

THE ROLE OF SUBORDINATED BONDS ON BANK REGULATION

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ABSTRACT

The Basel III international bank regulatory framework adopts subordinated bonds as the third pillar of bank regulation. This article examines the market discipline hypothesis that monitoring by the bond market enhances the effectiveness of bank regulation through disseminating information on bank default risk and suppressing excessive risk taking behaviors. This article empirically tests the association between the size of subordinated bonds and a bank's financial soundness using regression analysis. The data on bank samples are drawn from *COMPUSTAT Bank File* and the sampling periods are from 2005 to 2010, when the 2008 financial crisis revealed the information on regulatory effectiveness and bankruptcy risk. This study finds that subordinated bonds have an incremental explanatory power on the financial soundness of banks beyond regulatory capital, but in a smaller scale than regulatory capital. For bank regulation, subordinated bonds would be complementary to regulatory capital, but should not be substituted for regulatory capital.

Key words: bank regulation, subordinated bond, financial soundness, financial crisis

JEL Codes: G01, G21, G28

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INTRODUCTION

Since banks are quintessential to the economy, central government regulates them unlike industrial firms and often bail them out at the expense of taxpayers. One of the main reasons that banks got into troubles often is their excessive risk-taking behavior, which is partially the consequence of mispriced deposit insurance as well as ineffective bank regulation. Governments regulate banks via risk-based capital requirements and direct supervision set by the international standards. The Basel Committee on Banking Supervision in 2006 proposes *market discipline* as the third pillar in addition to risk-based capital requirements and direct supervision. Market discipline triggered by issuing subordinated bonds by banks has a potential to play a monitoring role on banks by private parties of bondholders, rating agencies, and analysts. While risk-based capital requirements are very rigid formulae and direct supervision is bureaucratic as well as human-error prone, the market is blindly seeking profit by assessing the riskiness of bank portfolios, which could provide costless, unbiased monitoring to all stakeholders. The bond market helps bank regulation in two ways: by revealing information on banks' default risk and via direct discipline toward underperforming banks.

This paper examines *the market discipline hypothesis* by measuring the association of banks' financial soundness against the size of subordinated bonds outstanding and risk-based capital. This paper tests the market discipline hypothesis before and after the 2008 financial crisis to gauge its efficacy under extremely severe financial stress. The 2008 financial crisis shifted financial paradigms banks have operated upon in terms of earnings, dividends, leverage, credits, and regulations. It was a cataclysmic event, which in turn provided a good opportunity to examine the existing bank regulatory framework.

This paper provides the evidence that the size of subordinated bonds has an explanatory power on financial soundness beyond the regulatory capital, which supports the market discipline hypothesis. However, the association of the regulatory capital with financial soundness of banks turns out to be much stronger than that of subordinated bonds. At the time of financial crisis, the regulatory capital dominated the subordinated bonds in explaining the financial soundness of banks. Subordinated bonds would help bank regulators, but regulatory capital requirements play more crucial role in regulating banks.

The paper organized as follows: Section II reviews previous researches; Section III develops the hypothesis; Section IV explains the research design; Section V analyzes the regression results; Section VI concludes.

I. LITERATURE REVIEW

There are a few articles that advocate a mandatory subordinated bonds issued by banks as a bank supervision mechanism. Evandoff and Wall (2000) proposed a three-

phased adoption of mandatory subordinated bonds to banks, which would be at least 3 percent of risk-weighted capital with 5 year maturity. Calomiris (1999) proposed that banks maintain a minimum fraction of their risky assets in medium-term subordinated bonds. Evandoff (1993) proposed that a significant portion of total capital would be held in short-term subordinated bonds. His proposed subordinated bonds would be short-term enough to go market discipline continually. Wall (1989) proposed subordinated bonds with a redemption feature that would allow bond holders to redeem their bonds. Though these articles are different in terms of maturity, size, and covenant of subordinated bonds, they all call for mandatory subordinated bonds as the Basel III International Standard requires.

Acharya, Gujral, Kulkarni, and Shin (2011) reported that the composition of bank capital had changed during the 2008 financial crisis. Banks raised capital more from debts or hybrid claims and eroded common equity by paying dividends throughout the crisis. This finding suggests that the primary buffer for declining asset values had shifted from the traditional common equity to subordinated debts. DeAngelo and Stulz (2013) found from their analytical model that banks choose high leverage due to the market force on liquidity premium and loan spreads. This findings suggest that bank regulation should weigh systemic risk from high leverage against the social cost of liquidity production. Davies (2015) reevaluated the role of subordinated bonds after the 2008 financial crisis. While he acknowledges the benefit of low cost debt financing and the market discipline from issuing bonds, he questions the final role of subordinated bonds in bank capital due to its lack of ability for loss absorption ex ante.

There are a few articles that directly test the market discipline hypothesis. Morgan and Stiroh (2001) tests the market discipline hypothesis by examining the relationship between the spreads of bonds banks issued in 1993 to 1998 and the portfolio of assets held by banks. They found that bond spreads reflect the riskiness of banks' portfolio in terms of credit card lending, commercial lending and trading activities. In summary of their conclusion, bondholders price, ex ante, the riskiness of banks' asset portfolio, and play a role of deterring excessive risk-taking behavior by banks. This study shows importantly the bond market actually alters investment decisions by banks as well as provides information on banks' default risk. Ashcraft (2006) tests the market discipline hypothesis by examining the relationship between the mix of bank capital and the probability of future financial distress. His major finding is that an increase of subordinated bonds plays a positive role in banks' recovery from financial distress. This study concludes the bond market plays an important role in regulating banks, especially at the time of financial distress. John, Mehran, Qian (2007) measured the intensity of bank monitoring by the size and the rating of subordinated bonds to test the empirical relation between bank CEO's incentive-based compensation and the intensity of bank monitoring. The positive relationship between the size of subordinated bonds and the market discipline is adopted as a maintained hypothesis for their study.

II. HYPOTHESIS

Tier I capital for bank regulation includes only typical owners' equity – common stocks, preferred stocks, non-controlling interests, and retained earnings. Subordinated bonds belong to tier II capital. Subordinated bond holders view tier I capital as a buffer before their claims are used up. Regulators and depositors view subordinated bonds as a buffer before depositors' claims are used up. Therefore any monitoring effect by subordinated bonds could be very different, depending on the size of tier I capital. Controlling the size of tier I capital is imperative in testing the efficacy of subordinated bonds on bank regulation.

Subordinated bonds issued by banks are priced based on its default risk and its specific bond covenants (Morgan and Stiroh, 2001), which is an informative and market-driven mechanism of assessing banks' financial soundness. The market mechanism helps bank regulators have additional information beyond a regulatory capital. Subordinated bond holders could influence on the riskiness of a bank portfolio by trading subordinated bonds or by bond covenants. Whether the magnitude of subordinated bonds is likely to be associated with banks' financial soundness, which must be correlated with the riskiness of banks' portfolio, beyond the size of a regulatory capital is an empirical question. The market discipline hypotheses this paper tries to empirically test is expressed as follows in an alternative form.

The magnitude of subordinated bonds outstanding has incremental explanatory power on the financial soundness of a bank after controlling the magnitude of a regulatory capital.

The financial soundness of a bank is measured in terms of profitability, quality of assets, a dividend yield, and a size of deposits. As a proxy for a bank's profitability, return-on assets and return-on-equities are selected. Both of the proxy variables are positively correlated with the financial soundness of a bank. As a proxy for a quality of bank assets, non-performing assets and reserves-for-credit-losses are selected. Both of the proxy variables are negatively correlated with the financial soundness of a bank. A dividend yield signals bank managers' confidence on future cash flows, which is an ex ante, positively correlated measure of financial soundness. Deposits are mostly insured by FDIC, which makes depositors indifferent capital providers. In other words, deposits are, at least, irrelevant or even detrimental to financial soundness of a bank.

III. RESEARCH DESIGN

Data are drawn from the *Compustat Bank File*. The sampling period is from 2005 to 2010, which are selected to examine the dramatic change of bank balance sheets around the 2008 financial crisis. Unless a bank's owners' equity is negative or tier 1 capital ratio is greater than 50%, all bank-year observations in the *Compustat Bank File* are selected. The reason for this arbitrary winsorization is to eliminate extreme samples. The number of bank-year observations are 3,957 and on average 660 banks are included in the sample for a given year.

$$FSI_{it} = \beta_0 + \beta_1 \text{RegCap}_{it} + \beta_2 \text{SubBond}_{it} + \varepsilon_{it} \quad (1)$$

FSI_{it} is a variable to measure financial soundness for bank i for year t . The primary goal of bank regulation is maintaining the solvency of a bank at the time of financial distress. This paper measures the effectiveness of bank regulation in terms of financial soundness of a bank, which is the backbone of solvency. Return on assets (ROA) and return on equity (ROE) measure a bank's profitability and are used as a proxy variable for financial soundness. Non-performing assets (NPA) and reserve for credit losses (RCL) measures a bank's exposure to excessively risky assets and are selected as a proxy variable for financial soundness. NPA captures failures of investments, i.e., ex post asset mix, while RCL does future failures of investments, i.e., ex ante asset mix. NPA and RCL are normalized by total assets and, by design, are inversely related with financial soundness of a bank. Dividend yield (DIV) for a bank's common stock represents a bank's capacity for cash flow and the market's assessment for financial soundness. This paper expects DIV to be positively related with financial soundness. Bank deposits (DEP) are mostly protected by the Federal Deposit Insurance Corporation. Deposit holders provide capital to banks and have no incentive to supervise banks due to deposit insurance. Bank managers with large deposits could engage in riskier loan activities. This paper expects DEP to be negatively related with financial soundness. The size of bank deposits (DEP) are normalized by total assets.

RegCap_{it} is the magnitude of the tier I capital normalized by risk-weighted total assets for bank i for year t . The general weight scheme is 0% for cash and OECD government issued bonds, 20% for claims on banks or U.S. governmental agencies, 50% for securities with collateral or hedging derivatives, and 100% for commercial loan. RegCap_{it} measures primary capital, which is consisted of common stocks, preferred stocks, non-controlling interests and retained earnings. RegCap_{it} is considered as a buffer capital to be used before subordinated bonds. SubBond_{it} is the size of subordinated bonds normalized by total assets for bank i for year t . Subordinated bonds are categorized as the tier II regulatory capital and are considered as a capital to be used before compromising bank deposits.

The expected sign of estimated coefficients, b_1 and b_2 , is positive when ROA, ROE, and DIV enters as a dependent variable. When NPA, RCL, and DEP enters, the expected sign of estimated coefficients, b_1 and b_2 , is negative.

V. RESULTS

Table 1 reports the regression results of the equation (1), which estimates the relation between financial soundness of a bank and regulatory variables. Profitability measures, ROA and ROE, are positively and statistically significantly associated with the size of bank's regulatory capital, which is inconsistent with the bank managers' claim that required capitals are costly enough to hurt their profitability. When there are more buffer capitals to absorb random and cyclical losses, the profitability of a bank improves. The size of subordinated bonds enters the equation (1) statistically insignificantly for both ROA and ROE. Furthermore it enters with negative sign when a

dependent variable is ROA. This findings could be interpreted as a weaker role of subordinated bonds on a bank’s asset mix decision and its profitability.

Both regulatory capital and subordinated bonds enter the equation (1) with the expected negative sign and statistical significance against NPA (non-performing assets) and RCL(reserve for credit losses), which is consistent with John, Mehran, Qian’s (2007) findings. Both regulatory capital and subordinated bonds help to improve ex post asset mix by reducing non-performing assets and ex ante asset mix by reducing reserves for credit losses. However, the magnitude of the regression estimated coefficient for regulatory capital is approximately 2 to 4 times greater than that for subordinated bonds. This could be interpreted as regulatory capital is more influential to the asset mix decision than subordinated bonds.

Dividend yield enters with a positive sign for regulatory capital and subordinated bonds as predicted. Dividend yield sends a signal on both future and current cash flow potential to the market, which makes it a market-based measure for financial soundness. Again the coefficient for regulatory capital is about 50% greater than that for subordinated bonds. Deposit is an FDIC insured capital to a certain degree and thus somewhat insulated from the financial soundness of a bank. For bank managers, deposits could be a source for excessive risk-taking due to lack of deposit holders’ incentive to monitor. The finding that regulatory capital and subordinated bonds are negatively associated with the size of deposits are consistent with the view that deposits are insulated from the financial soundness of a bank.

Table 1

OLS Estimations of Regression coefficients of the Equation (1)

Dependent Variable for Financial Soundness	Independent Variables	
	Regulatory Capital	Subordinated Bonds
Return on Assets	0.079	-0.001*
Return on Equity	2.661	0.255*
Non-Performing Assets	-0.083	-0.020
Reserve for Credit Losses	-0.023	-0.011
Dividend Yield	1.708	1.286
Deposit	-0.325	-1.056

All estimated coefficients are statistically significant at 5% level, except ones with *.

To check the robustness of the empirical relation between financial soundness of banks and the capital structure of banks, this paper estimates the equation (2), which measures the association between financial soundness and leverage. The leverage in this study is defined as subordinated bonds divided tier I capital. The leverage is an increasing function of subordinated bonds and a decreasing function of the regulatory capital. The logarithm of total assets is included to control the size effect among banks.

$$FSI_{it} = \beta_0 + \beta_1 \text{Leverage}_{it} + \beta_2 \log(\text{Total_Assets}_{it}) + \varepsilon_{it} \quad (2)$$

Leverage enters the regression (2) with significantly negative sign against profitability measures like ROA and ROE, which indicates more influence of regulatory capital over subordinated bonds. When a dependent variable is NPA or RCL, leverage enters with a weakly positive sign, which corroborates the role of regulatory capital over subordinated bonds. When a dependent variable is DIV, leverage enters with a positive sign, which is inconsistent with the findings of Table 1. Overall, the regression result of financial soundness on leverage is consistent with that regulatory capital is more associated with financial soundness of a bank than subordinated bonds is.

Table 2

OLS Estimation of the Regression of Equation (2)

Dependent Variable	Leverage Ratio	Logarithm of Total Assets
ROA	-0.0006	0.0005
ROE	-0.0645	-0.0278
NPA	0.0009	-0.0018
RCL	0.00009	0.00004
DIV	0.0038	-0.0077
DEP	-0.0069	-0.0575

To examine the market discipline hypothesis during the 2008 financial crisis, the equation (1) is estimated for each of the three sub-periods, i.e., the pre-crisis period (2005-6), the peak crisis period (2007-8), and the post crisis period (2009-10). The results of OLS regression are presented in table 3. When a dependable variable is ROA or ROE for the crisis periods, the regulatory capital enters more strongly in terms of the magnitude of estimated coefficients than subordinated bonds. This findings are interpreted as the more effectiveness of regulatory capital relative to subordinated bonds. This findings are extended when NPA, RCL, DIV are a dependent variable. The only exception is when deposits are a dependent variable.

In summary, subordinated bonds have an incremental explanatory power on financial soundness beyond that of regulatory capital, but regulatory capital shows stronger associations with financial soundness than subordinated bonds. The market discipline via subordinated bonds works, but the governmental regulation via regulatory capital works in a more potent way. These findings are more prominent during the financial crisis than ordinary times.

Table 4 presents the result of means tests for dichotomized samples with high or low subordinated bonds while controlling the tier I capital. The purpose of this test is to control the size of regulatory capitals and just to examine the efficacy of subordinated bonds on financial soundness. All sample banks are grouped into the 10 subsamples based on the magnitude of their tier I capital, decile 1 through 10. Within each 10 subsamples, banks are dichotomized and grouped to either high or low sample, based on the magnitude of subordinated bonds outstanding.

According to the results of the decile 3 through 8, the sample with low subordinated bonds have bigger, almost double in size, return on assets and return on equity than the sample with high subordinated bonds. The decile 1, 2, 9, 10 shows different, somewhat random patterns, which is likely caused by samples located at the tails of the distribution. Considering U.S. tax treatments on interest expenses, banks with higher debts would show lower net income than banks with lower debts, *ceteris paribus*. Therefore, difference in means of ROA and ROE is just a manifestation of a tax-leverage effect.

Table 3

OLS Estimation of Regression Coefficients of the Equation (1) for the 3 Sub-Periods

Dependent Variable	Independent Variables	2005-2006	2007-2008	2009-2010
ROA	RegCap	-0.004	0.095	0.168
	SubBond	-0.012	-0.002	0.009
ROE	RegCap	-0.397	0.467	7.715
	SubBond	-0.070	0.097	0.507
NPA	RegCap	-0.003	-0.120	-0.176
	SubBond	0.003	-0.020	-0.040
RCL	RegCap	-0.002	-0.026	-0.054
	SubBond	-0.010	-0.011	-0.011
DIV	RegCap	0.139	4.411	1.638
	SubBond	1.540	2.135	-0.426
DEP	RegCap	-0.116	-0.358	-0.576
	SubBond	-1.106	-0.947	-1.128

Table 4

Means Test for High & Low Debt Samples within Equivalent Tier I Capital

Tier I Capital Deciles											
	SubDebt	1	2	3	4	5	6	7	8	9	10
ROA	High	-0.0063	0.0031	0.0014	0.0036	0.0035	0.0039	0.0030	0.0028	0.0047	0.0060
	Low	-0.0158	0.0018	0.0025	0.0051	0.0055	0.0059	0.0051	0.0043	0.0040	0.0060
ROE	High	-0.0521	0.0042	0.0026	0.0061	0.0048	0.0076	0.0098	0.0088	0.0123	0.0090
	Low	-1.0850	-0.0427	0.0014	0.0102	0.0100	0.0211	0.0110	0.0139	0.0099	0.0100
NPA	High	0.0204	0.0146	0.0176	0.0140	0.0153	0.0150	0.0162	0.0143	0.0138	0.0110
	Low	0.0463	0.0186	0.0179	0.0132	0.0144	0.0142	0.0154	0.0170	0.0167	0.0140
RCL	High	0.0099	0.0085	0.0102	0.0094	0.0106	0.0106	0.0102	0.0099	0.0092	0.0080
	Low	0.0166	0.0104	0.0104	0.0104	0.0105	0.0103	0.0105	0.0106	0.0103	0.0080
DEP	High	0.6218	0.6344	0.6899	0.6990	0.7075	0.0109	0.7212	0.7160	0.7023	0.6580
	Low	0.7857	0.7467	0.7904	0.7910	0.8019	0.0103	0.8029	0.8040	0.8027	0.7730

Means for non-performing assets, reserves for credit losses and deposits are not significantly different between two dichotomized samples based on subordinated bonds for the decile 3 through 8. The magnitude of subordinated bonds does not make significant difference on return on assets, return on equity, non-performing assets, reserve for credit losses, and deposits. As subordinated bonds are found not to affect the portfolio decision of banks or its profitability, this findings could be interpreted as evidence against the market discipline hypothesis.

IV. CONCLUSION

This paper obtains the evidence that the size of subordinated bonds has an explanatory power on financial soundness beyond the regulatory capital, which supports the market discipline hypothesis. However, the association of the regulatory capital with financial soundness of banks turns out to be much stronger than that of

subordinated bonds. At the time of financial crisis, the regulatory capital dominated the subordinated bonds in explaining the financial soundness of banks. Subordinated bonds would help bank regulators, but regulatory capital requirements play more crucial role in regulating banks, which is consistent with the criticism that Davies (2015) brought on subordinated bonds' role on bank regulation.

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