

『学習院大学 経済論集』第44巻 第1号 (2007年4月)

Market Discipline on Bank Management

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Abstract

This paper presents several theoretical hypotheses on market discipline to bank managers, reviews empirical evidences on these hypotheses and derives some policy implications from them. We stress potential benefits to developing and transition economies from utilizing market discipline and discuss how they can realize the benefits. Various institutional structures are found to be essential to enhance the effectiveness of market discipline: disclosure and transparency, credible and modest safety net schemes, development of security markets, liberalization of bank activities, privatization of banks, and stable macroeconomic policy. The government should establish liquidation regimes for banks and improve the quality of legal and judiciary systems to make its commitment to limit the scope of the safety net credible.

1. Introduction

Frequent banking crises over the last two decades around the world have reminded us how important it is to promote safe management of banks. Among various disciplining devices, the ability of private agents to control bank risk-taking, i.e., market discipline, is attracting more and more attention by both policy-makers and economists. Depositors may withdraw deposits from, or require high deposit interests to, risky banks. Bond-holders may also require a risk premium. If banks recognize that deposit withdrawal or high funding costs endanger their survival, they will avoid excessive risk-taking and engage in prudential management. In addition, bank supervisors can make use of security prices to identify problem institutions and shorten the time lag to take corrective actions (Flannery, 1998). Market discipline is expected to complement the government's regulation and supervision. Basel (2003) designates market discipline as one of the three pillars on which future financial regulation should be based (The other two pillars are minimum capital standards and supervisory review of capital adequacy).

Key words: Market Discipline, Banks, Safety Net, Disclosure

* This paper is prepared for the presentation at ADBI training course, "Enhancing Banks Intermediation Role: Beyond Restoration of Financial Health," held on April 17-19, 2006.

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Growing complexity of banking activities and resulting limitations of government supervision partly account for why policy-makers are trying to rely more on market discipline than before. In addition, the fact that traditional government regulations, including capital requirements, do not seem to have performed as well as they were expected has also contributed to the growing emphasis on market discipline (See, e.g., Calomiris, 1999).

Bliss and Flannery (2000) and Flannery (2001) distinguish two components of market discipline: *monitoring* and *influence*. Monitoring refers to the process whereby investors correctly understand changes in a bank's condition and incorporate those assessments into the bank's security prices. On the other hand, influence refers to the process by which a security price change engenders bank responses to counteract adverse changes in bank condition. Kwast et al. (1999) further categorize market influence into direct and indirect influence. Direct influence refers to the process by which investors induce a bank to avoid risky investment by raising a risky bank's cost of funds or reducing a risky bank's source of funds. On the other hand, indirect influence is the process by which security prices serve as a signal to supervisors and induce them to take steps designed to reduce a bank's risk exposure.

Based on theoretical analyses, we present some hypotheses on market discipline in Section 2. We review the existing evidences on market monitoring and market influence in sections 3 and 4, respectively. In section 5, we review some evidences on the relationship between institutional factors, including deposit insurance and disclosure, and market discipline. Section 6 summarizes our survey. Section 7 discusses many policy implications particularly relevant to developing and transition economies.

2. Theory of Market Discipline to Bank Managers

In a frictionless financial market, security prices accurately reflect issuing firm condition, especially the firm default risk. The firm manager who is motivated to maximize profits will avoid excess risk-taking because it would result in a higher funding cost and a lower profit. This is the fundamental mechanism thorough which market discipline works effectively. In the case of banks, however, there are potentially two obstacles for security prices to function as a signal of bank condition. First, a bank can be regarded as a reservoir of private information of borrowing firms (e.g., Diamond, 1984; Boyd and Prescott, 1986). As a result, the value of bank asset is hard for outside investors to accurately assess. This is most likely the case for small depositors for whom acquiring and evaluating information about the quality of bank assets is costly relative to its benefits. As a result, they may face a free-ride problem in monitoring banks. Second, governments often guarantee bank debt either explicitly by deposit insurance or implicitly by *ex post* bailout. Government guarantees may reduce investors' incentive to monitor a bank.

Many researchers have analyzed theoretically whether market discipline works well when the two obstacles above are at play (e.g., Groppe and Vesala, 2004; Frexias and Rochet, 1997; Boot and Greenbaum, 1993; Dewatripont and Tirole, 1993; and Matutes and Vives, 1995). We summarize some theoretical predictions from these studies as testable hypotheses below. For the relationships between the deposit interest rate and bank risk (Hypotheses 1, 2, 6, 7 and 8A), we present a stylized model in Appendix 1.

Hypothesis 1 (Depositor monitoring): The deposit interest rate is higher as the bank default risk is higher, unless the government fully compensates depositors.

Hypothesis 2 (Government guarantee and depositor monitoring): The sensitivity of the deposit interest rate to bank default risk is greater as the probability of government guarantee is smaller.

Hypotheses 1 and 2 hold because depositors demand a risk premium according to the probability that they lose money in case of bank failure. As the probability of government compensation is lower, depositors demand a higher risk premium on deposits. Hypothesis 2 bears an implication that large depositors who are often unprotected by the government are more sensitive to bank risk.

Hypothesis 3 (Market monitoring through exit): The volume of bank debt is smaller as the bank default risk is higher, unless the government fully compensates creditors.

If investors have an identical estimate of bank risk and no serious asymmetric information problems or agency problems exist in the bank security markets, the supply of funds is perfectly elastic at the price that reflects the estimated bank risk. However, if investors have different estimates of bank risk, probably due to the opaqueness of bank asset, the supply of funds becomes upward sloping. In this case, bank risk affects the volume of securities as well as the security prices (e.g., Park and Peristiani, 1998). Moreover, if asymmetric information problems or agency problems exist, banks may face a quantitative constraint to some sources of funding. Diamond (1991), for example, argues that a firm without an established reputation will borrow through, and be monitored by, an intermediary but cannot gain access to a non-intermediated market (See Crabbe and Post (1994) for the application of Diamond's model to banking firms). These arguments lead to Hypothesis 3.

Hypothesis 4 (Subordinated debt spreads): The subordinate debt (SND) spread signals an increase in bank failure risk as long as the value of bank assets covers both senior and junior debt.

Given that subordinated debt is senior to equity but junior to deposits, the above hypothesis seems to be natural. Gropp, Vesala and Vulpes (2004) rigorously show the above result based on the option pricing theory. If the asset value falls below this threshold, the interests of junior claimants resemble those of equity holders (see also Dewatripont and Tirole, 1993; Blum, 2002). Generally, market information is available at a very high frequency and inherently forward looking. Subordinated debt spreads will be particularly useful to supervisors in detecting bank failure risk if Hypothesis 3 holds.

Hypothesis 5 (Equity Prices): Equity prices can signal a decrease in bank failure risk if bank leverage and the volatility of equity are adequately taken into account.

Depositors and bond-holders are concerned about bankruptcy risk just as supervisors. On the other hand, equity-holders are mainly interested in upside risk within *nondefault* outcomes because equity can be regarded as a call option (See, e.g., Berger, Davies, and Flannery, 2000). This is a reason why many researches analyzed the costs and volumes of deposits and other bank debt. It also forms a ground for recent policy proposals of compulsory SND issues in the U.S. However, without a change in asset volatility, both equity and bond values change similarly as the bank's asset value (Flannery, 2001). Gropp, Vesala and Vulpes (2004) rigorously show the above result based on the Black and Scholes (1973) model. They proposed the distance to default measure based on the market value of equity, leverage and the volatility of equity (See Appendix 2).

Hypothesis 6 (Government guarantee and market discipline): The bank managers exert a higher effort to monitor borrowers, resulting in a lower bank default risk, if the probability of government guarantee to deposits is smaller.

If the bank funding cost is sensitive to default risk, the manager can increase profits by raising the monitoring effort and hence lowering the default risk. Therefore, Hypothesis 2 immediately leads to Hypothesis 6. Some remarks are worth noting. First, this disciplinary effect of bank financing is stronger if the bank finances a larger share of uninsured sources. Second, the market discipline effect is stronger if the default risk largely depends on managerial effort rather than on exogenous shocks, including regional and macroeconomic shocks. Finally, Hypothesis 6 does not necessarily imply that the introduction of explicit deposit insurance undermines market discipline, because the government implicitly guarantees deposits to a more or less extent in most of the countries that do not have explicit deposit insurance. Whether explicit deposit insurance undermines market discipline depends on various institutional factors, as we see below.

Hypothesis 7 (Disclosure and Market Discipline): The bank managers exert a higher effort to monitor borrowers, resulting in a lower bank default risk, if the bank default risk is observable to depositors and bond holders as long as the exogenous bank default risk is sufficiently low.

If depositors or bond holders cannot observe bank default risk, they cannot play a disciplinary role because the deposit interest rate or the bond spread is insensitive to bank risk, resulting in a lower monitoring effort as long as the exogenous bank default risk is low. If the exogenous default risk is high, as in the systemic banking crisis, disclosure may not necessarily enhance the managerial monitoring incentive. Cordella and Yeyati (1998) point out that the presence of informed depositors may increase the probability of bank failures when banks do not control their risk exposure.

Hypothesis 8 (Restrictions on Bank Entry and Market Discipline):

A: The bank managers exert a higher effort to monitor borrowers, resulting in a lower bank default risk, if restrictions on bank entry are strong.

B: The negative effect of the government guarantee on market discipline (Hypothesis 6) is attenuated if restrictions on bank entry are weak.

Restrictions on bank entry endow banks with market power and increase the bank's charter value, resulting in a higher effort to monitor borrowers (Keeley, 1990; Hellman, Murdock and Stiglitz, 2001). In addition, corporate control of banks may be easier when the number of banks is small. On the other hand, if restrictions on entry generate large banks, which are more informationally opaque and hence difficult to monitor, restrictions on entry may result in excessive risk taking. In addition, large banks often receive subsidy under "too-big-to-fail" policy and hence may engage in excessive risk-taking.

Nier and Braumann (2006) propose Part B of Hypothesis 8. If competition is not strong, bank managers have little incentive to take excessive risk (Part A). In this case, market discipline is virtually irrelevant. On the other hand, if competition is fierce, bank managers potentially have a strong incentive to take a gamble. They actually take excessive risk if the government guarantee is generous and hence market discipline doesn't work effectively. However, even in a competitive market, bank managers cannot take excessive risk if the government guarantee is parsimonious and hence market discipline works effectively.

3. Empirical Evidences on Market Monitoring

Country studies on depositor monitoring

Empirical studies support the hypotheses on market monitoring, suggesting that bank risk is positively correlated with the interest rate on bank debt and negatively correlated with the quantity of bank debt and that these correlations are stronger for uninsured deposits and subordinated debt than for insured deposits.

For the U.S. banks, the interest rate on uninsured CDs was found to be associated with higher bank risk (e.g., Hannan and Hanweck, 1988; Ellis and Flannery, 1992). The quantity of commercial paper issued by the U.S. bank holding companies (BHCs) was also found to be negatively correlated with a rating downgrade (Crabbe and Post, 1994).

Some studies on U.S. banks investigate the relationship between the safety net and the sensitivity of the deposit interest rate and the amounts of deposits to bank risk. For example, Cook and Spellman (1996) analyzed the premiums for insured CDs over the January 1987-August 1988 period that was followed by the collapse of the deposit guarantor, Federal Savings and Loan Insurance Corporation (FSLIC). They found that the market priced the risk of both the guarantor and the thrift, suggesting the importance of repudiation risk and restitution costs involved with the recovery of deposits. Park and Peristiani (1998) examined the effects of default risk on the pricing and quantity of deposits at the U.S. thrifts

between 1987 and 1991. They found that riskier thrifts tended to pay higher interest rates and attracted smaller amounts of uninsured deposits and that qualitative results were similar for fully insured deposits, although statistical significance was substantially lower. Goldberg and Hudgins (2002) studied the U.S. thrifts over the 1984-1994 period and found that failing thrifts attracted fewer deposits from uninsured deposits prior to failure than did solvent thrifts. They also found failing institutions exhibited declining proportions of uninsured deposits-to-total-deposits prior to failure.

Though most studies on deposit interest rates regard the spread between deposit interest rates and comparable Treasury yields as a risk premium demanded by depositors, riskier banks may undertake a gamble for resuscitation by paying higher deposit interest rates and attracting more deposits when deposit insurance covers all or part of their losses. This is an identification problem between depositors' supply of and banks' demand for deposits. Guo (2003) examined the rates on the CDs issued by the U.S. thrifts during the 1987-89 period, finding that the subsidy-shifting premium was considerably greater than the risk premium.

For developed countries outside the U.S., Hosono (2004) investigated the effectiveness of depositor monitoring in Japan during the 1992-2002 banking crisis period. He found that depositors responded to bank risk both in terms of deposit growth and interest rates even though they were fully protected by the blanket guarantee of deposit insurance during the sample period. He also found that the risk sensitivity of the growth rate of time deposits increased just before the coverage limit of time deposits was reintroduced in 2002. Furthermore, he found that the sensitivity of the average interest rate to bank risk was not significant for the period of 2000-2002, suggesting that that BOJ's zero-interest rate policy may have undermined market monitoring (See also Tsuru, 2003; Murata and Hori, 2004; Fueda and Konishi, 2004 for the evidence of depositor monitoring in Japan).

For developing countries, Martinez Peria and Schmukler (2001) analyzed Argentina, Chili, and Mexico during the banking crises in the 1980s and 1990s and found that depositors withdrew deposits from risky banks and required higher interest rates to them. Barajas and Steiner (2000) examined Columbia during 1985-99 and found similar responses of depositors.

Institutional factors in emerging economies are different from those in developed countries. In particular, capital markets are underdeveloped, government ownership of banks are pervasive, deposit guarantees are generous, and disclosure and transparency are inadequate. Levy-Yehati, Martinez Peria and Schmukler (2004) examined the recent Argentine crisis and found that systemic risks may exert an overwhelming impact on market behavior, overshadowing the link between the latter and bank fundamentals. They assert that in emerging economies the analysis of market discipline should take into account the importance of institutional and systemic factors.

Deposit insurance and market monitoring

Deposit insurance may reduce depositors' losses from bank failure and hence reduce depositors' incentive to monitor bank risk. Though some country studies suggest this perverse effect of deposit insurance on depositor monitoring (e.g., Park and Peristiani (1998) and Goldberg and Hudgins (2002) for the U.S. thrifts, Hosono (2004), Tsuru (2003) and others for Japanese banks), Demirgüç-Kunt and Huizinga

(2004) was the first that explicitly examined the effect of deposit insurance on depositors' risk sensitivity, using cross-country data over the 1990-97 period across 30 countries. They found that explicit deposit insurance reduced the risk premium on deposits and its sensitivity to bank risk. They also found that higher coverage, coverage of interbank funds, existence of ex-ante funding, government provision of funds, and management only by governments tended to weaken the sensitivity of deposit interest rates to bank risk. They also examined whether market monitoring in terms of the growth rate of bank deposits is affected by explicit deposit insurance, using a larger data set of 51 countries, but they did not find consistent evidence.

Using a large panel of about 17000 bank-year data during 1992-2002 across 60 countries, Hosono, Iwaki, and Tsuru (2004) also investigated the impact of explicit deposit insurance and its properties on the sensitivity of the deposit interest rate to bank risk. Similar to Demirgüç-Kunt and Huizinga (2004), they found that explicit deposit insurance that is funded or whose membership is voluntary tend to reduce market discipline. However, their results on the existence of explicit deposit insurance are mixed. Their observations cover the countries where or years when deposit insurance is less credible than the observations covered by Demirgüç-Kunt and Huizinga (2004). Deposit insurance that is not very credible has some repudiation risk and hence does not necessarily reduce market discipline.

Bank regulations, ownership and market monitoring

In addition to deposit insurance, many institutional factors may affect the risk of bank failure and its cost incurred by depositors and thereby depositors' incentive to monitor banks. Hosono, Iwaki, and Tsuru (2004) investigated the impact of various institutional factors, besides deposit insurance, on the sensitivity of the deposit interest rate to bank risk. In particular, their results suggest that strict regulations on bank activities tend to decrease the deposit interest rate and its sensitivity to bank risk. Barth, Caprio and Levine (2004) also conducted a cross-country study and found that regulations on bank activities tend to increase the likelihood of a systematic banking crisis. Taken these studies together, we may say that strict regulations on bank activities are associated with generous bank bailouts, resulting in weak market discipline and bank moral hazard. There are several reasons why strict regulations on bank activities result in a generous bailout policy. Regulatory authorities may have an incentive to protect and bail out incumbent banks since by giving benefits to them, they can extract rents from them ("regulatory capture" hypothesis by Stigler (1971) or "tollbooth" hypothesis by Shleifer and Vishny (1998) and Djankov et al. (2002)). In addition, regulators may not want to lose their reputation as a supervisor ("reputation concern", Boot and Thakor (1993)).

Hosono, Iwaki, and Tsuru (2004) also investigated the relationship between the size of the government-owned banks and the sensitivity of the deposit interest rate to bank risk, and obtained a mixed result. Concerning the relationship between government ownership of banks and bank insolvency risk, Caprio and Martinez (2000) and Barth, Caprio and Levine (2004) obtained inconsistent results. Caprio and Martinez (2000), using panel data, found that government ownership is significantly and positively associated with increases in bank fragility, while Barth, Caprio and Levine (2004), using cross-country data, did not find a positive relationship between government ownership and the likelihood of a crisis.

Hosono, Iwaki and Tsuru (2004) also investigated the link between entry regulations and the risk sensitivity of deposit interest rate, but did not find a robust result.

Hosono (2005) analyzed the effectiveness of market discipline to banks in Indonesia, Republic of Korea, Malaysia and Thailand over the period of 1986-2003 based on the survey on disclosure, deposit protection, and some other institutional factors. Empirical evidences show that the deposit interest rate was negatively correlated with bank equity capital, suggesting that depositors could understand bank risk and identify a problem bank. This tendency was particularly evident in Indonesia and Republic of Korea. The sensitivity of the deposit interest rate to bank capital was higher before the crisis, probably reflecting the fact that deposit guarantee was less generous before the crisis than during and after the crisis. Market-valued capital was positively correlated with equity capital, suggesting that stock market incorporated bank risk and that accounting standards were reliable to some degree. This tendency was stronger for Malaysia and Republic of Korea and for the banks that had international ratings. The sensitivity of market-valued capital to equity capital has improved after the crisis, possibly reflecting improved disclosure and accounting standards. On the other hand, he did not find evidence for stock market monitoring to family-owned banks. His results suggest that adequate disclosure and limited deposit protection were of particular importance to enhance market monitoring in the four Asian countries.

Spreads on subordinated debt

Holders of uninsured bank debentures are expected to have a strong incentive to monitor banks as well as holders of uninsured large CDs. In the U.S., the mandatory issuance of subordinated bond and debentures (SNDs) is discussed both by economists (e.g., Calomiris, 1999; Evanoff and Wall, 2001) and by policy-makers (e.g., Board of Governors of the Federal Reserve System and the U.S. Department of the Treasury, 2000).

Empirical evidence on the U.S. bank holding companies (BHCs) during the early and mid-1980s did not find any statistically significant relationship between SND spreads and bank risk (Avery, Belton, and Goldberg 1988; Gorton and Santomero, 1990). However, after the federal regulators' too-big-to-fail policy was perceived to be abandoned in the late 1980s, market rates on bank holding company debentures were found to be positively correlated with bank risk (Flannery and Sorescu, 1996; De Young, Flannery, Lang and Sorescu, 2001). Using spreads on nearly 500 bank bond issues between 1993 and 1998, Morgan and Stiroh (2001) found that bond spreads reflected the overall mix of banks' assets at the time of issuance. They concluded that banks contemplating a shift into riskier activities like trading would face higher spreads as a result. Jagtiani and Lemieux (2001) examined the prices of bonds, either senior notes or subordinated notes, issued by the U.S. bank holding companies in the period prior to failure of their bank subsidiaries during 1980 to 1995. They found that bond spreads started rising as early as six quarters prior to failure as the issuing firm's financial condition and credit rating deteriorated. Flannery (1998) surveys the empirical analyses on private investors' abilities to assess the financial condition of the U.S. banking firms and concludes that the empirical evidence supports the proposition that market investors and analysts could reasonably provide a greater proportion of corporate governance services for large U.S. financial firms.

Sironi (2003) investigated European banks' SND issued during the 1991-2000 period and found that SND spreads were sensitive to bank risk, with the exception of SND issued by public sector banks, i.e., government owned or guaranteed institutions. His results also show that the sensitivity of SND spreads to measures of bank risk that do not incorporate external guarantees has been increasing from the first to the second part of the 1990s, with the perception of too-big-to-fail type guarantees gradually disappeared. (See also Sironi (2002) for the comparison of the SND spreads between major U.S. and European banks.)

These results show that bond-holders actually respond sensitively to bank risk unless the government's bailout policy is anticipated. However, it should be noted that we cannot rely solely on SND spreads to measure bank risk, because most small banks and other financial institutions do not have access to a liquid subordinated debt market. In addition, SND holders may prefer excessively risky portfolios to safe ones when the promised payment of senior debt is close to the firm value (e.g., Dewatripont and Tirole, 1993; Blum, 2002).

Furthermore, the case of Japan suggests that bond-holders may not curb bank risk-taking but rather even encourage it when bonds are not marketable. In Japan, banks issued SNDs and sold them to life insurance companies within the same financial group, *keiretsu*. Life insurance companies, in turn, issued SND and sold them to the banks within the same *keiretsu*. Both banks and life insurance companies had an incentive to cross-hold SND because they were subject to capital regulations under which subordinated debt was permitted to count as a part of capital. Hosono and Sakuragawa (2003) analyzed Japanese bank data during 1991-1999 and found that the share of non-performing loans increased as the share of SND in risk assets *increased*, given the other components of regulatory capital. This contradicts a traditional risk-shifting hypothesis positing that a bank tends to hold a riskier portfolio as their capital *decreases* as long as subordinated debt can be regarded as a part of capital, as it is under the current capital standards in Japan. They interpret this result as suggesting that Japanese banks tried to meet the capital standards by issuing SND at non-market basis on one hand, and hiding loan losses by rolling over loans to non-performing borrowing firms on the other. It is also notable that the Japanese government provided a blanket guarantee from 1995 to March 2002 under which unlimited amount of deposits and any other bank liabilities, including SND, were protected.

Share prices

In contrast to subordinated debt spreads, signals based on equity prices have been considered ill suited for supervisors until recently, because equity holders benefit from the upside gains that accrue from increased risk taking. Hoewver, Gropp, Vesala and Vulpes (2006), using a sample of EU banks, found that the distance to default, measured by the market value of equity, leverage and the volatility of equity, as well as subordinated debt spreads, had a predictive power to downgrade. Their results suggest that the distance to default predicts downgrades between six and eighteen months in advance, but its predictive power are poor when failure is immediate, while the predictive power of subordinated debt spreads improves when failure gets closer.

Recent Japanese banking crisis also provided a good opportunity to examine the performance of stock

market in assessing a bank's financial distress. Bremer and Pettway (2002) found that stock prices of Japanese banks dropped before rating downgrade during the 1986-98 period and suggested that sufficient information was disclosed. Brewer III, Genay, Hunter, and Kaufman (2003) examined the equity returns of Japanese banks between 1995 and 1998 and also found evidence that Japanese bank shareholders were able to incorporate available financial conditions into stock prices despite poor disclosure requirement (See, e.g., Shrieves and Dahl (2003) for the evidence of discretionary accounting practices by Japanese banks.)

4. Empirical Evidences on Market Influence

Direct Influence: Do depositors' and bond-holders' response control bank risk effectively and quickly?

As is discussed above, most of the studies that focus on the U.S. or some other countries and those that conduct cross-country analyses found that depositors and investors monitored banks to a more or less extent. On the other hand, evidence on direct market influence is still rare.

Bliss and Flannery (2000) used the U.S. BHCs' data over the 1986-88 period to see if abnormal stock and bond returns affected bank management decisions including reduction in leverage, dividend cuts, sale of new stock, or changes in uninsured deposits, but they found little evidence of such influence.

Current regulations including risk-based capital standards and regulator monitoring impose costs on a bank that are related with bank risk but invariant to the bank's use of insured versus uninsured liabilities. In such a regulatory environment, banks may be able to undermine the market discipline from the creditors of uninsured liabilities by shifting to relatively risk-insensitive insured deposits. Billett, Garfinkel, and O'Neil (1998) analyzed the U.S. bank holding companies (BHCs) for the 1990-1995 period and found that banks raised their use of insured deposits following downgrades, suggesting that uninsured liabilities became more costly than insured deposits in the face of increasing risk. Banks could offset the higher costs of uninsured liabilities to some extent by shifting source of funds to insured deposits.

The above studies seem to cast doubt on the ability of capital market participants to directly influence bank behavior. However, it should be noted that the distinction between direct influence and monitoring may be difficult to observe. Suppose that bank managers choose the bank's portfolio risk anticipating that their excessive risk-taking behavior would lead to a high cost or small amount of funds available. In this case, risk-sensitive investors provide bank managers with a strong *ex ante* incentive to avoid excessive risk, though no direct *ex post* influence is observed after the bank managers choose their portfolios (See Hosono (2002) for a formal game-theoretic model.)

Indirect Influence: Do depositors and bond-holders have additional and timely information as compared to supervisors?

Even if little direct influence can be observed, market monitoring may be useful to supervisors if security prices incorporate accurate and prompt information on the changes in bank risk that supervisors

do not have (“indirect influence”).

Berger, Davies, and Flannery (2000) compared the timeliness and accuracy of government assessment of bank condition against market evaluations of the U.S. BHCs. They used some confidential data including the supervisor’s rating as well as publicly available market data over 1989:Q4-1992:Q2. Based on the concept of Granger-causality, they found evidence suggesting that supervisors and bond rating agencies complemented one another, in the sense that each information set importantly helped to forecast the other group’s assessments of BHC condition. On the other hand, they found that supervisory assessments and equity market indicators such as abnormal returns to equity are not strongly related, possibly due to the difference in the incentives of rating agencies and equity-holders. Rating agencies are concerned mainly bankruptcy risk just as supervisors, while equity-holders focus more on upside risk within *nondefault* outcomes. They also found that supervisory assessments were less accurate than either bond or equity market assessments in predicting future changes in BHC performance.

De Young, Flannery, Lang and Sorescu (2001) used the supervisors’ bank exam ratings of large U.S. commercial banks over the 1989-1995 period and investigated whether examiner information was relevant to the risk premium on SNDs issued by the parent BHCs. They found that negative examiner findings were followed by reductions in SND spreads several quarters after an exam. Their result suggests that on-site examinations produce value-relevant information about the future safety and soundness of banks, possibly reflecting the anticipated regulatory responses.

Evanoff and Wall (2001) analyzed the relative accuracy of four alternative capital adequacy measures and SND spreads in predicting future supervisors’ ratings, using the SND yield data from 1985 to 1999 in the U.S. They found that SND spreads did as well or better than any of the capital adequacy ratios.

Curry, Elmer, and Fissel (2001), using a sample of publicly traded U.S. banks and thrifts whose supervisory ratings (CAMEL) were downgraded to problematic levels, found that stock prices exhibited a downward trend as many as two years before the downgrade. Krainer and Lopez (2002) conducted an event study using the stock prices of the U.S. publicly traded bank holding companies over the period from 1990 to 1999, and found that equity market variables anticipated supervisory ratings (BOPEC) up to four quarters and the improvements in forecast accuracy arising from conditioning on equity market information were statistically significant.

In sum, market prices provide supervisors with a valuable signal of bank condition and contribute to reduce the uncertainty about bank condition that supervisors assess. Based on these empirical analyses, Sironi (2003) summarizes that “the available empirical research on the U.S. banking industries indicate 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. (p.446)” Flannery (2001) stresses that supervisors can act sooner and avoid costly delay (“forbearance”) towards problem banks if they utilize the market’s assessment and reduce their uncertainty.

5. Institutional Arrangements and Market Discipline

The effectiveness of market discipline to curb bank excessive risk-taking may depend on various insti-

tutional factors, particularly the safety net, disclosure, and restrictions to entry (Hypotheses 6, 7, 8).

Demirgüç-Kunt and Detragiache (2002) found that explicit insurance tended to increase the likelihood of banking crises based on the data for 61 countries over 1980-1997. They suggest that an explicit insurance either diminishes the uncertainty of deposit guarantee or tempts the government to protect other security holders as well, resulting in weak market monitoring.

On the other hand, Gropp and Vesala (2004), using EU bank level data for 1992-1998, examined how deposit insurance had an impact on bank risk taking, measured by leverage (the book value of debt divided by the market value of assets), asset quality (the share of problem loans in total assets), and overall risk (the inter-day volatility of the bank's share price, corrected for the market component). Their findings can be summarized as follows: 1) the introduction of explicit deposit insurance in the EU significantly reduced banks' risk taking, 2) this effect was less prevalent for banks with high charter values and low subordinated debt shares, 3) the risk taking of a large bank was not affected, 4) banks shifted towards more insured deposits after the introduction of explicit deposit insurance. Their results suggest that deposit insurance served as a commitment device to limit the coverage of the safety net and permit monitoring by uninsured subordinated debt holders.

How can we reconcile the empirical results suggesting that explicit deposit insurance undermine market discipline (e.g., Demirgüç-Kunt and Detragiache, 2002; Demirgüç-Kunt and Huizinga, 2004), and those suggesting that explicit deposit insurance enhance market discipline (Gropp and Vesala, 2004). Hovakimien et al. (2003) suggest that weaker institutional structures, including the liquidation regimes for banks or the non-existence of liquid markets for banks' liabilities, as for emerging markets, make a limitation to the safety net less credible. Parsimonious deposit insurance may not be credible under weak institutional structures. Gropp and Vesala (2004) pointed out that in countries with underdeveloped subordinated debt markets, subordinated debt holders may not be able to perform the monitoring role. In fact, Hosono and Sakuragawa (2005) found evidence that subordinated debt holders did not play a disciplinary role to Japanese banks.

Nier and Braumann (2006) examined empirically the hypothesis that market discipline is effective in holding adequate capital buffers against adverse outcomes in portfolio risk. They used a cross-country panel data set consisting of 729 banks from 32 countries over the years 1993 to 2000. Their results suggest that government safety nets result in lower capital buffers and while a large proportion of uninsured liabilities and superior disclosure results in larger capital buffers, after controlling for bank asset risk. They also find that while restrictions on entry are associated with larger capital buffers and thus reduced risk-taking (Hypothesis 8. A), restrictions on entry attenuate the negative effect of the government support (Hypothesis 8. B). Their results suggest that while competition leads to greater risk taking incentives, market discipline is more effective in curbing these incentives in countries where competition among banks is strong.

6. Summary of Empirical Evidences

Empirical evidences show that market discipline works effectively under suitable institutional arrangements. Many studies analyzing developed countries and emerging markets show that the deposit

interest rate and the subordinated debt spreads are positively correlated with bank risk unless the government's bailout policy is anticipated (Hypotheses 1 and 3). In addition, the equity prices can signal a decrease in bank failure risk if bank leverage and the volatility of equity are adequately taken into account (Hypothesis 5). In addition, some country studies show that the quantity of deposits and subordinated debts are found to be negatively correlated with bank risk (Hypothesis 4). All these studies suggest that depositors and security-holders monitor bank risk and respond to the change in bank risk by requiring risk premium and selling securities issued by risky banks. Security prices have an advantage of predicting bank failure risk due to their forward-looking properties. Some studies on the U.S. subordinated debt spreads show that security prices have additional and timely information as compared to supervisors.

However, the effectiveness of market discipline depends on bank regulations and institutions, particularly on the scheme of deposit protection (Hypotheses 2 and 6), the disclosure and transparency of bank assets (Hypotheses 7), restrictions on bank entry (Hypothesis 8), regulations on bank activities, the development of security market, and the ownership structure of banks. We summarize the literature on these issues below.

First, some country studies and cross-country evidences show that the introduction of explicit deposit insurance decreases the sensitivity of the deposit interest rate to bank risk, suggesting that explicit deposit insurance undermines the effectiveness of market discipline. Consistent with these evidences, a cross-country study shows that the introduction of deposit insurance increases the probability of a banking crisis. However, even without deposit insurance, depositors may expect protection from the government in case of bank failure or the bailout of a failing bank by the government. In such a case, explicit deposit insurance can serve as a commitment of the government not to rescue depositors beyond the legislated insurance coverage, and thus strengthen market discipline. A study on EU banks shows that the introduction of explicit deposit insurance reduced bank risk-taking. Whether the introduction of explicit deposit insurance attenuates or strengthens market discipline depends on the preconditions concerning to what extent depositors expect government rescue without deposit insurance, and to what extent the government can commit itself not to protect depositors beyond the legislated insurance coverage. These preconditions, in turn, may depend on the liquidation regimes for banks, and more broadly, the quality of institutions, the rule of law, the contract enforcement, and the political stability.

Second, the disclosure and transparency of bank assets and risk management are an essential precondition of market discipline. A cross-country study on Asian banks suggests that the improvement of disclosure through international rating intensifies stock market monitoring. Another study on EU banks suggests that the improvement of disclosure reduces the bank failure risk.

Third, as for the relationship between restrictions on banking industries and market discipline, a cross-country study suggests that while competition leads to greater risk taking incentives, market discipline is more effective in curbing these incentives in countries where competition among banks is strong.

Fourth, though how the regulations on bank activities affects market discipline is not theoretically clear, there are some empirical evidences showing this link. A cross-country study shows that the sensitivity of the deposit insurance to bank risk is weak in a country where regulations on bank activities are strict. Another cross-country study shows that the probability of a banking crisis is higher in a country where strict regulations on bank activities are enforced. These studies show that strict regulations on

bank activities weaken market discipline, possibly because powerful regulatory authorities are likely to bailout failing banks.

Fifth, the development and liquidity of security markets are necessary for the security prices to incorporate bank risk adequately and timely. Though many studies on subordinated debt issued by U.S. and EU banks show that the subordinated debt spreads anticipate bank failure risk, little is known for SND spreads in the other countries. A study on the Japanese banks suggest that banks tended to take excessive risk as they issued more subordinated debt and cross-held it between life insurance companies within the same business group.

Finally, the evidences on the ownership structure and the market discipline are mixed. A study on the SND spreads issued by EU banks suggests that SND spreads do not incorporate bank risk for government owned or guaranteed financial institutions, while cross-country studies do not obtain consistent evidences on the links between the presence of the government-owned banks and market discipline or bank fragility. Government-ownership may be harmful to market discipline only if depositors and investors anticipate a bailout policy towards government-owned banks.

7. Policy Implications

Empirical studies bear many important policy implications concerning how policy-makers can enhance and take advantage of market discipline especially in developing and transition economies. Given large differences in the degree of market discipline across countries, there seems to a large potential benefit from enhancing the effectiveness of market discipline. The following policy measures may be desirable to realize the gains from market discipline.

First, improvement in accounting, audit and disclosure is a fundamental prerequisite to market discipline. It might be advisable to encourage banks to be publicly listed and to be rated by international rating agencies. In addition, securitization of bank loans, that are now rapidly progressed, will help evaluate the quality of bank asset.

Second, a suitable safety net should be carefully developed depending on the institutional structures. For developing and transition economies, the credibility of the government to limit the scope of the safety net is particularly important in order to abolish implicit guarantees to deposits and securities and to curb the risk-shifting behavior by bank managers. To this aim, the liquidation regimes for banks should be established and the quality of legal and judiciary systems should be improved. The rule of law, the contract enforcement, and the political stability are also essential. Explicit and modest deposit insurance is desirable as long as the credibility of the government is high.

Third, it depends on the quality of prudential regulations and the design of the safety net and other institutional arrangements whether restrictions on bank entry should be loosened or not. Unless prudential regulations are reliable, loosening restrictions on bank entry may result in bank managers' excessive risk taking. However, if the deposit insurance is credible and modest and disclosure is adequate, loosening restrictions on bank entry will promote competition, resulting in efficient bank management and good financial services to bank customers without inducing bank managers' excessive risk taking by virtue of effective market discipline.

Fourth, liberalizing regulations on bank activities is likely to enhance market discipline. In many countries, the regulatory authorities are now taking steps to allow banks to engage in insurance and securities business. Such deregulation towards universal banking will contribute to enhance market discipline and finally bank stability.

Fifth, supervisors can rely on SND spreads as predictors of bank failure risk only if secondary bond markets are well developed. Calomiris (1999) proposes that interbank subordinated debt be used as a substitute for bond markets. However, there is always a possibility that the government or the central bank avoids the default of subordinated debt in the interbank market by rescuing the issuing bank. In many developing countries, stock markets are relatively well developed than corporate bond markets. In such an environment, supervisors can make use of share prices, rather than subordinated debt spreads, as a predictor of bank failure by taking into account bank leverage and the volatility of equity.

Sixth, macroeconomic policies and regulations should not disturb the well functioning market mechanism. For example, if monetary policy generates an asset market bubble and its collapse, security prices cannot be an adequate predictor for bank risk. Another bad example is to fix some asset prices including the interest rate or the exchange rate. An extraordinarily expansionary monetary policy, as in the Japan's zero-interest-rate policy over the 1999-2005 period, may also be harmful to market discipline because it provides risky banks with abundant liquidity, resulting in no interbank market monitoring.

Seventh, privatization of banks may also be useful to enhance the credibility of the government to limit the scope of bank debt guarantee if government-ownership engenders the anticipation of a bailout policy.

Finally, supervisors should take advantage of security prices when they take steps to bank management as long as security markets are well developed. It will help the regulatory authorities commit themselves to timely intervention.

In sum, market discipline to bank managers is a revelation of market mechanism, which works well under strong contract enforcement and protection of property right, a high legal and judiciary quality, reliable accounting standards and disclosure, and a stable macroeconomic policy.

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Appendix 1: A Stylized Model

A stylized model helps us understand how and under what conditions market discipline works. The following model is based on the theoretical literature on market discipline and bank moral hazard (e.g., Gropp and Vesala, 2004; Frexias and Rochet, 1997; Boot and Greenbaum, 1993; Desatripont and Tirole, 1993; and Matutes and Vives, 1995).

Consider one period model where a risk neutral bank and risk neutral depositors exist. The bank is financed with one unit of deposit. For simplicity, we assume that the bank has no initial equity. The bank invests one unit of fund in a risky portfolio of loans and receives a rate of $r^L - 1$ on those loans. The loan portfolio yields zero with probability of $\rho(1 - m)$ and r^L with probability of $1 - \rho(1 - m)$, where m represents the bank's monitoring effort, with $m \in [0,1]$ and ρ exogenous default probability with $\rho \in [0,1]$. The bank chooses the monitoring effort level, m , so as to maximize its profit net of the monitoring cost, denoted by $V(m)$. We assume that $V(m) = \beta m^2$.

$$\max_m \pi(m) = (1 - \rho + m\rho)(r^L - r^D) - V(m) \quad (1)$$

Using this framework, we analyze some institutional factors that affect market discipline.

A. Government Compensation ¹

First, we examine the effect of government protection of deposits on market discipline. For this purpose, we assume that the government compensates depositors with probability γ in case of bank default. We assume the following timing. First, the bank chooses the monitoring effort level, which is observable by depositors, and then the deposit interest is determined at the competitive deposit market. Under this assumption, the deposit interest rate is a function of the monitoring level, m , and the probability of government compensation, γ .

Because the probability of bank failure is $\rho(1 - m)$ and the probability of depositors not being compensated in case of bank failure is $1 - \gamma$, we have the deposit interest rate as follows.

$$r^D(m, \gamma) = r + \rho(1 - m)(1 - \gamma) \quad (2)$$

, where r represents the risk-free interest rate. The following proposition is straightforward.

¹ This version is basically a simplified model developed by Gropp and Vesala (2004), though the latter does not analyze the effect of disclosure on market discipline.

Proposition 1. The deposit interest rate is higher as the bank default risk is higher, unless the government fully compensates depositors.

Proof. $\frac{\partial r^D}{\partial[\rho(1-m)]} = 1 - \gamma \geq 0$, with equality holds when $\gamma = 1$.

Substituting Eq. (2) into Eq. (1), we get the following first order condition:

$$\rho[r^L - r^D(m, \gamma)] - (1 - \rho + m\rho) \frac{\partial r^D(m, \gamma)}{\partial m} - V'(m) = 0 \quad (3)$$

The first term represents a direct effect of a higher monitoring effort on profit through a lower default probability. The second term represents a market discipline effect of a higher monitoring effect on profit through a lower deposit interest rate. This effect is stronger if the deposit interest rate is more sensitive to a default risk, and if the exogenous default probability, ρ , is lower. The third term is a marginal cost of monitoring. Rearranging the above first order condition, we get

$$m^* = \frac{1}{2} \left[\frac{\rho(r^L - r) + (1 - 2\rho)\rho(1 - \gamma)}{\beta - \rho^2(1 - \gamma)} \right] \quad (4)$$

From Eq. (2) and Eq. (3), we obtain the following propositions straightforward.

Proposition 2: The sensitivity of deposit interest rate to bank default risk is greater as the probability of government compensation in case of bank failure is smaller.

Proof: $\frac{\partial r^D}{\partial[\rho(1-m)]} = 1 - \gamma$ is a decreasing function of γ .

Proposition 3: The monitoring effort is higher as the probability of government compensation is smaller.

Proof. $\frac{\partial m^*}{\partial \gamma} = \frac{-(1 - 2\rho)\rho[\beta - \rho^2(1 - \gamma)] - \rho^2[\rho(r^L - r) + (1 - 2\rho)\rho(1 - \gamma)]}{2[\beta - \rho^2(1 - \gamma)]^2} < 0$

If the government never compensates depositors' losses, i.e., $\gamma = 0$, Eq. (4) implies that

$$m^* = \frac{1}{2} \left[\frac{\rho(r^L - r) + (1 - 2\rho)\rho}{\beta - \rho^2} \right] \quad (5)$$

B. Market Power

Suppose that the government restricts entry to banking industries, resulting in a higher loan rate.

Proposition 4: The monitoring effort is higher as the loan rate is higher.

$$\text{Proof. } \frac{\partial m^*}{\partial r^L} = \frac{\rho}{2(\beta - \rho^2)} > 0$$

C. Disclosure

Finally, we investigate the opaqueness of bank loan risk. For this purpose, we change the timing of events as follows. First, the deposit interest is determined at the competitive deposit market and then the bank chooses the monitoring level, m . Now we assume away government compensation. Depositors incur losses whenever the bank fails. In this setting, the bank maximizes its profit represented by Eq. (1) given the deposit interest rate, r^D . The first order condition is

$$\rho(r^L - r^D) - V'(m) = 0 \quad (6)$$

Comparing Eq. (6) with Eq. (3), we see that no market discipline effect exists without disclosure. Rearranging, we get

$$m^{**}(r^D) = \frac{\rho(r^L - r^D)}{2\beta} \quad (7)$$

Depositors anticipate the relationship of the deposit interest rate, r^D , and the default probability, $\rho[1 - m^{**}(r^D)]$. Consequently, the deposit interest rate is determined as

$$r^D = r + \rho[1 - m^{**}(r^D)] \quad (8)$$

Substituting Eq. (7) into Eq. (8), we get the equilibrium deposit interest rate and the monitoring incentive.

$$r^{D**} = \frac{2\beta r + 2\beta\rho - \rho^2 r^2}{2\beta - \rho^2} \quad (7)$$

$$m^{**}(r^{D**}) = \frac{\rho(r^L - r - \rho)}{2\beta - \rho^2} \quad (8)$$

Comparing Eq. (4) and Eq. (8), we get the following proposition.

Proposition 5 The effort level in the case of disclosure is higher than the effort level without disclosure if the exogenous default level, ρ , is sufficiently low.

Proof. From Eq. (4) and Eq. (8), we get

$$m^* - m^{**}(r^{D**}) = \frac{(2\beta - 2\beta\rho - \rho^2 + 2\rho^3)(r^L - r) + (2\beta\rho - \rho^3)}{(2\beta - 2\rho^2)(2\beta - \rho^2)} \quad (9)$$

As ρ approaches to zero, Eq. (9) converges to $\frac{(r^L - r)}{2\beta} > 0$. QED.

The market discipline effect is strong if the exogenous default probability is low. In that case, the effort level is higher and hence the default probability is lower in the case of symmetric information than in the case of asymmetric information.

Appendix 2. The distance to default

Gropp, Vesala and Vulpes (2004) proposed the following measure of the distance to default (DD) based on the market value of bank asset.

$$DD \equiv \frac{\ln\left(\frac{V_A}{D}\right) + \left(r - \frac{\sigma_A^2}{2}\right)T}{\sigma_A\sqrt{T}}$$

, where V_A denotes the market value of bank asset, D bank debt, σ_A the standard deviation of V_A , T maturity of debt, and r the risk-free rate.

DD represents the number of standard deviations that the firm is from the default point. They show that V_A and σ_A can be calculated from the observable market value of equity capital and the volatility of equity.