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What Can Bank Supervisors Learn from Equity Markets? A Comparison of the Factors Affecting Market-Based Risk Measures and BOPEC Scores

John R. Hall
Department of Economics and Finance
University of Arkansas at Little Rock
Little Rock, AR 72204
jrhall1@ualr.edu

Thomas B. King
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166-0442
Thomas.B.King@stls.frb.org

Andrew P. Meyer
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166-0442
ameyer@stls.frb.org

Mark D. Vaughan
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166-0442
mark.vaughan@stls.frb.org
314.444.8859

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John R. Hall
Department of Economics and Finance
University of Arkansas at Little Rock
Little Rock, AR 72204
501-569-3355
e-mail: jrhall1@ualr.edu

Andrew P. Meyer
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, Missouri 63166
314-444-4647
e-mail: ameyer@stls.frb.org

Thomas B. King
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, Missouri 63166
314-444-4676
e-mail: Thomas.B.King@stls.frb.org

Mark D. Vaughan
Banking Supervision and Regulation
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, Missouri 63166
314-444-8859
e-mail: mark.vaughan@stls.frb.org

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Abstract

Much recent academic attention has focused on the relative ability of markets and bank supervisors to assess the risk of depository institutions. We add to that literature by comparing the factors influencing bank holding company risk, as gauged by equity markets, with the factors influencing the confidential BOPEC scores, as awarded by bank supervisors. Specifically, we regress stock market measures of holding company risk and BOPEC scores on a host of on- and off-balance sheet risk measures taken from the Federal Reserve's Consolidated Financial Statements for Bank Holding Companies (FR Y-9C reports). Our sample includes data from 1988 through 1993. We estimate regressions year by year on a sample of 98 holding companies, with yearly observations ranging from 69 to 79. The results suggest that both equity markets and regulators closely scrutinize credit risk. Beyond that, the results suggest that regulators pay close attention to capital strength. Taken together, the evidence supports the view that the stock market emphasizes risk-return trade-offs, whereas regulators care more about probability of failure.

I. Introduction

Economists of all persuasions have long accepted the proposition that, in a frictionless world, unregulated, competitive outcomes maximize social welfare, and—though financial interemediation certainly does not meet the friction-free stipulation—in recent years this notion has started to seep into the theory and practice of bank regulation. Specifically, academics have begun to revisit the possibility that market pressure from bank claimholders can both force bank managers to keep risk to acceptable levels and provide signals about bank condition to government supervisors. [See, among many others, Flannery (1998), Hall et al (2000), Bliss and Flannery (2000), and Hall et al (2001).] Policymakers, always on the lookout for potential cost-cutting measures, are eager to embrace these ideas and delegate their responsibilities, at least in part, to the market. Indeed, an increasing number of high-level regulators have recently called for greater reliance on market feedback about the adequacy of risk controls [see Greenspan (1997), Meyer (1999), and Stern (1999)].

This enthusiasm for market discipline as a supervisory device has culminated in provisions within the recent Graham-Leach-Bliley Act (GLB) that require certain institutions to include subordinated debt in their capital structures [see Evanoff and Wall (2000)]. The GLB experiment requires nationally chartered banks among the 50 largest to maintain at least one issue of long-term unsecured debt with an investment-grade rating (i.e., "A" or better) before qualifying for ownership of a non-bank subsidiary. It further authorizes the Federal Reserve and Treasury Department to investigate the possibility of a similar requirement for national banks among the 100 largest. Additional proposals have suggested applying a like subordinated-debt rule to some or all of the remaining U.S. banking organizations [see, for example, Calomiris (1999) and Evanoff and Wall (2000)], and GLB requires that the Treasury and the Fed jointly study these possibilities. Quotas on subordinated-debt issuance have gained popularity among supervisors and academics because of the ability of banks—particularly large institutions—to maintain their preferred (socially sub-optimal) levels of risk by circumventing capital standards as fast as regulators can devise them [see Jackson et al (1999)]. Presumably debt markets are

astute enough to sniff out risk, no matter how a bank chooses to structure it, meaning that, while it can take years for regulators to recognize and respond to industrial developments with new legislation, bondholders can exert discipline instantaneously.

However, forcing banks to issue subordinated debt may not be an optimal policy and, at the margin, may actually decrease aggregate social welfare. Emmons and Gilbert (2000) have argued that proposals like those described above will only achieve their objectives under certain, possibly unrealistic assumptions, namely (1) that there is no chance of the government bailing out sub-debt holders in the event of bankruptcy and (2) that covenants on the debt can be freely negotiated. Given the current regulatory restrictions on allowable sub-debt covenants and the government's incentive (and demonstrated tendency) to bail out even nominally uninsured bank claimants, both assumptions seem tenuous at best. Consequently, the marginal benefit of sub-debt requirements may in practice be much less than is commonly envisioned. Furthermore, the marginal cost, in terms of social welfare, may be higher. Requiring banks to issue subordinated debt when they otherwise would not is effectively a tax on capital structure. To date there is little empirical or theoretical evidence about the size, incidence, or efficiency of this tax. Indeed, economists know little about the determinants of capital structure in general, and a wide array of factors—including contracting costs, signaling, and tax considerations—may play a role [see Barclay and Smith (1995)]. Because regulation can distort incentives and performance, studies of capital structure typically exclude highly regulated industries [see, for example, Vaughan and Williams (1996)]. The difficulty of determining *a priori* the effects of sub-debt requirements on bank capital structure and efficiency means that we cannot rule out the possibility of a substantial consequent deadweight loss.

The uncertainty about and potential for damage from the recent subordinated-debt proposals implies that, before rushing to embrace them, regulators ought to take another look at the information available from claims that banks already issue. In an analogue to "Goodhart's Law" from the literature on monetary policy, if bank managers know that supervisors are focusing on the price of a specific

instrument, such as subordinated debt, they have a strong incentive to manipulate that price to send a positive signal, rendering it useless for supervisory purposes. If supervisors look at an array of market data, on the other hand, banks will find it much harder to send misleading signals. Because such data are already available, it seems difficult to justify taking a more narrow approach, especially if doing so may result in the types of inefficiency described above.

In this paper we explore bank equity prices as one alternative source of supervisory information. Because most large banks (or bank holding companies) issue common stock, no additional constraints on capital structure are necessary and any that are imposed will generally be non-binding. Thus, no capital-structure tax will occur. Additionally, stock returns largely avoid the Goodhart's Law problem, because banks presumably already attempt to maximize shareholder value—they have little incentive to manipulate stock prices to placate regulators.

In the early 1990s, a previous attempt by regulators to incorporate stock-price data into prudential bank supervision met with little success. In 1994 the Federal Reserve began requiring its examiners to monitor trends in holding-company equity prices. However, the way in which this information was to be interpreted remained ambiguous. In the absence of empirical research on the issue, supervisors had no way of knowing whether to attribute price fluctuations to changes in bank condition (i.e., idiosyncratic factors), broad industrial or economic trends, or simply random noise. Lacking clear guidance about how to interpret the data, examiners simply gave up. Anecdotal evidence suggests that, in many cases, they collected the data as required but performed "analysis" consisting of only a few meaningless notes scribbled in long-hand on the computer printouts.

We believe that by following a more thoughtful and rigorous approach policymakers can breathe new life into this idea, and we provide a framework through which that might be accomplished. We look at the weights that stockholders place on various sources of risk at bank holding companies (BHCs) and compare these weights to those used by examiners, enabling us to learn the likely causes of stock-price fluctuations and the extent to which stock markets and regulators view risk similarly. Our sample period

includes both good and bad banking times to ensure robustness over general financial and business-cycle conditions. The results suggest that stockholders discipline credit risk to about the same degree that regulators do. They respond less elastically to liquidity, interest-rate, and leverage risk. Clearly stockholder discipline is not a perfect substitute for governmental regulation. But it *can* act as a check on certain types of bank risk, and supervisors *can* cull significant information from equity prices.

II. The Model

Our empirical approach draws on three related strands in the banking literature: factors affecting bank risk [e.g., Sinkey (1978), Pettway and Sinkey (1980), Avery and Berger (1988)], market assessment of that risk [e.g., Brewer, Koppenhaver, and Wilson (1986), Brewer, Fortier, and Pavel (1988), and Neuberger (1992)], and studies of market discipline of bank risk [e.g., Avery, Belton, and Goldberg (1988), Flannery and Sorescu (1996)]. The specification of the regressions, with equity market or supervisory risk measures on the left-hand side and accounting ratios representing sources of holding company risk on the right-hand side, is similar to a model used in Saunders, Strock, and Travlos (1990).

The first step in the analysis was obtaining equity market assessments of holding company risk. To obtain these risk measures, we estimated a two-factor model of holding company stock returns [Flannery and James (1984); Kane and Unal (1988)] year by year, using daily data for each year. Specifically, the model used was:

$$R_{it} = \alpha_i + \beta_{mi}R_{mt} + \beta_{ki}R_{kt} + \xi_{it} \qquad (1)$$

where

R_{it}	=	the ith bank holding company's equity return in period t
R_{mt}	=	the return on the CRSP equally weighted index in period t
R_{kt}	=	the innovation in the 30-year Treasury bond rate in period t
ξ_{it}	=	an idiosyncratic error term
α_i	=	the intercept term for the ith holding company (parameter to be estimated)
β_{mi}	=	market beta for the ith holding company (parameter to be estimated)
β_{ki}	=	interest rate beta for the ith holding company (parameter to be estimated)

For the interest rate variable, R_{kt}, we used the innovation in the 30-year Treasury bond rate, measured as the natural log of ($yield_{kt}/yield_{kt-1}$). We focused on long-term interest rates because changes in expectations of inflation, which dominate movements in nominal interest rates, show up more clearly in long-term rates [Fama (1975), Fama and Schwert (1977), and Fama and Gibbons (1982)]. We obtained the interest rate data from the Federal Reserve Quote files. Daily stock return data were obtained from the Center for Research into Security Prices (CRSP) tapes.

These regressions generated four market-based risk measures for each bank holding company. The market beta, β_{mi}, revealed the systematic market risk for the holding company. The interest rate beta, β_{ki}, gauged the exposure of the holding company to systematic interest rate risk. The variance of the error term, $\sigma^2(\xi_{it})$, provided a measure of idiosyncratic holding company risk. Finally, the variance of the total return, $\sigma^2(R_{it})$, identified the total risk associated with a holding company's stock.

Because the stake of supervisors in a holding company performance is similar to the stake of debt holders, it may seem odd to compare risk measures taken from the equity market with safety and soundness assessments taken from inspection reports. Debt holders care about expected losses from default; they do not care about returns in non-default states because these returns accrue to equity holders. Similarly, bank supervisors are held accountable for bank failures because these failures threaten the deposit insurance fund and macroeconomic stability. Like debt holders, supervisors derive little benefit from bank performance in non-default states. For these reasons, it would seem logical to compare debt risk measures with supervisory ratings.

Unfortunately, our sample (1988 to 1993) includes a time during which a "too big to fail" policy was in place. Under this policy, the government viewed the failure of any sizable banking organization as a potential threat to the stability of the financial system. Accordingly, the FDIC's approach to failure resolution made the obligations of large banking organizations *de facto* insured liabilities. Given the *de facto* insurance coverage of holding company liabilities, market participants did not demand risk premia

that fully reflected the likelihood of failure. We dealt with this issue by choosing risk measures taken from the equity market, as equity holders were not reimbursed under the "too big to fail" policy. This approach also gave us a sample that both spanned an entire business cycle.

The next step in the analysis was identifying a supervisory assessment of holding company risk. For this measure, we employed composite BOPEC scores. Supervisors evaluate five aspects of holding company safety and soundness—"B" for the condition of banking subsidiaries, "O" for the condition of other nonbank subsidiaries, "P" for the condition of the parent company, "E" for the strength of holding company earnings, and "C" for the adequacy of holding company capital. A grade of 1 (best) through 5 (worst) is assigned to the "B", "O", "P", "E", and "C." The composite score, also on a 1 (best) through 5 (worst) scale, reflects supervisors' overall assessment of a holding company's safety and soundness.

Because the on- and off-balance sheet risk measures primarily reflect the banking activity of the holding company, we also used the "B" from the BOPEC score as a supervisory rating since it represents the asset-weighted average of the composite CAMEL scores of the banks in the holding company. A composite CAMEL score reflects the overall assessment of a given bank, based on five individual categories—"C" for capital adequacy, "A" for asset quality, "M" for management strength, "E" for earnings, and "L" for liquidity. Again, each category is graded on a 1 (best) through 5 (worst) scale. We obtained the BOPEC composites and the "B" scores from the confidential National Information Center (NIC) database.

To compare market and regulator views of risk, we regressed the market-based risk measures and supervisory ratings on a set of on- and off-balance sheet risk variables and a set of control variables using ordinary least squares. Our approach to identifying on-balance sheet risk variables built on previous work [e.g., Brewer and Lee (1986), Saunders, Strock, and Travlos (1990)] by including measures of interest rate risk (GAP), credit risk (CREDIT), capital adequacy (CAPITAL), and liquidity (LIQUID). We measured off-balance sheet activities with three variables: loan commitments (LNCOMIT), standby letters of credit (STNDBYLC), and commercial and similar letters of credit (COMLC). As control

variables, we included return on assets (ROA) and holding company assets (SIZE). (Variable descriptions are listed in Table 1, along with the predicted signs of their regression coefficients.) The specific equations we estimated were:

$$MKTRISK_i = a_i + \beta_1 GAP_i + \beta_2 CREDIT_i + \beta_3 CAPITAL_i + \beta_4 LIQUID_i + \beta_5 STNDBYLC_i + \beta_6 COMLC_i + \beta_7 LNCOMIT_i + \beta_8 SIZE_i + \beta_9 ROA_i + \varepsilon_i \quad (2)$$

$$SCORE_i = b_i + \gamma_1 GAP_i + \gamma_2 CREDIT_i + \gamma_3 CAPITAL_i + \gamma_4 LIQUID_i + \gamma_5 STNDBYLC_i + \gamma_6 COMLC_i + \gamma_7 LNCOMIT_i + \gamma_8 SIZE_i + \gamma_9 ROA_i + \omega_i \quad (3)$$

Holding companies can be exposed to interest rate risk if, for example, the interest rates on the assets and liabilities of the banking subsidiaries adjust at different intervals. To measure a holding company's exposure to interest rate risk, we used the absolute value of the ratio of cumulative one-year maturity GAP to total assets. The GAP measure equals earning assets that reprice within one year, minus the sum of interest-bearing deposit liabilities that reprice within one year, the long-term debt that reprices within one year, and the variable-rate preferred stock. The data for the GAP measure were taken from Schedule HC-D of the FR Y-9C reports—the consolidated financial statements for bank holding companies. We expected that higher GAP levels would increase market risk and weaken supervisory ratings, thereby increasing the BOPEC composites and "B" scores.

Holding companies are also subject to credit risk, which is the risk that loans made by banking subsidiaries will not be repaid. We gauged the credit risk of the holding company using the ratio of nonperforming loans to total assets. Nonperforming loans are defined as the sum of loans 90 days or more past due and those in nonaccrural status. The nonperforming loan data were taken from Schedule

HC-H of the FR Y-9C report. We expected higher levels of nonperforming loans (CREDIT) to raise market risk and weaken supervisory ratings.

A holding company's capital is tied to overall risk in several important ways. First, because the owners are first in line to absorb losses from other sources of risk through diminished equity values, higher levels of capital mitigate the moral hazard associated with underpriced deposit insurance. Second, higher capital levels also imply lower levels of leverage. Using low levels of leverage reduces the risk that holding company cash flows will fall below debt service obligations, thereby prompting default. We measured capital adequacy by the ratio of total equity to total assets, the values of which were taken from Schedule HC of the FR Y-9C reports. We expected higher levels of capital (CAPITAL) to lower market risk and strengthen supervisory ratings, thereby decreasing the BOPEC composites and the "B" scores.

Holding companies also face liquidity risk, the risk that a sudden need to cover deposit withdrawals or honor loan commitments at subsidiary banks could force the organization to pay a hefty premium for funding or to liquidate assets at fire sale prices. We measured available liquidity by using liquid assets divided by total assets. Liquid assets are: cash and due from depository institutions, U.S Treasury and Agency securities, trading account assets, federal funds sold, and reverse repurchase agreements. Again, the values were taken from Schedule HC of the FR Y-9C reports. We expected higher levels of liquidity (LIQUID) to lower market risk and strengthen supervisory ratings.

Off-balance sheet activity has become an important source of fee income as well as an important tool for risk management at holding companies. For this reason, we included measures of off-balance sheet risk as explanatory variables. Off-balance sheet risk was measured by the ratios of commercial letters of credit, standby letters of credit, and loan commitments to total assets. Both commercial and standby letters of credit are credit enhancements; these enhancements guarantee the financial performance of the purchaser of the enhancement. Loan commitments are contractual obligations that enable a customer to borrow up to a maximum amount available on specific terms for a given period of time. In theory, off-balance sheet activity can be either risk-increasing or risk-decreasing. For example,

loan commitments can expose a holding company to interest rate, credit and liquidity risk. On the other hand, holding companies may reduce the risk in their current balance sheets to convince loan commitment purchasers that these commitments will be honored in the future [Boot and Thakor (1991)]. Because off-balance sheet activities can be either risk-increasing or risk-decreasing, we had no firm prior belief about the relationship between the off-balance sheet variables (STNDBYLC, COMLC and LNCOMIT) and market risk/supervisory ratings.

Because overall risk can vary with holding company size, we employed the natural log of total assets (SIZE) as a control variable. We had no firm prior belief about the relationship between size and market risk/supervisory ratings. Larger holding companies, for example, have the potential to engage in more off-balance sheet and non-banking activities [Sinkey and Carter (1995), Brewer (1989)]—activities which, as noted previously, may be either risk-increasing or risk-decreasing. Larger holding companies also have more opportunity to diversify, thereby reducing reduce risk. Finally, larger holding companies might be more willing take on risk, assuming that regulators deem them too big to fail. Data on holding company size was, again, taken from Schedule HC of the FR Y-9C report.

The final control variable we used was return on assets (ROA), which was defined as net income after taxes, divided by total assets. The net income after taxes data were taken from Schedule HI of the FR Y-9C report. We expected that, after controlling for specific on- and off-balance sheet sources of risk, higher earnings would be associated with lower stock market risk. Dividend cuts typically induce dramatic declines in a firm's stock price [Aharony and Swary (1980)], and higher earnings reduce the likelihood that a holding company will cut dividends. Moreover, earnings are an explicit component of the BOPEC and CAMEL scores; higher earnings lead to lower BOPEC composites and "B" scores.

III. A Closer Look at the Data

We estimated equations (2) and (3) year by year—1988 through 1993—for a subset of all publicly traded holding companies. To be included in the sample for a given year, a holding company had to pass three tests. First, daily stock return data from either the New York Stock Exchange, the American Stock Exchange, or over-the-counter markets had to be available for the entire year. Second, quarterly or semiannual accounting data from the FR Y-9C reports had to be available for the year. Third, the holding company had to have been inspected during the past year. We included the third criterion because research suggests that supervisory assessments of bank condition decay quickly [Cole and Gunther, 1995].

The FR Y-9C balance sheet data were yearly averages of quarterly or semiannual data. (Some holding companies report quarterly and some semiannually, depending on size.) We used yearly averages of balance sheet data rather than end-of-year data for two reasons: 1) the market risk proxies were estimated using data from the entire year; and 2) the holding company inspection could have taken place any time during the year. The FR Y-9C income statement data was end-of-year data, which reflected earnings for the entire year.

We estimated the equations year by year instead of by pooling because we expected to find some variation across years in the patterns of statistical significance for risk and control variables. We expected variation because our sample period (1988-1993) included significant changes in supervisory regimes, for example, the introduction of risk-based capital and prompt corrective action. Moreover, the sample period spanned a business cycle, and the monitoring parties may have held different views of risk at different stages in the cycle. Given the expectation of year-to-year changes in coefficient significance, pooling would have been inappropriate because it assumes coefficients to be equal across years.

A year-by-year comparison of significance patterns of the estimated coefficients in equations (2) and (3) constitutes the heart of the paper. For example, if in a given year, equity markets and supervisors

placed similar weights on the various on- and off-balance sheet risks, we should find consistent patterns of sign and significance in the coefficients across equations (2) and (3) for that year.

Before analyzing the empirical results, however, it is necessary to answer two questions about the data: How does the sample of holding companies in this study compare with the universe of holding companies, and how do the market-risk measures for the sample holding companies compare with the supervisory ratings for those companies? (Tables 2 through 5 contain summary statistics.)

The average size of the 98 holding companies in our sample, as measured by total assets, is much larger than the average for all holding companies. Between 1988 and 1993, 79.9 percent of holding companies held less than $1 billion in assets; 16.9 percent of holding companies held between $1 billion and $15 billion in assets; and 3.2 percent of holding companies held over $15 billion in assets. In our sample, 2.2 percent of the holding companies held less than $1 billion in assets; 66.9 percent held between $1 billion and $15 billion in assets, and 30.9 percent held over $15 billion in assets. The oversampling of large holding companies resulted from our stipulation that the company must have been publicly traded to be included in the sample. Only the larger holding companies have publicly traded stock.

Our sample of 98 holding companies also had composite BOPEC scores that were slightly stronger than those ratings in the general population. Of all holding companies in the time period 1988-1993, 16.6 percent were rated 1; 49.0 percent were rated 2; 20.0 percent were rated 3; 10.8 percent were rated 4; and 3.5 percent were rated 5. In our sample, 24.7 percent were rated 1; 47.4 percent were rated 2; 16.8 percent were rated 3; 9.8 percent were rated 4; and 1.4 percent were rated 5.

The other question to consider before looking at the results is how well the market risk measures for the sample holding companies correlated with the supervisory ratings. Because the supervisory ratings gauge both the risk and profitability of a holding company, they can be viewed as noisy measures

of bank risk. The market variables, in contrast, are pure measures of the risks of holding company stock. For the entire six-year sample (1988-1993), the correlation between the BOPEC composites and the total risk of the holding company stock was 0.582. Breaking total risk into its components revealed that the highest correlation was between the BOPEC composite score and the idiosyncratic risk of the holding company stock (0.658). The market systematic risk of the stock and the BOPEC composite were less highly correlated (0.317). The interest rate risk of the stock and the BOPECs exhibited almost no correlation (0.011). In short, the supervisory ratings do indeed appear to reflect the total risk, market systematic risk and idiosyncratic risk associated with holding company stock, albeit in a noisy fashion.

IV. Results

Overall, the variables representing interest rate risk, credit risk, liquidity risk, off-balance sheet risk, earnings, and size did a good job explaining the variance in the market measures of risk. (The regression results for equation (2) appear in tables 6 through 9.) In the equations with the total variance of the holding company returns serving as the dependent variable, the R^2 values for the equations ranged from 0.3063 for 1988 to 0.7448 for 1992, with an average value of 0.5547. The R^2 for the equations with the market beta as the dependent variable ranged from 0.6100 for 1992 to 0.7739 for 1990, with an average value of 0.6878. The R^2 for the equations with the error term variance as the dependent variable ranged from 0.3666 for 1989 to 0.8562 for 1992, with an average value of 0.6238. Only the interest rate beta equations exhibited a relatively poor fit. The R^2 for these equations ranged from 0.1039 for 1988 to 0.2398 for 1990, with an average value of 0.1493.

The equation (3) regressions, which used the same independent variables to explain movements in the BOPEC composites and "B" scores, also fit the data relatively well, in fact slightly better than the equations with market risk measures as the dependent variables. (The regression results for equation (3) appear in tables 10 and 11.) The R^2 for the equations with the BOPEC composite as the dependent variable ranged from 0.5123 for 1989 to 0.8127 for 1991, with an average value of 0.6881. The R^2 for

the equations with the "B" component of the BOPEC score as the dependent variable ranged from 0.4028 for 1989 to 0.7742 for 1991, with an average value of 0.6650. Overall, the independent variables explained an average of 68 percent of the variance in the supervisory ratings, compared with an average R^2 of 50 percent for the market risk measures.

In the equations using total variance of the holding company returns as the dependent variable (see Table 6), only credit risk, size and earnings were consistently significant across the six-year sample. Credit risk was positive and significant in 1989 through 1993, implying that higher levels of nonperforming loans raised the total variance of holding company stock returns in those years. Size was negative and significant in 1988, 1989, 1992 and 1993, suggesting that larger holding companies enjoyed a lower total variance of returns. The coefficient on earnings was negative and significant from 1990 through 1993, implying that higher returns on assets lowered the total variance of holding company returns. Three other variables were also significant, although in one year only. Liquidity was positive and significant in 1993, implying that higher levels of holding company liquidity raised the total variance of returns in that year. COMLC was negative and significant in 1991, suggesting that higher levels of holding company commercial letters of credit lowered total market risk for that year. Finally, LNCOMIT was positive and significant in 1990, implying that higher levels of loan commitments raised total risk in that year.

Only credit risk and holding company size consistently explained movements in systematic market risk (see Table 7). In all six years, credit risk was positive and significant, implying that higher levels of nonperforming loans accompanied higher market betas. Size was also positive and significant for all six years, suggesting that larger holding companies exhibited larger market betas. In addition, the coefficient on loan commitments was positive and significant in 1988, 1990, 1991 and 1992, indicating that higher levels of commitments raised the market beta in those years. Three other variables were also significant, albeit in two years only. In 1988 and 1993, the capital variable was negative and significant, suggesting that higher levels of capital lowered systematic market risk in those years. The standby letters

of credit variable was negative and significant in 1990 and 1991, implying that a greater volume of standby letters also lowered systematic market risk. And, finally, in 1988 and 1993, the return on assets variable was negative and significant, suggesting that higher earnings correlated with lower systematic market risk in those years.

The interest rate beta equations displayed no consistent patterns of significance for the risk or control variables (see Table 8). Four variables were significant in one year only. The credit risk coefficient was positive and significant in 1992, implying that higher levels of nonperforming loans correlated with higher interest rate betas in that year. The interest rate risk coefficient—GAP—was negative and significant in 1993, suggesting that *lower* absolute values of interest rate gaps were correlated with *higher* interest rate betas in that year. The level of loan commitments varied directly with the interest rate beta in 1990. And, finally, higher earnings correlated with a higher interest rate beta in 1989.

In the error term variance equations, credit risk, earnings and size were significant explanatory variables in most years (see Table 9). For all six years, higher levels of nonperforming loans implied greater idiosyncratic risk for holding company stock. For 1990 through 1993 higher returns on assets implied lowered idiosyncratic risk. And, in every year except 1991, larger holding companies exhibited lower idiosyncratic risk. Apart from credit risk, earnings and size, three other variables proved significant—loan commitments in 1990, liquidity in 1992 and 1993, and commercial letters of credit in 1991. In 1990, higher levels of loan commitments correlated with higher error term variances. In 1992 and 1993, higher levels of liquidity increased the idiosyncratic risk of a holding company's stock. Finally, in 1991 the level of commercial letters of credit varied inversely with idiosyncratic risk.

Overall, the evidence suggests that only credit risk is consistently related in the same way to stock market risk. (See Table 12 for a comparison of coefficient signs and significance levels across years and dependent variables.) In 18 of the 24 estimated equations (six years, four risk measures), higher levels of nonperforming loans raised the market's assessment of holding company risk. Size was

also consistently significant, but the sign changed depending on the risk measure. For example, the size coefficient was positive and significant in all six market beta equations, but negative and significant in nine of the remaining 18 equations. Earnings proved significant in 11 of the 24 equations—three times positive and eight times negative. After credit risk, size and earnings, only a few variables proved significant in more than one equation. Capital entered two of the 24 equations with a negative sign, and loan commitments entered seven of the 24 equations, six times with a positive sign and one time with a negative sign. Finally, liquidity was positive and significant in three of the 24 equations.

It is noteworthy that the GAP and off-balance sheet coefficients were not consistently significant across years or risk measures. The lack of significance on the GAP coefficient is consistent with the evidence presented by Vaughan (1993) that holding companies have hedged interest rate risk effectively since the late 1980s. Indeed, a look at the coefficient estimates for equation (1), which are not reported in this paper, reveals that less than 15 percent of the interest rate betas differed significantly from zero in the year-by-year (1988 through 1993) regressions. This lack of significance accounts for both the poor fit of the interest rate beta equations and the insignificant GAP coefficients in the market risk equations. The lack of significant coefficients on the off-balance sheet variables is consistent with the finding of Brewer, Koppenhaver, and Wilson (1986) that no significantly higher equity premia existed for holding companies participating in these activities.

When the regulators' BOPEC measures were used as the dependent variable, only credit risk and capital strength among the risk variables and size and earnings among the control variables were significant in a majority of the year-by-year regressions (see Table 10). Credit risk was positively related to BOPEC scores in every year, implying that higher levels of nonperforming loans were associated with weaker supervisory ratings from 1988 to 1993. Meanwhile, capital varied inversely with BOPEC composites for every year except 1992, suggesting that higher levels of capital were associated with stronger supervisory ratings in the other five years. Of the control variables, size and earnings were significantly negatively related to the composites in all six years. That is, larger holding companies

exhibited stronger BOPEC composites in every year, and holding companies with higher earnings also boasted stronger supervisory ratings. Loan commitments were also significantly related to BOPEC composites. Larger levels of loan commitments implied higher BOPEC composites in 1988, 1990, 1991 and 1993. The only other significant variable was liquidity, which had a negative coefficient in 1989.

In the equation (3) regressions with the "B" component of the BOPEC serving as the dependent variable, the pattern of coefficient significance was similar to the pattern exhibited in the equations containing the BOPEC composites (see Table 11). In all but 1989, higher levels of credit risk were associated with weaker (higher) "B" scores. From 1988 through 1990, higher levels of capital were associated with stronger (lower) "B" scores. Larger holding companies also exhibited stronger (lower) "B" scores from 1988 through 1991, and holding companies with higher earnings received stronger (lower) "B" scores in all years. Several other variables proved significant in at least one year. The liquidity coefficient was negative and significant in 1989, implying that more liquid assets led to a stronger (lower) "B" rating in that year. The commercial letters of credit coefficient, meanwhile, was negative and significant in 1988, indicating that holding companies with more letters of credit enjoyed stronger "B" ratings in that year. And, finally, loan commitments entered equation (3) as positive and significant in 1988, 1990 and 1993, suggesting that an increase in commitments weakened (raised) the "B" rating for a holding company in those years.

Taken together, the evidence from the supervisory rating regressions suggests that regulators focused on credit risk and capital strength when assigning BOPECs or CAMELs. (See Table 12 for a comparison of coefficient signs and significance levels across years and dependent variables.) In 11 of 12 equations (six years, two equations), higher levels of nonperforming loans were associated with weaker supervisory ratings. In eight of the 12 equations, higher levels of capital were associated with stronger supervisory ratings. Only a few other risk variables demonstrated same-sign significance in more than one year: loan commitments (positive in seven of the 12 equations) and gap (negative in three of the 12 equations). With respect to the control variables, in 10 of the 12 equations, larger holding

companies received stronger supervisory ratings (lower BOPEC composites or "B" scores). Also, in all 12 equations, holding companies with higher earnings received stronger supervisory ratings (lower BOPEC composites or "B" scores).

As McClosky (1996) has pointed out, it is important to consider magnitude or "economic significance" along with statistical significance when interpreting empirical results. Toward this end, we calculated the following statistic as a measure of economic significance:

$$E_{XY} \equiv \beta_{XY} \frac{\sigma_X}{\sigma_Y},$$

where σ_X is the standard deviation of the independent variable X, σ_Y is the standard deviation of the dependent variable Y, and β_{XY} is the regression coefficient on X. This measure is sometimes referred to in the econometrics literature as the "standardized" estimate.

Intuitively, E_{XY} is the number of standard deviations by which Y changes as a result of a one-standard-deviation change in X. If we view one standard deviation as a normal or typical range of fluctuation, then E_{XY} effectively answers the question, "Does a typical change in X tend to result in a change in Y that is bigger or smaller than is typical?" Thus, the greater the magnitude of E_{XY}, the more economically significant we can consider β_{XY} to be. Note that we must view E_{XY} in some respects as an ordinal statistic. That is, in the absence of a (theoretically determined) non-arbitrary cutoff for economic significance, we can only say whether one coefficient is "more economically significant" than another. Note also that there is no reason to think that unity is a benchmark value for E_{XY}. On the contrary, because E_{XY} measures only the effect of one explanatory variable in isolation, we should typically expect values considerably less than one. The main advantage of this measure, for our purposes, is that it allows us to compare the magnitude of our coefficients between the market and regulator equations. This type of comparison is impossible with normal coefficient estimates because of the differences in range and magnitude between the market and regulator left-hand-side variables.

We computed the average E_{XY} over all years and also over only those years that had a statistically significant coefficient for the variable in question. We were concerned that the inclusion of statistically insignificant standardized coefficients would bias the averages toward zero. For example, CREDIT in the TOTALVAR regression had an average E_{XY} of 0.4160 over all the years, but when we dropped the year in which it was insignificant, the E_{XY} measure rose to 0.4534.

The economic magnitude results are largely consistent with the patterns of statistical significance (see table 13). That is, CREDIT is similar in economic magnitude between the market and regulator equations, and CAPITAL appears to be economically important only in the regulator equations. CREDIT is by far the most important risk variable in the market equations, registering a higher E_{XY} than any other non-control variable in three of the four market equations. Specifically, the average E_{XY} for CREDIT in the market equations is 0.412 while the regulator equations average 0.459 (i.e. a one-standard-deviation change in CREDIT leads to almost half a standard deviation change in both types of risk measures). In contrast, the average E_{XY} for CAPITAL is only -0.082 in the market equations but averages –0.221 in the regulator equations—a figure nearly three times as large (in absolute value). The only other risk variable that consistently evinces economic significance in the market equations is LNCOMIT. Both control variables, SIZE and ROA, appear to be important.

Regulators appear to place an emphasis on CREDIT similar to that of the market. Furthermore, they do not value any other variable more highly. However, unlike in the market equations, other variables do have some economic significance. CAPITAL, which had little significance of either type in the market regressions, has an average E_{XY} of almost 0.3 in the regulatory regressions. LNCOMIT and ROA have about the same economic significance as in the market. GAP and LIQUID also show nontrivial E_{XY} values, but because they are not statistically significant in very many years, these results are uncertain. Finally, SIZE is less important in the regulator equations than in the market, although it is still quite significant.

Overall, the evidence suggests that regulators and equity markets both pay close attention to holding company credit risk. Beyond credit risk, the regulators focus on capital strength. These results are not surprising since credit risk is the most important source of risk for most banks. Moreover, in the late 1980s and early 1990s, asset quality problems bedeviled the banking industry, first with loans to less developed countries and later with real estate loans [Saunders (1996), pp. 176-177]. Rational investors and regulators should, therefore, have closely monitored credit risk exposure. Furthermore, regulators should have kept close watch on capital since higher capital levels reduce expected losses to the deposit insurance fund and unexpected shocks to the financial system.

Although the strong significance of capital in the regulator equations is consistent with theory, its poor showing in the market risk equations is somewhat puzzling. One possible explanation is that holding companies set current capital levels to reflect planned future risk, rather than current risk. We tested this hypothesis by lagging the capital variable one year in equation (2). The results, which are not reported in this paper, weakly support the lagged-capital specification. Lagged capital was negative and significant in five of the 24 market-risk equations; contemporaneous capital, in contrast was significant in only two of 24 equations. Still, supervisors put more weight on lagged capital than markets did; in 11 of 12 supervisory equations, lagged capital was negative and significant.

V. Robustness

The reported results were robust to changes in the data set, the econometric technique, and the specification. First, we examined the holding company data set for outliers. One holding company in the sample ceased to exist during the six-year period because most of its subsidiary banks failed; we eliminated it from the sample and then re-estimated equations (2) and (3). The results were essentially the same. Second, we estimated the supervisory equations with an ordered response logit instead of ordinary least squares. Again, the sign and significance patterns were almost identical. Third, we conducted a White test (1980) and found no evidence of heteroskedasticity. Fourth, we normalized all

the right-hand side variables (except size) using equity rather than assets and re-estimated equations (2) and (3). The sign and significance patterns remained essentially the same.

Because theory suggests that bank ownership involves some degree of optionality, leverage ratios may enter stock prices nonlinearly, making linear OLS an inefficient estimation technique. We tested this possibility by re-running the regressions using a spline over CAPITAL. In other words, we allowed the realtionship between CAPITAL and the risk measures to be kinked (i.e., continuous but nondifferentiable). However, t tests on the spline variables indicated that there was no statistically significant difference between the slope parameters on CAPITAL at high and low values—the data did not support a nonlinearity hypothesis. Even so, the regression coefficients on the other risk variables did not change substantially in the spline specification.

Finally, in light of Saunders, Strock and Travlos' (1990) finding that equity market risk varies directly with management's ownership stake in a holding company, we experimented with a specification that included the proportion of shares held by managers. Although owners would like the holding company to exploit the mispricing of deposit insurance by taking on large risks, management eschews risks because failure reduces the value of their human capital [Cannella, Fraser, and Lee (1995)]. Only a holding company in which management's incentives are aligned with owners' incentives—a company with a large management ownership stake—will pursue an aggressive approach to risk. Searches of *Compact Disclosure* provided management ownership data as well as the total number of shares outstanding for each holding company. The management ownership variable was added to equations (2) and (3) as a control variable.

Including management ownership in equations (2) and (3) did not alter the results. Specifically, the management ownership coefficient was significant only in a handful of equations, with no consistent sign pattern. More importantly, the sign and significance pattern for other coefficients was almost identical to the pattern in the original specifications. A drawback of the new specification, however, is

that management ownership data were available for only a small number of holding companies in the early years of our sample, thus reducing sample size significantly. For these reasons, we opted to present the results from the specifications that excluded the management ownership variable in tables 6 through 13.

VI. Implications and Caveats

Our findings suggest that there is still useful information to be had from bank equity prices. In particular, stock-risk measures are especially responsive to differences in credit risk and reflect earnings and other types of risk to a lesser extent. They may thus exert some discipline on bank risk-taking behavior and, if properly analyzed, provide useful signals to regulators.

Indeed, an important implication of our results is that supervisors may use stock-market data in a rigorous way to draw conclusions about bank condition. As mentioned in Section I, previous attempts to use stock prices in the supervisory process failed in the absence of guidance on how to interpret fluctuations in these prices. Our model permits a straightforward method of extracting and translating stock-market signals. By applying equation (1) to a series of bank-stock-price data one can easily estimate the total variance of returns, systematic market risk, interest-rate beta, and error-term variance for the stock in question over a specified period. Knowing that higher levels of these risk measures generally imply worse bank condition, one can make qualitative judgements about overall safety and soundness on the basis of these estimates alone. To determine the exact sources of any risk, one can study which specific risk measures are abnormally high and which are not. For example, the only explanatory variable that significantly affects both total-return variance and error-term variance but not the other risk measures is earnings. Thus if an institution has high levels of these two variables and normal values for its other risk measures, we may conclude that it is simply experiencing high earnings growth and not be overly concerned. On the other hand, if its systematic risk (market beta) is also high, the source of the risk is likely to be credit related, and examiners should investigate further. A useful

practical extension of our research would be to quantify this approach by estimating a four-variable model similar to equation (2) (perhaps using factor analysis). The risk equations would then constitute a linear system in these four variables and could be solved explicitly, for any series of stock-market data. This method would allow one to impute precise values of the underlying bank-risk variables to a given sample of stock prices and, if one liked, to construct confidence intervals and perform hypothesis tests on these imputations.

Our results are, however, subject to several qualifications. First, it is possible that we mismeasured on- and off-balance sheet risk, thereby biasing regression coefficients toward zero. For example, risk-based capital requirements were phased in over our sample period. The weaker explanatory value of the capital coefficient in the supervisory rating regressions for 1992 and 1993 may in fact reflect a change of regulatory emphasis from total capital to risk-based capital. Still, the respectable R^2 figures, coupled with the intuitive appeal of the credit risk and capital significance patterns, suggest that measurement error is not a fatal problem.

A more important issue is multicollinearity. If the right-hand side variables are highly correlated, then the variances of the ordinary least squares estimates of the collinear variables will be large, thereby weakening the power of hypothesis tests [Kennedy (1992)]. Indeed, there is reason to believe that many of the right-hand side variables in equations (2) and (3) may be correlated. For example, holding companies with large appetites for risk may increase all types of risk simultaneously. Multicollinearity may account for the erratic significance patterns reported in tables 6 through 11. Still, in the presence of multicollinearity, we can have confidence in those coefficients that are consistently significant with the same sign, enabling us to conclude that supervisors and equity markets both worry about credit risk, but that only supervisors care about capital.

VI. Summary

In this paper we addressed the question of whether equity markets can provide (1) discipline on bank risk-taking and (2) signals about bank condition to supervisors. This research question is important and timely because careful analysis of equity prices could provide an alternative to current proposals that would effectively tax bank capital structures by imposing subordinated-debt quotas. Our findings suggest that supervisors and the stock market worry about credit risk to a similar degree, although other types of risk—particularly involving capital levels—are less important to stockholders than to regulators. These findings imply that, while bank supervision cannot be delegated entirely to the stock market, it can at least do a good job of disciplining credit risk and can provide useful signals about overall bank condition. Given the ready availability of this information, jumping into new and untested restrictions on bank capital structure in the hope of extracting similar signals seems premature.

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Table One
Independent Regression Variables and Their Predicted Signs

This table lists the independent risk and control variables included in our market and regulator models. The coefficient sign indicates the anticipated effect of an increase in each variable on market and regulatory views of bank risk. A "+" implies that an increase in the variable should lead to greater risk and higher (worse) supervisory ratings.

	Variable name	Description	Hypothesis about sign of coefficient in regressions
Risk Variables	GAP	Absolute value of cumulative one-year-maturity gap.	+
	CREDIT	Nonperforming loans as a percentage of total loans.	+
	CAPITAL	Equity as a percentage of total assets.	-
	LIQUID	Liquid assets (cash, securities, fed funds, and reverse repos) as a percentage of total assets.	-
	STNDBYLC	Standby letters of credit as a percentage of total assets.	None
	COMLC	Commercial letters of credit as a percentage of total assets.	None
	LNCOMIT	Loan commitments as a percentage of total assets.	None
Control Variables	SIZE	Natural logarithm of total assets.	None
	ROA	Net income as a percentage of total assets.	-

Table Two

Sample Statistics for Dependent Variables

Market Risk Measures

This table shows sample statistics for the dependent market-risk variables for each year and for the pooled sample. Clearly, there is substantial variation across years in all of these measures. In general, bank risk increased over the first few years of the period, as the economy and industry deteriorated, and then recovered slightly in 1992 and 1993.

Variable	Num. Obs.	Mean	Std. Dev.	Minimum	Maximum
6-year Totals					
TOTALVAR	453	0.0005	0.0007	0.0000	0.0070
MKTBETA	453	0.7087	0.5167	-0.2311	2.2237
IRBETA	453	-0.0071	0.2337	-1.3019	0.8893
ERRORVAR	453	0.0192	0.0102	0.0027	0.0836
1988					
TOTALVAR	71	0.0003	0.0004	0.0001	0.0033
MKTBETA	71	0.3500	0.3021	-0.2311	1.4751
IRBETA	71	0.0246	0.0820	-0.2312	0.2405
ERRORVAR	71	0.0158	0.0074	0.0080	0.0573
1989					
TOTALVAR	79	0.0003	0.0002	0.0000	0.0012
MKTBETA	79	0.4526	0.4216	-0.2304	2.1230
IRBETA	79	-0.0066	0.1583	-0.4516	0.4722
ERRORVAR	79	0.0146	0.0048	0.0027	0.0345
1990					
TOTALVAR	79	0.0006	0.0004	0.0001	0.0029
MKTBETA	79	0.8138	0.4983	-0.0858	1.9871
IRBETA	79	0.0519	0.2716	-0.5069	0.8893
ERRORVAR	79	0.0226	0.0075	0.0102	0.0535
1991					
TOTALVAR	76	0.0010	0.0013	0.0000	0.0070
MKTBETA	76	0.8411	0.5230	-0.1997	1.7805
IRBETA	76	-0.1122	0.3392	-1.3019	0.5183
ERRORVAR	76	0.0256	0.0157	0.0047	0.0836
1992					
TOTALVAR	79	0.0006	0.0008	0.0001	0.0054
MKTBETA	79	0.8516	0.5128	-0.2033	2.2237
IRBETA	79	0.0394	0.2319	-0.4422	0.8614
ERRORVAR	79	0.0203	0.0109	0.0094	0.0739
1993					
TOTALVAR	69	0.0003	0.0002	0.0001	0.0012
MKTBETA	69	0.9414	0.5167	-0.2145	2.0401
IRBETA	69	-0.0452	0.1808	-0.7977	0.3175
ERRORVAR	69	0.0162	0.0051	0.0090	0.0343

TOTALVAR ≡ Total variance of holding company returns
MKTBETA ≡ Market beta of holding company stock
IRBETA ≡ Interest-rate beta of holding company stock
ERRORVAR ≡ Error term variance

Table Three

Sample Statistics for Dependent Regression Variables

Confidential Supervisory Assessments of Holding Company Safety and Soundness

This table shows sample statistics for the dependent regulatory variables for each year and for the pooled sample. Clearly, there is substantial variation across years in all of these measures. In general, supervisory scores increased (worsened) over the first few years of the period, as the economy and industry deteriorated, and then recovered slightly in 1992 and 1993.

Variable	Num. Obs.	Mean	Std. Dev.	Minimum	Maximum
6-year Totals					
BOPEC	453	2.0662	0.9431	1	5
B	453	2.1369	0.9354	1	5
1988					
BOPEC	71	1.8028	0.7487	1	4
B	71	1.8028	0.6891	1	4
1989					
BOPEC	79	1.8354	0.7584	1	4
B	79	1.8861	0.7509	1	4
1990					
BOPEC	79	2.2405	0.8506	1	4
B	79	2.3291	0.9019	1	5
1991					
BOPEC	76	2.3816	1.1772	1	5
B	76	2.4737	1.1486	1	5
1992					
BOPEC	79	2.2785	1.0734	1	5
B	79	2.3671	1.0522	1	5
1993					
BOPEC	69	1.8116	0.7722	1	4
B	69	1.9130	0.7424	1	4

BOPEC ≡ Composite BOPEC rating B ≡ Subsidiary bank ("B") component of BOPEC score

Table Four
Correlation Between Dependent Variables

This table shows overall and year-by-year correlations between the dependent variables used in the six regression models. As we would expect, there is a high correlation between the overall supervisory score (BOPEC rating) and the bank-subsidiary component of that score ("B"). There is also generally a strong relationship between total variance of holding company stock returns and the variance of the error term in the security market equation. Market assessments of risk are clearly imperfectly correlated with regulatory assessments. In general, the highest correlation (about 0.6) appears between the total return variance and the BOPEC rating.

	BOPEC	B	RVAR	BMLT	BILT	SIGLT
6-year Totals (453 Observations)						
BOPEC	1.0000	0.9301	0.5817	0.3172	0.0109	0.6583
B	0.9301	1.0000	0.5824	0.3338	0.0100	0.6519
TOTALVAR	0.5817	0.5824	1.0000	0.2470	-0.1103	0.9487
MKTBETA	0.3172	0.3338	0.2470	1.0000	0.2212	0.2291
IRBETA	0.0109	0.0100	-0.1103	0.2212	1.0000	-0.0971
ERRORVAR	0.6583	0.6519	0.9487	0.2291	-0.0971	1.0000
1988 (71 Observations)						
BOPEC	1.0000	0.8373	0.0991	0.1975	0.0023	0.2114
B	0.8373	1.0000	0.0391	0.1798	-0.0008	0.1365
TOTALVAR	0.0991	0.0391	1.0000	-0.2041	-0.0229	0.9406
MKTBETA	0.1975	0.1798	-0.2041	1.0000	-0.0045	-0.2740
IRBETA	0.0023	-0.0008	-0.0229	-0.0045	1.0000	0.0101
ERRORVAR	0.2114	0.1365	0.9406	-0.2740	0.0101	1.0000
1989 (79 Observations)						
BOPEC	1.0000	0.8898	0.2957	0.1293	0.1167	0.3180
B	0.8898	1.0000	0.1733	0.0912	0.0742	0.2270
TOTALVAR	0.2957	0.1733	1.0000	-0.0643	0.0244	0.9567
MKTBETA	0.1293	0.0912	-0.0643	1.0000	0.3876	-0.1797
IRBETA	0.1167	0.0742	0.0244	0.3876	1.0000	0.0026
ERRORVAR	0.3180	0.2270	0.9567	-0.1797	0.0026	1.0000
1990 (79 Observations)						
BOPEC	1.0000	0.9317	0.6787	0.2453	0.2626	0.6980
B	0.9317	1.0000	0.6690	0.2394	0.2347	0.6909
TOTALVAR	0.6787	0.6690	1.0000	0.2984	0.2614	0.9725
MKTBETA	0.2453	0.2394	0.2984	1.0000	0.4939	0.1932
IRBETA	0.2626	0.2347	0.2614	0.4939	1.0000	0.1980
ERRORVAR	0.6980	0.6909	0.9725	0.1932	0.1980	1.0000

BOPEC ≡ Composite BOPEC rating
B ≡ Subsidiary bank ("B") component of BOPEC score
TOTALVAR ≡ Total variance of holding company returns
MKTBETA ≡ Market beta of holding company stock
IRBETA ≡ Interest-rate beta of holding company stock
ERRORVAR ≡ Error term variance

Table Four
Correlation Between Dependent Variables
(Continued)

	BOPEC	B	RVAR	BMLT	BILT	SIGLT
1991 (76 Observations)						
BOPEC	1.0000	0.9493	0.7247	0.4426	-0.2179	0.7913
B	0.9493	1.0000	0.7476	0.4710	-0.2214	0.8047
TOTALVAR	0.7247	0.7476	1.0000	0.4048	-0.2473	0.9738
MKTBETA	0.4426	0.4710	0.4048	1.0000	0.1566	0.4116
IRBETA	-0.2179	-0.2214	-0.2473	0.1566	1.0000	-0.2803
ERRORVAR	0.7913	0.8047	0.9738	0.4116	-0.2803	1.0000
1992 (79 Observations)						
BOPEC	1.0000	0.9526	0.5790	0.3859	0.2464	0.6926
B	0.9526	1.0000	0.5591	0.4018	0.2736	0.6681
TOTALVAR	0.5790	0.5591	1.0000	0.1308	0.0698	0.9576
MKTBETA	0.3859	0.4018	0.1308	1.0000	0.2617	0.1427
IRBETA	0.2464	0.2736	0.0698	0.2617	1.0000	0.0998
ERRORVAR	0.6926	0.6681	0.9576	0.1427	0.0998	1.0000
1993 (69 Observations)						
BOPEC	1.0000	0.9201	0.7149	0.1504	-0.2266	0.7000
B	0.9201	1.0000	0.7417	0.1520	-0.1968	0.7272
TOTALVAR	0.7149	0.7417	1.0000	0.1174	-0.2550	0.9794
MKTBETA	0.1504	0.1520	0.1174	1.0000	0.2849	0.0363
IRBETA	-0.2266	-0.1968	-0.2550	0.2849	1.0000	-0.2076
ERRORVAR	0.7000	0.7272	0.9794	0.0363	-0.2076	1.0000

BOPEC ≡ Composite BOPEC rating
B ≡ Subsidiary bank ("B") component of BOPEC score
TOTALVAR ≡ Total variance of holding company returns
MKTBETA ≡ Market beta of holding company stock
IRBETA ≡ Interest-rate beta of holding company stock
ERRORVAR ≡ Error term variance

Table Five
Sample Statistics for Explanatory Variables

This table shows sample statistics for the independent accounting variables for each year and for the pooled sample. Clearly, there is substantial variation across years in most of these measures. For example, average bank size rose from about $5 billion to over $10 billion over the period. ROA ranged from 0.5% in 1991 to 1.09% in 1993. Nonperforming loans varied from 1.2% to 3.0% of total assets. On the other hand, the ratio of liquid to total assets was relatively stable, about 13%.

Variable	Num. Obs.	Mean	Std. Dev.	Minimum	Maximum
6-year Totals					
GAP	453	0.1874	0.1347	0.0001	0.6450
CREDIT	453	0.0173	0.0159	0.0008	0.1030
CAPITAL	453	0.0692	0.0143	0.0319	0.1284
LIQUID	453	0.1285	0.0810	0.0393	0.5940
STNDBYLC	453	0.0344	0.0330	0.0010	0.1615
COMLC	453	0.0054	0.0069	0.0000	0.0395
LNCOMIT	453	0.2679	0.2140	0.0000	1.6339
SIZE	453	15.7972	1.3470	12.3301	19.2376
ROA	453	0.0076	0.0071	-0.0353	0.0179
1988					
GAP	71	0.2133	0.1281	0.0027	0.6450
CREDIT	71	0.0115	0.0084	0.0010	0.0382
CAPITAL	71	0.0669	0.0142	0.0366	0.1085
LIQUID	71	0.1227	0.0562	0.0497	0.3358
STNDBYLC	71	0.0325	0.0275	0.0010	0.1292
COMLC	71	0.0049	0.0061	0.0000	0.0281
LNCOMIT	71	0.1745	0.1163	0.0000	0.5645
SIZE	71	15.4655	1.3406	12.3301	19.1446
ROA	71	0.0094	0.0048	-0.0136	0.0179
1989					
GAP	79	0.1499	0.1084	0.0028	0.4890
CREDIT	79	0.0118	0.0091	0.0008	0.0442
CAPITAL	79	0.0668	0.0129	0.0440	0.0987
LIQUID	79	0.1327	0.0740	0.0526	0.4221
STNDBYLC	79	0.0365	0.0352	0.0014	0.1615
COMLC	79	0.0056	0.0074	0.0000	0.0325
LNCOMIT	79	0.1708	0.1222	0.0041	0.5793
SIZE	79	15.6551	1.3345	12.6768	19.2073
ROA	79	0.0079	0.0059	-0.0137	0.0164

GAP ≡ Interest-rate risk (|Gap|/total assets)
CREDIT ≡ Credit risk (nonperforming loans/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)
LIQUID ≡ Liquidity position (liquid assets/total assets)
STNDBYLC ≡ Standby letters of credit (/total assets)
COMLC ≡ Commercial letters of credit (/total assets))
LNCOMIT ≡ Loan commitments (/total assets)
SIZE ≡ Natural log of total assets
ROA ≡ Return on assets (net income/total assets)

Table Five
Sample Statistics for Explanatory Variables
(Continued)

Variable	Num. Obs.	Mean	Std. Dev.	Minimum	Maximum
1990					
GAP	79	0.1588	0.1244	0.0023	0.5259
CREDIT	79	0.0299	0.0214	0.0043	0.1030
CAPITAL	79	0.0647	0.0119	0.0448	0.1011
LIQUID	79	0.1288	0.0754	0.0510	0.4606
STNDBYLC	79	0.0360	0.0339	0.0013	0.1478
COMLC	79	0.0055	0.0067	0.0000	0.0262
LNCOMIT	79	0.4543	0.2883	0.0373	1.6339
SIZE	79	15.7431	1.3709	12.5715	19.2376
ROA	79	0.0055	0.0081	-0.0353	0.0177
1991					
GAP	76	0.1595	0.1281	0.0014	0.5217
CREDIT	76	0.0204	0.0174	0.0014	0.0728
CAPITAL	76	0.0671	0.0152	0.0319	0.1149
LIQUID	76	0.1294	0.0795	0.0393	0.5302
STNDBYLC	76	0.0352	0.0358	0.0029	0.1585
COMLC	76	0.0050	0.0064	0.0000	0.0270
LNCOMIT	76	0.2615	0.1774	0.0216	1.1925
SIZE	76	15.8726	1.3126	12.7345	19.2037
ROA	76	0.0050	0.0086	-0.0300	0.0147

GAP ≡ Interest-rate risk (|Gap|/total assets)
CREDIT ≡ Credit risk (nonperforming loans/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)
LIQUID ≡ Liquidity position (liquid assets/total assets)
STNDBYLC ≡ Standby letters of credit (/total assets)
COMLC ≡ Commercial letters of credit (/total assets))
LNCOMIT ≡ Loan commitments (/total assets)
SIZE ≡ Natural log of total assets
ROA ≡ Return on assets (net income/total assets)

Table Five
Sample Statistics for Explanatory Variables
(Continued)

Variable	Num. Obs.	Mean	Std. Dev.	Minimum	Maximum
1992					
GAP	79	0.2018	0.1406	0.0001	0.5828
CREDIT	79	0.0176	0.0146	0.0027	0.0655
CAPITAL	79	0.0715	0.0138	0.0382	0.1086
LIQUID	79	0.1279	0.0923	0.0409	0.5940
STNDBYLC	79	0.0329	0.0334	0.0015	0.1501
COMLC	79	0.0055	0.0075	0.0000	0.0344
LNCOMIT	79	0.2567	0.1898	0.0356	1.2927
SIZE	79	15.9289	1.2963	13.8902	19.2011
ROA	79	0.0076	0.0071	-0.0254	0.0176
1993					
GAP	69	0.2505	0.1526	0.0064	0.5903
CREDIT	69	0.0116	0.0103	0.0015	0.0402
CAPITAL	69	0.0791	0.0134	0.0418	0.1284
LIQUID	69	0.1290	0.1036	0.0409	0.5398
STNDBYLC	69	0.0327	0.0319	0.0016	0.1496
COMLC	69	0.0057	0.0077	0.0000	0.0395
LNCOMIT	69	0.2819	0.2028	0.0356	1.3733
SIZE	69	16.1293	1.3796	12.6861	19.1992
ROA	69	0.0109	0.0059	-0.0192	0.0176

GAP ≡ Interest-rate risk (|Gap|/total assets)
CREDIT ≡ Credit risk (nonperforming loans/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)
LIQUID ≡ Liquidity position (liquid assets/total assets)
STNDBYLC ≡ Standby letters of credit (/total assets)
COMLC ≡ Commercial letters of credit (/total assets))
LNCOMIT ≡ Loan commitments (/total assets)
SIZE ≡ Natural log of total assets
ROA ≡ Return on assets (net income/total assets)

Table Six

Total Variance of Holding Company Returns

Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	0.0001	**0.314**	-0.0001	**-0.524**	0.0002	**0.695**	0.0005	**0.600**	0.0006	**1.513**	0.0001	**0.823**
	CREDIT	0.0110	**1.562**	0.0085	**3.030***	0.0062	**2.236****	0.0369	**4.224***	0.0241	**5.224***	0.0121	**6.476***
	CAPITAL	-0.0056	**-1.410**	0.0011	**0.608**	-0.0019	**-0.448**	-0.0054	**-0.580**	-0.0043	**-0.828**	0.0000	**0.005**
	LIQUID	-0.0007	**-0.772**	-0.0001	**-0.202**	0.0006	**0.956**	0.0006	**0.400**	0.0004	**0.635**	0.0004	**2.292****
	STNDBYLC	0.0025	**0.804**	-0.0007	**-0.850**	-0.0029	**-1.436**	-0.0035	**-0.780**	-0.0019	**-0.769**	-0.0011	**-1.257**
	COMLC	0.0096	**0.866**	0.0007	**0.210**	-0.0050	**-0.697**	-0.0344	**-1.830***	-0.0109	**-1.352**	0.0004	**0.152**
	LNCOMIT	-0.0005	**-0.858**	0.0000	**0.122**	0.0004	**1.958***	-0.0003	**-0.361**	0.0002	**0.609**	0.0000	**0.339**
Control Var.	SIZE	-0.0002	**-4.074***	-0.0001	**-2.613****	0.0000	**-0.615**	0.0000	**-0.432**	-0.0001	**-2.384****	0.0000	**-2.387****
	ROA	0.0108	**0.895**	-0.0061	**-1.402**	-0.0259	**-3.638***	-0.0614	**-3.522***	-0.0444	**-4.392***	-0.0087	**-2.240****
	INT	0.0037	**4.345***	0.0010	**2.843***	0.0010	**1.285**	0.0018	**0.973**	0.0028	**2.786***	0.0009	**2.656****
	R^2	0.3063		0.3232		0.5340		0.7158		0.7448		0.7042	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing the total variance of holding company stock returns as a function of the risk and control variables fit the data well. The results show that the market consistently placed a statistically significant emphasis on asset quality in assessing systematic risk. Liquidity and off-balance sheet activity were also occasionally significant factors.

Table Seven

Market Beta of Holding Company Stock

Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	-0.0891	**-0.433**	-0.3288	**-1.184**	0.6628	**2.572****	0.4707	**1.625**	-0.3093	**-1.032**	-0.2054	**-0.684**
	CREDIT	9.7948	**2.726*****	15.4118	**3.463*****	7.5770	**3.487*****	15.4080	**4.634*****	18.6244	**4.925*****	18.9691	**3.699*****
	CAPITAL	-3.4610	**-1.701***	-0.1575	**-0.055**	-2.5264	**-0.770**	-4.4706	**-1.253**	-0.5103	**-0.120**	-8.2340	**-1.930***
	LIQUID	-0.2785	**-0.576**	-0.1399	**-0.307**	0.6999	**1.498**	0.2355	**0.437**	0.7014	**1.309**	0.3038	**0.590**
	STNDBYLC	1.9178	**1.235**	0.2831	**0.209**	-3.7929	**-2.399****	-4.2227	**-2.482****	-3.3488	**-1.617**	1.6106	**0.657**
	COMLC	7.5407	**1.334**	1.5792	**0.298**	-7.0088	**-1.244**	-1.2633	**-0.177**	-4.7325	**-0.718**	3.4823	**0.528**
	LNCOMIT	-0.6014	**-2.027****	-0.0165	**-0.050**	0.5573	**3.685*****	0.5843	**2.017****	0.5761	**1.824***	0.1229	**0.401**
Control Var.	SIZE	0.1308	**5.125*****	0.2182	**6.637*****	0.2501	**7.350*****	0.2285	**5.778*****	0.2231	**4.812*****	0.1454	**2.888*****
	ROA	17.0532	**2.786*****	10.1784	**1.478**	8.8812	**1.585**	3.8049	**0.573**	4.6243	**0.559**	19.1587	**1.792***
	INT	-1.6559	**-3.868*****	-3.1627	**-5.583*****	-3.5096	**-5.835*****	-2.9228	**-4.123*****	-3.0670	**-3.697*****	-1.2743	**-1.337**
	R^2	0.6758		0.7125		0.7739		0.7266		0.6100		0.6279	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing holding company market beta as a function of the risk and control variables fit the data well. The results show that the market consistently placed a statistically significant emphasis on asset quality in assessing systematic risk. Off-balance sheet activity also appeared important in several years. Interest-rate risk and capital levels were occasionally significant factors, as well.

Table Eight

Interest Rate Beta of Holding Company Stock

Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	0.0435	**0.468**	-0.0855	**-0.482**	0.0752	**0.292**	0.0770	**0.228**	-0.1622	**-0.805**	-0.2906	**-1.812***
	CREDIT	1.1412	**0.704**	4.6316	**1.630**	3.5426	**1.631**	-5.7335	**-1.475**	5.4234	**2.132****	-2.7793	**-1.016**
	CAPITAL	-1.4357	**-1.564**	-1.1772	**-0.640**	-1.9918	**-0.607**	-0.9556	**-0.229**	-2.7802	**-0.976**	-1.7182	**-0.755**
	LIQUID	-0.1598	**-0.733**	-0.2753	**-0.946**	0.2672	**0.572**	0.4247	**0.675**	-0.1982	**-0.550**	0.1374	**0.500**
	STNDBYLC	-1.0437	**-1.489**	-0.1639	**-0.190**	-2.1075	**-1.334**	-1.8326	**-0.922**	0.4488	**0.322**	1.2398	**0.947**
	COMLC	3.5114	**1.376**	5.3351	**1.577**	-7.0147	**-1.246**	9.1403	**1.094**	3.5047	**0.791**	2.3139	**0.657**
	LNCOMIT	-0.0754	**-0.563**	-0.1199	**-0.574**	0.3971	**2.627****	0.2793	**0.825**	0.0049	**0.023**	-0.2249	**-1.374**
Control Var.	SIZE	-0.0044	**-0.380**	0.0147	**0.700**	0.0338	**0.993**	0.0190	**0.412**	-0.0046	**-0.146**	0.0013	**0.047**
	ROA	1.1738	**0.425**	9.7456	**2.217****	1.7626	**0.315**	-4.0473	**-0.522**	9.2078	**1.654**	4.1521	**0.728**
	INT	0.2045	**1.059**	-0.2430	**-0.672**	-0.5789	**-0.963**	-0.3347	**-0.404**	0.1682	**0.301**	0.1220	**0.240**
	R^2	0.1039		0.1685		0.2398		0.1119		0.1375		0.1343	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing holding company interest-rate beta as a function of the risk and control variables did not fit the data well. The results show that the market did not consistently place a statistically significant emphasis on any of our risk variables in assessing interest-rate exposure.

Table Nine
Error-Term Variance
Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	0.0013	**0.200**	-0.0027	**-0.576**	0.0006	**0.112**	0.0007	**0.088**	0.0001	**0.036**	0.0014	**0.513**
	CREDIT	0.2959	**2.680***	0.1969	**2.609**	0.1290	**2.815***	0.4912	**5.552***	0.4269	**8.711***	0.2848	**6.155***
	CAPITAL	-0.0919	**-1.469**	0.0035	**0.071**	-0.0314	**-0.455**	-0.0216	**-0.228**	-0.0403	**-0.734**	-0.0063	**-0.163**
	LIQUID	-0.0094	**-0.634**	-0.0060	**-0.774**	0.0083	**0.840**	0.0048	**0.337**	0.0131	**1.889***	0.0095	**2.039**
	STNDBYLC	0.0294	**0.615**	-0.0237	**-1.035**	-0.0541	**-1.623**	-0.0316	**-0.699**	-0.0132	**-0.493**	-0.0249	**-1.126**
	COMLC	0.1242	**0.715**	0.0050	**0.056**	-0.0362	**-0.304**	-0.3238	**-1.703***	-0.1310	**-1.534**	-0.0175	**-0.294**
	LNCOMIT	-0.0045	**-0.491**	0.0029	**0.517**	0.0068	**2.120**	-0.0006	**-0.072**	0.0028	**0.686**	0.0014	**0.498**
Control Var.	SIZE	-0.0046	**-5.846***	-0.0019	**-3.371***	-0.0013	**-1.815***	-0.0016	**-1.483**	-0.0033	**-5.428***	-0.0014	**-3.078***
	ROA	0.1338	**0.711**	-0.1803	**-1.544**	-0.4107	**-3.477***	-0.7302	**-4.137***	-0.5296	**-4.939***	-0.1758	**-1.822***
	INT	0.0883	**6.711***	0.0444	**4.621***	0.0415	**3.269***	0.0476	**2.522**	0.0703	**6.543***	0.0368	**4.281***
	R^2	0.4874		0.3666		0.5607		0.7858		0.8562		0.6859	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing the variance of the error term in the holding company security-market regression as a function of the risk and control variables fit the data well. The results show that the market consistently placed a statistically significant emphasis on asset quality in assessing idiosyncratic risk. Liquidity and levels of loan commitments were also occasionally significant factors.

Table Ten
Composite BOPEC Ratings
Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	-1.0879	**-2.014****	-0.0847	**-0.130**	-0.6734	**-1.255**	-0.5811	**-1.077**	-0.6250	**-1.228**	0.2053	**0.569**
	CREDIT	34.1302	**3.620*****	24.5377	**2.354****	19.0169	**4.203*****	23.4333	**3.782*****	42.0067	**6.541*****	44.2081	**7.180*****
	CAPITAL	-19.7080	**-3.691*****	-25.3470	**-3.755*****	-18.8570	**-2.760*****	-17.3380	**-2.608****	-10.4940	**-1.459**	-9.9603	**-1.944***
	LIQUID	-0.4114	**-0.325**	-2.5595	**-2.396****	-0.7630	**-0.784**	-1.2349	**-1.231**	-0.3458	**-0.380**	-0.5714	**-0.923**
	STNDBYLC	3.8893	**0.954**	-0.6437	**-0.203**	-1.5109	**-0.459**	2.1708	**0.685**	2.7583	**0.784**	-4.7208	**-1.603**
	COMLC	-18.7450	**-1.264**	0.9234	**0.074**	3.5651	**0.304**	10.5485	**0.792**	-0.2709	**-0.024**	3.4699	**0.438**
	LNCOMIT	1.3802	**1.773***	0.8207	**1.071**	0.7441	**2.363****	1.1275	**2.089****	0.6679	**1.245**	1.1674	**3.169*****
Control Var.	SIZE	-0.2531	**-3.778*****	-0.2204	**-2.862*****	-0.2219	**-3.131*****	-0.2330	**-3.162*****	-0.1826	**-2.320****	-0.1318	**-2.180****
	ROA	-43.1050	**-2.684*****	-41.2240	**-2.555****	-26.2730	**-2.252****	-56.9960	**-4.611*****	-41.2790	**-2.938*****	-41.7440	**-3.251*****
	INT	7.0549	**6.280*****	7.2435	**5.458*****	6.4317	**5.135*****	6.8771	**5.206*****	5.4243	**3.850*****	4.4942	**3.928*****
	R^2	0.6368		0.5123		0.6635		0.8127		0.7434		0.7599	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing the BOPEC rating as a function of the risk and control variables fit the data well. The results show that regulators consistently placed a statistically significant emphasis on asset quality in assigning BOPEC scores. Capital levels also appeared important in most years. Interest-rate risk and levels of loan commitments were occasionally significant factors, as well.

Table Eleven

Bank Subsidiary Ratings ('B' of BOPEC)

Regressed on risk and control variables

		1988		1989		1990		1991		1992		1993	
		Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.	Coef.	t.
Risk Variables	GAP	-1.0107	**-2.088** **	-0.2538	**-0.356**	-0.8822	**-1.757** *	-0.2357	**-0.408**	-0.4118	**-0.749**	0.1192	**0.325**
	CREDIT	35.3587	**4.185** ***	18.3929	**1.610**	14.5586	**3.439** ***	30.8543	**4.649** ***	39.3510	**5.674** ***	42.0869	**6.715** ***
	CAPITAL	-10.2690	**-2.147** **	-20.6480	**-2.792** ***	-16.4890	**-2.579** **	-10.6100	**-1.490**	-8.3414	**-1.074**	-1.2141	**-0.233**
	LIQUID	-0.2781	**-0.245**	-2.6007	**-2.222** **	-1.3106	**-1.440**	-1.3507	**-1.257**	-0.6009	**-0.612**	-0.6512	**-1.034**
	STNDBYLC	5.6441	**1.546**	3.6014	**1.038**	1.6981	**0.551**	2.6503	**0.780**	2.7693	**0.729**	-3.9563	**-1.320**
	COMLC	-38.1180	**-2.868** ***	-4.4306	**-0.326**	-3.9098	**-0.356**	-0.6141	**-0.043**	-4.5431	**-0.376**	1.7019	**0.211**
	LNCOMIT	2.6834	**3.847** ***	1.3148	**1.566**	1.0361	**3.517** ***	0.7918	**1.370**	0.5404	**0.933**	0.7799	**2.080** **
Control Var.	SIZE	-0.2078	**-3.462** ***	-0.2333	**-2.764** ***	-0.2535	**-3.823** ***	-0.1563	**-1.981** *	-0.1378	**-1.620**	-0.0778	**-1.265**
	ROA	-35.0000	**-2.432** **	-30.5350	**-1.728** *	-43.8380	**-4.017** ***	-46.4970	**-3.511** ***	-42.8160	**-2.821** ***	-49.7810	**-3.809** ***
	INT	5.4104	**5.375** ***	6.9912	**4.808** ***	6.9911	**5.966** ***	5.1839	**3.664** ***	4.7486	**3.121** ***	3.2719	**2.809** ***
	R^2	0.6556		0.4028		0.7380		0.7742		0.6884		0.7308	
	Observations	71		79		79		76		79		69	

* ≡ significant at the 10% level	LIQUID ≡ Liquidity position (liquid assets/total assets)
** ≡ significant at the 5% level	STNDBYLC ≡ Standby letters of credit (/total assets)
*** ≡ significant at the 1% level	COMLC ≡ Commercial letters of credit (/total assets))
	LNCOMIT ≡ Loan commitments (/total assets)
GAP ≡ Interest-rate risk (|Gap|/total assets)	SIZE ≡ Natural log of total assets
CREDIT ≡ Credit risk (nonperforming loans/total assets)	ROA ≡ Return on assets (net income/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	INT ≡ Intercept (constant) term

The yearly equations expressing the "B" component of the BOPEC rating (representing bank subsidiary performance) as a function of the risk and control variables fit the data well. The results show that regulators consistently placed a statistically significant emphasis on asset quality in assigning "B" scores. Capital levels also appeared important in 1988 – 1990 but less so in the later half of the sample period. Off-balance sheet activity was occasionally a significant factor, as well.

Table Twelve
Statistically Significant Variables by Year

1988		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP					neg**	neg**
	CREDIT		pos***		pos***	pos***	pos***
	CAPITAL		neg*			neg***	neg**
	LIQUID						
	STNDBYLC						
	COMLC						neg***
	LNCOMIT		neg**			pos*	pos***
Control Variables	SIZE	neg***	pos***		neg***	neg***	neg***
	ROA		pos***			neg***	neg**

1989		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP						
	CREDIT	pos***	pos***		pos**	pos**	
	CAPITAL					neg***	neg***
	LIQUID					neg**	neg**
	STNDBYLC						
	COMLC						
	LNCOMIT						
Control Variables	SIZE	neg**	pos***		neg***	neg***	neg***
	ROA			pos**		neg**	neg*

1990		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP		pos**				neg*
	CREDIT	pos**	pos***		pos***	pos***	pos***
	CAPITAL					neg***	neg**
	LIQUID						
	STNDBYLC		neg**				
	COMLC						
	LNCOMIT	pos*	pos***	pos**	pos**	pos**	pos***
Control Variables	SIZE		pos***		neg*	neg***	neg***
	ROA	neg***			neg***	neg**	neg***

This table shows the sign and statistical significance patterns for the independent variables in the market and regulatory regressions. It contains the same information as tables 6 through 11, in a way that emphasizes that cross-equation similarities and differences. Among the risk variables, the only factor consistently emphasized by the market is credit risk. Supervisors, on the other hand, appear to look at capital levels, as well.

* ≡ significant at the 10% level	GAP ≡ Interest-rate risk (|Gap|/total assets)
** ≡ significant at the 5% level	CREDIT ≡ Credit risk (nonperforming loans/total assets)
*** ≡ significant at the 1% level	CAPITAL ≡ Capital strength (total equity/total assets)
TOTALVAR ≡ Total variance of holding company returns	LIQUID ≡ Liquidity position (liquid assets/total assets)
MKTBETA ≡ Market beta of holding company stock	STNDBYLC ≡ Standby letters of credit (/total assets)
IRBETA ≡ Interest-rate beta of holding company stock	COMLC ≡ Commercial letters of credit (/total assets))
ERRORVAR ≡ Variance of error term	LNCOMIT ≡ Loan commitments (/total assets)
BOPEC ≡ Composite BOPEC score	SIZE ≡ Natural log of total assets
B ≡ Subsidiary bank ("B") component of BOPEC score	ROA ≡ Return on assets (net income/total assets)

Table Twelve
Statistically Significant Variables by Year
(Continued)

1991		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP						
	CREDIT	pos***	pos***		pos***	pos***	pos***
	CAPITAL					neg**	
	LIQUID						
	STNDBYLC		neg**				
	COMLC	neg*			neg*		
	LNCOMIT		pos**			pos**	
Control Variables	SIZE		pos***			neg***	neg*
	ROA	neg***			neg***	neg***	neg***

1992		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP						
	CREDIT	pos***	pos***	pos**	pos***	pos***	pos***
	CAPITAL						
	LIQUID				pos*		
	STNDBYLC						
	COMLC						
	LNCOMIT		pos*				
Control Variables	SIZE	neg**	pos***		neg***	neg**	
	ROA	neg***			neg***	neg***	neg***

1993		Market				Supervisors	
		TOTALVAR	MKTBETA	IRBETA	ERRORVAR	BOPEC	B
Risk Variables	GAP			neg*			
	CREDIT	pos***	pos***		pos***	pos***	pos***
	CAPITAL		neg*			neg*	
	LIQUID	pos**			pos**		
	STNDBYLC						
	COMLC						
	LNCOMIT					pos***	pos**
Control Variables	SIZE	neg**	pos***		neg***	neg**	
	ROA	neg**	pos*		neg*	neg***	neg***

* ≡ significant at the 10% level	GAP ≡ Interest-rate risk (|Gap|/total assets)
** ≡ significant at the 5% level	CREDIT ≡ Credit risk (nonperforming loans/total assets)
*** ≡ significant at the 1% level	CAPITAL ≡ Capital strength (total equity/total assets)
TOTALVAR ≡ Total variance of holding company returns	LIQUID ≡ Liquidity position (liquid assets/total assets)
MKTBETA ≡ Market beta of holding company stock	STNDBYLC ≡ Standby letters of credit (/total assets)
IRBETA ≡ Interest-rate beta of holding company stock	COMLC ≡ Commercial letters of credit (/total assets))
ERRORVAR ≡ Variance of error term	LNCOMIT ≡ Loan commitments (/total assets)
BOPEC ≡ Composite BOPEC score	SIZE ≡ Natural log of total assets
B ≡ Subsidiary bank ("B") component of BOPEC score	ROA ≡ Return on assets (net income/total assets)

Table Thirteen
Economic Significance of Risk and Control Variables

	TOTALVAR			MKTBETA			IRBETA			ERRORVAR			BOPEC			B		
	All Years	Statistically Significant Years		All Years	Statistically Significant Years		All Years	Statistically Significant Years		All Years	Statistically Significant Years		All Years	Statistically Significant Years		All Years	Statistically Significant Years	
	E_{XY}	E_{XY}	Years	E_{XY}	E_{XY}	Years	E_{XY}	E_{XY}	Years	E_{XY}	E_{XY}	Years	E_{XY}	E_{XY}	Years	E_{XY}	E_{XY}	Years
GAP	0.042		0	0.002	0.165	1	-0.045	-0.245	1	0.004		0	-0.067	-0.186	1	-0.067	-0.155	2
CREDIT	0.416	0.453	5	0.392	0.392	6	0.092	0.342	1	0.461	0.461	6	0.444	0.444	6	0.433	0.475	5
CAPITAL	-0.050		0	-0.098	-0.188	2	-0.128		0	-0.051		0	-0.266	-0.293	5	-0.176	-0.261	3
LIQUID	0.044	0.211	1	0.042		0	-0.011		0	0.041	0.153	2	-0.090	-0.250	1	-0.104	-0.256	1
STNDBYLC	-0.092		0	-0.078	-0.274	2	-0.093		0	-0.096		0	0.002		0	0.077		0
COMLC	-0.026	-0.164	1	0.009		0	0.120		0	-0.028	-0.133	1	-0.004		0	-0.071	-0.335	1
LNCOMIT	0.030	0.246	1	0.091	0.125	4	0.020	0.422	1	0.060	0.259	1	0.199	0.236	4	0.238	0.332	3
SIZE	-0.289	-0.401	4	0.581	0.581	6	0.047		0	-0.415	-0.471	5	-0.319	-0.319	6	-0.283	-0.346	4
ROA	-0.266	-0.379	4	0.151	0.245	2	0.133	0.362	1	-0.253	-0.347	4	-0.309	-0.309	6	-0.318	-0.318	6

TOTALVAR ≡ Total variance of holding company returns	ERRORVAR ≡ Variance of error term
MKTBETA ≡ Market beta of holding company stock	BOPEC ≡ BOPEC rating
IRBETA ≡ Interest-rate beta of holding company stock	B ≡ Subsidiary bank ("B") component of BOPEC score
GAP ≡ Interest-rate risk (|Gap|/total assets)	COMLC ≡ Commercial letters of credit (/total assets))
CREDIT ≡ Credit risk (nonperforming loans/total assets)	LNCOMIT ≡ Loan commitments (/total assets)
CAPITAL ≡ Capital strength (total equity/total assets)	SIZE ≡ Natural log of total assets
LIQUID ≡ Liquidity position (liquid assets/total assets)	ROA ≡ Return on assets (net income/total assets)
STNDBYLC ≡ Standby letters of credit (/total assets)	

This table shows the patterns of economic significance among the dependent variables in the six regressions. The term E_{XY} is computed as:

$$E_{XY} \equiv \beta_{XY} \frac{\sigma_X}{\sigma_Y},$$

where β_{XY} is the coefficient in the regression of X on Y, and σ_X and σ_Y represent the standard deviations of X and Y. We report the average of this statistic for each variable over all years and over only those years in which the variable is statistically significant.

If we view one standard deviation as a normal or typical range of fluctuation, then E_{XY} effectively answers the question, "Does a typical change in X tend to result in a change in Y that is bigger or smaller than is typical?" Thus, the greater the magnitude of E_{XY}, the more economically significant we can consider β_{XY} to be. In general we can see from the table that asset quality has an economically large impact on both the market variables and the regulator variables. On the other hand, capital appears to be important only in the regulatory equations.