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A COMPARATIVE STUDY OF THE EFFECT OF LEVERAGE ON RISK PREMIUMS FOR DEBT ISSUES OF BANKS AND BANK HOLDING COMPANIES

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I. Introduction

Four recent articles have investigated the responsiveness of capital markets to differences in leverage for banks and bank holding companies issuing long-term debt. Despite similar estimating equations and estimating techniques, the four studies arrived at different conclusions. Two studies found that increases in leverage had no effect on risk premium, the capital market's summary measure of expected risk, while the other two studies found that leverage is a statistically significant determinant of risk premium.

The purpose of this paper is to examine the possibility that differences in sample composition among the four risk premium studies might account for the differences in results achieved. Although the period of observation, 1970 to 1975, is approximately the same for all four studies, the types of firms included in the sample differ considerably. In particular, the papers by Pettway [6], Martin [4], and Beighley [1] use long-term debt issues that are the obligations either of banks or of bank holding companies, while the Herzig-Marx paper [2] used bank obligations only.

In the present paper, we gather a sample of issues that are direct obligations of holding companies. Using the estimating equation in the Herzig-Marx paper, analysis of variance and covariance is applied to determine whether or not the same econometric model fits bank holding companies as well. Specific interest centers on the leverage variable; that is, do financial markets respond to increased leverage on the part of banks but not on the part of bank holding companies?

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In the second section of this paper, a brief review of the four underlying studies will be presented, highlighting the estimating equations and the samples used. In the third section we will describe the holding company observations added to the Herzig-Marx data set and the statistical technique used to carry out the test. The fourth section presents results of the empirical analysis, and a concluding section follows.

II. Review of the Literature

Pettway's sample consisted of 77 capital notes and debentures issued between January 1, 1971 and December 31, 1974, 36 issues of banks and 41 issues of bank holding companies. All issues were public placements of subordinated nonconvertible capital notes with fixed maturity dates and had a stated yield to maturity. Martin's sample[1] eliminated all issues under $4 million and included 84 issues, 65 issued by holding companies and only 19 issued by banks. All obligations were offered publicly between January 1, 1971, and January 6, 1975. Maturities ranged from 3 to 27 years. Herzig-Marx's sample included 59 capital notes issued by 53 banks and offered between 1971 and 1975. Of the 59 issues, 34 of the notes were issued by holding company affiliated banks and 22 were placed privately. Assets of issuing banks ranged from $32 million to $25 billion, with seven banks under $100 million in assets. Mean size of the note issue was slightly under $20 million with a range from $5 million to $150 million. Beighley's study used a

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[1]Martin's sample appears to be composed of seasoned debt issues, prices being observed at a single point in time. The Pettway and Herzig-Marx samples represent newly-issued securities whose prices are observed as of the date of issuance.

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sample[2] of 56 capital notes or straight debentures issued by either the parent holding company or its lead bank between 1972 and 1974. There were 35 obligations of parent firms and 21 obligations of lead banks.

Although Pettway and Martin came to similar conclusions, their basic models were not derived from a specific theory of corporate finance. Although they both tried to incorporate general principles of risk analysis, their papers lack the rigorous theoretical basis provided by Merton's model in the Herzig-Marx study. Beighley's model investigated the same types of problems, but within a different framework of hypotheses, as will be seen later. Nonetheless the models do have significant similarities with the model used in this paper.

All four models use risk premium as the dependent variable. This is defined as the difference in yield of a debt issued by a bank and that of a Treasury security issued at the same time and for the same maturity. The Pettway model used two capital adequacy ratios as measures of leverage: deposits and non-capital borrowed funds/total capital (DEPCAP) and total equity capital/total assets, (EQCAP). A third measure of default probability, size of the issuing firm, was also used. Other variables used were: amount of the capital note (potential marketability--MKT); maturity of the note (term structure--MAT); an intercept dummy variable denoting a holding company versus bank distinction (DUM); and a variable indicating the number of quarters elapsed between the Comptroller's ruling that capital notes could be considered as bank capital for lending and regulatory purposes and the date the capital note issue was sold (learning curve--LCRV). The regression equation was:

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[2]Beighley's sample also appears to be purely cross-sectional, although more than one point of observation was used.

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$$\text{PREMIUM} = a_0 + a_1^{(-)}\text{DEPCAP} + a_2^{(+)}\text{EQCAP} + a_3^{(-)}\text{SIZE} + a_4^{(-)}\text{MKT} + a_5^{(+)}\text{MAT}$$
$$+ a_6^{(-)}\text{LCRV} + a_7^{(?)}\text{DUM}.$$

Pettway found that the coefficients of the marketability of the issue, the term to maturity, and the learning curve variable were highly significant and had the expected signs. The capitalization variables were not found to be statistically significant in explaining risk premium.

Martin incorporated different variables into his model. Risk premium was again the dependent variable, but different ratios were used as a measure of risk. They were: earnings per share growth from 1970-74 (EG); historical earnings before tax/interest on all long-term debt (EC); remaining number of years to maturity at year end 1974 (MAT); principal amount of the issue (MKT); parent's debt/equity ratio as of year end 1974 when holding company issued (PLEV); the total amount of assets of the issuing organization as of year end 1974 (SIZE); percentage of stockholders' equity/assets (CLEV); and finally, a dummy variable denoting bank or holding company (HBK). His equation was

$$\text{PREMIUM} = b_0 + b_1^{(-)}\text{EG} + b_2^{(-)}\text{EC} + b_3^{(+)}\text{MAT} + b_4^{(-)}\text{SIZE} + b_5^{(-)}\text{MKT} + b_6^{(-)}\text{PLEV}$$
$$+ b_7^{(-)}\text{CLEV} + b_8^{(-)}\text{HBK}.$$

Martin found that maturity, marketability, earnings growth, and earnings coverage were most important, while leverage was not important and neither was the distinction between holding company issue and bank issue.

Beighley's paper, although somewhat different from the other three, tried to determine whether long-term creditors of bank holding companies viewed firm size, financial structure, and loan losses as

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measures of perceived risk and whether creditors preferred to lend to the parent firm rather than to subsidiary firms. Risk premium was hypothesized to be a function of: the dollar volume of assets of consolidated BHC (SIZE); loan charge-offs net of recoveries over total loans (LOSS); total debt to book value of common equity for consolidated BHC (CLEV); total debt to book value of common equity for the parent firm in the BHC (PLEV); total debt to book value of common equity for bank of BHC (BLEV); total debt to book value of common equity for the issuing firm (ILEV); long-term debt to book value of common equity for consolidated BHC (CLTD); long-term debt to book value of common equity for parent (PLTD); long-term debt to book value of common equity for lead bank (BLTD); long-term debt to book value of common equity of issuing firm (ILTD); and a dummy variable equaling 1 if issue is obligation of parent, 0 if otherwise (ISS).

$$\text{PREMIUM} = c_0 + \overset{(-)}{c_1}\text{SIZE} + \overset{(+)}{c_2}\text{LOSS} + \overset{(+)}{c_3}\text{CLEV} + \overset{(+)}{c_4}\text{PLEV} + \overset{(+)}{c_5}\text{BLEV} + \overset{(+)}{c_6}\text{ILEV} + \overset{(+)}{c_7}\text{CLTD} + \overset{(+)}{c_8}\text{PLTD} + \overset{(+)}{c_9}\text{BLTD} + \overset{(+)}{c_{10}}\text{ILTD} + \overset{(?)}{c_{11}}\text{ISS}.$$

Beighley concluded that firm size, realized loan losses, and financial structure are important and that stockholders seem more concerned about the total leverage structure of the consolidated holding company. He also inferred that debt holders were concerned with long-term debt of the holding company and somewhat concerned about the financial structure of the lead bank. Debt holders were also found to be indifferent to whether the debt was located in the parent or the lead bank.

The Herzig-Marx model tries to give empirical treatment to Merton's work[5] on the valuation of risky corporate securities. The basic theory is that at a given point in time, for securities of a given maturity, risk premium is a function of only two variables: debt to

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firm value ratio and the volatility of the firm's operations. The dependent variable, risk premium, is a function of the following independent variables in the Herzig-Marx model: term to maturity (TERM); riskless rate of return (MKT RATE), defined as the yield to maturity of a Treasury security maturing at the same time as the risky security; investor confidence, defined as the difference between yield of a portfolio of medium grade bonds and the yield of a portfolio of highgrade bonds as found in Barron's (SPREAD). To substitute for the present value of Merton's debt to firm value ratio the model used the ratio of book value of interest bearing liabilities to book value of assets (BORROW). A regression of the capital asset pricing model using annual returns to each bank on annual returns to the market portfolio was the approximation of the systematic component of the variance of a bank return used to proxy volatility in the Merton model (EARNVAR). Gross rate of return on income-earning assets (EARNG) was used to categorize risk class of the firm. The size of the debt issue (ISSUE) was also included as a measure of marketability. The regression equation was

$$\text{PREMIUM} = d_0 + d_1\text{BORROW}^{(+)} + d_2\text{EARNVAR}^{(+)} + d_3\text{TERM}^{(+)} + d_4\text{MKT RATE}^{(-)} + d_5\text{SPREAD}^{(?)} + d_6\text{EARNG}^{(+)} + d_7\text{ISSUE}^{(-)}.$$

Herzig-Marx concluded, in agreement with Beighley but contrary to Pettway and Martin, that financial markets do demand a higher risk premium for banks that are more highly leveraged. All signs except for EARNVAR were predicted correctly and longer terms to maturity were found to elicit a higher risk premium. Also found highly significant was EARNG, indicating that debt issued by firms in higher risk classes requires higher premiums.

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III. Details of Present Study

Sample

In this study we expand the sample used by Herzig-Marx to include 78 newly issued capital notes offered by holding companies from January 1972 to December 1975. The primary source of information was a list published by Irving Trust Company [3]. Of the 78 issues, only 15 were placed privately. There were thirty-two issuances in 1972, sixteen in 1973, thirteen in 1974, and seventeen in 1975. The size of the issue varies from $1.5 million to $150 million, terms to maturity from 1.5 years to 30 years, and asset size of the issuing company from less than $1 billion to well over $100 billion.

Data

Balance sheet and income data are taken from Moody's Bank and Finance Manual for December 31 of the year prior to the year of issue. There are two possible sources of error. Since only 15 of the 78 notes were issued privately the probability of error due to frequent non-disclosure of final selling price is slight; however, it could entail some measurement error. For publicly placed issues the price reported was usually the price of the original offer to the public regardless whether the whole issue was sold at that price. This also could be a source of error due to sampling technique.

When only the month, but not the exact day of issue is known it is assumed that the issue was placed on the 15th day, or the closest business day to the 15th should the 15th be a weekend day.

BORROW, the leverage variable, is measured on a consolidated basis.

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IV. Results

The equation estimated is the same as that used in the Herzig-Marx study with the exception of EARNVAR. This variable was deleted on three related grounds: its sign was counter to expectation; it was not statistically significant; and since it was insignificant and of the wrong sign, the enormous time and effort required to calculate this variable was deemed unjustified.

Referring to Table 1 we see that when the basic regression model is run (Total Sample) all variables are significant except for BORROW, and all signs are predicted correctly. By dividing the sample into two groups, one consisting only of banks (1-59), and the other only of holding companies (60-137), we find a few changes in the significant variables. The bank only subsample is identical to the Herzig-Marx sample. In the holding company subsample, we find SPREAD is marginally significant, with ISSUE and PRIVATE becoming highly significant. All signs are as expected. As suspected the leverage variable (BORROW) is not significant in the holding company subsample while it is significant in the bank only sample. Since Pettway's and Martin's samples, which are dominated by bank holding companies, find leverage to be insignificant, it is reasonable to conclude that differences in sample construction produced divergent results.

Using the two subsamples described above we conducted an analysis of variance for differential intercepts. We find no significant difference of intercepts in the two subsamples ($F = 1.51$). Since this procedure is equivalent to incorporating an intercept dummy variable into the regression equation, it confirms the same finding by Pettway, Martin, and Beighley, all of whom used intercept dummies.

Continuing our analysis of covariance, we add an intercept dummy variable (HC) denoting holding company versus non-holding company affiliation

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and rerun the entire sample. By netting out the effect of differential intercepts, we test for differential slope coefficients between the two subsamples. An F-test again failed to reveal any significant differences ($F = 1.49$).

Next, a test is performed to see if the localized effect of the HC variable might not have been picked up in the analysis of covariance (see Table 3, which reports only variables involving HC). This is done by entering slope dummies into the regression equation yielding the following equation:

$$\begin{aligned} PREMIUM = e_0 &+ \overset{(+)}{e_1}BORROW + \overset{(+)}{e_2}TERM + \overset{(-)}{e_3}MKT\ RATE + \overset{(?)}{e_4}SPREAD + \overset{(+)}{e_5}EARNG \\ &+ \overset{(-)}{e_6}ISSUE + \overset{(?)}{e_7}PRIVATE + \overset{(?)}{e_8}HC*BORROW + \overset{(?)}{e_9}HC*TERM + \overset{(?)}{e_{10}}HC*MKTRATE \\ &+ \overset{(?)}{e_{11}}HC*SPREAD + \overset{(?)}{e_{12}}HC*EARNG + \overset{(?)}{e_{13}}HC*ISSUE + \overset{(?)}{e_{14}}HC*PRIVATE + \overset{(?)}{e_{15}}HC \end{aligned}$$

Since terms that are not interactive with HC denote bank issues, these coefficients will again be identical to the Herzig-Marx results. Testing for significance of individual variables, we began removing the most insignificant holding company variables. When HC*TERM, HC*SPREAD, HC*ISSUE, and HC*PRIVATE are removed all banking variables become significant, and HC*MKT RATE becomes significant.[3] When HC*TERM is returned to the regression HC*EARNG is added to the significant variables. When only HC*ISSUE and HC*PRIVATE are deleted from the equation all bank variables remain significant except SPREAD, and the only significant holding company variable is HC*EARNG. At no time does R^2 go above .38, but the F test goes from 8.17 when all four insignificant variables are removed, to 6.62 when only the latter two are omitted. This score is equal to the F test when all 16 variables are included in the equation.

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[3]Note that TERM, SPREAD, ISSUE, and PRIVATE reflect indenture provisions, investor confidence, and the possibility of private or public placement, which are features common to nearly every long-term borrower in the market. We would thus be extremely surprised if these variables affected risk premium differently for banks and bank holding companies.

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The most interesting finding from this analysis of the interactive terms is that the coefficient of HC*BORROW is never statistically significantly different from zero. Thus, although the difference between the two original subsamples is not statistically significant, it is nonetheless different enough to derive conflicting results on the key issue of leverage. We further examine the sample by reorganizing the groups. Running the regression equation for a group consisting both of banks affiliated with holding companies and of holding companies themselves (26-137), we find that all variables except BORROW are significant. Looking only at independent, non-affiliated banks (1-25) we find that MKT RATE, EARNG, and PRIVATE are significant. Lastly, TERM becomes the only significant variable in the regression model when observing only banks with holding company affiliation (26-59). At this point PRIVATE changes its sign invalidating our prediction.

Using this information we perform another analysis of covariance using two groups--those banks with holding company affiliation (26-59) and the other group of holding companies themselves (60-137). Comparing the residuals, we again find no significant difference between the subsamples.

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V. Conclusion

Four recent articles have examined the relationship between bank leverage and the market-determined risk premium on long-term bank debt. Despite using similar methodologies, the studies came to radically divergent conclusions, two finding leverage to be significant and two finding leverage to be insignificant in determining risk premium. The present paper originates from this divergence and seeks to account for the differences in results among the studies.

Because methodology and period of observation were substantially the same for all four papers, differences in results could only have arisen from differences in sample construction or estimating equations. A detailed, variable by variable comparison of regression equations was not undertaken in the present study since the equations estimated were overall quite similar. The most prominent difference among the four studies was the type of issuing firms included in the sample. Both studies finding leverage to be insignificant in explaining risk premium allowed both banks and bank holding companies into the sample, while one of the studies finding leverage to be important used only banks. The other study finding leverage to be important allowed both banks and bank holding companies to enter the regression model. The basis of the present paper is an attempt to discern whether differences in sample construction could have produced such divergent results on the important question of the effect of leverage on market valuations of securities.

On purely statistical grounds, the answer would seem to be "No." No significant difference, in a statistical sense, emerges from the analyses of variance and covariance for subsamples of banks and bank holding companies. On the other hand, since leverage is statistically significant in explaining

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risk premium when only bank issues are examined, but is statistically insignificant when holding companies alone are analyzed and when holding company issues are added to the bank issues, it is clear that markets evaluate holding companies and banks somewhat differently. Further attempts to infer what variables of the valuation model display significantly different coefficients for the two subsamples (banks and bank holding companies) meet with moderate success, but no difference is found for leverage.

The sample used in this paper, 59 bank issues and 78 holding company issues, is larger than the sample used for any of the four previous studies and probably includes most of the other studies' observations. Although statistical tests fail to indicate that the regression model fits the two subsamples differently, a more detailed examination of the underlying data is enlightening . Figure 1 is a plot of leverage (BORROW) against risk premium for the sample employed in this study. The letter "A" denotes an observation on a bank issue, while the letter "B" denotes a holding company issue. Ellipses have been drawn over the scatters of points for the subsamples.

The ellipses depict clearly why we obtained our results on leverage and risk premium. The partial relationship between leverage and risk premium for banks is evident, while this relationship for holding companies has no slope. The fact that holding company observations are concentrated in a horizontal band is sufficient to randomize the leverage-risk premium relationship when the two subsamples are lumped together. Finally, the extensive overlap between the two scatters of points shows why the coefficient of HC*BORROW is not significantly different from zero.

Figure 1 indicates that the distribution of risk premium is approximately the same for bank and bank holding company issues. Means and standard

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deviations calculated for the subsamples confirm this. Noteworthy is the fact that mean values of leverage are significantly different (see Table 4), and that, in addition, holding company issues display much

Table 4

Mean and Standard Deviation
for Leverage and Risk Premium

	Leverage		Risk Premium	
	Banks	HCs	Banks	HCs
mean	43.40	55.43	1.33	1.35
st. dev.	11.13	7.99	0.48	0.64
no. obs.	59	78	59	78

smaller variance of leverage. This feature is especially interesting in view of the often-heard contention that bank risk premiums should not be expected to respond to differences in leverage since there is so little variation across banks. It turns out, by comparison, that banks display much wider variations in leverage than do holding companies (consolidated basis).

In sum, a review of the results of available literature indicates that banks and holding companies are thought to be evaluated similarly by financial markets, but previous studies encompassing both types of firms within the same sample have used only simple intercept dummy variables to test this difference. Analysis of covariance also fails to turn up significant subsample differences; but when the slope dummy variable technique is used, significant differences are found (by deleting certain slope dummies whose coefficients can be expected to be insignificant). Thus, the slope dummy analysis suggests that financial markets do evaluate holding companies differently from banks.

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On the key issue of leverage, however, no significant difference emerges. Our examination of the underlying data, using a sample more extensive than any of the four previous studies, reveals that the distribution of the leverage variable probably accounts for the results obtained by previous researchers. Whether this finding, too, is a quirk of our sample, and would not be sustained by the underlying population, is a question we cannot answer. Given the evident importance of the relationship between leverage and market valuation, both for regulators and for students of financial markets, continued research comparing banks and bank holding companies is worthwhile.

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Table 1

	BORROW (+)	TERM (+)	MKT RATE (-)	SPREAD (?)	EARNG (+)	ISSUE (-)	PRIVATE (+)	R^2/d.f.	F test/ variance of the regression
1-137 TOTAL SAMPLE	.604535 (1.57078)	.0183550 (3.62290)*	-.290117 (-3.82072)*	.84749 (3.57490)*	.0828694 (3.59927)*	-.00575867 (-4.61815)*	.367048 (3.58191)*	.363/129	12.07/.2123
1-59 ALL BANKS	.0176396 (3.18606)*	.0234259 (3.40858)*	-.380378 (-4.13510)*	.399448 (1.19015)	.207605 (2.95915)*	-.00439282 (-2.08087)*	.290361 (2.15006)*	.403/51	6.59/.1376
60-137 HOLDING COMPANIES	.00846078 (1.03125)	.0103232 (1.22857)	-.119070 (-.880216)	.954483 (1.99276)	.0468640 (1.06801)	-.0065519 (-3.6445)*	.432284 (2.64200)*	.385/70	7.87/.2554

Table 2

1-25 INDEPENDENT BANKS	.014052 (1.33166)	.0198618 (1.55623)	-.608346 (-4.10884)*	.700930 (1.12890)	.419078 (3.06872)*	-.00400667 (.477537)	.605087 (2.65677)*	.471/17	4.05/.1520
26-59 BANKS AFFILIATED WITH HOLDING COMPANIES	.00968451 (1.17639)	.0299974 (3.57227)*	-.180246 (-1.44144)	.329513 (.788298)	.0896126 (.827285)	-.00295829 (-1.30240)	-.00498334 (-.0260762)	.329/26	3.32/.1269
26-137 ALL ORGANIZATIONS AFFILIATED WITH HOLDING COMPANIES	.00464886 (1.10575)	.0174638 (3.10083)*	-.230759 (-2.62928)*	.102598 (3.30706)*	.0694337 (2.57806)*	-.00555701 (-4.19226)*	.347583 (2.80139)*	.359/104	7.104/.2212

*Significant at the .975 level.
t-ratios shown in parentheses.

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TABLE 3

HC	HC*BORROW	HC*TERM	HC*MKT RATE	HC*SPREAD	HC*EARNG	HC*ISSUE	HC*PRIVATE
-.626449	-.0091788	-.0131027	.261308	.555035	-.160741	-.0021590	.141924
(-.611239)	(-.917620)	(-1.16038)	(1.57880)	(.933858)	(-1.70285)	(-.709255)	(.642218)
-1.15906	-.00808499		.344430		-.161616		
(-1.19526)	(-.828311)		(2.46536)*		(-1.85802)		

*Significant at the .975 level.
t-ratios shown in parentheses.

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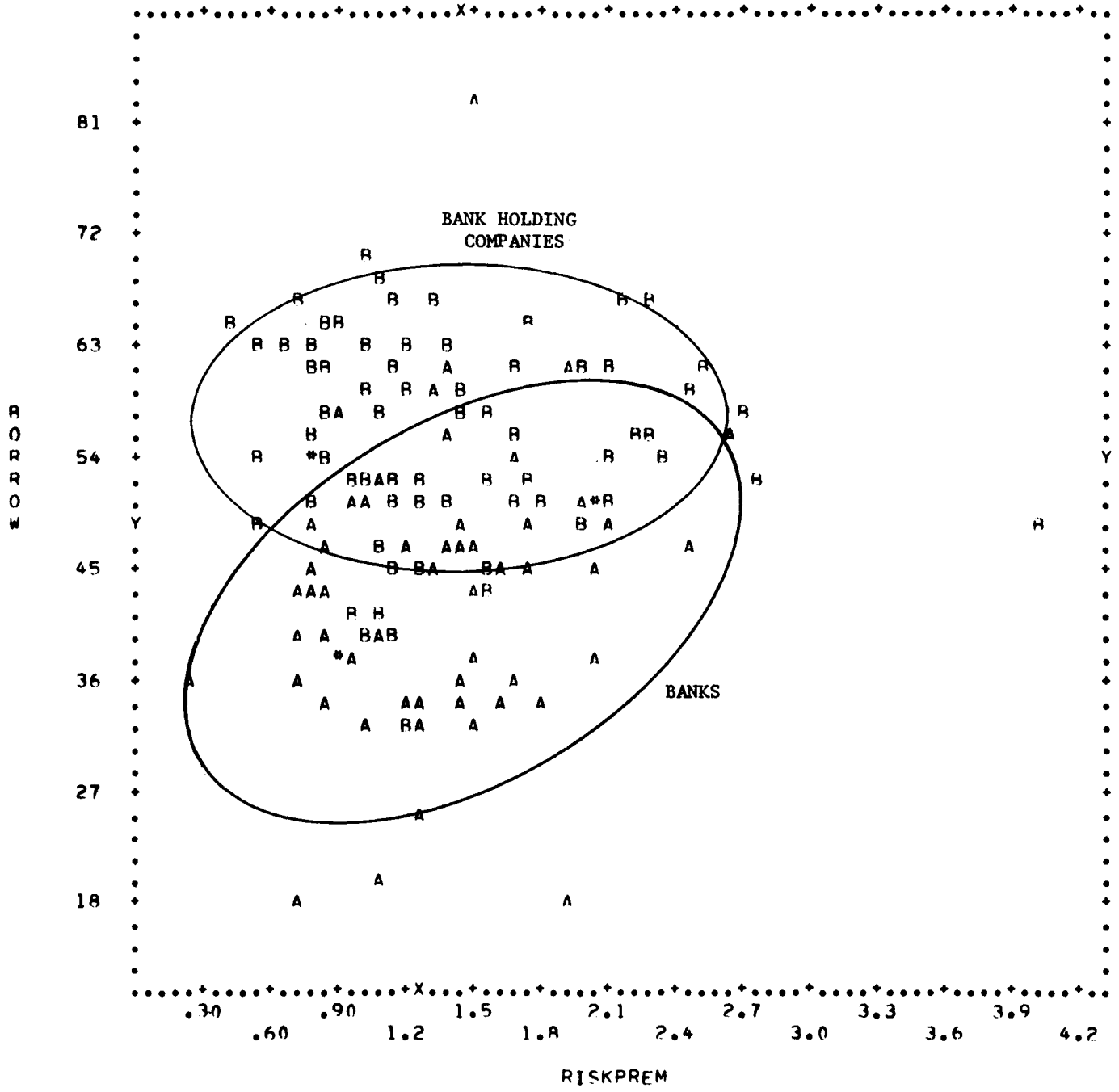

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