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A Note on the Relationship Between Bank Holding Company Risk and Nonbank Activity

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ABSTRACT

It has been argued that permitting banking organizations to expand into other lines of business will reduce their total risk through diversification. This note, using a stock market measure of risk, examines the proposition that diversification into nonbank activities decreases bank holding company (BHC) risk. In contrast to studies using accounting-based measures of risk, we find that expansion into nonbank activities during the 1979-1985 period substantially decreased BHC total risk. This suggests that limiting further expansion of nonbank activities of BHCs would reduce their ability to engage in risk reducing diversification.

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Given the recent financial difficulties experienced by many banking organizations and the large lending commitments made by money center institutions to heavily indebted African and Latin American nations, there is widespread concern about the effects of bank holding company (BHC) activity deregulation on bank riskiness. It is argued that further activity deregulation could compromise the safety and soundness of the banking system and extend the safety net designed for depository institutions to nondepository firms and commercial activities. Others have argued that bank subsidiaries are strengthened when BHC operates nonbanks profitably; yet, should those firms incur losses, bank subsidiaries are protected by the legal separateness of the BHC's corporate structure. In addition, going into nonbank activities diversifies the BHC's assets and provides an opportunity to reduce BHC risk sensitivity. Has diversification into nonbank activities by BHCs affected the safety of the banking system? In particular, have banking organizations diversified into nonbank activities in ways that increased or decreased their overall exposure to risk? The purpose of this note is to examine the proposition that diversification into nonbank activities decreases BHC risk.

Previous studies, using accounting-based measures of risk, find no indication that increases in nonbank activities increase BHC exposure to risk and weak, though quantitatively small, indications that such expansions in nonbank activities decrease BHC risk. However, these studies employed inappropriate measures of risk. When we employ BHC risk measures derived from stock price data, we find, among other things, that expansion into nonbank activities substantially decreases BHC risk. The new evidence summarized here suggests that proposals to limit further expansion of nonbank activities of BHCs would reduce their ability to engage in risk reducing diversification.

I. BHC risk and nonbank activities

Boyd and Graham (1986) and Wall (1987) attempt to assess the effect of nonbank activity on BHC risk. Unfortunately, both these studies rely primarily on accounting data and not capital market data, the latter of which provides a theoretically more satisfying basis for analysis in that investors' assessments are reflected in market risk measures. Boyd and Graham (1986) employ two measures of risk: (1) the standard deviation of the rate

of return on assets and (2) the probability of bankruptcy, i.e., the number of standard deviations below the mean that BHC profits would have to fall to make BHC book equity negative. This latter risk measure is similar to the one used by Wall (1987). The primary difference is that Wall's risk measure is based on return on equity rather than return on assets. Empirical analysis [e.g. Sinkey (1975)] has suggested that the standard deviation of earnings is not a good measure of risk. Bowman (1979) has shown that there is no theoretical relationship between earnings variability and at least one market-based risk measure, the systematic risk of the firm. The quality of accounting data for users attempting to measure risk is subject to question. Ronen and Sorter (1972), for example, criticize accounting information by suggesting that it does not explicitly deal with considerations of risk. Accounting data may supply assistance for risk assessment in an implicit, rather than an explicit, manner. The work of Beaver, Kettler and Scholes (1970) suggests that this is in fact the case. They concluded that accounting-determined measures of risk were indeed impounded in market-based risk measures. Brewer and Lee (1986) find that there is a significant but imperfect correlation between accounting-based measures of equity risk and market-based measures of equity risk. In another study, Brewer and Lee (1988) find that an accounting-based measure of interest rate risk exposure is significant in explaining the sensitivity of bank equity returns with respect to unanticipated interest rate movements.

Modern finance theory then suggests that the riskiness of BHCs' involvement in nonbank activities can be measured by analyzing stock market returns. BHC equity returns are sensitive to all the factors that affect the overall stock market as well as to factors specific to the banking industry. For example, banking organizations are sensitive to "earnings risk" through possible defaults on their loans and investments, changes in loan demand, and potential variability in growth and profitability of their non-portfolio operations. Banking organizations' equity returns are also sensitive to movements in interest rates because they typically fail to match the interest sensitivity of their assets and their liabilities. As a result, movements in interest rates affect the market value of each side of the banking organization's balance sheet and both its net worth and stock returns.

Changes in nonbank activities can affect banking organizations' stock returns because these activities could make them more or less exposed to earning and interest rate risks. Using stock market data, we can test how BHC's involvement in nonbank activities is related to a market-based risk measure. Such cross-sectional tests will not let us draw strong inferences about the riskiness of specific nonbank activities because we do not know the type of nonbank activity levels. However, the tests will at least let us determine how, in a particular period, levels of BHC risk and nonbank activity have been related— positively, negatively, or not at all.

II. Methodology and data

To investigate the relationship between nonbank activity and BHC risk, we examine common stock daily returns of BHCs during the period 1979-1985. The methodology utilized to examine differences in risk is similar to that used by Aharony, Jones and Swary (1980) in their study of corporate failure and by Aharony and Swary (1981) in determining the risk-return effects of the Bank Holding Company Act of 1970. Specifically, we use the standard deviation of BHC equity returns as a measure of the risk borne by the BHC.

The standard deviation of equity returns measures the risk of equity and does not entirely capture risk of BHC assets, as measured by the variability of the returns on BHC assets. We concentrate on the risk of equity because BHC equity can be viewed as an option on the assets of the BHC. Using option pricing theory, it can be shown that the variability of BHC equity returns is proportional to the variability of the returns on BHC's underlying assets. The proportionality factor measures the elasticity of the BHC stock price with respect to the underlying assets of the BHC. Therefore, the standard deviation of BHC equity returns must be assessed in order to properly measure risk of BHC assets.

The data used in this note are for 40 bank holding companies whose stock was traded on the New York Stock Exchange, American Stock Exchange, or Over the Counter and which filed Reports of Condition and Reports of Income and Bank Holding Company Annual Report Financial Supplements (FR Y-9). Balance sheet data are from the Board of Governors of the Federal Reserve System. Data for individual banks are grouped by holding company. Stock market data are from Interactive Data Services, Inc.

To obtain our measure of risk, we use daily data to estimate for each month in the sample period the standard deviation of returns on a BHC's stock. These monthly estimates were then averaged together to generate annual estimates of BHC stock price volatility for each year of the sample period.

We chose to test the proposition that diversification into nonbank activity decreases BHC risk by identifying those factors which affect the standard deviation of BHC stock returns. Boyd and Graham relate BHC risk to the ratio of capital-to-asset (CAPITAL) and the log of total asset (TA), a measure of BHC size. A recent study by Brewer and Lee (1986) relates market-based measures of risk to BHC balance sheet data. They find that three key variables were consistently related to BHC risk sensitivity: CAPITAL, loans-to-asset (LOANS), and purchased funds-to-asset

(FUNDS).[1] We relate these ratios to estimates of the standard deviation of BHC stock returns.

Besides CAPITAL, FUNDS, LOANS, and TA, we use an additional variable to measure bank holding company involvement in nonbank activities. The measure of this variable is one minus the ratio of estimated BHC's total bank assets to its total consolidated assets (NONBANK). An estimate of bank assets is obtained from Reports of Condition by summing deposits, federal funds purchased, other borrowings, and other liabilities. These dollar amounts were aggregated over all banks owned by each BHC to generate estimates of BHC's total bank assets. These estimates are then divided by BHC consolidated total assets to compute the proportion of BHC consolidated total assets atributable to bank activities. Our measure of BHC involvement in nonbank activities is one minus the proportion of BHC consolidated total assets attributable to bank activities. Another measure of nonbank activity is used to check the robustness of our results. The measure of this variable is one minus the ratio of the BHC's total bank assets obtained from Reports of Condition to its total consolidated assets (NONBANK1).[2]

The above discussion suggests the following models:

$$\text{STD}(R_{jt}) = a_0 + a_1\ \text{CAPITAL}_{jt} + a_2\ \text{FUNDS}_{jt} + a_3\ \text{LOANS}_{jt} + a_4\ \text{TA}_{jt} + a_5\ \text{NONBANK}_{jt} + e_{jt}$$

$$\text{STD}(R_{jt}) = b_0 + b_1\ \text{CAPITAL}_{jt} + b_2\ \text{FUNDS}_{jt} + b_3\ \text{LOANS}_{jt} + b_4\ \text{TA}_{jt} + b_5\ \text{NONBANK1}_{jt} + v_{jt}$$

where $\text{STD}(R_{jt})$ is the standard deviation of stock return on BHC_j in period t; $CAPITAL_{jt}$ is the market value of equity-to-total asset ratio of BHC_j in period t; e_{jt} and v_{jt} are error terms; and the other variables are defined as before.[3]

The seven years of data beginning in 1979 and ending in 1985 are pooled, yielding 280 observations. Using this pooled data, the relationship between BHC nonbank activity and the standard deviation of BHC equity returns was estimated using both ordinary least squares (OLS) regression and the Fuller-Battese technique for estimating regression coefficients when dealing with cross-section time series data.[4] Time dummy variables, Dum79-Dum84, are included in the equations estimated by OLS to control for the effects on the standard deviation of equity returns of changes in time-specific factors that are not captured by CAPITAL, FUNDS, LOANS, TA, and NONBANK (NONBANK1).[5] In using Fuller-Battese, rather than OLS with time dummies, the existence of other time as well as cross-sectional effects can be determined by the sample.

III. Empirical Results

The results of estimating different versions of equations (1) and (2) using both OLS and Fuller-Battese techniques are shown in Table 1.[6] The estimated values of the parameters represent their cross-sectional average values.[7] Where an increase in a financial ratio would be expected to increase risk, that ratio should have a positive coefficient. The first set of equations using OLS, (1a) and (2a), includes the market capital-to-asset ratio (CAPITAL), total assets (TA), and a measure of nonbank activity (NONBANK or NONBANK1). The coefficient on the capital ratio has a negative sign and is significantly different from zero at the 0.01 level in both equations. The coefficients of NONBANK and NONBANK1 are also negative and significantly different from zero at a high confidence level.[8] Three of the five time dummies are statistically significant. These results indicate that relative to 1986, BHC riskiness was higher, on average, in 1983 and lower in 1979 and 1981.

Equations (1b) and (2b) present coefficient estimates of taking other possible factors into account. The coefficients of these additional variables did not prove to be significantly different from zero. The third set of OLS results, (1c) and (2c), excludes TA. These results were marginally better than those in equations (1b) and (2b). The coefficient on the purchased funds ratio has a positive sign and is significantly different from zero in both equations (1c) and (2c). In the regression equations based on the Fuller-Battese estimator, the loans-to-asset ratio is statistically significant.[9] Increases in LOANS tend to raise BHC risk.

The sign of the coefficient on nonbank activity indicates that increases in nonbank activity tend to lower BHC total risk. This result is partially corroborated by evidence presented in Boyd and Graham (1986) and Wall (1987). Using accounting-based measures of risk, Boyd and Graham find a negative but insignificant association between nonbank activity and BHC risk during the 1978-1983 period. Wall (1987) has also used accounting data to investigated the relationship between nonbank activity and BHC risk of failure for a sample of 267 BHCs during the 1976-1984 period. He finds insignificant evidence that nonbank activities reduce BHC risk. Our conclusions are more substantial.[10] We find that BHCs with above-average nonbank activities will have below-average risk. The next question is whether or not the implied differences in risk are large. One way this can be established is by looking at the impact of a one-standard-deviation change in nonbank activity on the standard deviation of BHC equity returns. Table 2 shows how a one-standard-deviation change in both measures of nonbank activity translates into a change in the standard deviation of BHC equity returns. Using the results of Table 1, a one-standard-

deviation increase in nonbank activity causes the standard deviation of BHC equity returns to fall 8 - 11 basis points, or about 5 - 7 percent.

IV. Implications

The results presented here have two important public policy implications. To begin with, they point out the risk-reducing benefits associated with nonbank activities. Since nonbank activities appear to make BHCs less risky, then regulators might want to require BHCs with nonbank subsidiaries to hold lower levels of capital. However, it is not enough to show that nonbank activities make BHCs less risky, we also need to evaluate which types of nonbank activity reduce BHC riskiness.

What does all this say about recent proposals to substantially expand the nonbank powers of BHCs into such areas as insurance underwriting, investment banking, and real estate? We see some evidence that above-average nonbank activity has been associated with below-average risk. If results of these cross-sectional test indicate how future cross sections might look after major expansions of nonbank powers, there might be little reason for concern about increases in BHC risk. However, to the extent that the proposed activities are further removed from banking and much riskier than those permitted during our sample period, the results reported in this paper might provide little indication of the future relationship between nonbank activity and BHC risk. Nonetheless, there appears to be some potential for risk reduction via increases in the percentage of BHC assets devoted to nonbank activities.

Footnotes

[1] Purchased funds are defined as the sum of large time deposits of $100,000 or more, deposits in foreign offices, federal funds purchased and securities sold under agreements to repurchase, commercial paper, and other borrowings with an original maturity of one-year or less.

[2] This variable was used by Boyd and Graham (1986).

[3] The market value of equity was computed based on averages of outstanding common shares and prices during each year of the sample period.

[4] See Drummond and Gallant (1983) for a discussion of cross-sectional time-series models.

[5] For a discussion of the existence of "other effects" see Balestra and Nerlove (1966).

[6] The average values as a percent of total assets of the financial variables used in Table 1 are:

	1979	1980	1981	1982	1983	1984	1985
CAPITAL	0.0315	0.0293	0.0340	0.0307	0.0400	0.0387	0.0472
FUNDS	0.4186	0.4242	0.4431	0.4266	0.3945	0.3722	0.3637
LOANS	0.5279	0.5264	0.5293	0.5347	0.5286	0.5687	0.5574
NONBANK	0.1140	0.1113	0.1050	0.1245	0.1208	0.1150	0.1495
NONBANK1	0.0653	0.0628	0.0560	0.0750	0.0691	0.0629	0.0966

[7] Specific tests were made to determine whether pooling across time was permissible. The null hypothesis of homogeneity of slope coefficients across time cannot be rejected for both equations (1) and (2), F(30,238) equals 0.74 and 0.83, respectively.

[8] Similar results were obtained when equations (1a) and (2a), excluding time dummies, were estimated using the Fuller-Battese technique.

[9] When equations (1b) and (2b), excluding time dummies, were estimated using the Fuller-Battese technique, CAPITAL, LOANS, and the nonbank activity measure (NONBANK or NONBANK1) were significantly different from zero.

[10] We did some tests using the standard deviation of returns on assets over the 1979-1985 period as the dependent variable. The equations below are representative of these tests:[a]

(1) $$\mathrm{STD}(ROA_j) = 0.6335 - 2.7462\ \overline{CAPITAL}_j - 0.1477\ \overline{FUNDS}_j + 0.0209\ \overline{LOANS}_j - 2.2269\ \overline{NONBANK}_j$$
(1.342) (0.747) (0.457) (0.034) (1.942)**

$\overline{R}^2 = 0.0818$ F-Statistic = 1.869

(2) $$\mathrm{STD}(ROA_j) = 0.4909 - 3.2056\ \overline{CAPITAL}_j - 0.0910\ \overline{FUNDS}_j + 0.0608\ \overline{LOANS}_j - 2.1908\ \overline{NONBANK1}_j$$
(1.105) (0.894) (0.286) (0.101) (1.985)**

$\overline{R}^2 = 0.0858$ F-Statistic = 1.915

**Signigicantly different from zero at the 5% level.
[a]Numbers in parentheses beneath the regression coefficients are the corresponding t-statistics.

Where a bar (-) over a variable denotes an average value over the 1979-1985 period. The number of observation, in each equation is 40. These results are much less clear-cut than the ones presented in Table 1. While the standard deviation of returns on assets exhibits a negative relationship with nonbank activity, the significance levels are relatively lower than those reported in Table 1. In addition, we find no significant relationship between the standard deviation of returns on assets and the other independent variables. As a result, we do not have much confidence in these findings. We performed additional tests using accounting or market data covering 1979 through 1983, a sample period not too different from one of Boyd and Graham's (1986) subperiods, and obtained results somewhat weaker than those for the full sample period, 1979 through 1985.

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Table 1

The Relationship Between the Standard Deviation of BHC Stock Return and Nonbank Activity (1979 - 1985)

EQUATION	INTERCEPT	CAPITAL	FUNDS	LOANS	TA	NONBANK	NONBANK1	DUM79	DUM80	DUM81	DUM82	DUM83	DUM84	$\bar{R}^2$	F-Statistic	N
							A. Ordinary Least Squares									
(1a)	1.5389 (3.508)***	-7.6960 (3.837)***	--	--	0.0331 (1.385)	-2.0406 (4.198)***	--	-0.4427 (3.727)***	-0.1344 (1.124)	-0.2189 (1.867)*	0.0960 (0.814)	0.1858 (1.627)*	-0.0570 (0.497)	0.2323	10.382***	280
(1b)	1.7483 (3.024)***	-7.6355 (3.798)***	0.4007 (1.176)	0.5098 (1.352)	-0.0100 (0.237)	-1.6310 (2.931)***	--	-0.4587 (3.727)***	-0.1466 (1.185)	-0.2346 (1.923)**	0.0805 (0.664)	0.1906 (1.650)*	-0.0573 (0.500)	0.2331	8.710***	280
(1c)	1.6305 (5.540)***	-7.5313 (3.846)***	0.3342 (1.730)*	0.4746 (1.372)	--	-1.6751 (3.199)***	--	-0.4503 (3.826)***	-0.1387 (1.166)	-0.2269 (1.933)**	0.0875 (0.747)	0.1933 (1.685)*	-0.0556 (0.487)	0.2358	9.609***	280
(2a)	1.3302 (3.017)***	-8.2306 (4.119)***	--	--	0.0395 (1.635)*	--	-1.8179 (3.728)***	-0.4318 (3.615)***	-0.1245 (1.035)	-0.2064 (1.752)*	0.1009 (0.850)	0.1919 (1.670)*	-0.0517 (0.448)	0.2223	9.859***	280
(2b)	1.6289 (2.775)***	-8.0886 (4.042)***	0.4708 (1.379)	0.5962 (1.576)	-0.0129 (0.299)	--	-1.3449 (2.420)**	-0.4529 (3.661)***	-0.1409 (1.134)	-0.2269 (1.852)*	0.0814 (0.668)	0.1968 (1.696)*	-0.0522 (0.454)	0.2255	8.384***	280
(2c)	1.4750 (5.243)**	-7.9605 (4.080)**	0.3866 (2.010)**	0.5503 (1.594)	--		-1.4063 (2.729)**	-0.4422 (3.741)**	-0.1309 (1.095)	-0.2172 (1.842)*	0.0903 (0.767)	0.2002 (1.737)*	-0.0503 (0.438)	0.2281	9.244***	280
							B. Fuller-Battese									
(1c)	1.2490 (3.606)***	-7.9194 (3.380)***	0.1304 (0.428)	1.1630 (2.695)***	--	-1.4866 (2.898)***	--	--								280
(2c)	1.1046 (3.606)***	-8.0248 (3.413)***	0.1680 (0.551)	1.2430 (2.854)***	--	--	-1.2696 (2.471)***	--								280

Note: The numbers in parentheses below the regression coefficients are the absolute values of the corresponding t-ratios.

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 1 percent level.

Table 2

The Impact of Nonbank Activity on the Standard Deviation of Common Stock Returns

	Sample Average	Sample Standard Deviation	Change in standard deviation of Common Stock Returns due to a one standard deviation increase in nonbank activity	
			OLS	Fuller-Battese
NONBANK †	0.1200	0.0671	0.0011	0.0010
NONBANK1 ††	0.0697	0.0661	0.0009	0.0008
STD(R_{jt})	0.0147	0.0057		

†Based on Equation (1c)
††Based on Equation (2c)