Market Discipline Prior to Failure

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Abstract

This paper examines pricing behavior for bonds issued by bank holding companies in the period prior to failure of their bank subsidiaries. The results indicate that bond prices are related to the financial condition of the issuing bank holding companies, and that bond spreads start rising as early as six quarters prior to failure as the issuing firm's financial condition and credit rating deteriorate. Strong market discipline exists during this critical period -- bond spreads for troubled banking organizations are many times those of healthy ones. Our results suggest that bond spreads could potentially be useful to bank supervisors as a warning signal from the financial markets. In addition, our finding implies that the proposals to require bank holding companies to issue publicly traded debt in a greater volume and frequency will likely enhance market discipline in the banking system when it is most needed.

Market Discipline Prior to Bank Failure

I. Introduction

Banking deregulation or re-regulation has been an ongoing process since the 1970s. Many of the restrictions placed on banking as a result of banking panics in the 1920s have been either lifted or modified. Geographic barriers and many product restrictions have been eased. Financial market globalization, product innovations, new technologies, and consolidation, along with regulatory changes, are causing banks and bank supervisors to reconsider how they do business. Supervisors must balance their need for information with the burden imposed on the regulated entities. The objective is to minimize regulatory burden without compromising the safety and soundness of the banking organization. This can be achieved by increasing market discipline and the use of market information. Market discipline may be enhanced by increasing the incentives for debt holders to monitor bank management – thus complimenting the work of bank supervision. Debt holders can provide bank management with incentives to limit their risky activities by demanding a larger risk premium on bond spreads. In addition, the use of market information in bank supervision can potentially allow bank supervisors to spend less of their scarce resources collecting information from bank management.

Previous studies have examined the role of debt holders in disciplining bank management and have shown that pricing in the debt market is sensitive to the risk profile of the issuing banking firms [Flannery and Sorescu (1996) and Jagtiani, Kaufman, and Lemieux (2000)]. However, the literature sheds little light on whether debt holders can effectively monitor banking firms during the period prior to bank failure. Since the federal safety net subsidy is most critical and market discipline is most needed during the period prior to failure, we focus on the pricing of bank bonds during the twelve quarters prior to failure. Understanding the pricing behavior of

banking firms' publicly traded debt during the period prior to failure is a critical element of maintaining the stability of the financial system.

This paper may be considered an extension of two earlier studies by Jagtiani, Kaufman, and Lemieux (2000) and Flannery and Sorescu (1996), which examine the pricing of bank holding company (BHC) bonds during the post-FDICIA period (1992-1997) and pre-FDICIA period (1986-1991), respectively. Both studies find some degree of market discipline in the market for bonds issued by BHCs. However, there has been no study that investigates pricing behavior when banking organizations are facing financial difficulties -- our paper fills this gap in the literature. Our results provide implications for proposals that 1) attempt to utilize debt holders to compliment bank supervision, 2) advocate the use of bond spreads in the supervisory process, and 3) advocate increased disclosure to enhance market discipline [see Evanoff (1993) and Haubrich (1998)]. The rest of the paper is organized as follows. Section II describes the data and presents summary statistics of the data. Section III discusses the empirical methodology. Section IV presents the empirical results, and Section V concludes.

II.   **The Data**

Our sample consists of banks that failed during the period 1980 to 1995, whose parent bank holding company had publicly traded bonds outstanding during the recent quarters prior to failure. We started with 185 failed banks (104 BHCs) during the sample period. Several of the failed banks were associated with the same BHCs.[1] Most of the banks on our initial list were eliminated because of the lack of bond data. None of the banks in our sample had outstanding publicly-traded debt, and the parent BHCs of only five of these failed banks did. Our final sample includes those five failed banks whose parent BHCs had outstanding bonds as of their

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[1] For example, 28 bank subsidiaries of First Republic Bank Corporation, 20 bank subsidiaries of MCorp, 16 bank subsidiaries of First City Bancorp of Texas, and 12 bank subsidiaries of Texas American Bancshares Inc.

fail date. These banks are Continental Bank, MBank, Southeast Bank N.A., Bank of New England, and Maine Savings Bank. Their parent BHCs are Continental Illinois Corp., MCorp, Southeast Bank Corp., Bank of New England Corp., and One Bancorp, respectively. All of the bonds in our sample are straight bonds, which are not convertible, callable, or puttable.[2] Bonds issued by Continental and MCorp are senior notes, and the rest are subordinated notes.

Of all the outstanding bonds of these five BHCs, we selected the bond that had the most price observations. Our sample period varies, depending on when the bond was issued and the fail date. For each banking organization, the sample period starts either twelve quarters prior to failure or when the bond was first traded in the secondary market. All of the prices (end-of-quarter) used in this paper are secondary market prices collected from the *Moody's Bond Record* and *Standard and Poor's Bond Guide*.[3] Historical Treasury yields, which are used in calculating bond spreads, are taken from the Federal Reserve Statistical Release H.15 Selected Interest Rates when not available from the Bloomberg. Table 1 lists the sample banks and their parent BHCs, the fail date, and the sample periods.

The accounting risk characteristics of the BHCs are collected from the quarterly Y-9 Reports. Moody's historical bond ratings are collected from the monthly *Moody's Bond Record*. BOPEC ratings (given by bank regulators) are collected from the National Examination Database (NED). In addition to the limitation on bond data, our study is also limited by availability of the accounting and rating information.[4] As a result, our sample observations are significantly reduced in the analysis that involves insured deposits, bad loans, or BOPEC rating.

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[2] Including bonds with a put or a call option will not increase our sample size, because all of the failed banks or their holding companies which had outstanding callable or puttable bonds also had straight bonds outstanding.
[3]   It is unlikely, but possible, that some parent BHCs of other failed banks may also have had outstanding bonds that meet the requirements to be included in this study. However, their prices are not recorded in Moody's Bond Record or Standard and Poor's Bond Guide or the Bloomberg Data Services.
[4] For BHCs, the accounting data from Y-9 Reports was only available semi-annually (rather than quarterly) until 1986. For subsidiary banks, the necessary information for calculating insured deposits was reported only annually

Market capitalization for BHCs is calculated using share prices times the number of shares outstanding as reported in the *Standard and Poor's Stock Guide*. Table 2 lists total consolidated assets, size of the failed banks (as a proportion of BHCs' assets), and the Moody's rating prior to failure. Continental Bank and Southeast Bank are the primary subsidiaries of their parent BHCs, comprising approximately 95 percent of their parent BHC's assets. Bank of New England and MBank are 66 percent and 39 percent, respectively, of their parent BHC's assets. Unlike the rest of the sample, Maine Savings Bank is only a small fraction (about 4 percent) of One Bancorp, which is the smallest BHC in the sample.

III.   The Empirical Methodology

Following Jagtiani *et al*. (2000), we examine the relationship between bond spreads and risk characteristics of the issuing BHCs. Six different credit risk measures are specified in the model: 1) bad loans to total assets; 2) return on assets; 3) percent of insured to total deposits; 4) leverage ratio; 5) bank regulators' ratings; and 6) Moody's bond rating. In addition, a number of control variables are specified in the model, including asset size, a dummy variable that differentiates senior debt from subordinated debt, and dummy variables identifying each of the sample banks in the fixed-effect equation, as shown in equations (1), (1)', (2), and (3) below.[5] In order to avoid multicollinearity, the intercept, asset size (*LOGTA*), and class of debt dummy (*DUMSUB*) are excluded from the estimation in equation (1)' when the bank dummies (DUM_{Conti}, DUM_{SE}, DUM_{NE}, DUM_{One}, and DUM_{MCorp}) are included in the model. The definition of the variables are given below and summarized in Table 3.

(in June) until mid-1991. In addition, non-performing loan information was reported only semi-annually (in June and December) until mid-1985. Moreover, the credit ratings by regulators (BOPEC or CAMEL), which were developed in 1982, are not available on the NED until 1986.

[5] Our use of the current values of the variables rather than their lags implicitly assumes that the market is efficient so that all available information is immediately incorporated into the price of the bonds. The previous study by Jagtiani, Kaufman, and Lemieux (2000) reports that using lag variables when estimating a similar specified equation (spread as of January 31 and accounting variables as of December 31) does not change the results.

$$SPREAD_{it} = a + \beta_1 LOGTA_{it} + \beta_2 MKTLEV_{it} + \beta_3 BADLOAN_{it} + \beta_4 ROA_{it} + \beta_5 DUMSUB_i \quad (1)$$

$$SPREAD_{it} = \mu_1 MKTLEV_{it} + \mu_2 BADLOAN_{it} + \mu_3 ROA_{it} + \mu_4 DUM_{Conti} + \mu_5 DUM_{SE}$$
$$+ \mu_6 DUM_{NE} + \mu_7 DUM_{One} + \mu_8 DUM_{MCorp} \quad (1)'$$

$$SPREAD_{it} = ?_1 MOODY_{it} + ?_2 DUM_{Conti} + ?_3 DUM_{SE} + ?_4 DUM_{NE} + ?_5 DUM_{One} + ?_6 DUMM_{Corp} \quad (2)$$

$$SPREAD_{it} = ?_1 BOPEC_{it} + ?_2 DUM_{Conti} + ?_3 DUM_{SE} + ?_4 DUM_{NE} + ?_5 DUM_{One} + ?_6 DUMM_{Corp} \quad (3)$$

The dependent variable (*SPREAD*) is calculated by subtracting the estimated yield on U.S. Treasury securities with the same term to maturity from the yield on the observed BHC bond. The Treasury yield is obtained from yield curves as of each quarter-end estimated by a straight-line extrapolation from quarter-end market yields reported by Bloomberg for 3, 6, and 9-month and 1, 2, and 3-year to maturity.

BADLOAN is the ratio of the sum of non-performing and defaulted bank loans plus other real estate owned, which represents collateral obtained through foreclosure, to total on-balance-sheet assets (consolidated across all subsidiary banks). Non-performing loans include loans past due over ninety days that may be accruing or non-accruing. The larger the *BADLOAN* ratio is, the greater the likelihood of loss, and the larger the bond spread; therefore, a positive coefficient is expected. *ROA* is the ratio of the BHC's annualized quarterly net income to its quarter-end, on-balance-sheet assets. The more profitable the BHC is, the less likely it is to default, and the smaller the bond spread; therefore, a negative coefficient is expected. *MKTLEV* is the leverage ratio measured by the BHC's ratio of book value of liabilities to the market value of common stock plus the book value of perpetual preferred stocks. This is also the definition used in Jagtiani *et al*. (2000) and Flannery and Sorescu (1996). The higher the leverage is, the more likely bondholders will incur losses, and the larger the bond spreads; thus, a positive coefficient is expected.

MOODY is a cardinalized credit rating for the sampled bonds assigned by Moody's as of the end of quarter. The cardinalization is based on Ronn and Verma (1987), ranging from 1 to 9 (see the Appendix). The larger numerical ratings indicate poorer credit quality, so a positive coefficient is expected. Below-investment grade bonds are assigned a number larger than 4.[6] *BOPEC* is the regulator's credit rating assigned to BHCs based on the examination results performed by the Federal Reserve. The ratings range from a high of 1 to a low of 5 and are assigned for each of the components (B=Bank, O=Others, P=Parent, E=Earnings, and C=Capital) as well as a composite overall rating. This rating system was adopted in 1982; however, the ratings are available on the NED much later. These ratings are not available for Continental, which failed in 1984; therefore, Continental is dropped when BOPEC ratings are included in the analysis. The BOPEC rating for Bank of New England was not available until December 1987.[7]

Unlike Moody's ratings, which may be adjusted continuously, BOPEC is assigned approximately every twelve to eighteen months. In addition, BOPEC ratings are not assigned on the same date across the sampled BHCs. BOPEC ratings are subject to an aging problem, which has been recognized in previous studies. Following previous studies, we attempt to deal with this problem by taking into account the amount of time that has passed since the rating was assigned. This is particularly important for those banking firms whose BOPEC was downgraded. Thus, our measure of the BOPEC rating is a weighted-average of the rating that was assigned immediately prior to and immediately after the associated observation date. The weight is time, and more weight is given to the rating that is closer to the relevant date.

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[6] The cardinalization imposes an implicit assumption that a one-notch deterioration in the rating is linearly related to the risk profile of the firm. For example, a rating deterioration from Aaa to Aa1 (from 1 to 1.66) and from A1 to A2 (from 2.66 to 3.0) are equally bad. In reality, the Moody's rating may not represent a linear progression of the

In addition to the aging problem, the overall composite BOPEC ratings tend to vary little across our sample BHCs. This may be due to the deteriorating financial condition of the banking organization in our sample. It is important to point out that these *composite* BOPEC ratings are relatively subjective, and are not obtained through a mathematical formula based on the individual components (B,O,P,E,C). Unlike the composite rating, the rating of the individual components tends to vary significantly across failed banks, reflecting the varying condition of the components across these banks, and through time. Our measure of BOPEC is an average of each *component*'s weighted-average rating.

Several control variables are included in the model. *LOGTA* is the log of total consolidated assets. *DUMSUB* is a dummy variable which is equal to one for subordinated debt (Bank of New England Corp., Southeast Bank Corp., and One Bancorp) and zero for senior debt (Continental Illinois Corp. and MCorp). Finally, DUM_{Conti}, DUM_{SE}, DUM_{NE}, DUM_{MCorp}, and DUM_{One} are bank dummies, which take the value of one for Continental, Southeast, Bank of New England, MCorp, and One Bancorp, respectively, and zero otherwise.

IV.   The Empirical Results

The empirical results are presented in Table 4 and in Figures I and II.[8] From Table 4 column (1), all but one of the variables are significant with the expected signs. BHCs with more bad loans (*BADLOAN*) and BHCs that are less profitable (*PROFIT*) are required to pay a larger spread. *DUMSUB* is significantly positive, as expected, indicating that subordinated notes are subject to a larger risk premium than senior notes. Comparing this estimation with our analysis of healthy BHCs in Jagtiani *et al*. (2000), we find that increases in profitability seem to be more

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firm's creditworthiness. Jagtiani *et al*. (2000) permit nonlinearity by using dummy variables to group the sample bonds, and find that the linearity assumption has no significant effect on the results.

[7] The last rating available on the NED was assigned in December 1989, and the bank failed in January 1991.

important (larger negative coefficient) in the pricing of healthy BHC bonds than troubled BHC bonds. In addition, the coefficients of *DUMSUB* suggest that the priority of claims in the event of failure is much more important as serious financial problems become apparent. In terms of leverage ratio, *MKTLEV* is not significant. We have also examined the various interactive terms of *MKTLEV* with bad loans and profitability, but they are also not significant. The results suggest that the market does not view leverage to be important in determining the spread for BHC bonds during the period prior to failure.[9] However, Jagtiani *et al*. (2000) find that, under normal financial conditions, *less-capitalized* banks are penalized more than *better-capitalized* ones for each additional unit of increased risk as measured by these ratios. Our accounting risk factors overall explain about 66 percent of the variation in spread during this stress period. The results suggest that there is strong market discipline in the market for BHC bonds during the period prior to failure.

The regression in Table 4 column (1)', allows each BHC to have a different intercept capturing the effect of firm-specific variables not being explicitly included in the model. The intercept, asset size, and *DUMSUB*, which are included in column (1), are not included here to avoid multicollinearity. When individual bank variations are considered, the results remain consistent with those reported in column (1). The coefficients of *BADLOAN* and *PROFIT* remain unchanged in terms of sign and magnitude, although the significance of *PROFIT* declines from the 1 percent level to 11 percent. Overall, the general results hold that BHCs with more bad loans and BHCs that are less profitable pay a larger bond spread.

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[8] Because of the collinearity between the size and debt seniority dummies and the institution dummies, they are not simultaneously included in our estimation.
[9] This may be explained by Peek and Rosengren (1997a and 1997b), which report that several banks were classified as well-capitalized until a few quarters or even one quarter prior to failure during the New England banking crisis. In addition, for one-third of those failed banks, the leverage ratio declined by more than 5 percentage points in a single quarter, enough to wipe out the entire capital of less-capitalized banks.

The regressions in columns 2 and 3 of Table 4 show that both *MOODY* and *BOPEC*

credit ratings are significantly positive as expected. *MOODY* and *BOPEC*, along with the firm-

specific dummies, explain approximately 73 percent and 64 percent, respectively, of the

variation in spreads across firms and through time. It is interesting that, unlike in the *MOODY*

equation, only the *DUM_{NE}* variable is significant in the *BOPEC* equation, implying that

regulators' ratings capture bank-specific characteristics more completely than the ratings

assigned by credit rating agencies.

The results here are consistent with Jagtiani *et al.* (2000), which examines the pricing of

BHC bonds under normal financial conditions. Comparing these results with Jagtiani *et al.*

(2000) suggests that, at the BHC level, market discipline is strong when it is most needed; i.e.,

when the subsidiary bank is in real financial difficulties.   From Figure I, bond spreads range

widely from under 1 percent to extremely large spreads prior to failure -- just under 20 percent

for MCorp. and 30 percent for Southeast. For Bank of New England, the spread was about 70

percent two quarters prior to failure, and up to 100 percent just before its failure. In contrast,

Jagtiani *et al.* (2000) report a very small range of bond spreads (less than 1 percent) in the

normal environment.

It is obvious from Figure I that the market penalizes the banks by charging dramatically

larger spreads starting approximately five or six quarters prior to failure, particularly for Bank of

New England Corp., MCorp, and Southeast Bank Corp. The spread did not change very much

for One Bancorp, probably because its failed subsidiary bank, Maine Savings Bank, was only a

small fraction of the overall BHC (about 4 percent of the BHC's assets). In the case of

Continental Illinois Corp., the spread also did not increase much, although the failed bank was

about 65 percent of the BHC's assets. This is quite unusual, and may be explained by the fact

that the market and the credit rating agencies at that time seemed to believe that actions taken by Continental Bank's management to restructure its liabilities would resolve the bank's financial problems.[10] As shown in Figure II, the Moody's rating for Continental Illinois Corp. did not deteriorate as much as the other sampled BHCs. The rating on Continental's bonds remained at A2 until the bank actually failed, compared with Caa and Ca for other sample BHCs. In general, the credit ratings fell below investment grade around eight quarters prior to failure.

Overall, our results in this section provide important policy implications for bank supervision. First, since BHC bonds are priced according to risk, requiring banking organizations to issue debt in greater volume and frequency will likely enhance market discipline in the banking system, due to the increased oversight of bank management by concerned bondholders. Second, since spreads on BHC bonds rise sharply as the subsidiary banks' financial condition deteriorates, regulators may be able to augment supervisory information with market information on spreads on publicly traded debt issued by banking organizations.

In addition, our results in conjunction with Berger and Davies (1998) highlight the importance of market disclosure to effective market discipline. Berger and Davies (1998) find that bank examinations produce valuable private information, particularly when the examinations result in rating downgrades, suggesting that the information may reach the market through loan quality data released to the public during the examination process. Consistent with Berger and Davies (1998), our examination of the timing of published reports of negative financial information and the timing of market reaction in each of these failures further demonstrates the importance of mechanisms that ensure accurate and timely financial disclosure to effective

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[10] Continental Bank was forced to take a $61 million write-off in the third quarter of 1982 as a result of its financial relationship with Penn Square, a bank in Oklahoma, which failed on July 5, 1982. To counter the loss in investor confidence, which forced the bank out of the Fed Funds and domestic CD markets and into the Eurodollar interbank market, the bank began to downsize -- reducing its total assets by about 50 percent. As seen in the improvement in

market discipline. Specifically, we find that the change in bond spreads was preceded by disclosure of negative financial information, which occurred during the regulatory examinations in four out of five cases, with the exception of MCorp.[11]

V. Conclusions

This paper examines the pricing of bonds issued by the parent BHCs of failed banks. Our findings indicate that BHC bonds are priced according to risk in the period where the federal safety net subsidy is most critical (prior to the failure of its subsidiary bank). Bond spreads start rising as early as six quarters prior to failure, as the issuing firm's financial condition and credit rating deteriorate. While previous studies of bond spreads for healthy BHCs find spreads range several basis points across BHCs, we find that spreads for troubled banking organizations are many times those of healthy BHCs.

The results of this study concur with Jagtiani, Kaufman, and Lemieux (2000) and Flannery and Sorescu (1996), indicating that proposals that attempt to increase market discipline by increasing subordinated debt would be effective (at the BHC level). Requiring BHCs to issue publicly traded debt in greater volume and frequency will likely enhance market discipline in the banking system when it is most needed -- when a banking organization's financial condition deteriorates. Our results also highlight the importance of market disclosure in effective market discipline. Efforts to increase accurate market disclosure in a timely fashion will improve the ability of the market to correctly price bank risk and effectively enhance market discipline.

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the Moody's ratings, the market seemed to feel that these actions would take care of Contintental's financial difficulties.

[11]   Examples include disclosures of: 1) a substantial loss of $1.23 billion on the fourth quarter of 1989 for Bank of New England, 2) a substantial increase in non-performing real estate loans in April 1989 for One Bancorp, 3) an announcement of a special investigation by federal regulators for Southeast, and 4) the news of the failure of Penn Square Bank for Continental.

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Table 1
Characteristics of the Data

BHC of the Failed Bank (Failed bank)	Class of BHC Bond	Sample Period*	Fail Date
Continental Illinois Corp. (Continental Bank)	Senior Notes	1981:Q4 – 1983:Q4	5/17/1984
MCorp (M Bank)	Senior Notes	1985:Q2 – 1988:Q4	3/28/1989
Bank of New England Corp. (Bank of New England)	Subordinated Notes	1989:Q4 – 1990:Q4	1/6/1991
Southeast Banking Corp. (Southeast Bank N.A.)	Subordinated Notes	1989:Q2 – 1991:Q2	9/19/1991
One Bancorp (Maine Savings Bank)	Subordinated Notes	1989:Q1 – 1990:Q3	2/1/1991

Note: * Sample period starts from when the bond was issued and traded in the secondary market (or 12 quarters prior to failure).

Table 2
Size and Credit Ratings As of Fail Date

Bank Name	Failed Bank's Assets as % of BHCs	BHC's Assets ($Mill)	Moody's Rating on BHC Bond
Continental Bank	94.9%	42,097	A2
M Bank	39.2%	18,743*	Ca
Bank of New England	65.7%	20,434	Ca
Southeast Bank N.A.	98.0%	11,247	Caa
Maine Savings Bank	4.1%	2,189**	Ca

Note: * as of September 1988; ** as of September 1989.

Table 3
Summary of Variable Definitions

Variables	Definition
SPREAD	Bond yield minus maturity-matched Treasury rate (%)
LOGTA	Log of total on-balance-sheet assets
MKTLEV	Book value of total liabilities divided by market value of equity plus book value of perpetual preferred stock
BADLOAN	Loans past due over 90 days (accruing and non-accruing) plus OREO to total assets (%)
PROFIT	Net income to total assets (%)
MOODY	Cardinalized Moody's bond rating (larger number for poorer rating)
BOPEC	Average of the weighted-average (aging) of B, O, P, E, and C
DUMSUB	Dummy variable equals to 1 for subordinated debt, zero for senior debt
DUM_{Conti}	Dummy variable that equals 1 for Continental Illinois Corp., zero otherwise
DUM_{MCorp}	Dummy variable that equals 1 for MCorp, zero otherwise
DUM_{One}	Dummy variable that equals 1 for One Bancorp, zero otherwise
DUM_{SE}	Dummy variable that equals 1 for Southeast Banking Corp., zero otherwise
DUM_{NE}	Dummy variable that equals 1 for Bank of New England, zero otherwise

Table 4
Spread on Bonds Issued by BHCs whose Bank Subsidiary Failed
Important Factors that Determine *SPREAD* in the Period Prior to Failure

Dependent variable is ***SPREAD***. P-values are in parentheses. *** and ** denote significance at the 1 and 5 percent level respectively.

Variable	(1)	(1)'	(2)	(3)
Intercept	-322.1658*** (0.00001)			
LOGTA	17.6782*** (0.0001)			
BADLOAN	4.0076*** (0.0001)	2.7321*** (0.0038)		
MKTLEV	0.0107 (0.5259)	0.0129 (0.3974)		
PROFIT	-1.9546*** (0.0004)	-0.6775 (0.1100)		
DUMSUB	24.8696*** (0.0001)			
DUM_{MCorp}		-13.3348** (0.0440)	-17.8162** (0.0210)	-22.9837 (0.2442)
DUM_{Conti}		2.5507 (0.6878)	7.6908 (0.2677)	
DUM_{SE}		11.9194** (0.0355)	1.6996 (0.7285)	5.1278 (0.5208)
DUM_{NE}		37.5698*** (0.0001)	39.3841*** (0.0001)	42.9477*** (0.0001)
DUM_{ONE}		-12.7728** (0.0453)	-11.9285** (0.0480)	0.0869 (0.9920)
BOPEC				7.4822* (0.0890)
MOODY			4.9280*** (0.0001)	
Adjusted R^2	0.6629	0.7270	0.7311	0.6384
N	39	39	39	28

Appendix

Cardinalization Table of Moody's Rating Based on Ronn and Verma (1987)

Moody's Bond Rating	Cardinalization
Aaa	1.00
Aa1	1.66
Aa2	2.00
Aa3	2.33
A1	2.66
A2	3.00
A3	3.33
Baa1	3.66
Baa2	4.00
Baa3	4.33
Ba1	4.66
Ba2	5.00
Ba3	5.33
B1	5.66
B2	6.00
B3	6.33
Caa	7.00
Ca	8.00
C	9.00

Figure I: Monthly Bond Spreads Prior to Failure

Legend:
- Continental (5/84)
- Southeast (9/91)
- MCorp (3/89)
- Bank of NE (1/91)
- One Bancorp (2/91)

X-axis: Quarters Prior to Failure
Y-axis: Spread (%)
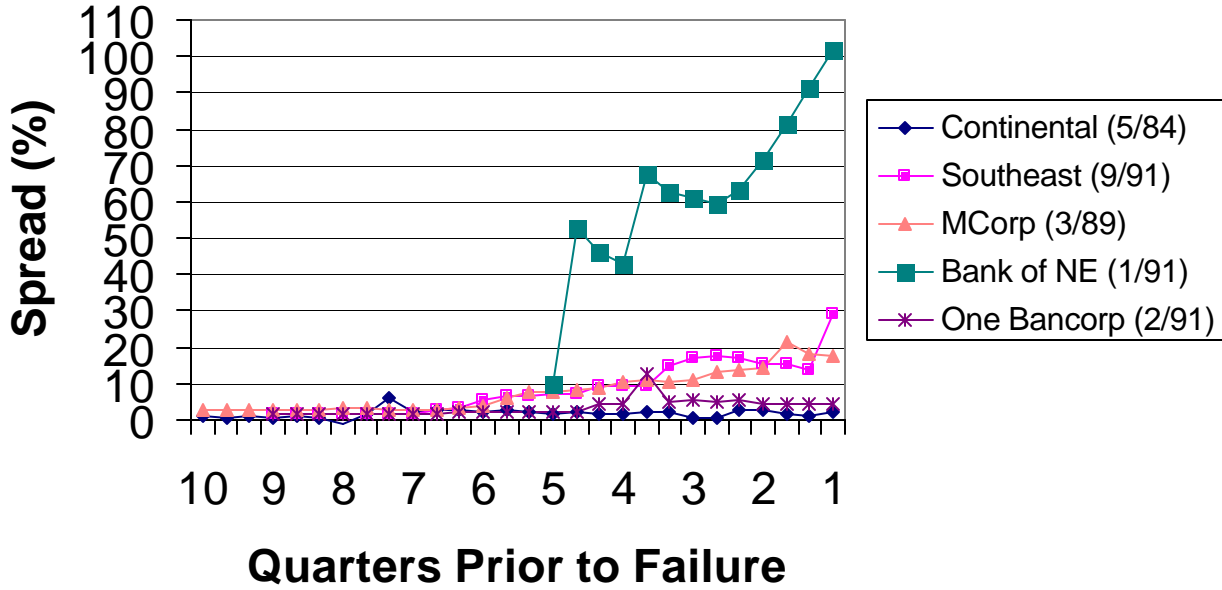
Figure II: Monthly Moody's Ratings Prior to Failure

Legend:
- Continental (5/84)
- Southeast (9/91)
- MCorp (3/89)
- Bank of NE (1/91)
- One Bancorp (2/91)

X-axis: Quarters Prior to Failure
Y-axis: Moody's Ratings (cardinalized)
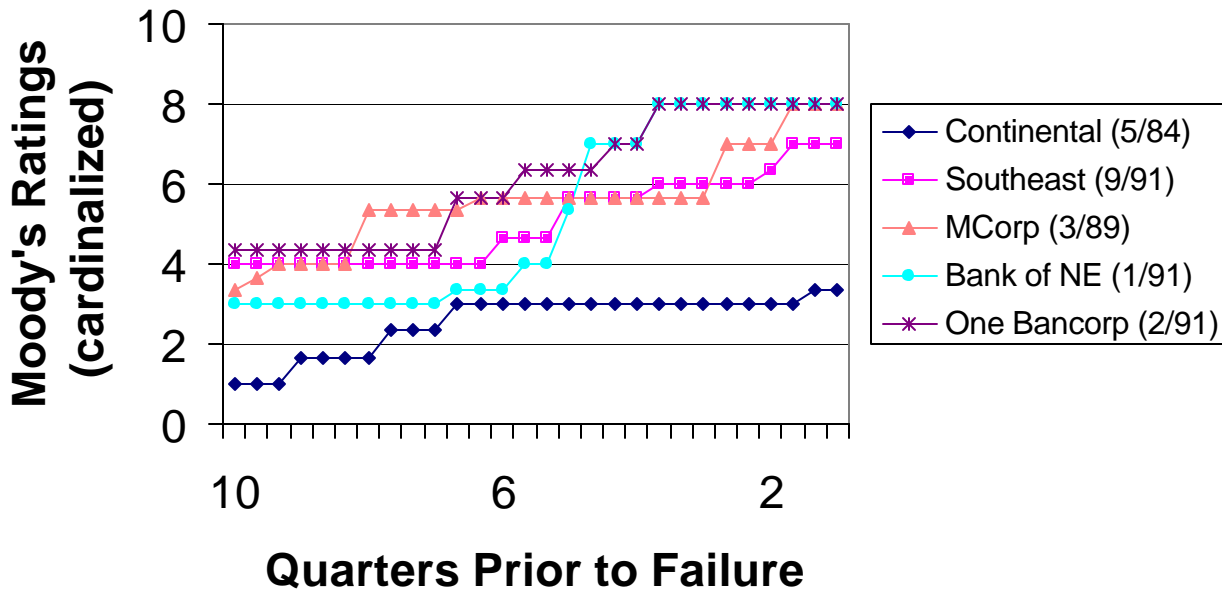
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