Can the Stock Market Tell Bank Supervisors Anything They Don't Already Know?

Jeffery W. Gunther, Mark E. Levonian, and Robert R. Moore

Stock prices provide useful predictive information, even after taking into account past rating information and information from the quarterly financial statements banking organizations file between inspections.

Jeffery W. Gunther is a senior economist and research officer and Robert R. Moore a senior economist and policy advisor in the Financial Industry Studies Department of the Federal Reserve Bank of Dallas. Mark E. Levonian is a vice president in the Banking Supervision and Regulation Division of the Federal Reserve Bank of San Francisco.

Various initiatives have been pursued in recent years to enlarge market forces' role in promoting a safe and sound financial system. Faced with dramatic increases in the size, scope, and complexity of banking organizations, policymakers have increasingly considered the possibility that the forces determining prices and quantities in the financial markets might be harnessed to supplement supervisory efforts aimed at maintaining safety and soundness.

A primary example of the increased emphasis on market forces is the comprehensive approach to capital adequacy recently developed by the Basel Committee on Banking Supervision. The new framework rests on three pillars—minimum capital requirements, supervisory review, and market discipline. By including market discipline, the committee recognizes that market forces can reinforce capital regulation and other efforts to promote safety and soundness.

Another example of the new emphasis is the Gramm–Leach–Bliley Act of 1999, which directed the Federal Reserve Board and the Treasury secretary to assess the appropriateness and value of requiring large depository institutions to issue subordinated debt. While the resulting study did not recommend the immediate establishment of such a requirement, the Board and the Treasury nevertheless concluded that the evidence supports use of subordinated debt both in supervisory monitoring and to encourage market discipline.[1]

This article considers only one of several avenues through which market forces might be used to support safety and soundness—the idea that investors' views on the financial condition and prospects of banking organizations can be distilled from stock prices and that such views can provide a useful supplement to supervisory assessments. Despite its intuitive appeal, insufficient analysis has been undertaken to document the empirical content of this basic idea. As a result, controversy remains over whether the financial markets can say anything about the health and prospects of financial institutions that supervisors do not already know.

Our empirical work uses supervisory ratings as a benchmark for banking organizations' financial safety and soundness, under the assumption that the results of supervisory inspections accurately reflect the financial condition of individual organizations. If after an inspection bank supervisors know everything about an organization's financial condition that investors know, and perhaps more, the question becomes whether market data can provide incremental information in the periods between inspections,

beyond that offered by past inspection results and regularly reported data. It is important to note that the issue here is not which of these sources of information is better or more accurate. To be valuable, market indicators need not be superior to standard supervisory indicators. They just have to add a new perspective or dimension that helps provide a more complete picture of an institution's financial health, as Flannery (forthcoming) suggests. The tests reported in this article address this issue.

We find that a measure of financial viability based on stock prices helps predict the financial condition of individual banking organizations, as reflected in their supervisory ratings. Moreover, this measure provides useful information beyond that of past inspection results and quarterly financial statements. To the extent that these data are a reasonable proxy for the full set of information supervisors use between inspections, these findings indicate the financial markets can provide useful information to supplement supervisory assessments. The equity-market data give the right signals—or at least they are in broad agreement with subsequently assigned supervisory ratings—and they appear to contain new, or more timely, information not reflected by financing accounting statements.

EQUITY-BASED MARKET SIGNALS

The consensus of investors regarding individual organizations is reflected in market prices and price movements. The prices depend on future payoffs to investors and so are inherently forward-looking. With money at stake, investors have a strong incentive to collect valid information, evaluate it, and accurately assess the potential risks and rewards. At least in principle, a sense of what that assessment is can be extracted from the pricing of any risky claim on a bank or bank holding company.

In practice, the equity claims of an organization's owners have a number of advantages as a source of this type of information. Compared with other types of bank-related claims, markets for common shares are fairly liquid, so the quality of the price signals is reasonably high. Moreover, equity values are sensitive to changes in the condition of the issuing firm, making those changes easier to observe in share prices.

Equity claims present some complications because shareholders benefit if the issuer does well but have limited downside risk should losses occur, given the legal limits on their liability. Shareholders' limited liability is a particularly prominent issue in banking, since deposit insurance severely restricts or altogether eliminates the downside risk for depositors, leaving a substantial degree of that risk with the deposit insurance fund. However, models have been developed to account for these factors.

One prominent model is the option-based framework developed by Merton (1974, 1977). This model relies on the fact that under limited liability, equity is equivalent to a call option on the issuer's assets. With the analogy to options, the technology of option pricing can be brought to bear, and information on investors' implicit views of risk can be extracted from stock prices. This model has often been used in the banking context.[2]

KMV LLC has commercially implemented a variant of this model and incorporated proprietary elements that extend the basic Merton approach. Crosbie (1999) describes the KMV framework, in which the EDF™ credit measure serves as a summary measure of default risk. (EDF is an acronym for *expected default frequency*.) In essence, the EDF measure for a firm represents an estimate of the percentage of firms in the same financial condition that historically defaulted on an obligation within the next twelve months. We use KMV's EDF credit measure to investigate market information's capacity to supplement supervisory assessments.

A number of studies address the issue of whether market data can usefully supplement supervisory monitoring efforts. Flannery (1998) provides an overview of these and related studies, many of which focus on subordinated debt. Relatively recent studies examining equity-market data include that of Berger, Davies, and Flannery (2000), who find that supervisory assessments are generally less accurate than equity-market indicators in anticipating changes in financial performance, such as earnings, except when the supervisory assessments are based on a very recent inspection. Elmer and Fissel (2001) offer evidence that stock returns can help forecast bank failures. And finally, in the study most similar to our own, Krainer and Lopez (2001) find that equity-market information can help forecast downgrades in the supervisory ratings assigned to bank holding companies. Our analysis is distinguished by the estimation of statistical models based directly on downgrades from various rating categories, whereas Krainer and Lopez infer downgrade forecasts from a single statistical model based on the level of ratings. The estimation of downgrade models may allow a sharper focus on the contribution of equity-market data to the identification of adverse financial changes and at a minimum

Table 1
Definitions of Explanatory Variables

Equity-market data	
EDF	EDF™ credit measure (EDF is an acronym for *expected default frequency.*)
Past supervisory assessments	
BOPEC-1	Composite BOPEC rating from the immediately prior inspection of the holding company
CAMELS	Asset-weighted average composite CAMELS rating from the most recent exams of individual banks
Financial accounting data	
SIZE	Log of total assets
CAPITAL	Total equity capital
RESERVES	Loan-loss reserves
PAST-DUE 30	Loans past due 30–89 days
PAST-DUE 90	Loans past due 90 or more days
NONACCRUAL	Nonaccrual loans
SECURITIES	Investment securities
LARGE CDs	CDs of $100,000 or more
PROVISIONS	Loan-loss provisions in quarter
ROA	Net income for quarter

NOTES: *EDF* is proprietary and from KMV LLC. *BOPEC-1* and *CAMELS* are confidential and from the Federal Reserve Board. *SIZE* and the financial ratios are based on data from a regulatory report, Consolidated Financial Statements for Bank Holding Companies (FR Y-9C), issued by the Federal Reserve Board. *EDF* is as of the end of the month falling two months prior to the month in which the corresponding holding company inspection was opened. *CAMELS* is based on the most recent bank exam (one-bank holding company) or exams (multibank holding company) closed prior to the month in which the corresponding holding company inspection was opened. Financial ratios are scaled by assets, except for *PROVISIONS* and *ROA*, which are relative to average assets. These variables, along with *SIZE*, are from the quarter-end two months prior to the three-month period in which the corresponding holding company inspection was opened.

provides a separate vehicle for confirming the positive results Krainer and Lopez document. The following section details the types of data our analysis uses.

DATA

At the holding company level, the primary supervisory indicator is the BOPEC rating, derived from financial performance along five dimensions: bank subsidiaries (*B*), other (nonbank) subsidiaries (*O*), the parent company (*P*), consolidated earnings (*E*), and consolidated capital (*C*). The composite rating forms the basis of the dependent variables in the regressions reported below. This rating is defined as follows: 1—basically sound in every respect; 2—fundamentally sound but with modest weaknesses; 3—financial, operational, or compliance weaknesses that cause supervisory concern; 4—serious financial weaknesses that could impair future viability; and 5—critical financial weaknesses that render the probability of near-term failure extremely high.

Current BOPEC ratings serve as our benchmark for banking organizations' financial safety and soundness. For many of the largest banking organizations, this clearly is an oversimplification. For these firms, continuous on-site supervision provides supervisors with far more information about current conditions than can be captured and conveyed by a single composite measure, such as the BOPEC rating. Nevertheless, for banking organizations in general, the BOPEC rating is a good summary indicator of condition, and for the purposes of our analysis we assume this rating accurately reflects the financial condition of individual organizations.

With BOPEC ratings as our primary benchmark, we examine how these ratings are related to other types of information. Specifically, we assess the extent to which various types of information can help explain, or predict, the BOPEC rating an organization will receive once it is inspected. The variables we use to explain the level of and changes in BOPEC ratings fall into three main categories: equity-market data in the form of EDFs, past supervisory assessments, and financial accounting data. In combining the various data, an effort is made to reflect the flow of information as it occurs in real time, after accounting for reporting lags and other factors. That is, to predict a BOPEC at any point, we only use information that realistically would have been available to bank supervisors.[3] This allows us to focus on whether market data can provide incremental information to bank supervisors between inspections, beyond past inspection information and regularly reported accounting data. The explanatory variables themselves are summarized in Table 1 and discussed below.

Equity-Market Data

To incorporate information from the equity market, the analysis includes the EDF credit measure for individual banking organizations, as constructed by KMV (*EDF*). As described above, *EDF* is an estimate of the probability a firm will default within the next year. As a measure of credit risk, *EDF* should be positively associated with problem BOPEC ratings; while BOPEC ratings are not explicit estimates of the probability of default or failure, we would expect institutions in relatively weak financial condition to have higher *EDF* values and higher (worse) BOPEC ratings. KMV generally releases data about two weeks after each month's end, so *EDF* is as of the end of the month falling two months prior to the month in which the corresponding inspection was opened.

Past Supervisory Assessments

To help predict BOPEC ratings for individual organizations, the analysis includes two variables reflecting supervisory assessments made prior to the opening of the current inspection. The first variable is the rating an organization

received on its most recent prior inspection (*BOPEC-1*), which may be positively related to the organization's current rating. In addition, information is included from a separate bank exam process, which complements supervision at the organization level. Bank-level exam results can trigger changes in an organization's BOPEC rating. Ratings at the bank level range from 1 (best) to 5 (worst), similar to composite BOPEC ratings, and are referred to as CAMELS ratings. Composite CAMELS ratings are derived from the evaluation of six bank-level factors: capital adequacy (*C*), asset quality (*A*), management (*M*), earnings (*E*), liquidity (*L*), and sensitivity to market risk (*S*). The asset-weighted average of the composite ratings for an organization's bank subsidiary or subsidiaries (*CAMELS*) is included to capture supervisory information at the bank level. The variable *CAMELS* is based on the most recent bank exam (one-bank holding company) or exams (multibank holding company) closed prior to the month in which the corresponding holding company inspection was opened.

Financial Accounting Data

The analysis also controls for the potential predictive capacity of a number of indicators based on the quarterly reports banking organizations file with the Federal Reserve. One basic indicator is an organization's size. The log of total assets (*SIZE*) may reduce the chances of a substandard BOPEC rating if largeness provides financial strength, through either a greater ability to diversify risk or a closer relationship with the broader financial market.

The remaining nine variables are financial ratios that reflect various aspects of financial strategy and performance. The balance-sheet variables are scaled using total assets, and the income statement variables are expressed relative to average assets. Total equity capital (*CAPITAL*) and loan-loss reserves (*RESERVES*) serve as measures of capital adequacy. Each of these variables is expected to reduce the chances of a substandard BOPEC rating. Asset quality is measured using loans past due thirty to eighty-nine days (*PAST-DUE 30*), loans past due ninety or more days (*PAST-DUE 90*), and nonaccrual loans (*NONACCRUAL*). These variables are expected to raise the chances of a substandard BOPEC rating. Liquidity is measured using two variables: investment securities (*SECURITIES*) and certificates of deposit of $100,000 or more (*LARGE CDs*). *SECURITIES* should reduce the chances of a substandard rating, while the reverse is true for *LARGE CDs*. A reliance on this latter type of funding is often associated with aggressive banking strategies and frequently subjects an organization to added expenses. Finally, two income-statement variables are included to capture the effect of asset quality problems and other factors on profitability: loan-loss provisions (*PROVISIONS*), which should hurt BOPEC ratings, and net income (*ROA*), which should help the ratings. The financial ratios and *SIZE* are as of the quarter-end two months prior to the three-month period in which the corresponding holding company inspection was opened. The two-month lag used in the regressions compensates for lags in the submission and processing of financial statements.

Sample

The sample is based on bank holding company inspections opened in the period from June 1996 through March 2000. Of the 11,450 inspections and corresponding BOPEC ratings for this period, prior BOPEC ratings are available for 10,315. While many banking organizations have publicly traded stock, many more do not. Largely because of this, equity-market data can be obtained for only 948 of these 10,315 observations. Of the 948, supervisory financial reports are available for 914. Given the lagged structure of the regressions, the financial reports used are for the period from first quarter 1996 through fourth quarter 1999. CAMELS ratings are available for all of these remaining 914 observations.

RESULTS

Sample Means

Table 2 shows the sample means of the explanatory variables for the different BOPEC ratings.[4] Reading across the columns in the first row of the table, worse supervisory ratings are associated with a higher *EDF*. Organizations that are assigned worse BOPEC ratings tend to have had worse ratings at the prior inspection (*BOPEC-1*). Weak BOPEC ratings also tend to be associated with previous supervisory problems at the bank level (*CAMELS*), asset quality problems (*PAST-DUE 30*, *PAST-DUE 90*, and *NONACCRUAL*), a reliance on large CDs (*LARGE CDs*), and high loan-loss provisions (*PROVISIONS*). In addition, substandard supervisory ratings are negatively related to capital adequacy (*CAPITAL*), profitability (*ROA*), and organization size (*SIZE*).

Two minor surprises are that the relationship between investment securities (*SECURITIES*) and supervisory ratings is not statistically significant (p value $\leq .05$) and that loan-loss reserves

Table 2
Sample Means
(Quarterly Data for 1996–99)

	BOPEC rating				
	1	2	3	4	*p* value
Equity-market data					
EDF	.25	.39	1.33	2.89	.001
Past supervisory assessments					
BOPEC-1	1.16	1.91	2.66	2.71	.001
CAMELS	1.15	1.86	2.57	2.43	.001
Financial accounting data					
SIZE	15.22	14.90	13.89	12.81	.001
CAPITAL	9.16	8.28	6.86	6.15	.001
RESERVES	.97	.99	1.12	1.62	.001
PAST-DUE 30	.69	.78	.86	1.34	.001
PAST-DUE 90	.12	.17	.24	.54	.001
NONACCRUAL	.30	.46	.90	1.30	.001
SECURITIES	24.71	23.53	21.89	24.75	.115
LARGE CDs	8.68	9.93	10.61	13.71	.007
PROVISIONS	.06	.07	.16	.77	.001
ROA	.36	.30	.14	–.21	.001
Observations	449	428	29	7	—

NOTES: Dates are for the quarterly Y-9C data used to construct the financial ratios. Corresponding dates for *EDF*, *CAMELS*, and the current BOPEC rating are in the Table 1 notes. Composite BOPEC ratings are defined as follows: 1—basically sound in every respect; 2—fundamentally sound but with modest weaknesses; 3—financial, operational, or compliance weaknesses that cause supervisory concern; 4—serious financial weaknesses that could impair future viability; and 5—critical financial weaknesses that render the probability of near-term failure extremely high. To preserve the data's confidentiality, the sample's single 5-rated observation is not shown. *P* values less than or equal to .05 are associated with statistical significance. For *BOPEC-1*, the *p* value is determined by a likelihood ratio chi-square test, based on the ratios of observed and expected frequencies, for the null hypothesis of no association with current BOPEC ratings. The *p* values for the remaining variables are determined by the *k*-sample Van der Waerden test (chi-square approximation) for the null hypothesis of the same location parameter across BOPEC ratings. Financial ratios are multiplied by 100.

(*RESERVES*) do not appear to ameliorate supervisory problems. However, the positive association between *RESERVES* and supervisory problems can be explained, as asset quality problems are not held constant when comparing the average level of *RESERVES* across ratings. Problem institutions are likely to be so in part due to poor asset quality, which is commonly addressed through higher loan-loss provisions, leading to higher levels of reserves. The multivariate statistical techniques used in the next section facilitate an assessment of the relationship between *RESERVES* and BOPEC ratings that holds asset quality constant.

Predicting BOPEC Ratings

While Table 2 reveals interesting patterns involving potential relationships between an organization's current BOPEC rating and the explanatory variables, each variable's importance in explaining BOPEC ratings cannot be determined based on the differences in means alone. To identify each variable's incremental information content in predicting BOPEC ratings, we estimate a statistical model, or regression, of BOPEC ratings. If a variable is statistically significant in this regression, the variable conveys useful predictive information beyond whatever information may be contained in the other variables. As a first step, all the variables listed in Table 1 are included in the regression. The least significant variable is then dropped from consideration, and the regression is estimated again. This process is repeated until all the included variables are statistically significant.

The first column of Table 3 shows the results. The key finding is that the equity-market variable, *EDF*, is highly significant in explaining BOPEC ratings, indicating stock prices provide useful predictive information, even after taking into account past rating information and information from the quarterly financial statements banking organizations file between inspections. The positive sign of the estimated coefficient on *EDF* indicates supervisory problems are associated with higher values of *EDF*, as would be expected. The other significant variables are *BOPEC-1*, *CAMELS*, *CAPITAL*, *RESERVES*, *PAST-DUE 90*, *NONACCRUAL*, *PROVISIONS*, and *ROA*. The sign of the coefficient on each of these variables corresponds to expectations. For example, lower values of *ROA* are associated with more severe supervisory problems. *SIZE*, *PAST-DUE 30*, *SECURITIES*, and *LARGE CDs* are not significant in explaining BOPEC ratings.

To assess the extent of *EDF*'s contribution to the ability to predict BOPEC ratings, the second column of Table 3 displays the results of estimating the regression in column 1 with *EDF* excluded. The predictive capacity of the two regressions can be compared based on the measures of association shown in the last three rows of the table. For the purposes of these measures, pairs of observations are categorized as concordant (loosely speaking, the model gets it right), discordant (the model gets it wrong), or tied. A high incidence of concordant pairs, together with a low incidence of discordant pairs, indicates superior predictive capacity in the form of a close association between predicted and actual outcomes. The statistic gamma is a summary measure based on the number of concordant and discordant pairs; a high gamma value reflects superior predictive performance. The maximum value for gamma is 1. As the first and second columns of Table 3 show, the measures of association register only slightly better values for the regression including *EDF* than for the regression excluding it.

However, the regressions shown in the first and second columns apply to BOPEC ratings in general, most of which are unchanged from the prior inspection. Given the significant inertia in

Table 3

Probit Regressions of BOPEC Ratings

	Ordered regressions, all rating levels		Binary regressions			
			Downgrades from 1		Downgrades from 2	
α_1	3.02**	2.88**	2.95**	2.52**	.11	–.87
	(.37)	(.36)	(.47)	(.45)	(.83)	(.74)
α_2	6.89**	6.47**				
	(.44)	(.41)				
α_3	10.24**	8.74**				
	(.71)	(.61)				
α_4	18.02**	14.65**				
	(1.85)	(1.63)				
Equity-market data						
EDF	.55**		.72**		.97**	
	(.10)		(.19)		(.23)	
Past supervisory assessments						
BOPEC-1	1.14**	1.21**				
	(.13)	(.12)				
CAMELS	1.65**	1.60**	1.97**	1.94**		
	(.15)	(.14)	(.27)	(.26)		
Financial accounting data						
CAPITAL	–10.18**	–10.36**			–27.29*	–25.67*
	(3.37)	(3.29)			(11.02)	(10.09)
RESERVES	–52.71**	–46.52**				
	(17.70)	(17.03)				
PAST-DUE 90	117.7**	98.76**	148.7*	129.6*		
	(31.25)	(30.64)	(66.74)	(64.57)		
NONACCRUAL	43.02**	35.99*			117.8**	91.95**
	(16.19)	(15.98)			(31.92)	(28.60)
PROVISIONS	235.9**	190.6**				
	(59.22)	(56.08)				
ROA	–141.8**	–126.1**	–338.9**	–375.1**	–447.9**	–556.8**
	(39.65)	(35.08)	(100.2)	(99.64)	(151.7)	(130.6)
Measures of association						
Concordant	95.2	94.8	85.2	82.6	96.3	91.4
Discordant	4.4	4.9	14.4	16.8	3.6	7.8
Gamma	.91	.90	.71	.66	.93	.84

** Significant at the 1 percent level.

* Significant at the 5 percent level.

NOTES: Each type of regression is first estimated using all the variables in Table 1, except that *BOPEC-1* is excluded from the two types of downgrade regressions. The least significant variable in each type of regression is then dropped from consideration, and the regressions are estimated again. This process is repeated until all the included variables are significant at the 5 percent level. *EDF* is then dropped from the resulting regressions for comparison. Standard errors are in parentheses. The current BOPEC rating is the dependent variable in the ordered regressions. The likelihood contribution of an observation with a BOPEC rating of i is $N(\alpha_i - \beta'X) - N(\alpha_{i-1} - \beta'X)$, where $N(\cdot)$ is the standard normal cumulative distribution function, $\alpha_0 = -\infty$, and $\alpha_5 = \infty$. The dependent variable is 1 for downgrades and 0 otherwise in the binary regressions. The likelihood contribution of an observation that is not downgraded is $N(\alpha_1 - \beta'X)$, and the contribution of a downgraded observation is $1 - N(\alpha_1 - \beta'X)$, where $N(\cdot)$ is the standard normal cumulative distribution function. The regressions for downgrades from a rating of 1 are based on 429 observations (*BOPEC-1* = 1), including fifty-two downgrades. The regressions for downgrades from a 2 rating are based on 453 observations (*BOPEC-1* = 2), including seventeen downgrades. The predicted probability of the dependent variable falling into the best category—a rating of 1 for the ordered regressions and 0 for the downgrade regressions—is grouped into intervals of length .002 and defined as the "event probability." A pair of observations with different values of the dependent variable is defined as concordant if the observation with the best (lowest) value also has a higher event probability. The opposite case is defined as discordant. If a pair of observations with different values of the dependent variable is neither concordant not discordant, it is defined as a tie. Let n represent the number of pairs with different values of the dependent variable, c the number of concordant pairs, and d the number of discordant pairs. Concordant observations are reported as $100 \cdot c/n$ and discordant as $100 \cdot d/n$. The summary measure of association is the Goodman–Kruskal gamma, an indicator of rank correlation between the observed ratings and predicted probabilities, defined as $(c - d)/(c + d)$.

these ratings, the measures of association shown in the first two columns may not reflect the extent of *EDF*'s help in predicting whether an organization receives a different rating than it received during its last inspection. A change in rating is an event of considerable supervisory interest, particularly if the newly assigned rating is worse than the previous one. Reflecting these considerations, the next section focuses on *EDF*'s contribution to the ability to predict supervisory downgrades.

Predicting BOPEC Downgrades

The third and fourth columns of Table 3 show the results of predicting which 1-rated organizations are downgraded to a rating of 2 or worse; the fifth and sixth columns apply to the downgrade of 2-rated organizations to a 3 or worse. The number of observations involving downgrades from a rating of 3 or 4 is too small to support statistical estimation. In the downgrade regressions we estimate for 1- and 2-rated organizations, we follow the same procedure used in estimating the regressions for BOPEC ratings in general, through which statistically insignificant variables are sequentially eliminated from the list of variables in Table 1.

As Table 3 shows, a smaller number of variables help predict BOPEC downgrades than BOPEC ratings in general. Nevertheless, *EDF* is identified as a statistically significant variable in predicting BOPEC downgrades for both 1- and 2-rated organizations. In addition, the measures of association indicate considerably better performance for the regressions including *EDF* than for the regressions excluding *EDF*, suggesting *EDF*'s incremental contribution to the ability to predict BOPEC downgrades is notable.[5] The summary gamma statistic shows a 7 percent reduction in the association between predicted and observed outcomes when *EDF* is excluded from the regression predicting downgrades of 1-rated organizations. And the exclusion of *EDF* results in a 10 percent reduction in predictive association for downgrades of 2-rated organizations.[6] These results indicate equity-market information is valuable in identifying potential downgrades.

CONCLUSION

Our results show an indicator of financial viability based on stock prices provides incremental information to bank supervisors during the periods between inspections, beyond the information contained in past supervisory ratings and the quarterly financial statements routinely used in the supervisory process. We see this finding as evidence that investors' views regarding the financial condition of individual banking organizations, as distilled from equity prices, provide a useful supplement to supervisory assessments. In essence, the markets give the right signals, and the information they provide is not redundant.

This interpretation of our results hinges on whether past rating information and quarterly accounting data together form a reasonable proxy for the extent of supervisory information between inspections. It is important to note that the supervisory information produced between inspections in some—and perhaps many—cases almost surely extends beyond the types of information included in our statistical models. This is especially true for the largest organizations, where a continuous on-site presence provides supervisors with more information about current conditions than is reflected in the past rating information and quarterly financial data we use as standard supervisory indicators. Based on these considerations, further work is needed to incorporate additional supervisory information into the analysis. Related to this work is the important issue of the extent to which supervisors systematically quantify any assessments formed between inspections.

An additional question is whether market data can provide incremental information, even when inspections are current. We have shown market information is useful in tracking financial conditions, as reflected in BOPEC ratings. But are BOPEC ratings a comprehensive indicator of organizations' financial condition? BOPEC ratings themselves may be only imperfect indicators of risk levels. One possible avenue for exploring this question would be further work along the lines of Berger, Davies, and Flannery (2000) that compares the ability of equity-market information and BOPEC ratings to predict additional indicators of financial condition, such as default.

NOTES

The authors would like to thank KMV LLC for providing the proprietary data this study uses. They also would like to acknowledge the helpful comments and suggestions of participants at the Conference on Using Market Data in Banking Supervision, May 2 and 3, 2001, sponsored by the Federal Reserve Bank of Minneapolis and the Federal Reserve Bank of San Francisco.

[1] See Board of Governors of the Federal Reserve System and U.S. Department of the Treasury (2000).

[2] For example, see Ronn and Verma (1986).

[3] The data we use to construct financial ratios are from

quarterly financial reports, Consolidated Financial Statements for Bank Holding Companies (FR Y-9C), issued by the Federal Reserve Board. Insofar as these data are subject to revision, the values of our financial ratios may not reflect their assigned values when the data were first reported, since we do not have access to the original data.

[4] The sole 5-rated observation is not shown to preserve the data's confidentiality.

[5] These results are based on the degree of association within the estimation sample. We have insufficient data to assess how well the various models forecast events outside the estimation sample.

[6] When all the variables shown in Table 3 are included in the downgrade regressions, whether they are significant or not, the reductions in association resulting from the exclusion of *EDF* are 8 percent and 4 percent, respectively.

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