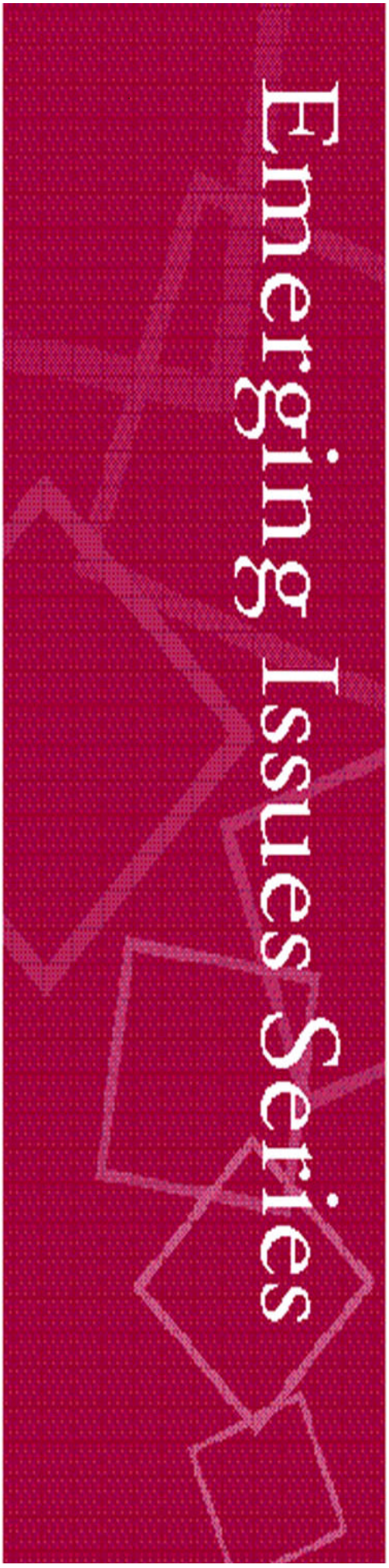

Stumbling Blocks to Increasing Market Discipline in the Banking Sector: A Note on Bond Pricing and Funding Strategy Prior to Failure

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Abstract

This paper examines pricing behavior for bonds and certificates of deposit issued by bank holding companies (BHCs) and their subsidiary banks in the period prior to failure. It is evident that strong market discipline exists in the market for BHC bonds, but there is little or no evidence of market discipline in the uninsured CD market. We also observe a significant increase in the banking firm's reliance on insured deposits as the organization's financial condition deteriorates prior to failure and following a Moody's downgrade. These results have several implications for bank supervision and regulation. First, bond spreads could potentially be useful to bank supervisors as a warning signal from the financial markets. Second, proposals to increase market discipline at the BHC level through the bond market would likely be effective. However, BHCs tend to avoid market discipline by replacing uninsured debt with insured deposits as the spreads on uninsured debt rise – thus, transferring the responsibility of disciplining the organization from the market to bank supervisors. Finally, our investigation suggests that market information such as bond spreads and changes in Moody's ratings may not add value over and above information already collected in the supervisory process.

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Stumbling Blocks to Increasing Market Discipline in the Banking Sector: A Note on Bond Pricing and Funding Strategy Prior to 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 by supervisory or legislative action. Geographic barriers and many product restrictions have been eased. Financial market globalization, product innovations, new technologies, and consolidation, along with supervisory and regulatory changes, are causing banks and bank supervisors to reconsider how they do business. Supervisors must balance their need for information with the burden their presence causes the regulated entities.

An important consideration is how to minimize regulatory burden without compromising the oversight of the safety and soundness of the organization. This objective 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 through loan covenants and 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 – thus reducing regulatory burden and the cost of supervision without compromising the safety and soundness of the banking system.

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 (1999).

However, the literature sheds little light on whether debt holders can effectively monitor banking firms during the period prior to bank failure; i.e., whether market discipline exists when it is most needed. We attempt to answer this important question by examining whether banks' and BHCs' liabilities are sensitive to the risk of the issuing organization as it approaches failure (where the federal safety net subsidy is most critical). Understanding the behavior of banks prior to failure is a critical element of maintaining the stability of the financial system.

The analysis in this paper is divided into two sub-sections. First, we examine the existence of market discipline imposed on failed banks during the period just prior to failure. Second, we examine whether the sample failed banks attempted to avoid market discipline by shifting their funding towards insured deposits. 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 bank supervision, and 3) advocate limitations on banks' organizational structure in order to contain the federal safety net subsidy.[1]

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 and results from the analysis of market discipline using the pricing of bonds issued by the parent BHCs. Section IV investigates the changes in the banking firm's sources of financing during this stress period. The analysis on certificates of deposit (CDs) issued by failed banks and the shift in their funding sources during the period just prior to failure are discussed in Section V. Section VI discusses policy implications of our results for bank supervisory process, and Section VII concludes.

II. The Data

[1] See, for example, Evanoff (1993) and Haubrich (1998).

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 bank holding companies) during the sample period. Several of the failed banks were associated with the same bank holding companies, 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. 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 during the recent quarters prior to their failure. The parent holding companies of five of these failed banks had outstanding bonds. Our final sample includes the five banks which failed during the period 1980 to 1995 whose parent holding companies had outstanding bonds as of their fail date.[2] These banks are Continental Bank, MBank, Southeast Bank N.A., Bank of New England, and Maine Savings Bank. Their parent holding companies 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 putable.[3] Bonds issued by Continental Illinois Corp. and MCorp are senior notes, and the rest are subordinated notes.

Of all the outstanding bonds issued by each of these five parent bank holding companies, we select the bond that had the most price observations. Our sample period varies, depending on when the bond was issued and the date of bank failure. For each banking organization, the sample period starts either twelve quarters prior to failure or when the bond was first traded in

[2] A portion of our analysis includes all failed banks in the sample. The results are presented in Table 6.

[3] 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.

the secondary market. All 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*.[4] The sample banks and their parent holding companies, the date of bank failure, and the sample periods are listed in Table 1.

The accounting risk characteristics used in this study are collected from the quarterly Reports of Condition and Income (Call Reports) for banks and from quarterly Y-9 Reports for bank holding companies. Moody's historical bond ratings at the end of each quarter are collected from the monthly *Moody's Bond Record*. BOPEC and CAMEL ratings (rated 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 credit rating information. For bank holding companies, 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 (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. Because of these limitations, our sample observations are significantly reduced in the analysis that involves insured deposits, bad loans, or BOPEC/CAMEL ratings.

Market capitalization for bank holding companies is calculated from the *Standard and Poor's Stock Guide*. Interest rates on certificates of deposit issued by the sample banks prior to failure are collected from *Bank Rate Monitor*. These are weekly averages of 6-month CD rates for those CDs issued in the last week of the quarter. These CD rates are not available for two

[4] It is unlikely, but possible, that some parent holding companies of other failed banks may also have had outstanding bonds that meet the requirements to be included in this study. However,

banks in our sample: Southeast Bank and Maine Savings Bank. Historical Treasury yields, which are used in calculating interest rate spreads, are collected from Bloomberg Data Services and from the Federal Reserve Statistical Release H.15 Selected Interest Rates.

Total consolidated asset size, size of the failed banks (as a porportion of BHCs' assets), and the Moody's rating prior to failure are listed in Table 2. 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. Pricing Behavior of Bonds Issued by Parent Bank Holding Companies Prior to Failure of the Subsidiary Banks

Since the critical time when market discipline is most needed is the period prior to failure, we focus our analysis on the bond pricing behavior during the twelve quarters prior to failure of the subsidiary banks. We examine whether the bonds issued by BHCs are priced according to risk and how the pricing behavior changes as failure approaches. This may be considered an extension of two earlier studies by Jagtiani, Kaufman, and Lemieux (1999) and Flannery and Sorescu (1996). Jagtiani, Kaufman, and Lemieux (1999) examine the pricing of bonds issued by 39 large BHCs during the period 1992 to 1997 (post-FDICIA period). Flannery and Sorescu (1996) examine pricing behavior of BHC bonds during the pre-FDICIA period. 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.

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their prices are not recorded in Moody's Bond Record or Standard and Poor's Bond Guide or the Bloomberg Data Services.

We examine the relationship between bond spreads and the risk characteristics of the issuing BHCs. Six different credit risk measures are specified in the model: 1) the issuer's ratio of bad loans to total assets; 2) return on assets; 3) percent of insured to total deposits; 4) the issuer's leverage ratio; 5) bank regulators' ratings; and 6) Moody's bond rating. In addition, a number of control variables are specified in the model. The control variables include asset size, a dummy variable that differentiates senior debt from subordinated debt, and bank dummies 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.

$$SPREAD_{it} = a + ß_1 LOGTA_{it} + ß_2 MKTLEV_{i_t} + ß_3 BADLOAN_{it} + ß_4 ROA_{it} + ß_5 DUMSUB_i \quad (1)$$

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

$$SPREAD_{it} = d_1 BOPEC_{it} + d_2 DUM_{Conti} + d_3 DUM_{SE} + d_4 DUM_{NE} + d_5 DUM_{One} + d_6 DUM_{MCorp} e_{it} \quad (3)$$

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

[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 (1999) 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.

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 straight-line extrapolation from quarter-end market yields reported by Bloomberg for 3, 6, and 9-month and 1, 2, and 3-year Treasury securities. Historical rates on Treasury securities are taken from the Federal Reserve Statistical Release H.15 Selected Interest Rates when not available from the Bloomberg.

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). ***BADLOAN*** includes loans past due over ninety days that may be accruing or non-accruing. The larger the bad loan 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 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 ratio of the book value of total liabilities to the market value of the BHC's common stock plus the book value of its perpetual preferred stocks. This is also the definition used in Jagtiani, Kaufman, and Lemieux (1999) and Flannery and Sorescu (1996). The higher the leverage is, the more likely bondholders will incur losses, and the larger the bond spreads. Therefore, 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 as shown in 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, for example, June 1987 for Mcorp. These ratings are not available for Continental, which failed in 1984. The BOPEC rating for Bank of New England was available from December 1987.[7] Continental is dropped from the sample in our analysis when BOPEC/CAMEL ratings are included.

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 firm's creditworthiness. Jagtiani, Kaufman, and Lemieux (1999) 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.

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, $\boldsymbol{DUM_{Conti}}$, $\boldsymbol{DUM_{SE}}$, $\boldsymbol{DUM_{NE}}$, $\boldsymbol{DUM_{MCorp}}$, and $\boldsymbol{DUM_{One}}$ are bank dummies, which take the value of one for Continental Illinois Corp., Southeast Bank Corp., Bank of New England Corp., MCorp, and One Bancorp, respectively, and zero otherwise. As mentioned earlier, these bank dummies are included to capture the fixed-effect when ***LOGTA*** and ***DUMSUB*** are not in the model. The empirical results are presented in Table 4 and in Figures I and II.[8]

From Table 4 (column 1), estimated based on equation (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 also significantly positive as expected, indicating that subordinated notes are subject to a larger risk premium than senior notes. The 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.[9] The results suggest that the market does not view leverage to be important in determining the spread required to hold bonds issued by BHCs during the period prior to failure of the subsidiary bank. This is consistent with Peek and Rosengren (1997a and 1997b).[10] 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'), estimated based on equation (1)', uses a model that allows each BHC to have a different intercept capturing the effect of firm-specific variables not being included in the model. The intercept, asset size, and ***DUMSUB***, which are included in column 1 are not included here to avoid multicolinearity. 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. 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 (2),

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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] However, Jagtiani, Kaufman, and Lemieux (1999) 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.

[10] Peek and Rosengren (1997a and 1997b) report that several banks were classified as well-capitalized by bank regulators until a few quarters or even one quarter prior to failure during the New England banking crisis. They also find that 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 any bank below the well-capitalized threshold.

in the ***BOPEC*** equation (3), only the $\boldsymbol{DUM_{NE}}$ variable is significant, implying that regulators' ratings capture a bank's firm-specific characteristics more completely than the ratings assigned by credit rating agencies. Again, market discipline exists during this most critical period.

The results here are consistent with our earlier work (Jagtiani, Kaufman, and Lemieux 1999), which examines the pricing of BHC bonds under normal financial conditions. Comparing these results with Jagtiani, Kaufman, and Lemieux (1999) shows that, at the BHC level, market discipline is stronger 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, Kaufman, and Lemieux (1999) 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 failures, 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), as reported in Table 2. 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.[11] As shown in Figure II, the Moody's rating for Continental

[11] 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

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. Overall, the credit ratings fell below investment grade around eight quarters prior to failure.

Our results in this section provide two 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 health deteriorates, regulators may be able to augment supervisory information with market information on spreads on publicly traded debt issued by banking organizations. Whether or not this market information adds to information already collected in the supervisory process is discussed in further detail in Section VI.

IV. Changes in Funding Sources During the Period Prior to Failure of the Subsidiary Banks

The previous section demonstrates that market discipline exists. This section examines whether the banking firms can avoid market discipline by shifting their funding sources when their credit ratings deteriorate prior to failure. As mentioned earlier, we are subject to data limitations in that the information on insured deposits was reported only annually until mid-1986. Therefore, our measure of ***INSURED*** for Continental (failed in 1984) and MCorp (failed

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

in March 1989) was obtained through a straight-line extrapolation of existing data for the missing quarters when possible.

Figures III to VII plot the changes in Moody's bond rating (***MOODY***), percent of deposits that are insured (***INSURED***) in the entire banking organization, and percent of assets funded with subordinated debt (***SUBDEBT***) for Continental Illinois Corp., Southeast Bank Corp., Bank of New England Corp., MCorp, and One Bancorp, respectively. It is evident from these figures that these banking firms shifted their funding sources towards insured deposits as their credit ratings deteriorated prior to failure. Both their Moody's rating and their reliance on insured deposits start rising as early as eight to ten quarters prior to failure.

The proportion of insured deposits rises to approximately 80 percent or more for all the sampled BHCs. In the case of One Bancorp, its insured deposit ratio was over 95 percent around eight quarters prior to the failure of its bank subsidiary, Maine Savings Bank, in 1991. Subsequently, its two other bank subsidiaries failed -- Southstate Bank for Saving in 1992 and Bank of Hartford in 1994. The rise in insured deposits in this case seems to reflect One Bancorp's attempt to avoid market discipline by increasing reliance on insured deposits as several of its bank subsidiaries were facing financial difficulties.

In addition to the graphic presentation, we also examine this shift in funding behavior in a regression analysis, as shown in equations (4) and (5) below. The results are reported in Table 5.

$$?INSURED = ?_1(?2MOODY) + ?_2 DUM_{Conti} + ?_3 DUM_{SE} + ?_4 DUM_{NE} + ?_5 DUM_{One} + ?_6 DUM_{MCorp} + e_{i,t} \quad \textbf{(4)}$$

$$INSURED_{i,t} = a + ?_1 QUARTER_{i,t} + ?_2 DUM_{Conti} + ?_3 DUM_{SE} + ?_4 DUM_{NE} + ?_5 DUM_{One} + ?_6 DUM_{MCorp} + e_{i,t} \quad \textbf{(5)}$$

where:

INSURED is the percentage of insured deposits to total deposits;

QUARTER is the number of quarters prior to the fail date;

? INSURED is the change in ***INSURED*** from the previous quarter (***INSURED*** $_t$ minus ***INSURED*** $_{t-1}$);

? 2 MOODY is the change in the Moody's rating between the previous two quarters and the previous quarter (***MOODY*** $_{t-1}$ minus ***MOODY*** $_{t-2}$).

From Table 5 (Column 1), the coefficient of ***? 2 MOODY*** is significantly positive, indicating that a Moody's downgrade causes banking firms to increase their portion of insured deposit funding in the next quarter. Changes in Moody's bond rating along with the firm-specific dummies explain approximately 93 percent of the variation in changes in insured deposit funding.[12] From column 2, the coefficient of ***QUARTER*** is significantly negative, indicating that our sampled failed banks increased their reliance on insured deposits as they approached failure. The results are consistent with our earlier findings that these failed banks tend to shift their funding towards insured deposits to take advantage of the federal safety net prior to failure.

To summarize, we find that a Moody's downgrade of BHC bonds causes the BHC's subsidiary banks to increase their reliance on insured deposits as a source of funding in order to avoid being penalized by the market (as the price of uninsured funds rises). Our results concur with those of Billet, Garfinkel, and O'Neal (1998), suggesting that the federal safety net subsidy may be maximized by the banking firms through their increased use of insured deposits as their financial condition deteriorates. These results also provide important implications for bank supervision and regulation. Bank supervisors can minimize this risk in several ways -- for example, by limiting the amount of time available for the funding shift, by restricting access to insured deposit funding by monitoring interest rates paid on insured funds, or by limiting risky

[12] Our analysis suggest that there is no auto-correlation problem in our data. The results remain unchanged when the White's correction for auto-correlation was performed.

activities undertaken by insured institutions.[13] It is important to note that these results indicate that insured deposit funding at the bank may be used to replace uninsured funding at the consolidated BHCs.

V. Examination of Pricing of CDs Issued by the Failed Banks and the Shift in Their Funding Sources Prior to Failure

We would ideally like to examine the pricing of publicly traded bonds issued by our sample of failed banks in the quarters prior to failure. Because this data is not available, our analysis focuses on the spreads on certificates of deposit (rather than bond spreads) issued by the sample banks. Two sets of CD rates are used – 1) CD rates reported in the weekly publication *Bank Rate Monitor*, and 2) imputed CD rates calculated from the bank's quarterly Call Report data. The rates reported by *Bank Rate Monitor* have the advantage of listing a specific maturity, but they are rates on regular, fixed-rate CDs (not uninsured). The rates calculated from the Call Report data are based on uninsured CDs (those more than $100,000), but they do not have a specific associated maturity reported. The spreads for these uninsured CDs are calculated under the assumption that the average maturity is 6 months; thus, 6-month Treasury rates are used in the spread calculation.

From Figure VIII, spreads on insured CDs (as reported in *Bank Rate Monitor*) fluctuate with no clear pattern as the fail date approaches. Some of these CD rates are below the matching Treasury rates (negative spreads) even one quarter prior to failure (for Continental Bank). The results suggest that market discipline does not exist in the market for certificates of deposit. This is not surprising because of the federal deposit guarantee provided to insured depositors.

[13] Many of these restrictions are incorporated in the discretionary and mandatory provisions under Prompt Corrective Action.

Figure IX attempts to investigate the spreads on uninsured CDs. Although they are not explicitly insured by the FDIC, the market may perceive the FDIC insurance to be extended to cover uninsured CDs as well. These uninsured CD rates are defined as the percentage of interest expenses on CDs larger than $100,000 to total outstanding jumbo CDs at the end of quarter.[14] We observe no clear pattern of rising uninsured CD spreads as the fail date approaches. The spreads rise as the fail date approaches for Bank of New England and Maine Savings Bank. However, the spreads decline sharply for Continental Bank and decline slightly for Southeast Bank and MBank as the fail date approaches. It is not clear that market discipline exists in the market for uninsured CDs. Uninsured CDs may be perceived by the market to be implicitly protected by the federal safety net. It should be noted, however, that our conclusion here is based on data for banks that failed prior to FDICIA (December 1991). FDICIA made significant changes in the supervision and resolution of problem banking organizations, and may have changed the market's perception of the extension of the federal safety net.[15]

For a rigorous testing, we expand our analysis to include all the failed banks whether or not they or their holding companies may have had outstanding bonds. Specifically, our sample for this section of the study includes other 166 commercial banks (with no outstanding bonds), which were larger than $1 million as of failure and failed during the period 1985 to 1994.[16] We investigate the changes in their funding strategy for the period between twelve quarters prior to

[14] The quarterly interest expenses are annualized prior to subtracting the matching Treasury rates.

[15] Baer and Brewer (1986) and Hannan and Hanweck (1988) find market discipline exists for uninsured deposits during the normal environment. Their data is also for the pre-FDICIA period. The measure of uninsured CD rates used in Baer and Brewer is the same measure as thst being used in this paper (based on the quarterly Call Report).

[16] Of these 166 failed banks with more than $100 million in total assets, 151 of them (93 percent) are smaller than $2 billion in assets, and all of them are smaller than $15 billion. While there are total of 1,270 commercial banks that failed during the period 1985-1994, we exclude those small community banks smaller than $100 million in our extension since they tend to rely on insured deposits regardless of whether or not they approach failure.

failure and the fail date. We estimate the model, as written in equation (6), using a time-series cross-sectional regression analysis.

$$INSURED_{i,t} = a + ?_1 LOGTA_{i,t} + ?_2 DUMQ1_{i,t} + ?_3 DUMQ2_{i,t} + ?_4 DUMQ3_{i,t} + ?_5 DUMQ4_{i,t} + ?_6 DUMQ5_{i,t} + ?_7 DUMQ6_{i,t} + ?_8 DUMQ7_{i,t} + ?_9 DUMQ8_{i,t} + ?_{10} DUMQ9_{i,t} + ?_{11} DUMQ10_{i,t} + ?_{12} DUMQ11_{i,t} + e_{i,t} \quad (6)$$

The explanatory variables include log of total asset size (***LOGTA***) and eleven dummy variables representing the number of quarters prior to failure, where:

DUMQ1 is a dummy equal to 1 for the period one quarter prior to failure and zero otherwise; ***DUMQ2*** is equal to 1 for the period two quarters prior to failure, and zero otherwise; ….. ***DUMQ11*** is equal to 1 for the period eleven quarters prior to failure, and zero otherwise. All the eleven dummy variables take the value of zero in the period twelve quarters prior to failure. The results, presented in Table 6, indicate that the coefficients of ***DUMQ1***, ***DUMQ2***, ***DUMQ3***, ***DUMQ4***, ***DUMQ5***, and ***DUMQ6*** are significantly positive, while the coefficients of ***DUMQ7*** to ***DUMQ11*** are not significant. In addition, the magnitude of the coefficients seem to increase continuously from ***DUMQ6*** to ***DUMQ2***, indicating larger coefficients as the failure approaches. Thus, the overall results suggest that the sample failed banks started increasing their insured deposits funding around six quarters prior to failure, and that their reliance on insured deposits continued to rise and started to flatten out at around two quarters prior to failure. The results, again, confirm our earlier findings regarding the attempts by failed banks to rely more on insured deposits as a funding source as they approach failure as a way to avoid market discipline.

VI. Did the Market (Bondholders) Know More Than Bank Regulators Prior to Failure?

Our results reported in the previous sections indicate that market information (i.e. bond spreads and Moody's ratings) about the trouble banking institutions was conveyed approximately

six quarters prior to failure. The results imply that regulators may be able to augment market information in the supervisory process. However, it is arguable that this information may not add value to the supervisory process if bank regulators have already obtained the information prior to it being conveyed through the market in terms of changes in bond spreads and credit ratings. Our discussion in this section aims to shed some light on this important issue.

It should be pointed out here that regulators' knowledge is not necessarily completely embodied in the BOPEC ratings. As a bank's condition deteriorates, regulators tend to focus on capital levels, loan losses, and management oversight, rather than revising the BOPEC ratings. We investigate regulators' action prior to the failure, particularly to see whether these actions were taken prior to the changes in bond spread or Moody's ratings. Each of the five BHCs in our analysis is disussed below:

Continental Illinois (failed in May 1984): Problems became evident in July 1982, when news of the failure of Penn Square Bank broke, and nonperforming assets increased sharply. Moody's downgraded Continental's unsecured long-term debt to Aa3 in July 1982. Prior to that, an examination of the Continental Corp. conducted in April 1982 by the OCC exposed the weakened condition of the BHC, and the subsequent report outlined the areas needing improvement and proposed a program of enhanced supervisory oversight. This three-month lag between market reaction and regulator reaction implies that regulator had superior information than the market. In addition, Continental's bond spreads did not respond strongly to the deteriorating condition, and Moody's also responded slowly to the developing situation.[17]

Bank of New England (failed in January 1991): The bank's troubles became obvious to the market in November 1989 (about five quarters prior to failure) when it announced a

[17] Moody's later downgraded Continental's unsecured long-term debt again to A2 in October of 1982; and to A3 in February 1984. The ratings never reached those typical of a failing institution (i.e., Caa or Ca).

"substantial" loss in the fourth quarter. Bond spreads also started to rise sharply. The Federal Reserve and the OCC responded to the news by conducting a joint special examination on liquidity, capital position and credit quality in December 1989. The examination resulted in a consent order between the BHC and the federal regulators to develop a plan to get the BHC back on track. Moody's also started to downgrade Bank of New England's subordinated debt around the same time (in December 1989).[18] In this case, both market information and supervisory information seem to be equally timely.[19]

One Bancorp (failed in February 1991): Problems started in April 1989 when a "substantial increase" in nonperforming real estate loans was reported. The examination conducted by the FDIC in June 1989 (slightly more than six quarters prior to failure) resulted in the filing of a Cease and Desist order on the basis of poor asset quality, excessive concentration of real estate development credits, inadequate equity capital, and other violations in January 1990. Moody's also responded promptly to the news of initial problems in April 1989 by downgrading One Bancorp's subordinated debt to B1. However, Moody's was slow in its subsequent downgrades and did not downgrade to Ca until after One Bancorp publicly announced the orders handed down by the FDIC. In addition, there was no strong reaction from bondholders, thus, keeping the spreads relatively flat until failure. This presents another example of superior supervisory information compared to market.

Southeast Bank Corp. (failed in September 1991): In this case, regulator information is clearly superior to market information. The problem became known because the federal

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[18] Moody's downdraded the bank's subordinated debt to Ba3 in December 1989; to Caa in January 1990; and finally to Ca in April 1990.

[19] Randall (1993) documents that the seriousness of the problems at New England banks "became apparent to supervisors only gradually…. There were numerous instances of two- or

regulators announced a special investigation into the bank's credit quality in March 1990. Later, the bank's own action to cut its quarterly dividend in June 1990 aggravated the situation. Moody's downgraded Southeast's subordinated debt promptly in March 1990 (six quarters prior to failure) and again in June 1990. In July 1990, regulators (the OCC and the Federal Reserve Bank of Atlanta) negotiated an agreement with Southeast to boost its capital and strengthen its credit-related policies. This action by regulators (slightly less restrictive than a cease and desist order) took place about five quarters prior to failure. Moody's, however, was slow in their subsequent downgrades, and failed to downgrade Southeast's debt to Caa until April 1991 (less than two quarters before failure), and never downgraded it to Ca.

MCorp (failed in March 1989): MCorp's difficulties first became public in January 1986, when bad loans linked to the energy sector doubled in the fourth quarter of 1985. Unlike the other four cases, where regulators intervened promptly when the first warning signs became public, in this case the federal regulators did not take aggressive supervisory action. The market, on the other hand, acted much more promptly. MCorp's debt was downgraded by Moody's to below-investment grade approximately eight quarters prior to failure, and bond spreads started to shoot up between five and six quarters prior to failure.[20]

Overall, our investigation of the warning signs that led to the failures of the five BHCs under study suggests that market information, such as changes in bond spreads and credit rating by rating agencies, do not seem to add value over and above information already collected in the supervisory process. The federal regulators intervened in an attempt to prevent failure prior to the ratings agencies severely downgraded the institutions' debt in four of the five cases (Mcorp

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three-step drops in bank ratings, and infrequent examinations appear to have contributed to this to some extent."

[20] Moody's did not downgrade MCorp to Caa until July 1988 (less than three quarters prior to failure) since the agency believed that MCorp provided debtholders with numerous protection including adequate capitalization and a well-structured funding base.

was an exception). In two out of five cases, bond spreads did not respond strongly to bad news, and the spreads stayed flat until failure for Continental and One Bancorp.

VII. Conclusions

Our analysis of the pricing of bonds issued by the parent BHCs of failed banks suggests 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. The results of this study concur with Jagtiani, Kaufman, and Lemieux (1999) 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 debt in greater volume and frequency will likely enhance market discipline in the banking system when it is most needed.

However, our results also indicate that any discipline applied by debt holders will be limited by the banking organization's access to insured deposits. These sample failed banks start increasing their reliance on insured deposits approximately six quarters prior to failure, as their financial condition and credit rating deteriorated. These results hold at both the bank and the BHC level. The increased proportion of insured deposit funding of the failing banks represents an increased liability to the FDIC insurance fund. Therefore, the responsibility for "discipline" is transferred from the market to bank supervisors when a banking organization's financial condition deteriorates.

Further, these results indicate that proposals advocating increased market discipline must consider how to limit the replacement of market funding with insured funding as an organization's financial condition deteriorates. Regulations that limit the amount of time

available for the funding shift, restrict access to insured deposit funding by monitoring interest rate offered to insured depositors, or limit risky activities will enhance the ability of proposals that advocate issuing debt in greater volume and frequency to increase market discipline.

Again, the results indicate that the market price of debt is related to the financial condition of the issuer, and that credit rating agencies recognize the deteriorating financial condition as early as six quarters prior to failure. While previous studies of bond spreads for healthy BHCs find spreads range of several basis points across BHCs, we find that spreads for troubled banking organizations are many times those of healthy BHCs. However, this market information may not add value over and above information already collected in the supervisory process.

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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 (%)
INSURED	Insured deposits to total deposits (%)
LAG(INSURED)	Insured deposits to total deposits in the previous quarter (%)
MOODY	Cardinalized Moody's bond rating (larger number for poorer rating)
LAG(MOODY)	Cardinalized Moody's bond rating in the previous quarter
BOPEC	Average of the weighted-average (aging) of B, O, P, E, and C
CAMEL	Average of the weighted-average (aging) of C, A, M, E, and L
DUMSUB	Dummy variable equals to 1 for subordinated debt, zero for senior debt
SUBDEBT	Total subordinated debt outstanding to total assets (%)
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**

Table 5
Increased Reliance on Insured Deposits Following Moody's Downgrade And As the Fail Date Approaches

Results are based on equations (4) and (5). Dependent variable in equation (4) is ***? INSURED,*** which is the change in proportion of insured deposits from the previous quarter, and defined as $INSURED_t$ minus $INSURED_{t-1}$. The variable ***? 2 MOODY*** is the change in the Moody's rating between the previous two quarters and the previous quarter, and defined as $MOODY_{t-1}$ minus $MOODY_{t-2}$. P-values are in parentheses. *** , **, and * denote significance at the 1, 5, and 10 percent, respectively.

	Dependent Variable= *? (INSURED)*	**Dependent Variable =*INSURED***
	Equation (4)	**Equation (5)**
? 2 (MOODY)	***0.6279*** ***(0.0145)***	
QUARTER		***-0.5939*** ***(0.0019)***
DUM_{Conti}	***5.8575*** ***(0.0001)***	***-9.0943*** ***(0.0001)***
DUM_{SE}	***1.9054*** ***(0.0001)***	***-3.8206*** ***(0.0077)***
DUM_{NE}	***1.0957**** ***(0.0772)***	***3.8281**** ***(0.0529)***
DUM_{ONE}	***-0.1719*** ***(0.5441)***	***17.0576*** ***(0.0001)***
DUM_{Mcorp}	***-0.2133*** ***(0.2518)***	***82.8892*** ***(0.0001)***
Adjusted R^2 **(N)**	**0.9351** **(N=24)**	**0.9171** **(N=33)**

Table 6
Increased Reliance on Insured Deposits As Fail Date Approaches
All 166 Commercial Banks That Failed in 1985-1994

Results are based on equation (6). Dependent variable ***INSURED***. P-values are in parentheses. *** , **, and * denote significance at the 1, 5, and 10 percent, respectively. Total number of observation used in the estimation is 678 observations. The measure of fit, Schwartz's Bayesian Criterion, is -2618.46.

$$INSURED_{i,t} = a + ?_1 LOGTA_{i,t} + ?_2 DUMQ1_{i,t} + ?_3 DUMQ2_{i,t} + ?_4 DUMQ3_{i,t} + ?_5 DUMQ4_{i,t} + ?_6 DUMQ5_{i,t} + ?_7 DUMQ6_{i,t} + ?_8 DUMQ7_{i,t} + ?_9 DUMQ8_{i,t} + ?_{10} DUMQ9_{i,t} + ?_{11} DUMQ10_{i,t} + ?_{12} DUMQ11_{i,t} + e_{i,t} \quad (6)$$

Variables	Coefficient	P-Value
Intercept	140.445***	0.0001
LOGTA	-4.864***	0.0001
DUMQ1	11.018***	0.0001
DUMQ2	12.343***	0.0001
DUMQ3	7.269***	0.0070
DUMQ4	7.682***	0.0064
DUMQ5	5.319**	0.0413
DUMQ6	5.914*	0.0531
DUMQ7	2.658	0.3306
DUMQ8	3.985	0.2134
DUMQ9	-1.033	0.7037
DUMQ10	4.596	0.1382
DUMQ11	-2.483	0.3974

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

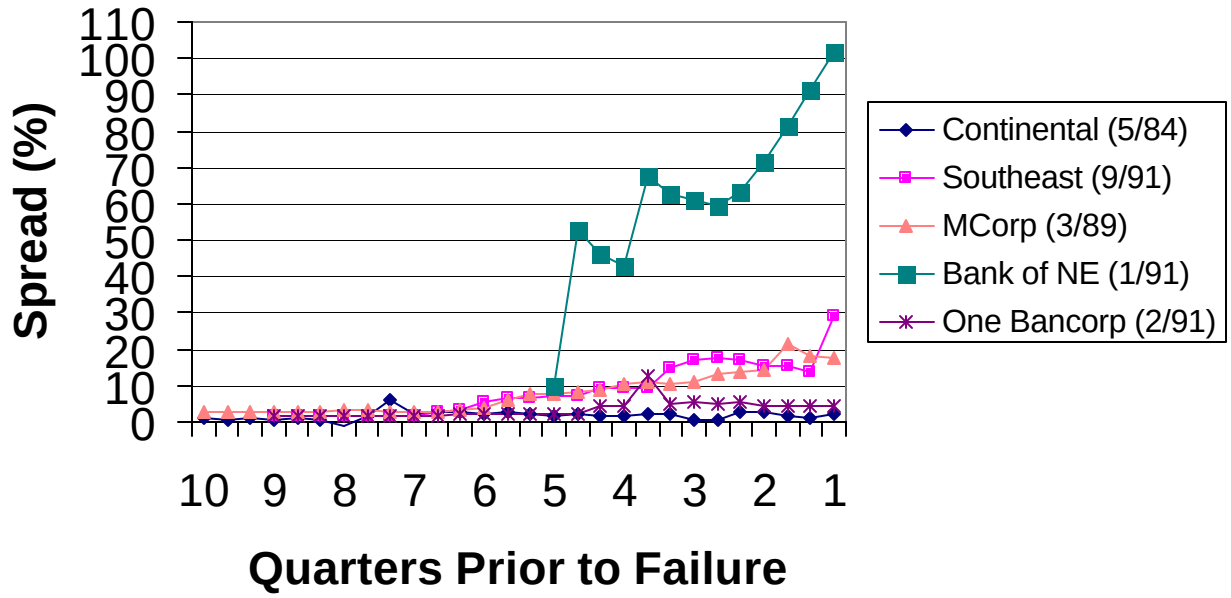


Figure II: Monthly Moody's Ratings Prior to Failure

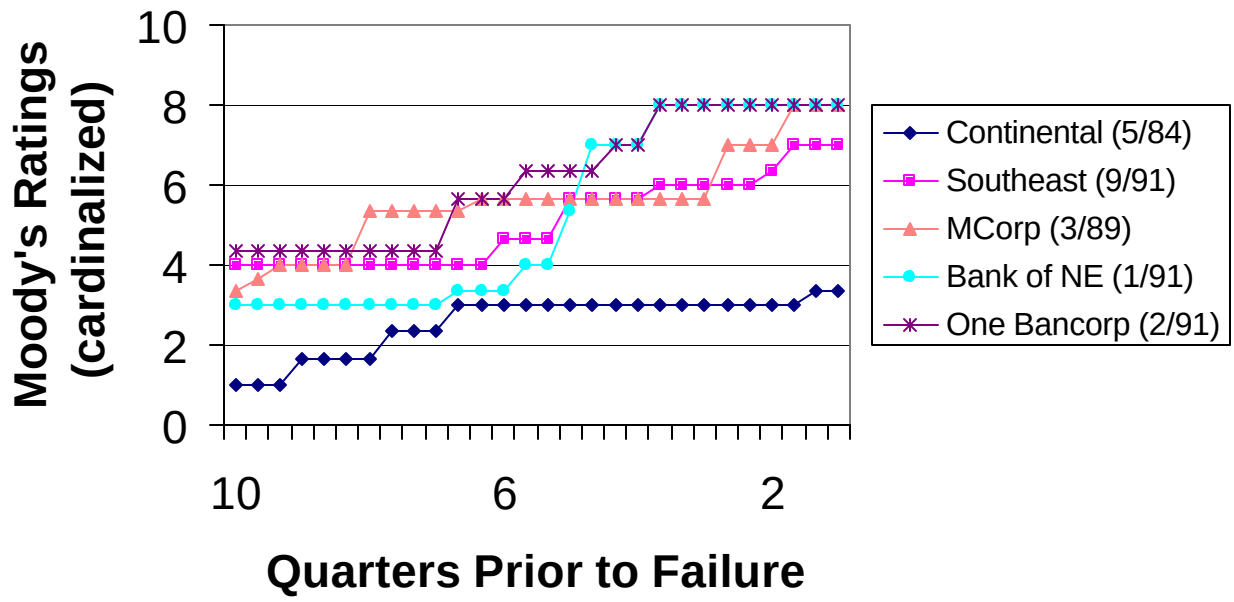


Figure III: Continental Illinois Corp (Fail Date 5/84)
Moody's Ratings and Funding Sources Prior to Failure

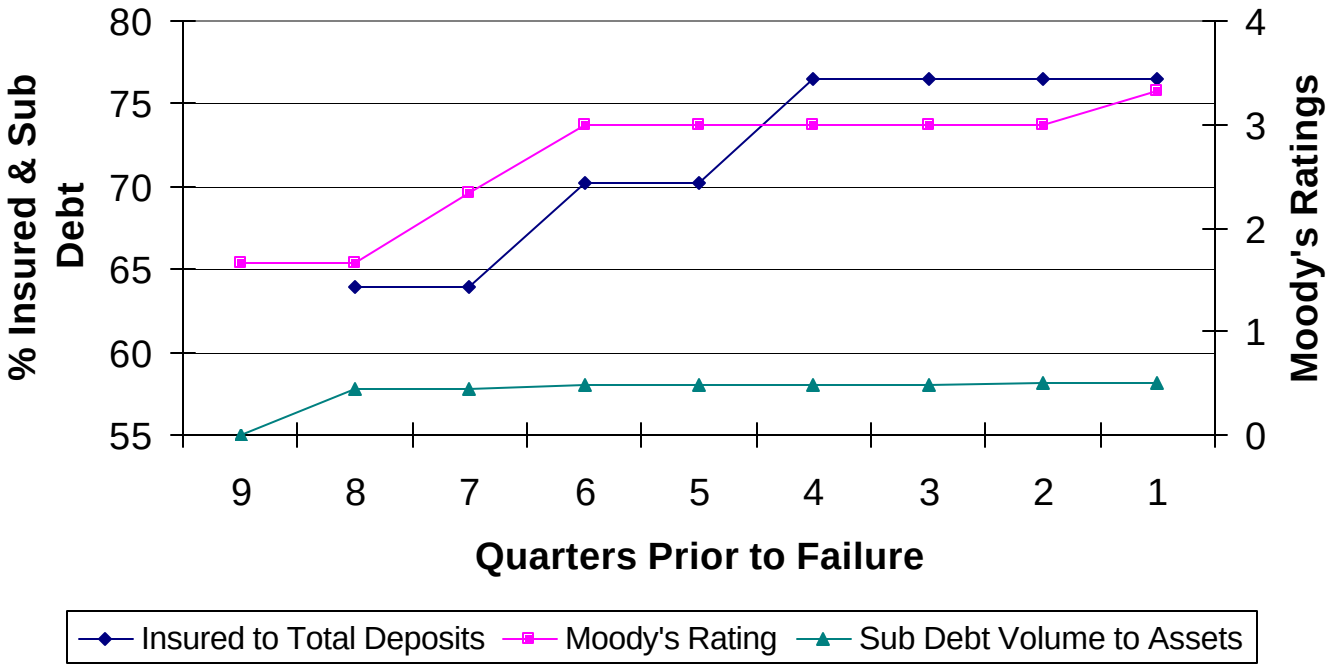


Figure IV: Southeast Banking Corp (Fail Date 9/91)
Moody's Ratings and Funding Sources Prior to Failure

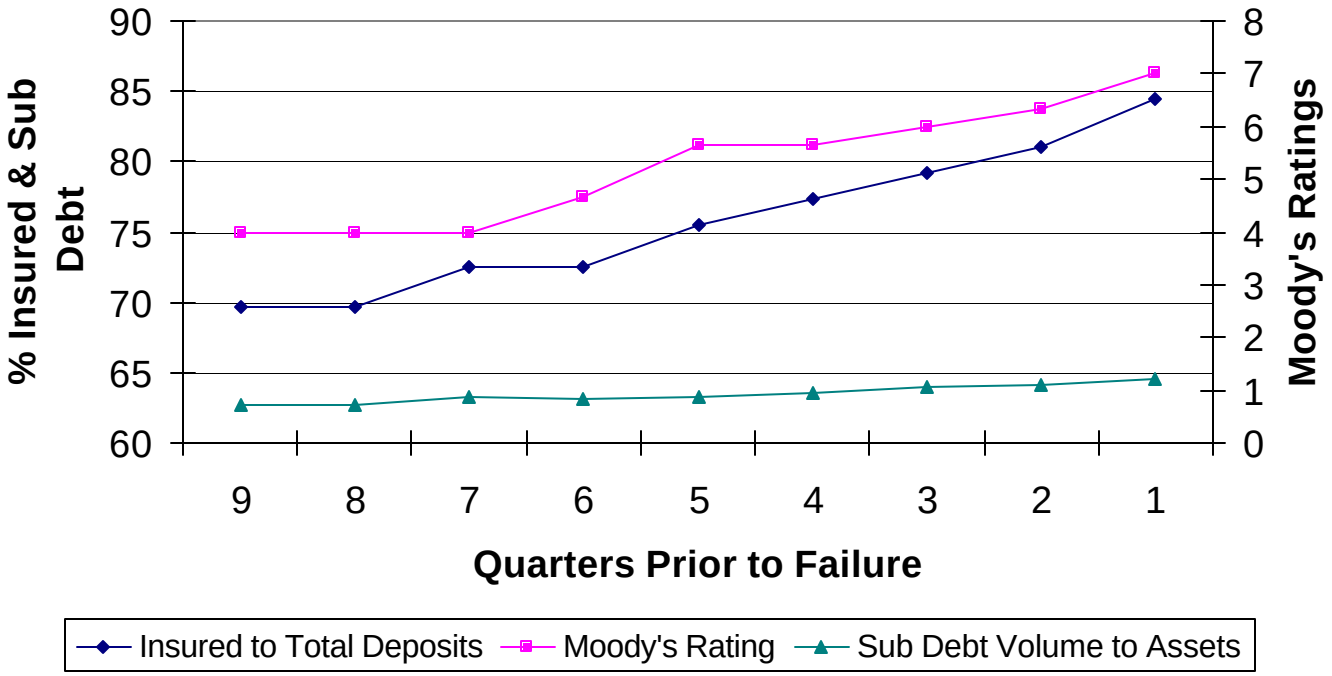


Figure V: Bank of New England (Fail Date 1/91)
Moody's Ratings and Funding Sources Prior to Failure

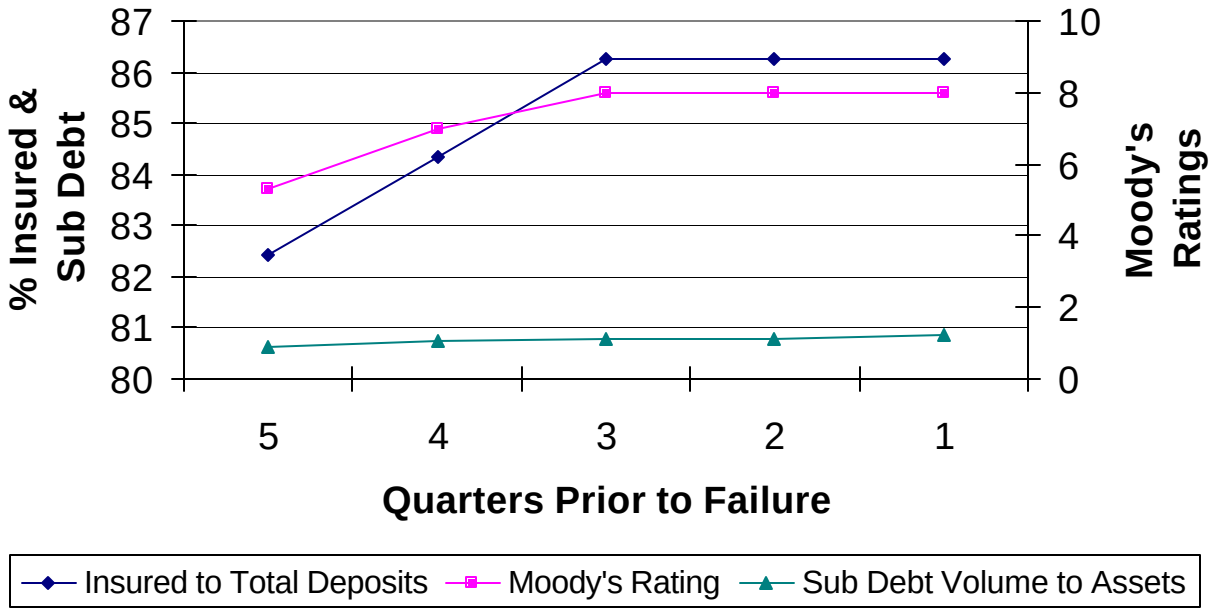


Figure VI: MCorp (Fail Date 3/89)
Moody's Ratings and Funding Sources Prior to Failure

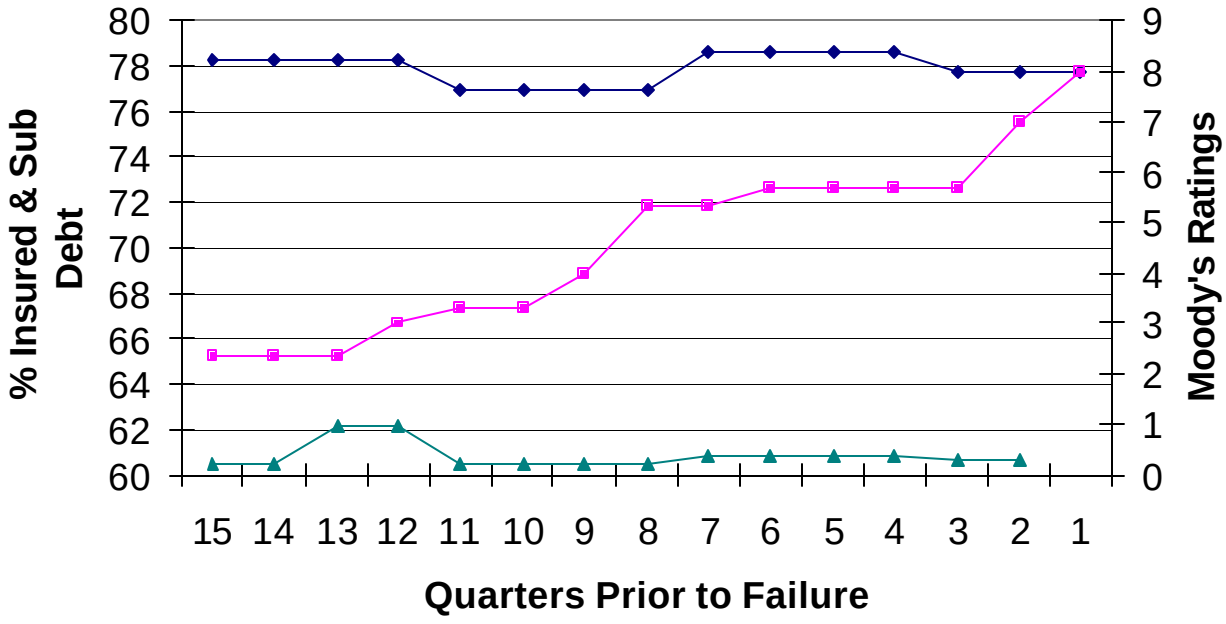


Figure VII: One Bancorp (Fail Date 2/91)
Moody's Ratings and Funding Sources Prior to Failure

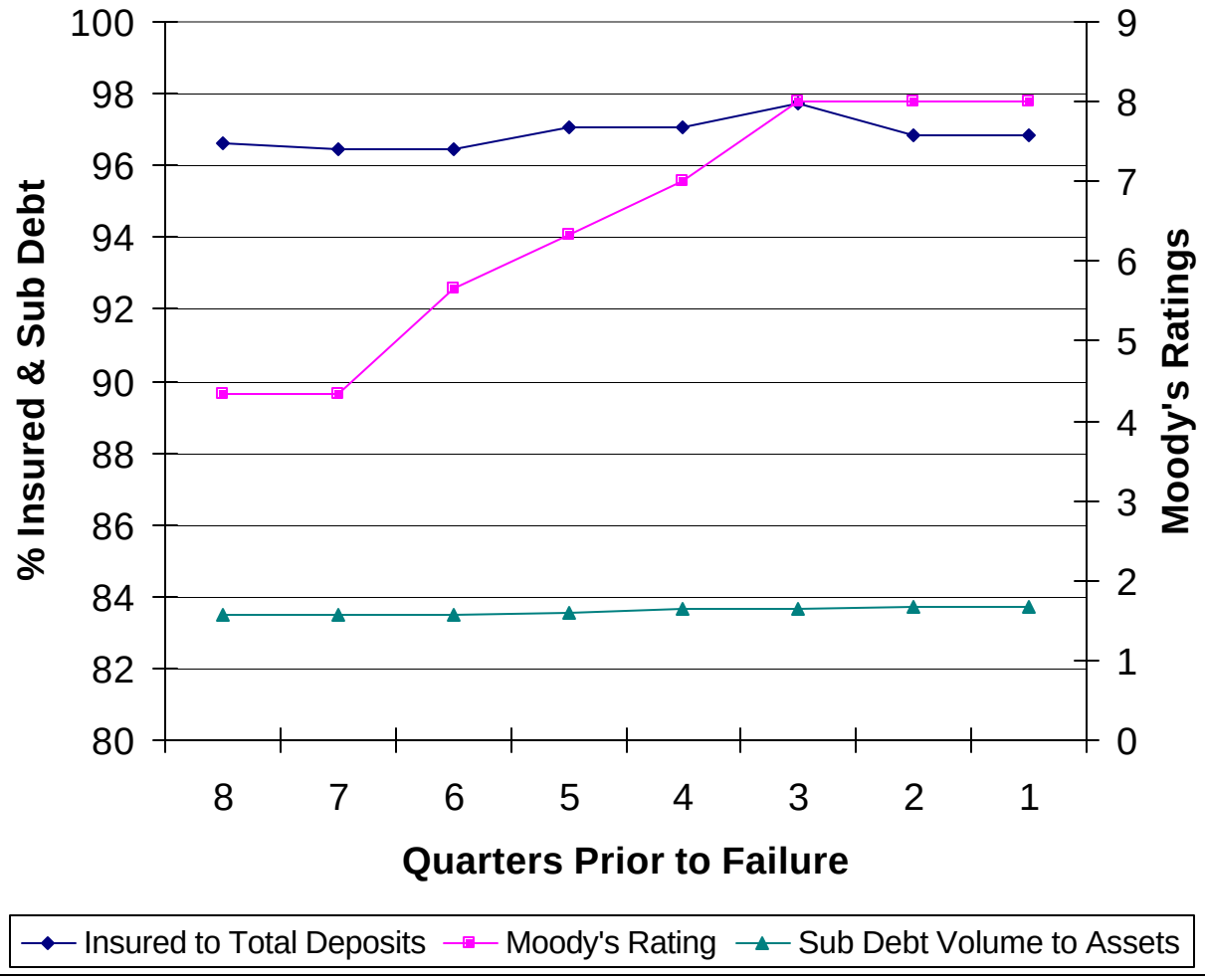


Figure VIII: Spreads on Insured CDs Prior to Failure

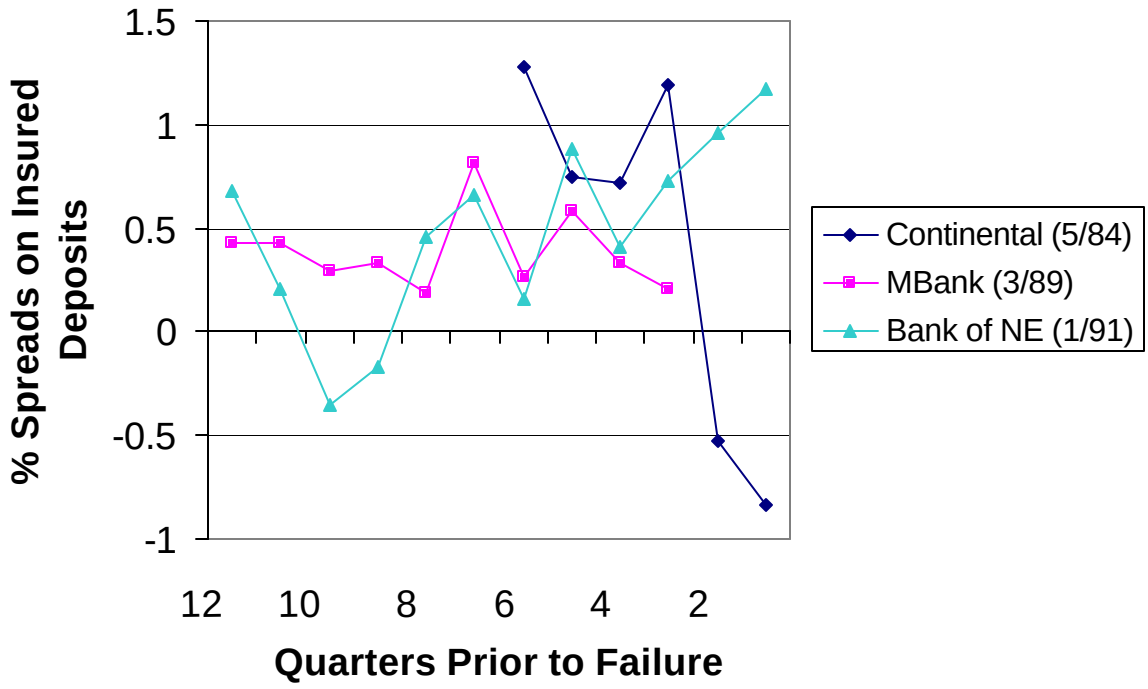
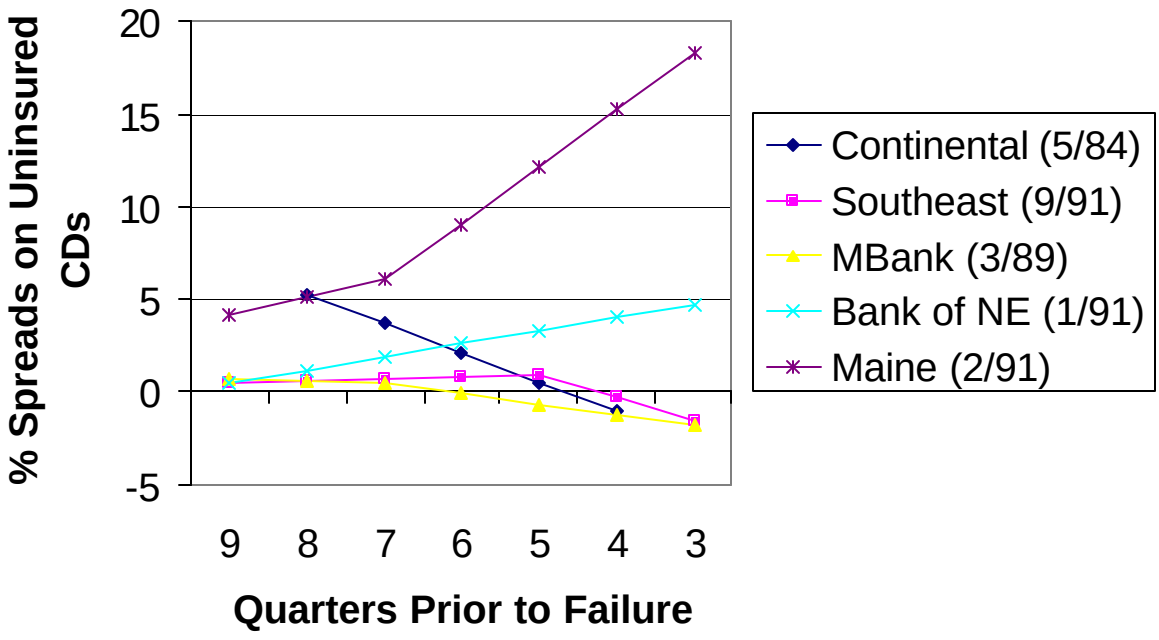


Figure IX: Spreads on Uninsured CDs Prior to Failure



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