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## LARGE BANK FAILURES AND INVESTOR PERCEPTIONS OF THE RISKINESS OF BANKING

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of the Riskiness of Banking

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## Large Bank Failures and Investor Perceptions of the Riskiness of Banking

Considerable research time and effort have been devoted lately to examining the question whether financial markets can exert significant control over risk-taking by commercial banks and whether market-based information might prove a useful adjunct to the present regulatory apparatus. On the whole, available evidence indicates that financial markets are sensitive to the degree of leverage banks employ and levy higher costs of funds against more leveraged banks. In addition, there is a growing volume of evidence that markets anticipate deterioration in bank soundness before regulators do, often long before. What evidence there is, however, falls far short of incontrovertible proof that the bank examination process can safely be left to the workings of financial markets. Because banking presently is highly regulated, considerable sentiment remains that investor senses are dulled from relying on regulators to monitor bank soundness.

An interesting line of research that has been pursued in two recent studies is to examine investor behavior before and after the failures of large commercial banks. United States National Bank of San Diego and the Franklin National Bank of New York were both far larger than any other bank to fail in U.S. history. Indeed, these failures launched Congressional hearings into the adequacy of federal bank regulation (federal bank protection?). Surely, had investors previously assumed bank securities to be safe investments, after these cataclysmic events they no longer would.

A model by Richard H. Pettway [6] looked at the rate of return required by investors in bank common stocks. Donald R. Fraser and J. Patrick McCormack [2] modeled rates of return required by investors in long-term bank debt. If large bank failures really did alter investor risk perceptions, one should detect a structural change in such valuation models, higher rates of return now required as compensation for the higher perceived level of risk. The results of Pettway's study were that perceived risk to investors did not change as a result of either large bank failure and no permanent structural change in the equity model could be detected. Fraser and McCormack, on the other hand, found that required rates of return increased sharply and substantially (about 66 basis points) after Franklin failed.

Pettway's study used best methodology to test his hypothesis, thus this paper will not have any direct comment to make on his work. This paper will argue that Fraser and McCormack arrived at a correct conclusion but their model was inadequate to discern the true nature of the change that occurred. Their dummy variable approach was unable to separate changed investor perceptions concerning individual banks from changed investor perceptions of the banking sector. Qualitative results of the more refined analysis in this paper will support Fraser and McCormack's conclusion, while quantitative estimates of the magnitude of the change will indicate that the result is not much different from Pettway's. The policy implication of the present findings is important, however. After Franklin failed, investors perceived risk in the banking industry to be procyclical rather than insensitive to the business cycle as before. This means that financial markets will exert more restraint over banks during periods of deteriorating bank soundness, which makes market regulation of bank risk-taking more feasible.

## I. Model, Sample, and Data

Following most previous empirical work on the valuation of risky debt securities, this paper posits a risk premium model. It is illustrative, however, to write out the model in promised yield form:

$$(1) \quad RR = RF + MC(\cdot) + IC(\cdot),$$

where RR is the promised yield to maturity on risky debt, RF is the yield to maturity on risk-free debt of the same maturity, MC is a function representing conditions in money and capital markets, and IC is a function of risk characteristics of specific issuers. When estimated for a purely contemporaneous cross section, variables in MC are suppressed since market conditions are constant over the entire sample. When observations are drawn from differing time periods, however, MC must be specified, which Fraser and McCormack fail to do.

Equation (1) is a microeconomic relationship, and such a model could be applied to any class of financial or non-financial firms. The methodological difference between the present paper and that of Fraser and McCormack can best be understood by imagining that (1) is to be aggregated over all commercial banks and then incorporated into a general equilibrium model of the financial sector. The IC function can then be seen to denote individual bank deviations from the norm for all commercial banks. Hence in the aggregation process the IC function will drop out (except possibly for certain institutional features that might appear in the general structural model). The perceived riskiness of the commercial banking sector is captured by the MC function, which relates the banking industry to events in the economy as a whole. Thus, when asking questions about investor perceptions

of the banking industry, one is actually testing hypotheses about the parameters of the MC function, not the IC function. Since Fraser and McCormack do not specify MC completely, their model is insufficient to answer the question they raise. Changes over time in parameters from the IC function, on the other hand, indicate whether relative riskiness of banks within the sector has altered.

In specifying the MC function, two types of variables are included. The first type measures general conditions in financial markets, and for this purpose the present paper uses the overall level of interest rates as measured by Treasury yields and the yield spread between medium grade and high grade bonds as reported by Dow Jones and Company (Barron's National Business and Financial Weekly). The yield on Treasury securities anchors one end of the risk structure of interest rates and, because it is the most efficient of the debt markets, Treasury yields are probably observed with the least error. Justification for the spread between medium and high grade bond yields as an indicator of general economic conditions can be found in the work of Jaffee [4]. He found that the Baa-Aaa rate spread (Moody's ratings) was satisfactorily explained by six variables denoting economic conditions: consumer sentiment, growth rate of corporate retained earnings, growth rate of fixed capital investment, the unemployment rate, growth rate of the output price index, and the level of interest rates. In this paper, Jaffee's results are inverted. The yield spread, denoted SPREAD, increases when economic conditions deteriorate and decreases during expansions. Hence its sign is expected to be positive. Following recent theoretical work of Merton [5], the expected sign of MKT RATE, the Treasury yield, is negative.

The second set of variables included in MC are aspects of investor preferences unrelated to specific issuing firms, namely, marketability, term to maturity, and private vs. public placements. Marketability of an issue is measured by its total size (ISSUE) and term to maturity (TERM) is in years and decimals from the date of issue. The sample for the present study differs from that of Fraser and McCormack by including issues placed privately as well as publicly marketed bonds. The variable PRIVATE takes the value unity if the bond is privately placed, zero otherwise. Although marketability is not of concern for private issuances, the size of the bond issue can be taken to measure per unit transactions costs, mostly negotiation costs. Thus, the expected sign of ISSUE is negative for private as well as public issues. The expected sign of TERM is positive, since the probability of default is usually taken to be an increasing function of time. The expected sign of PRIVATE is positive, since one expects smaller firms and also those with weaker financial conditions to prefer private placements.

The IC function is specified to contain two variables. The capitalization variable, LEVERAGE, is the ratio of all interest-bearing liabilities to total assets. Non-interest bearing liabilities are dominated by demand deposits, which for most banks are held primarily as part of the customer relationship and thus assure a line of credit. As compensating balances, they tend to be a stable source of funds to the bank. Interest-bearing liabilities, on the other hand, are dominated by federal funds, certificates of deposit, and other borrowings, which are highly interest-sensitive and thus are the most important

source of balance sheet leveraging. The other IC variable is the gross rate of return on income-producing assets, RGROSS, which is included as a measure of the riskiness of the total bank portfolio. The expected signs of both LEVERAGE and RGROSS are consequently positive.

Before estimation, the coefficient of RF in equation (1) is constrained to be unity by subtracting that variable from both sides of the relationship. The dependent variable is thus risk premium.

The sample consists of 230 observations drawn mainly from the Irving Trust Company bimonthly listings of securities issued by banks and bank holding companies [3]. As with most previous research, this sample includes debt issued by both banks and bank holding companies. Detailed analyses conducted elsewhere [7] have indicated that, for this exact sample, the regression model used in this paper is not sensitive to the distinction between banks and bank holding companies. Observations are taken from years 1971 through 1977 inclusive, and thus encompass a considerably longer period than any other published study of bank risk premiums. In particular, a full year and a half's additional observations after the failure of Franklin National are included in the present sample than were included in Fraser and McCormack's (in total, 129 observations after Franklin failed).

Balance sheet and income data come from Reports of Condition and Income filed with federal bank regulators. Yields on Treasury securities are used for RF, the risk-free rate. Fraser and McCormack use Aaa bond rates instead, mostly because such bonds are issued more frequently, hence tax considerations related to widely differing coupons are minimal. The present study excludes deep discount bonds ("flower bonds"). The



gain in degrees of freedom is consequently judged to outweigh any minor difference due to tax.

## II. Results

Table 1 presents basic regression results for the risk premium model described in section I. The column labeled "whole sample" under Model 1 gives parameter estimates for the empirical counterpart of equation (1) of the text. Each of the five variables comprising the MC function bears the expected sign and is significantly different from zero at the 1% level of Type I error. MKT RATE, SPREAD, and PRIVATE have coefficients that are quantitatively important, while the coefficients of ISSUE and TERM imply that investors are not especially sensitive to changes in the underlying variables. A \$10 million increase in the size of the issue results in only a 4 basis point decrease in risk premium, while each additional year in term to maturity requires only 2 basis points in yield. Of the two variables in the IC function, only the gross rate of return on assets is different from zero at the 5% level. To this extent, the findings of the present paper agree with those of Fraser and McCormack, who also found leverage to be unimportant as a determinant of risk premium and issue size to be moderately important. The explanatory power of the present model, judged by adjusted R-squared, is a good deal lower than Fraser and McCormack's model, but the value of the overall F statistic is much higher.

Although in Model 1 the distinction between issues sold publicly and those placed privately is denoted by a simple intercept dummy variable, an analysis of covariance was conducted to determine if slope coefficients are the same across both types of issues. The

value of the F statistic for this test is 0.856 for Model 1 and 1.486 for Model 2. Thus, any difference between private and public evaluations of bank debt securities is satisfactorily captured by the intercept term.

Adding a dummy variable (FRANKLIN) for issues sold after the failure of Franklin National Bank (Model 2) shows the results of adopting Fraser and McCormack's methodology. This addition produces two striking effects on the regression model. The coefficient of RGROSS falls by half and becomes insignificantly different from zero. Through the remainder of the empirical tests to be reported, the coefficient of RGROSS remains insignificant. To some extent, this change is due to multicollinearity among RGROSS, MKT RATE, and FRANKLIN. Since RGROSS is a bank-specific variable, and hence does not convey information on investor perceptions of commercial banking as a financial sector, we are content simply to note the decline in its significance without attempting to discover the precise cause.

The more interesting change occurring between Models 1 and 2 is that the coefficient of SPREAD falls by more than half while still retaining statistical significance. This variable is extremely important since it denotes the economy's position in the business cycle and thus its coefficient directly relates investor perceptions concerning bank risk to macroeconomic conditions. The fact that SPREAD's coefficient is strongly altered by the inclusion of FRANKLIN suggests the possibility of structural change in the regression model due to the failure of Franklin National Bank. The two columns under Model 1 labeled "before" and "after" estimate the regression model on the two

subperiods separately. The F statistic from the test of the homogeneity of slopes before and after Franklin, allowing different intercepts, is 3.319 with 7 and 214 degrees of freedom, significant at the 1% level. One must thus conclude, as Fraser and McCormack stated, that a structural change did occur after the failure of Franklin National Bank. Comparing the "before" and "after" columns shows that only variable whose coefficient changes dramatically is SPREAD, which changes from significantly negative to significantly positive. One might also note that the explanatory power of the model falls sharply in the "after" period, although one can easily reject the null hypothesis that all slope coefficients are zero.

Because an F test for homogeneity of slopes is not particularly sensitive to changes in individual coefficients, separate slope dummy variables for the period after Franklin failed were entered into a single regression equation, one slope dummy variable for each of the seven independent variables other than FRANKLIN. Only one slope dummy proved statistically significant (two-tailed tests), that for SPREAD. Regression results for Model 2 of Table 1 augmented by this interactive term are shown in the middle column of Table 2. Figure 1 graphs the relationship between risk premium and SPREAD before and after Franklin failed. SPREAD is interpreted as a measure of macroeconomic risk, larger values as stated before representing deteriorating economic conditions. The relationship between macro risk and return, assumed linear, is drawn as a solid line for the period before Franklin failed. The intercept and slope for this line are the coefficients of "intercept" and SPREAD in Table 2, and the slope is

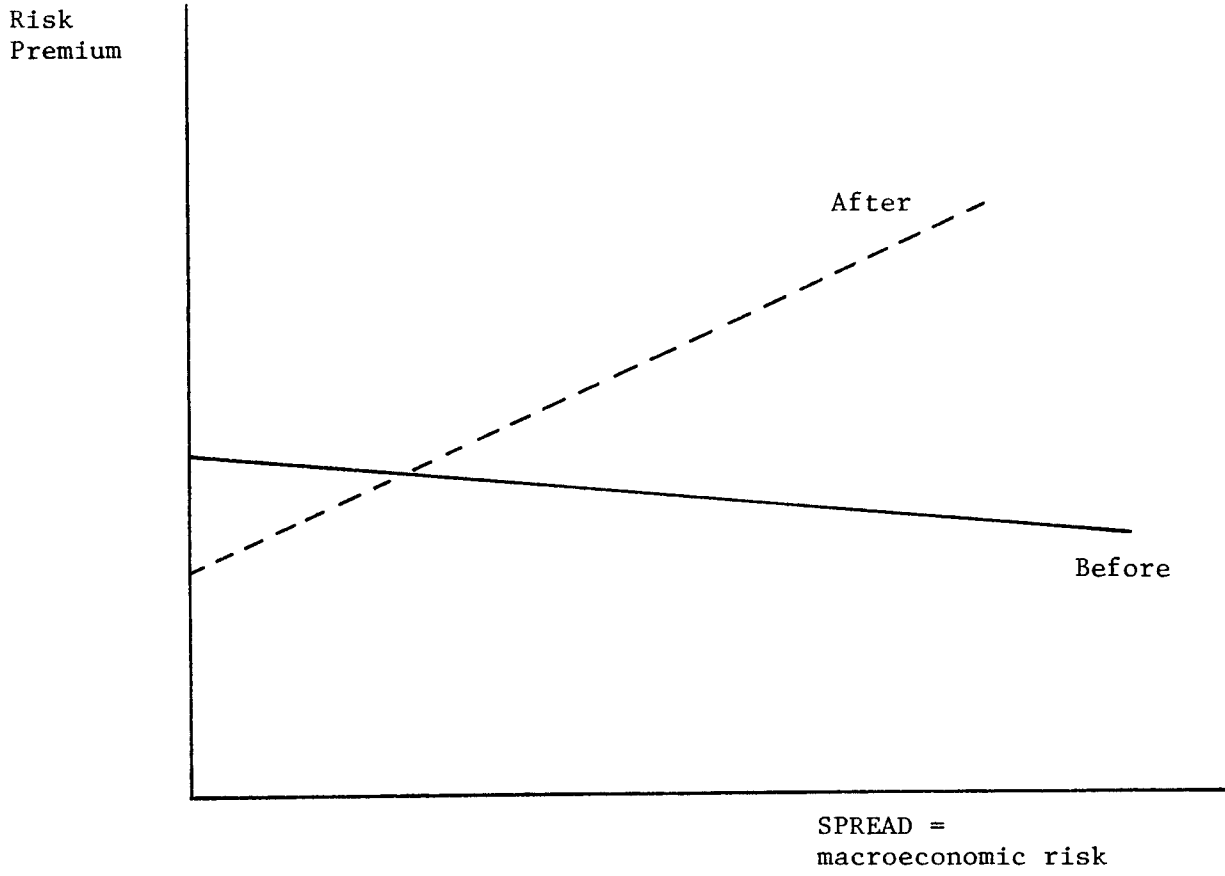


Figure 1

drawn taking the coefficient of SPREAD to be significantly different from zero. This relationship shows that before Franklin failed investors believed bank debt securities became more safe as economic conditions worsened. The intercept and slope for the macro risk relationship after Franklin failed are calculated by summing, respectively, "intercept" with FRANKLIN and SPREAD with FRANKLIN\*SPREAD and are shown as the dotted line. Thus, after Franklin failed, worsening economic conditions were generally associated with a significantly greater degree of risk to holders of bank securities.

An alternative means of presenting these results follows from the work of Cohan [1]. Although economic and finance theory indicate that investors require higher expected rates of return as compensation for bearing greater risk, risk premium is itself a not very enlightening index of risk. Risk is usually taken to mean the probability that an investment will default in whole or in part. Noting that in perfect capital markets investors will not expect to earn, in the long run, in excess of the risk-free rate of return, Cohan is able to derive an expression for the probability of payment in whole over the life of a bond, which probability is a simple function of the promised yield on the bond and the promised yield on a risk-free bond of identical maturity. The relationship is

$$P = \left[ \frac{1 + RF}{1 + RR} \right]^{1/T},$$

where RF and RR have already been defined as risk-free and risky rates of return and T is term to maturity (number of periods). Since P is the periodic probability of payment in whole, 1-P is the periodic pro-

bability of default in whole or in part. The quantity  $1-P$ , denoted DEFAULT, is used as the dependent variable of the risk premium model in the right-hand column of Table 2. Coefficients indicate the effects of one unit increases in the independent variables on the probability of default per year. The units of the dependent variable are percentage points of probability; i.e., a one-half chance of default would be 50.0.

Signs of all coefficients are the same with DEFAULT as the dependent variable with the exception of TERM, which is an arithmetic quirk. Given a promised yield on a risky bond, larger values of TERM imply smaller periodic probabilities of default. Apart from the intercept, the only variables whose coefficients are quantitatively important are FRANKLIN and FRANKLIN\*SPREAD. Note also that the coefficient of SPREAD itself in this formulation is not significantly different from zero. Thus, drawing Figure 1 with probability of default on the vertical axis instead of risk premium would depict the pre-Franklin relation as essentially horizontal. After Franklin failed, however, probabilities of default became viewed as increasing as the economy moved into a cyclical trough and decreasing as the economy moved into an expansionary phase.

The quantitative importance of these results can best be made clear from calculations based upon the sample at hand. At mean values for all issues before Franklin failed, the probability of repayment in full over the entire life of the average bond in the sample was 98.6% (average term to maturity is 16.6 years). A one standard deviation increase in the medium grade-high grade yield spread,

equivalent to 10.7 basis points, would have raised that probability in investors' eyes to at most 98.7%. At mean values for all issues after Franklin failed, the probability of payment in full over the entire life of the average bond in the sample was 98.2%, or about four-tenths of one percent lower than bonds issued in the pre-failure period.

A one standard deviation increase in SPREAD, equivalent to 9.9 basis points, would now reduce the probability of repayment in full to 97.8% (average term to maturity is 15.3 years). Thus, while it is reasonably clear that a structural change in the way market investors view the riskiness of long-term bank debt did occur after the failure of Franklin National Bank, the size of the change was certainly not great when gauged by the effect of worsening economic conditions on the probability of repayment in full. The banking sector was not suddenly seen to be enormously more risky than it had been. Furthermore, investors did not alter the way they judged relative riskiness of firms within the banking sector.

### III. Summary and Conclusions

Fraser and McCormack report that after the failure of Franklin National Bank spreads between yields on Aaa rated bonds and bank debt increased some 66 basis points. This increase they attributed to an alteration in the risk structure of interest rates that banks face in debt markets. Since their risk variables were not significant in explaining risk premium, it is not entirely clear just what their use of the term "risk structure of interest rates" is intended to convey. Results of this paper, using a more completely specified model of risk premium, show that the structural change occurring after Franklin's

demise concerned investor perception of bank riskiness over the business cycle. Before Franklin, the riskiness of investment in long-term bank debt securities was viewed as more or less insensitive to the economy's position in the business cycle, while after Franklin's failure bank risk was viewed as being pro-cyclical. Interestingly, the intercept term on the risk-return tradeoff is smaller after Franklin than before, which is contrary to the result that Fraser and McCormack present. The explanation for this is simple, however: banks are now viewed as being significantly less risky during expansionary periods as well as more risky during troughs. The "risk structure of interest rates" facing banks can thus be viewed on a macro as well as on the more customary micro level. On the micro level, results in this paper are similar to Fraser and McCormack's in that traditional micro measures of risk, such as leverage and gross rate of return on assets, are not significant in explaining risk premium. It is on the macro level where the significant structural shift of investor risk perceptions occurred.

Finally, one can compare the results of these two debt market papers with the findings of Pettway based on equity markets. Because methodologies are so different, a definitive reconciliation of the divergent results is probably impossible. One should note, however, that results in the present paper can be compared with Pettway's more appropriately than can results given by Fraser and McCormack because both Pettway and the present paper compare measures of investor risk with events in the general economy. While this paper finds investor perceptions of the riskiness of the banking sector to have become more procyclical after



the failure of Franklin, Pettway finds no such significant shift. A conflict of results thus remains to be reconciled; but evidence presented here, that implied probabilities of failure increased only slightly after Franklin's failure, suggests that quantitatively there is not much of a conflict to resolve.

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Table 1  
Regression Results for Risk Premium Model

Independent Variable	Model 1			Model 2
	whole sample	before	after	whole sample
Intercept	2.242*** (0.344)	4.092*** (0.365)	2.618* (1.511)	3.557*** (0.491)
MKT RATE	-0.352*** (0.066)	-0.514*** (0.057)	-0.388** (0.196)	-0.494*** (0.075)
SPREAD	1.191*** (0.243)	-0.639 <sup>a</sup> (0.262)	1.722*** (0.516)	0.553*** (0.294)
ISSUE	-0.004*** (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)
TERM	0.020*** (0.004)	0.030*** (0.004)	0.014* (0.011)	0.024*** (0.004)
PRIVATE	0.341*** (0.073)	0.244*** (0.074)	0.355*** (0.115)	0.280*** (0.073)
RGROSS	0.042** (0.020)	0.017 (0.019)	0.006 (0.035)	0.021 (0.020)
LEVERAGE	0.003 (0.003)	0.005** (0.003)	-0.001 <sup>a</sup> (0.005)	0.002 (0.003)
FRANKLIN				0.521*** (0.142)
R <sup>-2</sup>	.334	.654	.233	.369
F	17.380***	30.171***	6.207***	17.730***
RSS	47.161	8.345	31.766	44.466

Notes: Standard errors are in parentheses. RSS is residual sum of squares.

Significance of coefficients is judged by one-tailed tests (two-tailed for intercepts) and denoted as follows:

\*significant at 10% level of Type I error.

\*\*significant at 5% level of Type I error.

\*\*\*significant at 1% level of Type I error.

<sup>a</sup>Sign counter to expectation, significance not indicated.

Table 2  
Regression Results with Interactive Variable

Independent Variable	Dependent Variable	
	PREMIUM	DEFAULT
Intercept	4.164*** (0.492)	0.402*** (0.072)
MKT RATE	-0.493*** (0.072)	-0.040*** (0.011)
SPREAD	-0.633 <sup>a</sup> (0.391)	-0.054 (0.057)
ISSUE	-0.004*** (0.001)	-0.000** (0.000)
TERM	0.026*** (0.004)	-0.005*** (0.001)
PRIVATE	0.291*** (0.070)	0.022** (0.010)
RGROSS	0.016 (0.019)	0.005** (0.003)
LEVERAGE	0.002 (0.003)	0.000 (0.000)
FRANKLIN	-1.141*** (0.402)	-0.179*** (0.059)
FRANKLIN*SPREAD	2.469*** (0.562)	0.299*** (0.082)
$\bar{R}^2$	0.417	0.402
F	19.212***	18.115***
RSS	40.877	--

Notes: See Table 1.