitability is proxied either by ROE or the ratio of net interest revenue to total assets ($NIRA$). Higher

[7] This fact does not mean that size effects should be completely neglected. The existence of possible threshold effects can be taken into account correctly only by leading a multivariate econometric analysis of the relationship between banking performance and the quantity of subordinated debt outstanding.

$NIRA$ generally indicates the existence of significant interest margins and thus, reasonable financing costs. Conventional wisdom strongly implies that investors prefer banks with high returns/enough margins provided that the asset quality and the franchise value are preserved.

The bank capitalization is expressed by the equity/total liabilities ratio (EL) and the ratio of capital funds (equity + hybrid capital instruments + subordinated debt) to total assets ($CFTA$). Generally, the European banks issue subordinated debt, which is included in Tier 2 regulatory capital defined under Basel standards, in order to improve their capital adequacy ratios. Certain banks assert that they issue subordinated debt only if such a decision positively affects their Cooke ratios.[8] Our choice for two distinct capital ratios stems from the fact that it is possible that banks having issued important amounts of subordinated debt exhibit low Tier 1 ratios even if their overall capitalization is in fact important.[9]

As in the previous cases, the bank risk profile is assessed based on two variables: the ratio of non performing loans to total (gross) loans ($NPLGL$) and the ratio of loan loss reserve to total (gross) loans ($LLRGL$). The first variable is a proxy for the quality of bank assets, while the second one can be considered as a measure of the financial cushion aiming to absorb losses on the bank credit portfolio.

If market discipline is effective in the European banking sector (either through *supply-* or *demand-side quantity effects*), the amount of subordinated debt should vary over time and across banks. The testable hypothesis of the "strong form" efficiency of market discipline can be expressed as follows:

> H_1: (the "strong form" of market discipline) "*If the issuing decision is endogenous and market discipline is effective, the amount of subordinated debt held on the right-side of the balance sheet is positively correlated with various ex-post measures of bank performance (profitability, capital adequacy, and sound risk management).*"

Based on Kwan (2004a), we test this hypothesis by comparing the distribution of each bank performance variable in the two sub-samples. In order to check the robustness of our results, we perform non parametric Wilcoxon rank sum tests separately for each year of the entire analyzed period (1996-2002), as well as for two separate sub-periods (1996-1998 and 1999-2003, i.e. before and after the euro adoption).[10]

[8] See BIS (2003, p.5 *et passim*) for an excellent discussion of how bank capital regulation affects the decision to issue subordinated debt.

[9] Initially, we included in the analysis of bank capitalization the two most frequently used risk based capital ratios (Tier 1 and Total or Cooke ratios). It is worth noting that these capital adequacy ratios cannot be calculated simply by looking at the balance sheet data, because of the weights that are assigned internally by each bank. Despite the fact that they are not obliged to do so, some banks *voluntarily* publish these ratios in their annual report. However, more than 50% of the European banks included in our sample decided *not* to publicly disclose this kind of information to investors.

[10] From an official point of view, 1998 represented a "turning point" in the euro adoption process: the member countries were identified by the European council, the governor of the ECB was appointed, and official exchange rates between the European currencies were fixed. See Sironi (2003).

3.2. *Results*

Table 5 reports descriptive statistics on the main variables measuring the three dimensions of the banking performance, as well as the total number of observations (banks – years) in various samples. Our bivariate analyses presented in the next three sections are performed with respect to each of these variables.

3.2.1. The first dimension of bank performance: profitability. The first measure of profitability, ROE, calculated separately for the two samples (mean and median values), is presented in Table 6. Wilcoxon z statistics are highly significant for all periods (except year-end 2003). Banks included in sample B ($SDTA > Q_3$) are more profitable on average than their competitors holding largely insignificant amounts of subordinated debt on the right-side of their balance sheets. The difference in profitability between the two populations of banks is also significant from an economic point of view (4-5% at the beginning and 2-3% towards the end of the considered period). Moreover, this result is robust to the criteria used to define the distribution of banks in the two sub-samples, i.e. according to the median or upper/lower quartiles of the $SDTA$ ratio.

{Table 6}

Under certain conditions, using ROE to compare bank profitability has an obvious downside. More exactly, this profitability measure is directly influenced by significant differences in terms of financial leverage (that seems to be the case in our sample, vide infra). For example, all else being equal, an under-capitalized bank might announce a high ROE even if its income inflows are not satisfactory. To avoid this shortcoming, we used an alternative measure of bank profitability, which is less sensitive to this interpretation problem and more specific to banks: the ratio of net interest revenue to total assets ($NIRA$).[11]

Table 7 summarizes mean (median) values of this alternative measure of banking performance for the various sub-samples.

{Table 7}

The results are somewhat less convincing than those reported above. However, there is a significant difference in the profitability of the two samples of banks, especially at the end of the analyzed period. This difference amounts to 20-30 bps on average between 1999

[11] However, it is worth emphasizing that $NIRA$ also has its own problems. First, to the extent that banking markets are efficient, a bank can obtain a higher expected margin only by taking more risk. Second, even if banks' ability to collect and process private information allows them to earn economic rents (as is usualy the case), returns are still likely to be correlated with risk. Third, $NIRA$ does not capture the efficiency with which a bank produces its output. To be more precise, a bank could have a high $NIRA$ but low earnings because it is simply... *inefficient*. In alternative specifications, we also used other measures of bank profitability (return on average assets, ROA, and especially the cost to income ratio, CIR). Unfortunately, the interpretation of the results obtained by using these alternative proxies for bank performance is less clear-cut.

and 2003 and 40-70 bps at the end of 2002 and 2003, respectively. As the higher number of observations improves the power of the Wilcoxon test and the quality of the Gaussian approximation of z statistics, we are able to reject the hypothesis of equality of the two distributions between 1996 and 1998, even though the differences were not significant at the end of each of these years.

3.2.2. The second dimension of performance: bank capitalization. The implications of capital adequacy, another fundamental dimension of bank performance, for promoting sound banking practices are well documented in the literature (see e.g. Santos, 2001). Bivariate comparisons of our first bank capitalization measure, the ratio of equity to total liabilities (EL), are presented in Table 8.

{Table 8}

The results reveal the existence of a significant difference (at the 1% level) in the capitalization (stricto sensu) between the two sets of banks. This difference (2.5% on average between 1996 and 2003) is a little bit lower towards the end of the period (1% in 2002 and 2003). Banks included in sample B ($SDTA > Q_3$) report relatively lower EL ratios as compared with their sample A ($SDTA < Q_1$) competitors. Nevertheless, as we have already noted, this result is not surprising. Under current regulations, issuing large amounts of subordinated debt (i.e. Tier 2 capital) allows banks to lower their equity (Tier 1) ratios, while still satisfying minimum capital requirements.

To test for this behavioral hypothesis, we also studied another capital adequacy measure defined in a broader sense: $CFTA$. This new proxy for bank capitalization is computed as a ratio of capital funds (shareholders equity + hybrid capital instruments + subordinated debt) to total assets. The results are presented in Table 9.

{Table 9}

The Wilcoxon z statistics are not statistically different from 0 at the end of each year from 1996 through 1998. However, the differences in capitalization become significant (at the 1% level) over the 1999-2003 period, in particular 2.4% in 2001, 1.3% in 2002, and 1.4% in 2003. This difference is in fact significant even between 1996 and 2003 thanks to the higher number of observations obtained by pooling data over the entire analyzed period. Consequently, our intuition is valid: banks having issued significant amounts of subordinated debt report relatively higher Tier 1 + Tier 2 capital ratios, especially after euro adoption.

These results illustrate, to a certain extent, the idea of direct market discipline formalized in the continuous-time model proposed by Rochet (2004, *Proposition 3*). Under certain restrictive conditions,[12] a mandatory SDP allows the regulator to lower Tier 1 capital adequacy requirements. In other words, market discipline leads to a lower optimal closure

[12] E.g. long maturity, liquid secondary market, the absence of asset substitution strategies by bank managers.

threshold (defined with respect to the capital ratio) which approaches the first best. However, the SDP always leads to an increase in bank capital ratios defined in a broad sense (Tier 1 + Tier 2).

3.2.3. The third dimension of bank performance: credit quality. Finally, the last dimension of the banking performance considered in our study is the quality of the credit portfolio. One of the most frequently used measures is the ratio of non performing loans to total (gross) loans ($NPLGL$). A higher value of this ratio indicates a deteriorated credit risk profile. Table 10 summarizes the main findings of the bivariate comparisons.

{Table 10}

The two categories of banks present similar risk profiles: differences in credit quality at the end of each year of the analyzed period are not significant at conventional levels. Nevertheless, when the observations are pooled over the sub-period 1996-1998, the quality of sample B banks is relatively higher ($p = 0.01$). This result is reversed after 1999 ($p = 0.05$), so that, over the entire period, the sample B banks tend to hold relatively larger amounts of bad loans in their credit portfolios. This finding should however be interpreted with a lot of caution. Firstly, the total number of observations is relatively less important (about 1,600 against the potential maximum of 3,400), affecting the quality of the Gaussian approximations and the power of the Wilcoxon test. Secondly, sample A banks tend to be systematically more reticent to disclose this kind of sensitive information. Indeed, missing data are relatively more frequent for banks included in sample A: the total number of observations is 648 (sample A) against 964 (sample B). As high-risk banks generally choose not to disclose the bad quality of their credit portfolios, the tests are biased towards rejecting the "strong form" of market discipline hypothesis, H_1.

An alternative proxy for this third dimension of the banking performance is the amount of reserves that banks constitute to protect themselves against future losses on their credit portfolios. A satisfactory level of loan loss reserves increases the financial cushion to absorb future declines in the value of assets and protects the bank against negative shocks. Bivariate comparisons of this alternative measure of the risk profile ($LLRGL$) are presented in Table 11.

{Table 11}

Once again, if one considers the variable of interest at the end of each year between 1996 and 2003, the characteristics of the two sets of banks are not significantly different from a strict statistical point of view. However, over the entire period, as well as over the two considered sub-periods, the $LLRGL$ ratio is relatively higher (50 bps, $p = 0.01$) for the banks included in sample B. This result is more straightforward if the two sub-samples are defined with respect to the median $SDTA$ ratio.

All in all, even though sample B banks tend to hold higher amounts of bad loans in their credit portfolios, they are better protected against the risk of future losses. Indeed, their

capitalization (defined in a broad sense, Tier 1 + Tier 2), as well as their loan loss reserves, are significantly higher as compared with those of their competitors.

4. Concluding remarks and some interesting avenues for further research...

The market reality provides a puzzling paradox that could to some extent justify the reluctance toward a mandatory SDP. On the one hand, the voluntary issues of subordinate debt realized by large banks located in most developed countries are slightly superior to the minimum amounts proposed by the various proponents of SDP. On the other hand, primary and secondary sub-debt markets seem to behave according to the fundamental principles behind the market discipline theory. Under these circumstances, one could infer that the net benefits of mandatory, regular, issues of subordinated debt would not necessary outweigh those currently involved under the voluntary issuance regime.

However, our approach provides a more convincing argument in favor of a mandatory SDP by tracking down the basic flaws in the market discipline mechanism in the absence of such a policy. If unconstrained by a SDP, banks are free to time their issuing decisions and possess enough flexible instruments to substitute insured deposits for subordinate debt and so to avoid the burden of market discipline. A mandatory SDP eliminates these arbitrage opportunities, by forcing banks to expose themselves to the investors' judgment. In this manner, market discipline is activated at the very junctures when bank regulators need it, that is, when the bank risk profile starts to deteriorate. This basic intuition is illustrated by a simple two-period model of financing policy and risk-taking by banks in the presence of a credible deposit insurance scheme.

In order to put our theoretical intuition into perspective, we performed several non parametric tests for detecting significant differences between the *ex-post* performance measures of two distinct samples of large European banks. The first sample includes the banks exhibiting very low sub-debt/total assets ratios, whereas the second sample contains banks having issued significant amounts of subordinated debt. Three essential dimensions of the banking performance were explicitly considered: the profitability, capitalization, and risk profile. All the variables of interest were expressed as ratios, computed by using balance sheet data provided by *Fitch-IBCA BankScope*. We reveal that under current banking regulations the sub-debt issues are generally made by the most profitable European banks. As far as bank capitalization is concerned, it is worth noting that voluntary sub-debt issues allow banks to reduce their Tier 1 ratios, while improving their overall capitalization (Tier 1 + Tier 2 ratios). Finally, the amount of sub-debt reported on the right side of the bank balance sheets is negatively correlated with the quality of credit portfolio, but positively correlated with the ratio of loan loss reserve to total (gross) loans.

Our results can be partially interpreted as tentative evidence of the existence of a "strong form" of market discipline in the European banking sector. Indeed, if the issuing decision is endogenous and investors are really able to influence the current behavior of bank managers, the quantity of subordinated debt held in the bank balance sheet should be *positively*

correlated with the *ex-post* banking performance.

By way of conclusion, we propose some interesting directions for further research, likely to strengthen the preliminary results reported in the paper and expand our understanding of the functioning of market discipline in banking.

1° The passage from a bivariate framework to a multivariate analysis, which takes into account a large set of control variables (e.g. size, composition of bank assets and liabilities, differences in bank regulation and supervision policies across countries, efficiency of national bond and equity markets), represents a natural further step to validate the relevance of our findings. In contrast to the US banking sector, where the largest banking organizations are all private stock corporations, the European one is characterized by the presence of a significant number of *state owned banks* and *cooperative banks*. This peculiarity of the European banking sector may be relevant for the issues explored in the current study because the owners of this kind of banks have different goals than the owners of privately owned banks. Depending upon the country, state owned and cooperative banks may also face limits on the types of customers they serve, on their access to the equity markets, and/or on the geographic markets they serve. These institutional constraints could cause both differences in their reliance on subordinated debt and differences in the variables of interest to this study (i.e. profitability, capitalization, and credit quality). Moreover, the reliance of banks' funding managers on subordinated debt may also reflect differences in supervisory policy in the various countries and/or the efficiency of national debt markets.

2° An empirical strategy able to distinguish between the two types of quantity effects (i.e. *demand- vs. supply*-side effects) in the mechanics of market discipline would also be very useful. In the absence of such a strategy, our preliminary findings could be attributed either to (i) the *endogenous* character of the issuing decision, (ii) the ability of investors to *influence* banking performance, or (most likely!) (iii) various combinations of (i) and (ii). In this last case (iii), simple OLS regressions of the banking performance variables on the amount of subordinated debt outstanding (and *vice versa*) generate *biased* and *incoherent* estimates for the parameters of interest. A well suited solution to overcome this problem consists in conducting a Hausman (1978) endogeneity test in order to identify the direction of causality and then to use the instrumental variable, 2SLS or GMM estimation procedure.

3° The contradictory impact of market discipline on the amount of impaired loans in bank credit portfolios deserves further investigation. Is this effect attributable to the asymmetries characterizing the distribution of missing data in our sub-samples, i.e. to the reticence of certain high-risk banks to reveal this kind of sensitive information? Or, is it simply due to the ineffectiveness of market discipline in the European banking sector?

4° An alternative measure of the bank risk profile, which would be interesting to study, is the traditional and especially the financial strength ratings assigned by the specialized agencies like Fitch-IBCA, S&P or Moody's. Are banks issuing relatively large amounts of sub-debt better rated than their competitors?

5° Another interesting avenue for future research is to analyze whether the distinction between *publicly* offered and *privately* placed subordinated debt have any particular rel-

evance for the market discipline transmission mechanism. At first sight, debt securities exchanged in the secondary market constitute a better disciplinary tool because both channels of market discipline (*direct* and *indirect*) are likely to be effective. Conversely, in the case of private placements, the *indirect* channel is substantially ineffective because a continuous real time public market signal is not available on the secondary market. However, the *direct* channel turns out to be more effective in the case of private debt due to the relative ease of future renegotiation of initial contracts and the absence of free riding in the direct monitoring of bank issuers.[13]

6° Finally, this study could be broadened by including large bank holding companies, which were voluntarily neglected in our empirical analysis. The topic is all the more insightful as these large multinational banking organizations are engaged in a wide range of activities (banking, underwriting, insurance etc.) and their supervision turns out to be a very complex and expensive task.

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[13] By studying a comprehensive sample of US industrial firms issuing both types of debt contracts, Kwan and Carleton (2004) provide strong empirical evidence supporting this assertion. According to a study conducted by the Basel Committee on Banking Supervision, the amount of bank subordinated debt issued through public offers in Europe represented 70% of total subordinated debt outstanding at the end of 2001 (see BIS, 2003).

References

Altman, Edward I. and Anthony Saunders (2001) : "An Analysis and Critique of the BIS Proposal on Capital Adequacy and Ratings," Journal of Banking and Finance, vol. 25, no. 1, pp. 25-46;

Baer, Herbert and Elijah Brewer (1986) : "Uninsured Deposits as a Source of Market Discipline: Some New Evidence", FRB of Chicago, Economic Perspectives, pp. 23-31;

Bank for International Settlements (BIS) (2003) : "Markets for Bank Subordinated Debt and Equity in Basel Committee Member Countries", Basel Committee, Working Paper, No. 12;

Bank for International Settlements (BIS) (2004) : "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee;

Berger, Allen N. (1991) : "Market Discipline in Banking", in "Proceedings of a Conference on Bank Structure and Competition", FRB of Chicago, pp. 419-437;

Billett, Matthew R., Jon A. Garfinkel et Edward S. O'Neal (1998) : "The Cost of Market vs. Regulatory Discipline in Banking", Journal of Financial Economics, vol. 48, no. 3, pp. 333-358;

Birchler, Urs W. et Andréa M. Maechler (2002) : "Do Depositors Discipline Swiss Banks?", in "Research in Financial Services: Private and Public Policy", G. Kaufman (ed.), Elsevier Science, pp. 243-275;

Bliss, Robert R. et Mark J. Flannery (2002) : "Market Discipline in the Governance of U.S. Bank Holdings Companies: Monitoring vs. Influencing", European Finance Review, vol. 6, no. 3, pp. 361-395;

Board of Governors of the Federal Reserve System (BGFRS) (1999) : "Using Subordinated Debt as an Instrument of Market Discipline", Staff Study, No. 172;

Board of Governors of the Federal Reserve System and the Secretary of the U.S. Department of Treasury (BGFRS&DT) (2000) : "The Feasibility and Desirability of Mandatory Subordinated Debt", Report submitted to the Congress;

Buser, Stephen A., Andrew H. Chen et Edward J. Kane (1981) : "Federal Deposit Insurance, Regulatory Policy, and Optimal Bank Capital", Journal of Finance, vol. XXXV, no. 1, pp. 51-60;

Calomiris, Charles W. (1997) : "The Postmodern Bank Safety Net: Lessons from Developed and Developing Countries", Washington, D.C., The AEI Press;

Calomiris, Charles W. (1998) : "Blueprints for a New Global Financial Architecture", Washington, D.C., The AEI Press;

Calomiris, Charles W. (1999) : "Building an Incentive-Compatible Safety Net", Journal of Banking and Finance, vol. 23, no. 10, pp. 1499-1519;

Calomiris, Charles W. et Robert E. Litan (2000) : "Financial Regulation in a Global Marketplace", Brookings-Wharton Papers on Financial Services, The Brookings Institution, pp. 283-339;

Calomiris, Charles W. et Andrew Powell (2001) : "Can Emerging Market Bank Regulators Establish Credible Discipline? The Case of Argentine, 1992-1999", in "Prudential Supervision: What Works and What Doesn't?", F. Mishkin (ed.), NBER, University of Chicago Press, Chicago, IL, pp. 147-196;

Chan, Yuk-Shee, Stuart I. Greenbaum, et Anjan V. Thakor (1992) : "Is Fairly Priced Deposit Insurance Possible?", Journal of Finance, vol. XLVII, no. 1, pp. 227-245;

Chayim, Herzig-Marx et Anne S. Weaver (1979) : "Bank Soundness and the Market for Large Negotiable Certificates of Deposits", FRB of Chicago, Staff Memorandum, No. 79-1;

Cooper, Kerry S. et Donald R. Fraser (1988) : "The Rising Cost of Bank Failures: A Proposed Solution", Journal of Retail Banking, vol. 10, pp. 5-12;

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

Covitz, Daniel M., Diana Hancock et Myron L. Kwast (2004) : "Market Discipline in Banking Reconsidered: the Roles of Funding Manager Decisions and Deposit Insurance Reform", Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, No. 2004-53;

Covitz, Daniel M. et Paul Harrison (2004) : "Do Banks Time Bond Issuance to Trigger Disclosure, Due Diligence, and Investor Scrutiny?", Journal of Financial Intermediation, vol. 13 , no. 3, pp. 299-323;

Crabbe, Leland et Mitchell A. Post (1994) : "The Effect of a Rating Downgrade on Outstanding Commercial Paper", Journal of Finance, vol. XLIX, no. 1, pp. 39-56;

Demirgüç-Kunt, Aslı et Edward J. Kane (2002) : "Cross-Country Evidence on Deposit Insurance", Quarterly Review of Economics and Finance, vol. 42, no. 4, pp. 695-699;

Eisenbeis, Robert A. et Paul M. Horvitz (1986) : "Market Discipline", in "Perspectives on Safe and Sound Banking: Past, Present, and Future", G. Benston, R. Eisenbeis, P. Horvitz, E. Kane et G. Kaufman (eds.), The MIT Press, Cambridge, pp. 173-201;

Ellis, David M. et Mark J. Flannery (1992) : "Does the Debt Market Assess Large Banks' Risk? Time Series Evidence from Money Center CDs", Journal of Monetary Economics, vol. 30, no. 3, pp. 481-502;

Evanoff, Douglas D. (1992) : "Preferred Sources of Market Discipline: Depositors vs. Subordinated Debt Holders", in "Issues in Financial Regulation", FRB of Chicago, Working Papers Series, No. WP-92-21;

Evanoff, Douglas D. et Larry D. Wall (2000) : "Subordinated Debt and Bank Capital Reform", FRB of Chicago, Working Paper, No. 2000-07;

Evanoff, Douglas D. et Julapa Jagtiani (2004) : "Use of Subordinated Debt in the Supervisory & Monitoring Process and to Enhance Market Discipline", FMA European Conference, Zürich;

Federal Deposit Insurance Corporation (FDIC) (1983) : "Deposit Insurance in a Changing Environment", a study submitted to the U.S. Congress by the FDIC, Washington, D.C.;

Federal Deposit Insurance Corporation (FDIC) (2000) : "Deposit Insurance Options Paper", FDIC, Washington, D.C.;

Field, William (1991) : "Deposit Insurance: A Market-Based Reform Proposal", Review of Business, vol. 13, no. 3, pp. 30-33;

Flannery, Mark J. (1982) : "Retail Bank Deposits as Quasi-Fixed Factors of Production", American Economic Review, vol. 72, no. 3, pp. 527-536;

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, vol. 30, no. 3, pp. 273-305;

Flannery, Mark J. and Stanislava Nikolova (2004) : "Market discipline of U.S. financial firms: Recent evidence and research issues", in Hunter, W.C., Kaufman, G.G., Borio, C., Tsatsaronis, K. (eds.), Market Discipline Across Countries and Industries, MIT Press, Cambridge, pp. 87–100;

Freixas, Xavier et Jean-Charles Rochet (1998) : "Fair Pricing of Deposit Insurance. Is It Possible? Yes. Is It Desirable? No.", Research in Economics, vol. 52, no. 3, pp. 217-232;

Gilbert, Alton R. et Mark D. Vaughan (2001) : "Do Depositors Care About Enforcement Actions?", Journal of Economic and Business, vol. 53, nos. 2-3, pp. 283-311;

Goldberg, Lawrence G. et Sylvia C. Hudgins (2002) : "Depositor Discipline and Changing Strategies for Regulating Thrift Institutions", Journal of Financial Economics, vol. 63, no. 2, pp. 263-274;

Hall, John R., Thomas B. King, Andrew P. Meyer et Mark D. Vaughan (2002) : "Did FDICIA Enhance Market Discipline? A Look at Evidence from the Jumbo-CD Market", FRB of St. Louis, Supervisory Policy Analysis Working Paper, No. 2002-04;

Hamalainen, Paul, Barry Howcroft et Maximilian J.B. Hall (2003) : "A Mandatory Subordinated Debt Policy for the UK? Evidence from the Issuance Activity of Banks and Building Societies", Loughborough University Banking Centre, Research Paper, No. 163/2003;

Hannan, Timothy H. et Gerald A. Hanweck (1988) : "Bank Insolvency Risk and the Market for Large Certificates of Deposits", Journal of Money, Credit, and Banking, vol. 20, no. 2, pp. 203-211;

Hellmann, Thomas F., Kevin C. Murdock et Joseph E. Stiglitz (2000) : "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?", American Economic Review, vol. 90, no. 1, pp. 147-165;

Horvitz, Paul M. (1986) : "Subordinated Debt Is Key to New Bank Capital Requirements", American Banker, p. 5;

Jagtiani, Julapa et Catharine Lemieux (2000) : "Stumbling Blocks to Increasing Market Discipline in the Banking Sector: A Note on Bond Pricing and Funding Strategy Prior to Failure", Federal Reserve Bank of Chicago, Emerging Issues Series, No. S&R-98-8R;

Jones, David S. (2000) : "Emerging Problems with the Accord: Regulatory Capital Arbitrage and Related Issues", Journal of Banking and Finance, vol. 24, nos. 1-2, pp. 35-58;

Jordan, John S. (2000) : "Depositor Discipline at Failing Banks", New England Economic Review, pp. 15-28;

Karacadag, Cem (2001): "Comments on Sironi", Journal of Financial Services Research, vol. 20, nos. 2-3, pp. 267-273;

Keehn, Silas (1988) : "Banking on the Balance: Powers and the Safety Net: A Proposal", FRB of Chicago, Monograph Series, No. 2;

Klein, Michael A. (1971) : "A Theory of the Banking Firm", Journal of Money, Credit, and Banking, vol. 3, no. 2, pp. 205-218;

Krishnan, C. N. V., Peter H. Ritchken et James B. Thomson (2005) : "Monitoring and Controlling Bank Risk: Does Risky Debt Help?", Journal of Finance, vol. LX, no. 1, pp. 343-378;

Kwan, Simon H. (2004a) : "Risk and Return of Publicly Held versus Privately Owned Banks", FRB of New York, Economic Policy Review, vol. 10, no. 2, pp. 97-107;

Kwan, Simon H. (2004b) : "Testing the Strong-Form of Market Discipline: The Effects of Public Market Signals on Bank Risk", FRB of San Francisco, Working Paper Series, No. 2004-19;

Kwan, Simon H. et Willard T. Carleton (2004) : "Financial Contracting and the Choice between Private Placement and Publicly Offered Bonds", FRB of San Francisco, Working Paper, No. 2004-20;

Lang, William W. et Douglas D. Robertson (2002) : "Analysis of Proposals for a Minimum Subordinated Debt Requirement", Journal of Economics and Business, vol. 54, no. 1, pp. 115-136;

Litan, Robert E. et Jonathan Rauch (1997) : "American Finance for the 21st Century", U.S. Treasury Department;

Maechler, Andréa M. et Kathleen M. McDill (2003) : "Dynamic Depositor Discipline in U.S. Banks", IMF, Working Paper, No. wp/03/226;

Marino, James A. et Rosalind L. Bennett (1999) : "The Consequences of National Depositor Preference", FDIC Banking Review, vol. 12, no. 2, pp. 19-38;

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

Park, Sangkyun et Stavros Peristiani (1998) : "Market Discipline by Thrift Depositors", Journal of Money, Credit, and Banking, vol. 30, no. 3, pp. 345-364;

Pop, Adrian (2004) : "The Indirect Channel of Market Discipline in Banking: Testing the 'Sine Qua Non' Hypothesis", LEO Working Paper, No. 2004-14;

Rochet, Jean-Charles (2004) : "Rebalancing the Three Pillars of Basel II", FRB of New York, Economic Policy Review, vol. 10, no. 2, pp. 7-21;

Santos, João A. C. (2001) : "Bank Capital Regulation in Contemporary Banking Theory: A Review of the Literature", Financial Markets, Institutions, and Instruments, vol. 10, no. 2, pp. 41-84;

Santos, João A. C. (2004) : "Do Markets 'Discipline' All Banks Equally?", FRB of New York, mimeo;

Shadow Financial Regulatory Committee (SFRC) (2000) : "Reforming Bank Capital Regulation: A Proposal by the U.S. Shadow Financial Regulatory Committee", Washington: The AEI Press, Policy Statement, No. 160;

Sironi, Andrea (2001) : "An Analysis of European Banks' SND Issues and its Implications for the Design of a Mandatory Subordinated Debt Policy", Journal of Financial Services Research, vol. 20, nos. 2-3, pp. 233-266;

Sironi, Andrea (2003) : "Testing for Market Discipline in the European Banking Industry: Evidence from Subordinated Debt Issues", Journal of Money, Credit, and Banking, vol. 35, no. 3, pp. 443-472, juin ;

The Bankers Roundtable (1998) : "Market-Based Incentive Regulation and Supervision: A Paradigm for the Future", Washington, D.C.;

Wall, Larry D. (1989) : "A Plan for Reducing Future Deposit Insurance Losses: Puttable Subordinated Debt", FRB of Atlanta, Economic Review, pp. 2-17;

White, Lawrence J. (2003) : "What Constitutes Appropriate Disclosure for a Financial Conglomerate?", Brookings-Wharton Papers on Financial Services, The Brookings Institution, pp. 245-272.

Table 1. Subordinated debt outstanding (large banking organizations,* average ratios SD/TA)

Country	1996	1997	1998	1999	2000	2001	2002	2003
Germany	0.81%	1.00%	0.94%	1.13%	1.17%	1.22%	1.26%	1.24%
Austria	1.61%	2.11%	2.38%	2.27%	2.48%	2.64%	2.49%	2.10%
Belgium	1.85%	1.98%	2.05%	2.04%	2.16%	2.35%	2.30%	2.12%
Denmark	0.49%	1.39%	1.61%	1.98%	1.64%	1.77%	1.62%	1.53%
Spain	1.33%	1.32%	1.51%	1.90%	2.08%	2.99%	2.98%	2.81%
France	1.07%	1.06%	1.23%	1.14%	1.16%	1.24%	1.31%	1.30%
Ireland	1.90%	1.96%	1.73%	2.39%	2.23%	2.14%	1.89%	2.42%
Italy	1.01%	0.99%	1.23%	1.69%	2.36%	2.82%	2.93%	2.75%
Netherlands	1.43%	1.37%	1.30%	1.34%	1.32%	1.40%	1.57%	0.85%
UK	1.52%	1.43%	1.43%	1.98%	2.17%	2.21%	2.05%	2.15%
Sweden	1.87%	1.75%	1.69%	1.69%	1.63%	1.72%	1.72%	1.74%
Total U.E.	1.26%	1.33%	1.37%	1.78%	1.85%	2.05%	2.01%	1.91%
Suisse	1.45%	1.56%	1.98%	2.18%	1.78%	1.57%	1.46%	1.20%
United States	2.54%	2.36%	2.47%	2.45%	2.59%	2.78%	2.84%	2.73%
Japan	2.12%	2.48%	2.95%	3.17%	1.96%	1.77%	1.69%	1.75%

* total assets higher than USD 50 bn. at the end of 1999; SD = subordinated debt; TA = total assets; similar ratios relative to the 1996–1999 period are also provided by Sironi (2001, p.240). *Source :* Fitch-IBCA BankScope

Table 2. Minimum amounts of subordinated debt recommended by various proponents of SDP

References	Minimum percentage
1. FDIC (1983)	**5%** of deposits
2. Eisenbeis and Horvitz (1986)	**3-5%** of deposits
3. Horvitz (1986)	**4%** of deposits
4. Cooper and Fraser (1988)	**3%** of deposits
5. Keehn (1988)	**4%** of risky assets
6. Wall (1989)	**4-5%** of *RWA**
7. Field (1991)	**5%** of total assets
8. Evanoff (1992ab)	**4%** of *RWA**
9. Randall (1994)	**4%** of total assets
10. Calomiris (1997)	**2%** of total non-reserve assets and off-balance sheet commitments
11. Litan and Rauch (1997)	**1-2%** of *RWA**
12. Calomiris (1998)	**2%** of *RWA**
13. The Bankers Roundtable (1998)	**2%** of total liabilities
14. BGFRS (1999)	**2-3%** of *RWA**
15. Calomiris (1999)	**2%** of risky assets (i.e. excluding T-bills)
16. BGFRS&DT (2000)	**2%** of *RWA**
17. Calomiris and Litan (2000)	**2%** of *RWA**
18. Evanoff and Wall (2000)	**2%** of *RWA** in the second stage **3%** of *RWA** in the third stage
19. SFRC (2000)	**2%** of total assets and off-balance sheet commitments
20. Sironi (2001)	**4%** of *RWA**
21. Lang and Robertson (2002)	**2%** of total assets
22. Hamalainen *et al*. (2003)**	**2.5%** of *RWA** at the beginning; **3.5%** of *RWA** afterward
23. White (2003)	**2%** of total assets

* *RWA* is the acronym for *Risk Weighted Assets* (see BIS, 1988, for further details)
** The recommended ratios concern exclusively the six largest banking organizations in the UK.

Table 3. Distribution of bank sub-debt issues by rating class (Europe, 1991--2000:Q1)

Moody's/*S&P* issue ratings, *at lunch*		*Moody's*/*S&P* issuer ratings, *at lunch*		*Moody's Bank Financial Strength*/ *FitchIBCA Individual* ratings, *at lunch*	
Rating class	Number of issues	Rating class	Number of issues	Rating class	Number of issues
AAA/Aaa	17	AAA/Aaa	36	A	27
AA+/Aa1	40	AA+/Aa1	68	B+, A/B	83
AA/Aa2	45	AA/Aa2	69	B	85
AA–/Aa3	73	AA-/Aa3	62	C+, B/C	47
A+/A1	43	A+/A1	16	C	41
A/A2	34	A/A2	38	D+, C/D	7
A–/A3	34	A–/A3	1		
BBB+/Baa1	4				
Total	290	Total	290	Total	290

NOTE: our representation based on the descriptive statistics reported by Sironi (2003)

Table 4. Distribution of the SDTA ratio (%) by year (1996--2003)

Year	N	Q1	Q2	Q3
1996	309	0.000	1.096	2.010
1997	366	0.000	1.060	1.880
1998	388	0.002	1.080	1.920
1999	430	0.206	1.146	1.991
2000	464	0.200	1.200	1.947
2001	480	0.380	1.290	2.160
2002	496	0.510	1.354	2.230
2003	505	0.480	1.470	2.260

Table 5. Descriptive statistics

	Global sample	Various sub-samples			
		A SDTA<Q1	**B** SDTA>Q3	**A** SDTA<Q2	**B** SDTA>Q2
ROE	10.62%	8.84%	12.08%	9.26%	11.98%
	(10.13%)	(8.67%)	(11.49%)	(9.09%)	(11.36%)
NIRA	2.16%	2.17%	2.45%	2.07%	2.24%
	(2.03%)	(1.88%)	(2.24%)	(1.88%)	(2.13%)
EL	7.59%	9.95%	7.40%	8.42%	6.76%
	(6.45%)	(8.14%)	(6.75%)	(6.90%)	(6.08%)
CFTA	8.26%	9.09%	9.78%	7.99%	8.53%
	(7.45%)	(7.78%)	(9.12%)	(6.93%)	(7.93%)
NPLGL	4.00%	3.43%	4.43%	3.68%	4.21%
	(2.59%)	(1.96%)	(2.87%)	(2.21%)	(2.85%)
LLRGL	2.93%	2.72%	3.15%	2.75%	3.10%
	(2.25%)	(1.97%)	(2.33%)	(2.01%)	(2.46%)
N	3.438	862	862	1719	1.719
Subordinated debt	1.149.9	19.4	2.062.1	617.3	1.680.6
(2003, USD bn.)	(126.3)	(0.0)	(326.9)	(31.6)	(293.6)
Total deposits	39.155.4	12.875.2	34.128.1	37.511.2	40.799.8
(2003, USD bn.)	(6.841.5)	(4.090.0)	(5.783.3)	(6.153.4)	(7.744.5)
Market funding	14.969.3	4.762.0	11.360.8	15.103.6	14.834.3
(2003, USD bn.)	(1.408.7)	(133.4)	(1.915.4)	(720.9)	(1.962.5)
Total assets	68.000.0	19.000.0	69.000.0	64.000.0	71.000.0
(2003, USD bn.)	(10.000.0)	(6.411.9)	(10.000.0)	(8.741.0)	(13.000.0)

NOTES: The reported numbers are mean (median) values. SDTA – the ratio of subordinated debt to total assets; Q1, Q2, Q3 – the quartiles of the SDTA distribution; ROE – the return on equity; NIRA – the ratio of net interest revenue to total assets; EL – the ratio of equity to total liabilities; CFTA – the ratio of capital funds (equity + hybrid capital instruments + subordinated debt) to total assets; NPLGL – the ratio of non performing loans to total (gross) loans; LLRGL – the ratio of loan loss reserve to total (gross) loans; N – number of total observations

Table 6. Bivariate comparison of ROE

Year/ Sample period	SDTA<Q1 Mean ROE (Median ROE)	SDTA>Q3 Mean ROE (Median ROE)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean ROE (Median ROE)	SDTA>Q2 Mean ROE (Median ROE)	Wilcoxon *z* (*p value*)
1996	7.588	12.922	–3.1607***	7.958	12.312	–3.7186***
	(7.314)	(10.264)	(0.0016)	(8.460)	(10.339)	(0.0002)
1997	8.612	13.907	–3.1861***	9.593	13.072	–3.4101***
	(9.127)	(12.832)	(0.0014)	(9.315)	(11.694)	(0.0006)
1998	9.871	12.148	–2.7760***	10.095	12.524	–2.9832***
	(9.067)	(11.605)	(0.0055)	(10.119)	(11.896)	(0.0029)
1999	8.980	13.859	–3.5128***	9.781	13.745	–4.8805***
	(9.858)	(14.262)	(0.0004)	(9.709)	(13.095)	(0.0000)
2000	11.375	13.559	–2.6763***	11.584	14.351	–3.3918***
	(10.798)	(14.109)	(0.0074)	(10.412)	(12.928)	(0.0007)
2001	8.627	12.088	–2.5308**	9.524	11.408	–2.3288**
	(8.817)	(11.311)	(0.0114)	(9.867)	(11.257)	(0.0199)
2002	6.148	9.757	–1.7555*	7.104	9.006	–2.3908**
	(7.395)	(10.096)	(0.0792)	(7.822)	(9.384)	(0.0168)
2003	9.371	9.560	–1.4057	8.474	10.335	–3.3125***
	(8.009)	(10.321)	(0.1598)	(7.991)	(10.680)	(0.0009)
1996--1998	8.775	12.981	–5.3486***	9.302	12.651	–6.0767***
	(8.538)	(11.570)	(0.0000)	(9.180)	(11.465)	(0.0000)
1999--2003	8.873	11.664	–5.2804***	9.243	11.680	–7.2713***
	(8.705)	(11.394)	(0.0000)	(9.036)	(11.325)	(0.0000)
1996--2003	8.843	12.077	–7.9110***	9.261	11.981	–8.8175***
	(8.671)	(11.487)	(0.0000)	(9.091)	(11.359)	(0.0000)

NOTES: The results are based on a total number of about 3,400 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

Table 7. Bivariate analysis of an alternative measure of bank profitability (NIRA)

Year/ Sample period	SDTA<Q1 Mean NIRA (Median NIRA)	SDTA>Q3 Mean NIRA (Median NIRA)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean NIRA (Median NIRA)	SDTA>Q2 Mean NIRA (Median NIRA)	Wilcoxon *z* (*p value*)
1996	2.396	2.901	–1.5969	2.443	2.605	–0.9845
	(2.204)	(2.457)	(0.1103)	(2.112)	(2.259)	(0.3249)
1997	2.449	2.527	–1.0804	2.439	2.378	–0.4241
	(2.157)	(2.363)	(0.2800)	(2.203)	(2.163)	(0.6715)
1998	2.526	2.363	–0.6580	2.241	2.314	–0.0902
	(2.191)	(2.195)	(0.5105)	(2.079)	(2.131)	(0.9281)
1999	2.203	2.552	–1.7487*	2.078	2.257	–0.9606
	(1.903)	(2.213)	(0.0803)	(1.941)	(2.066)	(0.3367)
2000	2.292	2.285	–0.5730	2.061	2.132	–0.9187
	(1.914)	(2.127)	(0.5667)	(1.790)	(2.118)	(0.3583)
2001	2.127	2.276	–1.4824	2.075	2.024	–0.3284
	(1.750)	(2.200)	(0.1382)	(1.889)	(2.014)	(0.7426)
2002	1.818	2.520	–4.0586***	1.781	2.228	–3.6931***
	(1.631)	(2.322)	(0.0000)	(1.659)	(2.210)	(0.0002)
2003	1.799	2.376	–3.6899***	1.752	2.141	–3.5318***
	(1.638)	(2.281)	(0.0002)	(1.573)	(2.126)	(0.0004)
1996--1998	2.462	2.577	–1.7686*	2.367	2.421	–0.2175
	(2.188)	(2.323)	(0.0770)	(2.115)	(2.178)	(0.8279)
1999--2003	2.038	2.400	–5.2944***	1.943	2.155	–4.1277***
	(1.748)	(2.230)	(0.0000)	(1.771)	(2.099)	(0.0000)
1996--2003	2.168	2.455	–5.4109***	2.073	2.237	–3.4963***
	(1.877)	(2.245)	(0.0000)	(1.875)	(2.126)	(0.0005)

NOTES: NIRA is the ratio of net interest revenue to total assets. The results are based on a total number of about 3,400 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

Table 8. Bivariate comparison of bank capitalization (*stricto sensu*, EL)

Year/ Sample period	SDTA<Q1 Mean EL (Median EL)	SDTA>Q3 Mean EL (Median EL)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean EL (Median EL)	SDTA>Q2 Mean EL (Median EL)	Wilcoxon *z* (*p value*)
1996	10.211	7.202	4.6535***	8.581	6.723	3.0884***
	(8.514)	(6.414)	(0.0000)	(6.783)	(5.860)	(0.0020)
1997	9.679	6.742	5.3550***	8.527	6.196	4.4683***
	(8.328)	(6.128)	(0.0000)	(6.990)	(5.704)	(0.0000)
1998	10.484	7.006	5.3974***	8.629	6.353	5.0131***
	(8.786)	(6.255)	(0.0000)	(7.038)	(5.520)	(0.0000)
1999	9.840	7.444	4.1022***	8.470	6.514	4.1852***
	(7.903)	(6.664)	(0.0000)	(7.310)	(5.692)	(0.0000)
2000	10.955	7.034	5.1875***	8.690	6.379	4.5535***
	(8.174)	(6.711)	(0.0000)	(7.132)	(6.068)	(0.0000)
2001	9.547	7.311	3.7152***	8.229	6.766	3.0900***
	(7.775)	(6.772)	(0.0002)	(6.900)	(5.994)	(0.0020)
2002	9.589	7.789	2.3360**	8.122	7.057	1.6277
	(8.103)	(7.093)	(0.0195)	(6.604)	(6.303)	(0.1036)
2003	9.499	8.314	2.1426**	8.248	7.813	1.4268
	(7.927)	(7.215)	(0.0321)	(6.814)	(6.770)	(0.1536)
1996--1998	10.127	6.883	8.9597***	8.580	6.407	7.2653***
	(8.466)	(6.269)	(0.0000)	(6.988)	(5.679)	(0.0000)
1999--2003	9.875	7.596	7.4087***	8.344	6.927	6.5867***
	(8.036)	(6.985)	(0.0000)	(6.869)	(6.233)	(0.0000)
1996--2003	9.953	7.402	11.0192***	8.417	6.765	9.5873***
	(8.142)	(6.750)	(0.0000)	(6.901)	(6.080)	(0.0000)

NOTES: EL is the ratio of equity to total liabilities. The results are based on a total number of about 3,400 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

Table 9. Bivariate analysis of bank capitalization (*lato sensu*, CFTA)

Year/ Sample period	SDTA<Q1 Mean CFTA (Median CFTA)	SDTA>Q3 Mean CFTA (Median CFTA)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean CFTA (Median CFTA)	SDTA>Q2 Mean CFTA (Median CFTA)	Wilcoxon *z* (*p value*)
1996	9.941	9.563	0.4566	8.213	8.483	–1.1501
	(8.282)	(8.997)	(0.6479)	(6.964)	(7.758)	(0.2501)
1997	9.335	9.203	–0.6577	8.208	8.047	–0.4216
	(7.936)	(8.498)	(0.5107)	(6.973)	(7.766)	(0.6733)
1998	9.642	9.416	0.6847	8.340	8.231	0.6445
	(8.444)	(8.764)	(0.4935)	(7.161)	(7.579)	(0.5193)
1999	9.023	9.535	0.4321	8.085	8.257	–0.8661
	(7.968)	(8.899)	(0.6657)	(7.190)	(7.401)	(0.3865)
2000	9.237	9.446	–0.0489	8.200	8.184	–0.6328
	(7.754)	(8.948)	(0.9610)	(6.945)	(7.540)	(0.5268)
2001	8.337	10.753	–2.3672**	7.555	8.956	–3.0226***
	(7.327)	(9.138)	(0.0179)	(6.827)	(7.977)	(0.0025)
2002	8.754	10.003	–2.7778***	7.737	8.759	–3.6987***
	(7.322)	(9.283)	(0.0055)	(6.513)	(8.235)	(0.0002)
2003	8.763	10.097	–1.8603*	7.785	9.175	–3.0660***
	(7.480)	(9.737)	(0.0628)	(6.682)	(8.604)	(0.0022)
1996--1998	9.622	9.383	0.8527	8.258	8.239	–0.5185
	(8.180)	(8.767)	(0.3938)	(6.993)	(7.691)	(0.6041)
1999--2003	8.824	9.974	–3.0376***	7.867	8.674	–5.7160***
	(7.546)	(9.214)	(0.0024)	(6.879)	(8.082)	(0.0000)
1996--2003	9.087	9.784	–1.6500*	7.995	8.534	–4.6057***
	(7.777)	(9.118)	(0.0989)	(6.935)	(7.935)	(0.0000)

NOTES: CFTA is the ratio of capital funds (equity + hybrid capital instruments + subordinated debt) to total assets. The results are based on a total number of about 2,700 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

Table 10. Bivariate comparison of credit portfolio quality (NPLGL)

Year/ Sample period	SDTA<Q1 Mean NPLGL (Median NPLGL)	SDTA>Q3 Mean NPLGL (Median NPLGL)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean NPLGL (Median NPLGL)	SDTA>Q2 Mean NPLGL (Median NPLGL)	Wilcoxon *z* (*p value*)
1996	6.036	5.211	–0.1690	5.398	6.203	–0.2415
	(3.175)	(3.877)	(0.8658)	(3.549)	(4.125)	(0.8092)
1997	4.716	4.499	–1.2551	5.297	4.546	0.3456
	(2.306)	(2.774)	(0.2094)	(2.885)	(2.956)	(0.7296)
1998	4.810	5.142	–0.1136	5.311	4.625	–0.0819
	(1.924)	(4.364)	(0.9096)	(2.339)	(3.044)	(0.9347)
1999	3.162	3.827	–0.8960	3.933	4.218	–0.1584
	(1.560)	(2.197)	(0.3703)	(1.977)	(2.589)	(0.8741)
2000	2.738	4.201	–0.0857	2.730	3.840	–2.9520***
	(1.404)	(2.628)	(0.9317)	(1.726)	(2.590)	(0.0032)
2001	2.698	4.333	–0.8476	2.495	3.934	–1.9847**
	(1.771)	(2.713)	(0.3967)	(1.668)	(2.883)	(0.0472)
2002	2.761	4.528	–1.1569	2.892	3.939	–1.4116
	(1.954)	(3.080)	(0.2473)	(1.937)	(2.608)	(0.1581)
2003	2.852	4.273	0.5475	3.107	3.673	–1.0746
	(1.866)	(2.907)	(0.5841)	(2.090)	(2.329)	(0.2825)
1996--1998	5.054	4.933	–2.7782***	5.326	5.009	–0.2653
	(2.302)	(3.540)	(0.0055)	(2.914)	(3.257)	(0.7908)
1999--2003	2.835	4.256	–2.2242**	3.009	3.910	–2.5105**
	(1.707)	(2.620)	(0.0261)	(1.879)	(2.593)	(0.0121)
1996--2003	3.431	4.427	–4.0314***	3.681	4.212	–2.8532***
	(1.955)	(2.866)	(0.0001)	(2.212)	(2.850)	(0.0043)

NOTES: NPLGL designates the ratio of non performing loans total assets. The results are based on a total number of about 1,600 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively

Table 11. Bivariate analysis of an alternative measure of the bank risk profile (LLRGL)

Year/ Sample period	SDTA<Q1 Mean LLRGL (Median LLRGL)	SDTA>Q3 Mean LLRGL (Median LLRGL)	Wilcoxon *z* (*p value*)	SDTA<Q2 Mean LLRGL (Median LLRGL)	SDTA>Q2 Mean LLRGL (Median LLRGL)	Wilcoxon *z* (*p value*)
1996	3.435	3.300	–0.3495	3.209	3.916	–1.2672
	(2.417)	(2.821)	(0.7267)	(2.535)	(3.044)	(0.2051)
1997	3.034	3.084	–0.6039	3.187	3.194	–1.1526
	(1.995)	(2.269)	(0.5459)	(2.142)	(2.506)	(0.2491)
1998	3.054	3.459	–0.3730	3.221	3.365	–1.2846
	(1.848)	(2.845)	(0.7091)	(2.026)	(2.812)	(0.1989)
1999	2.363	2.948	–1.6002	2.667	3.054	–1.4005
	(1.564)	(1.961)	(0.1096)	(1.816)	(2.579)	(0.1614)
2000	2.545	2.797	–1.0572	2.421	2.735	–1.8529*
	(1.903)	(2.083)	(0.2904)	(1.764)	(2.397)	(0.0639)
2001	2.613	3.407	–0.0611	2.480	3.105	–1.0872
	(1.935)	(2.401)	(0.9513)	(1.906)	(2.459)	(0.2769)
2002	2.503	3.223	–0.9242	2.318	2.982	–2.2438**
	(2.003)	(2.364)	(0.3554)	(1.909)	(2.339)	(0.0248)
2003	2.520	3.117	–0.3072	2.808	2.866	–1.3942
	(2.254)	(2.180)	(0.7587)	(2.209)	(2.180)	(0.1633)
1996--1998	3.164	3.286	–1.5820	3.206	3.471	–1.7832*
	(2.036)	(2.622)	(0.1137)	(2.203)	(2.752)	(0.0746)
1999--2003	2.512	3.101	–1.7507*	2.536	2.947	–3.8199***
	(1.929)	(2.208)	(0.0800)	(1.936)	(2.373)	(0.0001)
1996--2003	2.715	3.153	–2.5698**	2.749	3.103	–3.5565***
	(1.965)	(2.329)	(0.0102)	(2.015)	(2.459)	(0.0004)

NOTES: LLRGL is the ratio of loan loss reserve to total assets. The results are based on a total number of about 2,500 observations between 1996 and 2003. If the sample size is not the same, the Wilcoxon *z* statistics are calculated with respect to the smaller sub-sample.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively