Federal Reserve Bank of Minneapolis
Research Department Working Paper

BANK HOLDING COMPANY DIVERSIFICATION INTO NONBANK LINES OF BUSINESS:
The Effects on Risk and Rate of Return

John Boyd and Stan Graham*

Working Paper 296

Revised January 1986

*Federal Reserve Bank of Minneapolis

I. Summary

Bank holding companies (BHCs) control thousands of nonbank subsidiaries in such diverse lines of business as mortgage banking, discount brokerage, insurance underwriting, data processing, and futures commission merchanting. The purpose of this study is to determine if operation in these nonbank business lines systematically affects the return distributions of bank holding companies. In particular, we are interested in the question, "Do such nonbank activities affect BHCs' profitability and risk of failure, relative to what they would be if banking were their only line of business?"

The key explanatory variable in this study is a cross-sectional measure of BHC involvement in nonbank activity, the ratio of banking assets to total consolidated assets of the BHC. Over the full sample period studied, 1971-1983, we find no evidence that a BHC's degree of involvement in nonbank businesses systematically affected either its profitability, or its risk of failure. In the first part of the period, however, (1971-1977), BHCs with above-average nonbank involvement seemed to experience above-average rates of return on assets. Yet, these returns were also more variable than average and according to our estimates, the net effect of higher returns and higher volatility was a higher-than-average probability of failure.

We are not sure why results seem to depend on the sub-period studied. Perhaps, there was a learning period for bankers and/or regulators in the earlier years when involvement in many nonbank activities was relatively new. In any case, what we don't find is perhaps more important than what we do. Notably missing is any evidence that diversification into nonbank lines reduces a BHC's risk of failure--a relationship that is implicit in past and present regulatory strategy for bank holding companies.

II. Background and Motivation for the Study

The 1970 amendments to the Bank Holding Company Act set the basic guidelines under which BHCs now operate. These amendments did away with the previously important distinction between one-bank and multi-bank holding companies, and empowered the Fed to determine what nonbank business lines would be permitted for BHC affiliates. 1/ One of the important lines of reasoning behind that legislation (and subsequent regulatory policies of the Federal Reserve System) was that diversification is desirable. Bank holding company affiliates, engaged in profitable nonbank lines of business, could be a source of strength to their holding companies and, perhaps more importantly, to their banking affiliates. If nonbank earnings are less than perfectly correlated with bank earnings (and that seems very likely), risk-reducing diversification is possible. A major objective of the 1970 legislation and subsequent regulatory interpretation of it was to reduce the likelihood of bank failures (Chase and Mingo, 1975; Eisenbeis, ; Talley,). 2/

This regulatory strategy implicitly assumes that if given the opportunity to diversify so as to reduce risk, BHC managers will take advantage. Although intuitively plausible, that assumption is theoretically sound only if BHC managers are strongly risk averse.

Consider Figure 1a, where the solid curve represents the set of risk-return opportunities in banking only, and the dashed curve represents the expanded opportunity set when some nonbank opportunities are permitted also. Next, consider a risk-averse bank which chooses to operate at position 0. If allowed, through its BHC, to go into nonbank activities, it might choose a new position such as N_0 or N_1 which both exhibit lower risk than 0. This is, apparently, what the regulatory authorities assume that a BHC would rationally choose to do. However, if only mildly averse to risk, it might instead choose a new position such as N_2 with somewhat higher risk than 0, compensated by higher returns.

Moreover, according to corporate finance theory, risk aversion is an attribute of investors, not of corporations. Corporations are risk-neutral, and maximize shareholders' wealth by finding underpriced assets and investing as much as possible in them. It is not necessary for corporations to diversify, since individual investors can and will obtain whatever degree of diversification they desire in the securities markets. If BHCs are actually risk-neutral as this theory holds, permitting nonbank activities would cause them to move from 0 to N in Figure 1b. That is, they would always seek the highest returns available. Depending on how we draw the dashed curve in 1b, though, N could also exhibit higher or lower risk than 0.

Recent literature on the so-called *moral hazard problem* in banking has shown that our system of FDIC deposit insurance may induce banks to be risk seekers; e.g., have a preference for more, as opposed to less variability of returns. If this theory is correct, when confronted with an expanded investment opportunity set, bankers will seek to increase their risk exposure, not decrease it. (See, for example, Karaken and Wallace, _____.) This distortion of incentives could also extend to the nonbank activities of bank holding companies, if nonbank losses can be passed along to the FDIC (e.g., if the deposit insurer actually ends up insuring some or all of the liabilities of nonbank affiliates). Although we know of no studies explicitly dealing with the moral hazard problem in BHCs, it is clear that this sort of loss shifting has occurred in some instances. (See footnote 4.)

Figure 1c portrays what might occur if BHCs were risk-seekers. The shaded area at the top of the graph represents the maximum level of risk permitted by the regulatory authorities. With or without nonbank activities, BHCs would simply go to the boundary, the highest level of risk permitted. It is quite possible, however, that nonbank activities complicate the regulators' task of risk monitoring and control. If that is true, N would actually exhibit higher risk than O.

In summary, it is by no means sure that, if given expanded investment opportunities, BHC managers have an incentive to use those opportunities so as to reduce risk. It is even possible that they will attempt to use them to increase risk, due to the distortion of incentives caused by deposit insurance. Whether or not they could actually do so depends on how effectively the authorities can monitor and control risk.

III. Risk and Return Measures: The Dependent Variables

Unfortunately, we cannot conduct simple before and after tests of the sort depicted in Figures 1a-1c. The data will not permit this, as there are no well defined "before" and "after" periods. However, BHCs have exhibited varying levels of nonbank activity as measured by the variable Γ, defined as the ratio of nonbank assets to total consolidated assets. Such variations in Γ across firms are perhaps due to differences in BHCs' risk preferences, or differences in the market opportunities confronting them. In any case, it is possible to carry out cross-sectional tests in which return and risk measures are related to Γ across BHCs. Such tests do not permit us to draw inferences about risk preferences since we don't know the specific cause of observed differences in Γ. However, they do allow us to determine ex-post how BHC performance has been related to levels of nonbank activity. These tests may also provide inferential evidence as to what would happen if BHCs' nonbank opportunities were further enhanced.

The rate of return measure used in this study is consolidated after tax profits of the holding company, divided by consolidated assets. We call this asset return measure $\tilde{r}$, where a tilde denotes a random variable. For some purposes a rate of return on equity measure might have been preferable, but with bank holding companies the correct definition of equity is not obvious, and there may be problems maintaining a consistent definition across BHCs. For our purposes, the simpler return on assets measure avoids such problems.

Let i denote bank holding company, j denote year, and n denote the length of the sample period. Then, the empirical return measure is:

$$(1) \qquad \bar{r}_i = \sum_{j=1}^{n} \tilde{r}_{ij}/n.$$

Here, and throughout this paper, a bar denotes a mean. Thus, $\bar{r}_i$ is an estimate of ρ_i, the true mean of the $\tilde{r}_i$ distribution.

Two risk measures are employed. The first is a measure of the variability of the accounting rate of return on assets, specifically, the standard deviation of r. The estimated standard deviation of r for the i-th holding company is defined:

$$(2) \qquad s_i = [\sum_{j=1}^{n} (\tilde{r}_{ij}-\bar{r}_i)^2/(n-1)]^{1/2},$$

where s_i is an estimate of the true standard deviation, σ_i.

It is worth emphasizing that the return measure we employ, $\tilde{r}$, is net of (after) interest expense. This means that both $\bar{r}$ and s will be functions of financial leverage (by financial leverage, we mean the BHC's choice of debt and equity financing). To see that this is so, let A_i = consolidated assets, L_i = consolidated debt, $\tilde{r}_{Ai}$ = the rate of return in assets <u>before</u> interest expense, $\tilde{\ell}_i$ = the rate of interest on debt, and $\tilde{\pi}_i$ = consolidated profits, all for the i-th bank holding company. Then, ignoring taxes,

(3) $$\bar{r}_i = \bar{\pi}_i/A_i = \bar{r}_{ai} - \bar{\ell}_i * L_i/A_i.$$

As the leverage measure L_i/A_i increases, ceteris paribus, the mean asset return $\bar{r}_i$ will fall.

Next, defining S_i^2, S_{ai}^2, and $S_{\ell_i}^2$ as the estimates of the variance of r_i, r_{ai} and ℓ_i, respectively, and $\text{cov}(r_{ai},\ell_i)$ as the estimated covariance between r_i and ℓ_i,

(4) $$S_i^2 = S_{ai}^2 + S_{\ell_i}^2 (L_i/A_i)^2 - 2(L_i/A_i)*\text{cov}(r_{ai},\ell_i),$$

and S_i^2 is obviously a function of L_i/A_i. It is not difficult to show that S_i^2 has a minimum in L_i/A_i so that the relationship between these variables could theoretically be positive or negative or both, depending on the range of the data with which we test.

Conceptually, Γ could influence mean rates of return as measured by $\bar{r}$, and risk as measured by S in two ways. If the rate of return distributions of nonbank activities are systematically different than those of bank activities, Γ may influence both $\bar{r}_a$ and S_a^2. And, if nonbank affiliates are financed differently that bank affiliates (and these differences are not offset at the parent level), Γ may influence L/A. And, as we have seen above, both $\bar{r}$ and S^2 are functions of L/A. In the tests which follow, however, we will ignore such indirect leverage effects and treat L/A as a separate "control variable," distinct from Γ. A priori, *we don't know whether variations in Γ actually cause variations in* L/A, or vice versa. In any case, whatever the cause of financial leverage decisions in BHCs, their effects are fairly well understood and susceptible to direct regulatory control. What are less well understood are the asset portfolio effects of nonbank diversification (represented by the distribution of r_a), and it is these effects that we will attempt to isolate.

It should also be clear at this point that we have no theoretical priors as to the exact relationships between Γ and ρ, and between Γ and σ. Thus, it is impossible to write down formal statistical models of the relationships between these variables. The best we can do is to conduct simple tests of association between them.

An Alternative Risk Measure

It is convenient to assume that a bank holding company is organized and operated as a consolidated concern, which survives or fails as a single entity. This allows us to define a second risk measure, the probability of a "consolidated bankruptcy," or more precisely, $p(\tilde{\pi} < -E)$, where E is consolidated holding company equity. [4] Defining $k = -E/A$,

$$(5) \qquad p(\tilde{\pi} < -E) = p(\tilde{r} < k) = \int_{-\infty}^{k} \phi(r)dr,$$

where ϕ is the probability density function of $\tilde{r}$. For many distributions such as the normal, which are completely characterized by a location and a dispersion parameter, equation (5) may be simplified by changing coordinates. If, for example, $\tilde{r}$ is normally distributed as is assumed in this analysis,

$$(6) \qquad p(\tilde{r} < k) = \int_{-\infty}^{z} N(0,1)dz \text{ and } z = (k-\rho)/\sigma.$$

z was the risk measure employed, except that the sample estimate S was substituted for σ, and $\bar{r}$ substituted for ρ. The sample estimate of -z, (z is a negative number) is labeled Z.

Z is the number of standard deviations below the mean that profits would have to fall in order to result in negative consolidated equity. In this sense, it is an indicator of the probability of "consolidated bankruptcy." This risk measure is very different than volatility measures such as S, that are more commonly seen in the literature and more easily related to individual risk preferences. For present purposes, however, Z is particularly attractive since it is the risk of failure that is of primary concern to the regulatory authorities.

IV. The Sample

The decision was made early to limit the sample to large BHCs for which the necessary data could be easily obtained from public sources. Our sample includes all domestic BHCs with total assets exceeding $5 billion at the end of 1983. Six firms were deleted since, for one reason or another, not enough data were available. The sample period covers a thirteen-year span, from 1971 to 1983. 1971 was chosen as the starting point because it is the first full year in which the 1970 amendments to the Bank Holding Company Act were in effect. 1984 data became available too late for inclusion.

The basic data include consolidated total assets, deposits, purchased funds and equity of BHCs, consolidated net income of BHCs, and total assets of bank affiliates of BHCs. Annual BHC consolidated data since 1976 come from a data base maintained by the Board of Governors of the Federal Reserve System. We used this source for convenience only, as these data are publicly available. Annual BHC consolidated data prior to 1976 were obtained from Moody's Bank and Finance Manual.

V. Explanatory Variables

The key explanatory variable in this analysis is Γ_i, defined as bank assets of the i-th holding company divided by total consolidated assets of the i-th holding company. Unfortunately, Γ cannot be directly computed with published financial statements, because these do not separate the results of operations, assets, or liabilities of individual BHC subsidiaries. Since Γ is not directly observable, we employ several different proxy measures for it, and these are discussed below.

Separate data on banking subsidiaries of BHCs are available from the Reports of Condition. Using this source, one estimate of Γ we employed is the ratio of total assets of BHC affiliated banks to total consolidated assets. This variable is labeled γ. It must be emphasized that the numerator and denominator in γ come from "different sets of books," and that the two are difficult to reconcile. The main problem with the ratio is that banking subsidiary total assets from the Reports of Condition do not always equal the amount of bank subsidiary assets in the consolidated financial reports. Although we cannot observe the latter, we know this must be so since the ratio of bank assets to consolidated total assets frequently exceeds the supposed upper limit of 100 percent. 5/

A second estimate of Γ employed in this study is the sum of BHC consolidated deposits, Federal Funds purchased, and repurchase agreement liabilities, all divided by consolidated total assets. In effect, we add up liabilities that are obviously bank issued to obtain an alternative estimate of bank affiliate assets. This indicator, γ', can be derived entirely from consolidated balance sheets, and thus avoids problems in attempting to reconcile two different accounting sources. It suffers, however, from the fact that it is an incomplete proxy for bank assets. Only those liability categories that are clearly distinguishable as belonging to banks enter the numerator and bank equity is ignored entirely. This variable systematically understates the relative amount of bank activity, but by some unknown amount. And that amount may vary across BHCs.

A third indicator of Γ is the ratio of BHCs' parent company book value investment (equity) in bank affiliates to their book value investment (equity) in all affiliates. This measure, γ'', represents the market value of subsidiaries at the time of acquisition. These data are only available since 1976, a subset of the sample period. For that reason, γ'' is only used to check the reasonableness of γ and γ', the other proxies for Γ. It is not used as an explanatory variable in our later testing.

We will return to consider the relationships between γ, γ', and γ'' momentarily, after first briefly discussing control variables.

VI. Control Variables

In addition to the proxy measures for Γ, which are the key explanatory variables, several control variables are employed. They include a measure of financial leverage and a measure of firm size.

As discussed earlier, financial leverage must be included in the analysis because in theory, ρ, σ, and z are all functions of this variable. We shall use the control variable L/A, defined as consolidated total debt (including deposits and all other short-term borrowing) divided by consolidated total assets.

We also include an asset size measure, as a rough proxy for bank asset diversification. It has been argued that, whether or not they are involved in nonbank activities, large BHCs typically have better diversified bank asset portfolios than small BHCs do. From casual observation, it does appear that the loan portfolios of large banks affiliated with large BHCs, may be more diversified (geographically and by type of loan) than are loan portfolios of smaller banks. If this observation is correct, bank asset diversification could reduce our risk measures, S and Z, independent of the effects of BHC diversification into nonbank business lines. The size measure we employ is consolidated total assets, A. [6]

VII. Interrelationships Between γ, γ', and γ''

In Table 1, equations (1a), (1b), and (1c) show strong positive correlations between all three γ's. This gives some confidence that we are indeed obtaining proxy measures of the relative levels of bank and nonbank activity, since each of the three proxies for Γ is different, and subject to different possible accounting errors. Equations (1d) and (1e) indicate that the relationships between the γ's remain strong even when ln(A) and L/A enter as additional explanatory variables. Not surprisingly, there is some evidence of statistical association between ln(A) and the γ's, and between L/A and the γ's. These relationships depend on which γ is used as the dependent variable, suggesting that γ and γ' may contain somewhat different information. Yet, neither variable is preferred on a priori grounds. In some of the tests that follow, therefore, <u>both</u> variables will be included simultaneously as explanators. In these cases, an F-test is employed against the null hypothesis that coefficients of both γ and γ' are zero. Obviously, if this null were rejected, care would have to be taken in interpreting the results since it is likely that γ and γ'' are capturing something else besides variations in Γ. As it turns out, such hazardous interpretations will not prove necessary.

VIII. Empirical Results

Table 2 shows the results of tests with $\bar{r}$ the dependent variable. The coefficients of γ and γ' are not significant at the 90 percent confidence level or higher when these variables enter one at a time. And when both γ and γ' enter (equation 2c), the null hypothesis that both coefficients are zero is only rejected at about the 50 percent confidence level. This suggests there is little association between the pair (γ and γ') and $\bar{r}$. Although they are not reproduced here, more sophisticated "instrumental variable" tests were run, using γ as an instrument for γ', and vice versa. The idea of this procedure, roughly speaking, is to purge poorly measured explanatory variables (such as γ and γ') of undesirable random noise. In no case, however, did these tests uncover a statistically significant relationship between γ or γ' and $\bar{r}$. Nonlinear specifications produced the same kind of results. Overall, it is fair to state that if there is indeed an association between Γ and $\bar{r}$ in these data, it is very weak.

In every specification with $\bar{r}$, the dependent variable, the coefficient of the leverage variable L/A was negative and significantly different than zero at a high confidence level. As suggested previously, this result is no surprise. (See equation 3.) There is high multicollinearity between BHC size and leverage, and not surprisingly, when L/A is excluded the coefficient and t-value of ln(A) increase greatly in absolute value.

Table 3 shows some regression equations in which the risk measure S is the dependent variable. With S dependent, choice of structural form seemed to matter, and we have, therefore, included both linear and log-linear versions of the regressions. There is no evidence, however, of a relationship between either γ or γ' and S. The F-test in equation (3F) is perhaps most instructive, for it suggests there is about a 75 percent chance that coefficients of both γ and γ' are zero. Instrumental variables tests and numerous other specifications unanimously supported the same conclusion: There is no evidence of association between Γ and s in these data.

Results with the control variables in Table 3 are quite different. For example, the coefficient of L/A is positive and significantly different than zero at reasonably high confidence levels in the log-linear specifications. The coefficient of the size variable, ln(A), is consistently negative with t-values in excess of 2.0, suggesting that risk is negatively associated with asset size. Although there could be other explanations for this relationship, the most obvious is the one suggested earlier--large BHCs have better diversified bank assets than do small ones.

Table 4 presents tests with the risk measure Z, the dependent variable. As explained, Z represents the theoretical probability of bankruptcy and is a very different measure of risk than is S. Even so, the results in Table 4 are not qualitatively different than those in Table 3. There is no evidence of association between Γ and Z, either in the results shown here or in other regressions, including instrumental variable tests. However, the tests in Table 4 do indicate a strong negative association between L/A and Z, and a strong positive one between ln(A) and Z. Since higher values of Z signal a lower probability of bankruptcy, the entailments are the same as those in Table 3: higher risk is associated with higher leverage and with smaller scale of BHC operations.

IX. Other Empirical Results

It would be convenient for us to stop here and summarize the results so far, for they are quite consistent and easy to interpret. In essence, the risk and return measures are apparently independent of Γ. It would be cheating to stop here, though, for we have some other results that are different and tend to somewhat confound our conclusions.

We had access to another set of findings that we obtained in connection with a previous study and never published (Boyd and Pithyacharyakul, 1980). These earlier tests (hereafter, the "BP" tests), employed data on individual BHC affiliates that are collected by the Federal Reserve Banks and are confidential. By doing our own aggregation of affiliate data, we were able to estimate Γ directly, thereby avoiding many of the accounting problems discussed earlier. These data covered a shorter period, 1971-1977, and included all BHCs with nonbank affiliates reporting to the Fed. After many eliminations due to data problems, we were left with a sample of 435 BHCs as of 1977 which had a total of 895 nonbank affiliates.[7/]

Table 5 shows average values of Γ, $\bar{r}$, s, and Z for five groups of BHCs ranked according to Γ. The five cutoff values of Γ which determine the groups were chosen arbitrarily, except for the requirement of a reasonably large number of firms in each group. For groups 1 to 4, both $\bar{r}$ and s are relatively flat and there is no apparent relation between these variables and Γ. But in group 5 (those BHCs with the highest ratios of nonbank activity), there is an extremely sharp jump in both $\bar{r}$ and s. Z, in the other hand, falls continuously across sample groups. Formal statistical testing revealed positive relationships between Γ and $\bar{r}$, and between Γ and s, and a negative relationship between Γ and Z. All were statistically significant at high confidence levels. With $\bar{r}$ and S dependent, "best fits" were highly nonlinear, increasing with Γ at increasing rates.

In summary, results in the earlier BP study were very different than those we have reported in Tables 2-4 (hereafter the "BG" results). BP suggested that BHCs with greater-than-average involvement in nonbank activities also exhibited above-average returns on assets and above-average risk. These relationships were most apparent for BHCs in group five--those that had gone most heavily into nonbank business lines. The BG tests, on the other hand, found no such relationships.

Can the Results be Reconciled?

There are at least three possible explanations as to why the BP and BG results are so different. The two studies employed:

(a) different measures of Γ, (presumably Γ was better measured in the earlier BP tests);

(b) different sample sizes and composition, (the BP sample was much larger and included many smaller BHCs, not in the BG sample);

(c) different sample periods, (BP included only 1971-1977, BG included 1971-1983).

It is impossible to test the effects of sample differences (a) and (b) above, without going back to the disaggregated data--a major undertaking, and one we sought to avoid from the inception of the present research. However, the effects of sample difference (c) are directly testable, since the BP sample period is a subset of the BG sample period. Therefore, we reestimated all the equations in Tables 2-4, using only data from the 1971-1977 period.

Some of these results are presented in Table 6. Just as reported earlier in Table 2, there is no evidence of association between Γ and r. However, the abbreviated data suggest a significant positive relationship between Γ and S, and a significant negative relationship between Γ and Z just as we found in the BP study. Coefficients and t-values of the control variables ln(A) and L/A are generally of the same sign and magnitude as those in Tables 2, 3, and 4. In other words, using data from 1971-1977 only, the BG results look much like the BP results when S and Z are the dependent variables. It remains a mystery to us, though, why r appears to be related to Γ in the one data set and not in the other. Most probably, the explanation lies in factors (a) and (b) discussed above.[8]

Footnotes

1/Subject to the proviso that permitted nonbank activities be "so closely related to banking as to be proper incident thereto."

2/Whether bank failures actually result in social costs, and resultantly should be avoided as a matter of public policy, is a question that goes beyond the scope of this paper. In any case, the assumption underlies much bank and bank holding company regulation in this and other countries.

3/Some previous work we have done suggests that, whatever BHC risk incentives are, the actual opportunities for risk reduction via nonbank diversification may be small. This is due to the fact that, based on historical return distribution data on individual affiliates of BHCs, permitted nonbank lines of business appear to have been quite risky, at least relative to banking. (See Boyd and Pithyacharyakul, 1980.)

4/In point of fact, each affiliate of a bank holding company is a separate corporation and, theoretically, the fortunes of any one of them need not affect the others. As a practical matter, though, genuine corporate separateness is rarely maintained. The affiliates may borrow from and lend to one another, exchange assets, and centralize services such as data processing, payments, and collections. Moreover, parent holding company management often makes the major decisions for the operating companies.

In recognition of such interconnectedness, the Fed imposes restrictions on dividend payments, management fees, and other transactions that might divert resources from bank to non-bank affiliates or to the parent. But these constraints are not always effective. The 1976 failure of Hamilton National Bank, for example, occurred shortly after it had purchased large amounts of substandard assets from a mortgage affiliate. In 1974, Beverley Hills Bank Corporation, a holding company, experienced widely publicized financial problems which culminated in a run on its bank subsidiary and its eventual failure. Other examples could be cited. The point is that treating a BHC as a single consolidated entity is not totally unrealistic, and arguably is a useful abstraction for modeling the risk of failure in this sort of a multi-affiliate organization.

5/ Several explanations for this finding are plausible. First and most important, bank affiliate assets are reported gross, whereas consolidated BHC assets reflect the effect of consolidation of inter-subsidiary accounts. Second, year-end balance sheet dates may differ. Even if the time interval is short, adjustments in bank total assets may not be trivial, given the supposed bankers' penchants for year-end window dressing. Third, purchases or sales of bank affiliates may give rise to timing differences in the recognition of ownership.

6/ The variable A is in dollars and exhibits considerable scale differences across firms in the sample. To avoid problems of heteroskedasticity (error variance systematically related to one or more of the explanatory variables), A is always entered as a natural logarithm. However, coefficients, and t-values of other variables, are little affected if A is included in level form.

7/ Sample size and composition changed over time, as there was considerable entry and some exit of nonbank affiliates during the 1971-1977 period.

8/ We carried out some tests using yet another risk measure as the dependent variable, the so-called beta of a bank holding company's common stock. (It is beyond the scope of this paper to define beta or explain its pros and cons as a risk measure.) The equation below is representative of these tests, in which the dependent variable was beta as reported by the <u>Value Line Investors Survey</u>.

(5)
$$\beta_{77,88} = \underset{(5.082)}{1.168 + .1106 \ln(A)} + \underset{(.6907)}{1.034\ E/A} - \underset{(3.166)}{2.232\,\gamma} + \underset{(.1313)}{.0766\,\gamma'}$$

$$\bar{R}^2 = .617$$

$$n = 38.$$

In some specifications, we used the beta estimate for 1983, the end of the sample period. In others (including the above) we employed a simple average of the 1977 and 1983 beta estimates, 1977 being at the middle of the period. It didn't seem to make much difference, nor were results particularly sensitive to the inclusion or exclusion of control variables. As above, the coefficient of γ was always positive and significantly different than zero at a relatively high confidence level. So, too, was the coefficient of γ', if γ was excluded. Beta did not seem to be related to the leverage measure E/A, but was strongly positively related to size, as represented by ln(A).

Having obtained these results the problem is interpreting them. Beta is by construction a measure of systematic risk only. And BHCs' portfolio choice is severely restricted by regulation, to the point that they cannot invest in most equities. Thus, they may be exposed to very substantial unsystematic risk. From a regulatory perspective and from the perspective of this study, it is total risk that is important, not just a component of it, and we do not know the relationship between beta and total risk for BHCs.

Even so, the finding of an apparent positive association between Γ and beta is of interest, especially in conjunction with the earlier finding of no apparent association between Γ and S, since S is one possible measure of total risk. If correct, these results could suggest that BHCs which have chosen to go more heavily into nonbank activities (those having higher-than-average values of Γ), take on more-than-average systematic risk. However, this may be accompanied by a more or less offsetting decline in unsystematic risk. It is possible, for example, that nonbank asset powers permit some BHCs to better diversify against regional and industry-specific risk factors, which do not significantly affect national market conditions. This interpretation is consistent with the fact that permitted nonbank lines of business are not geographically restricted, whereas banking is restricted to some extent. Admittedly, there could be many other interpretations of these findings.

Table 1

Tests with γ, γ', or γ'' as the Dependent Variable

	Dependent Variable	Constant Term	Coefficient of ln(A)	E/A	γ	γ'	γ''	$\bar{R}^2$
(1a)	γ	.4921				.5722 (7.189)		.446
(1b)	γ	.5798					.4192 (10.813)	.644
(1c)	γ'	.4033					.4688 (7.2665)	.451
(1d)	γ	.2516	.0101 (2.823)	.5498 (1.969)		.6343 (7.849)		.495
(1e)	γ'	.3223	-.0143 (3.731)	-.5082 (1.605)	.7987 (7.849)			.542

Form of equations is linear, however, the variable ln(A) is a natural log.

Sample size = 64

t-values in parentheses

Table 2

Tests with $\bar{r}$ as the Dependent Variable

	Dependent Variable	Constant Term	Coefficient of ln(A)	L/A	γ	γ'	$\bar{R}^2$
(2a)	$\bar{r}$	.0032	-.0001 (.4515)	.1234 (8.257)	-.0020 (.4215)		.663
(2b)	$\bar{r}$	.0062	-.0001 (.7520)	.1219 (8.298)		-.0043 (1.021)	.668
(2c)	$\bar{r}$	.0052	-.0002 (.8481)	.1202 (7.882)	.0029 (.4275)	-.0062 (1.017)	.663

*F(2,59) = .6057
Significance = .549

Form of equations is linear, however, the variable ln(A) is a natural log.

Sample size = 64

t-values in parentheses

*F-test is against the null hypothesis that coefficients of both γ and γ' are zero.

Table 3

Tests with s as the Dependent Variable

	Dependent Variable	Constant Term	----------Coefficient of---------- ln(A)	E/A	γ	γ'	$\bar{R}^2$	Form
(3a)	s	.0027			-.0015 (.4929)		.000	linear**
(3b)	s	.0075	-.0003 (2.546)	-.0139 (1.548)	-.0011 (.3878)		.056	linear**
(3c)	ln(s)	-6.805			-1.571 (.8206)		.000	log linear
(3d)	ln(s)	-4.517	-.2798 (3.721)	-.7104 (2.060)	-1.416 (.8039)		.164	log linear
(3e)	ln(s)	-4.541	-.2820 (3.589)	-.7428 (2.156)		.0573 (.0415)	.155	log linear
(3f)	ln(s)	-4.577	-.2496 (3.010)	-.6518 (1.852)	-2.974 (1.184)	1.709 (.8719)	.160	log linear

F(2,59) = .702
Significance = .500

Sample size = 64

t-values in parentheses

*F-test is against the null hypothesis that coefficients of both γ and γ' are zero.

**Except the variable ln(A), which is a natural log.

Table 4

Tests with Z as the Dependent Variable

	Dependent Variable	Constant Term	Coefficient of ln(A)	Coefficient of E/A	Coefficient of γ	Coefficient of γ'	$\bar{R}^2$
(4a)	Z	-411.4	17.31 (4.065)	2083.0 (5.940)	88.18 (.7826)		.358
(4b)	Z	-302.5	17.16 (3.846)	2120.0 (6.081)		-25.84 (.2562)	.352
(4c)	Z	-358.0	14.93 (3.169)	1998.0 (5.598)	220.6 (1.379)	-165.8 (1.163)	.362

*F(2,59) = .9842
Significance = .380

Form of equations is linear, however, the variable ln(A) is a natural log.

Sample size = 64

t-values in parentheses

*F-test is against the null hypothesis that coefficients of both γ and γ' are zero.

Table 5

Return and Risk Statistics for Grouped Data

The 1971-1977 Industry Data

Group	Firms in Group Having Γ	Number of Firms in Group	Group Average $\bar{\Gamma}$	Group Average Return on Assets, $\bar{r}$	Group Average Standard Deviation of Rates of Return, $\bar{s}$	Group Average Z-score, Z
1	$1.0 > \Gamma_i > .995$	118	99.8	.79	.17	92.7
2	$.995 > \Gamma_i > .985$	101	99.0	.81	.22	72.0
3	$.985 > \Gamma_i > .975$	60	98.0	.80	.21	68.0
4	$.975 > \Gamma_i > .950$	65	96.3	.79	.22	55.4
5	$.950 > \Gamma_i$	91	82.0	1.34	1.08	37.3
full sample	$1.0 > \Gamma_i > 0.0$	435	95.2	.91	.38	67.3

Table 6

Tests with $\bar{r}$, S, and Z as Dependent Variables
based on period 1971-1977

	Dependent Variable	Constant Term	Coefficient of: ln(A)	E/A	γ	γ'	$\bar{R}^2$
(6a)	$\bar{r}$	-.0024	-.0001	.1182	.0039		.662
			(.4989)	(8.267)	(.8880)		
(6b)	$\bar{r}$	-.0001	-.0001	.1203		.0014	.658
			(.4205)	(8.459)		(.3113)	
(6c)	$\bar{r}$	-.0018	-.0001	.1172	.0056	-.0025	.657
			(.5219)	(8.025)	(.9173)	(.4008)	
						*F(2,59) = .4690	
						Significance = .628	
(6d)	S	.0097	-.0002	-.0012	-.0056		.253
			(2.980)	(.2228)	(3.269)		
(6e)	S	.0097	-.0023	-.0043		-.0058	.256
			(3.259)	(.7978)		(3.309)	
(6f)	S	.0106	-.0002	-.0026	-.0032	-.0035	.268
			(3.104)	(.4694)	(1.398)	(1.496)	
						*F(2,59) = 6.538	
						Significance = .003	
(6g)	Z	-718.4	16.99	1540.0	467.1		.210
			(2.460)	(2.862)	(2.811)		
(6h)	Z	-767.6	18.51	1804.0		542.4	.239
			(2.742)	(3.458)		(3.247)	
(6i)	Z	-825.5	17.8?	1698.0	197.4	403.9	.236
			(2.618)	(3.165)	(.8817)	(1.760)	
						*F(2,59) = 5,639	
						Significance = .006	

Form of equations is linear, however, the variable ln(A) is a natural log.

Sample size: 64

t-values in parentheses

*F-test is against null hypothesis that coefficients of both γ and γ' are zero.