The Potential Diversification and Failure Reduction Benefits of Bank Expansion into Nonbanking Activities

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ABSTRACT

BHC expansion into nonbank financial activities may increase or decrease the standard deviation of BHC ROA and/or the probability of bankruptcy of the BHC. Using individual firm data and a new application of a simulated merger methodology, I find the standard deviation minimizing and bankruptcy probability minimizing nonbank weights for a variety of nonbanking activities for two time periods, 1979-86 and 1987-97, for all BHCs and for large BHCs. I find that relatively substantial levels of investment in life insurance underwriting are optimal for reducing the standard deviation of BHC ROA. Appreciable levels of investment in life insurance underwriting, casualty insurance underwriting, and securities brokerage are optimal for reducing the probability of bankruptcy of the BHC.

For many years now, banking industry groups, members of Congress, and regulators have been clamoring for the elimination of regulatory barriers between bank and non-bank financial activities. At the same time, even though repeated efforts to repeal the Glass-Steagall Act and other statutes have failed, the Federal Reserve and other regulatory agencies continue to liberalize their interpretation of the law, with the result that banks have in fact already pushed into nonbanking activities.

Banks may argue that they need to be able to offer their customers a wider range of financial products in order to remain "competitive." Regulators may favor expanding the set of activities permissible to banks because they believe that doing so would result in potential diversification benefits.

The purpose of this paper is twofold. First, I investigate whether there are potential diversification benefits to be had from permitting BHCs to engage in nonbanking activities to a greater extent than they already do. In order to accurately make this assessment, I allow the potential for diversification benefits to differ between 1979-86 and 1987-97. Beginning in 1987, the Federal Reserve allowed bank holding companies (BHCs) to set up securities underwriting units. Therefore, it is possible that even if there were potential diversification benefits from an increase in securities underwriting in the earlier period, such benefits may have been exhausted by the later period, when the correlation between BHC and securities underwriting returns could have been higher. Regarding other nonbanking activities, the change in regulatory regime or the simple passage of time could also have affected the benefits of expanding into these areas.

The second task of the paper is to ascertain whether, by engaging in a particular

nonbanking activity, a BHC could reduce its probability of bankruptcy. The potential for diversification benefits, defined as the potential for reducing the variance of return on assets (ROA) by expanding into a nonbank activity, is not a sufficient condition for the potential for a reduction in the probability of bankruptcy. If expected returns from the nonbanking activity are sufficiently below those for the BHC alone, the potential decrease in the variance may not be large enough to offset the decrease in expected returns such that the probability of bankruptcy would fall with diversification.

I use a methodology that in some ways is very similar to that used by Boyd and Graham (1988). Like Boyd and Graham, I pair BHCs with nonbank financial firms and use the historical return series of the set of mock pairs to assess the possibility of a reduction in the probability of bankruptcy from BHCs becoming engaged in each particular nonbank industry. However, my methodology differs from Boyd and Graham's methodology in several important respects. First, whereas Boyd and Graham analyze data for only 100 random pairs for each nonbank industry, I analyze all possible combinations of individual BHCs and individual nonbank firms.

Second, unlike Boyd and Graham, I do not add the assets and net income of each BHC to those of its partner nonbank and then calculate the variance of the return on assets of the resulting hybrid firm. This approach restricts the weights on BHC and nonbank activities to be equal to those implied by the actual relative sizes of the component BHC and nonbank firm. Therefore, I simply calculate the median correlation across pairs between returns of BHCs and their partner nonbank firms. Along with estimates of the standard deviations of returns for BHCs and each nonbank industry, these correlations can then be used to calculate the range of

weights on BHC and nonbank activities that offer the potential for diversification benefits, as well as the range of weights that offer the potential for a reduction in the probability of bankruptcy.[1]

Third, I derive results separately for two sets of BHCs: all BHCs and the largest BHCs. In contrast, Boyd and Graham do not single out the largest BHCs in their sample for separate analysis. The motivation for conducting two separate analyses is that the largest BHCs likely have a higher than average degree of diversification, so any additional potential diversification benefits offered by nonbank activities likely are smaller than for BHCs as a whole.

Fourth, as noted above, I allow the summary statistics underlying the calculations pertaining to diversification and the probability of bankruptcy to differ across two time periods that had different regulatory regimes.

Finally, I divide securities firms into those that primarily are securities brokers or dealers and those that primarily provide investment advice. These are two very different activities. In addition, BHCs are permitted to provide investment advice to an unlimited degree, but are restricted in the amount of revenues that they can derive from securities brokerage.

The remainder of the paper is as follows. The first section reviews other authors'

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[1]Boyd, Graham, and Hewitt (1993) take a different approach to allowing flexible portfolio weights than is taken in this paper. Before combining BHC assets and net income with partner nonbank firm assets and net income, they scale the nonbank time series of assets and net income by a given factor. This allows them to simulate the results of using different scale factors, but it also means that the portfolio weights are constrained to vary over time in accordance with the variations in the relative sizes of the BHC and the nonbank firm that are in the data.

results regarding the risk of the nonbank activities that are studied in this paper. The second section explains the methodology and data used in this paper. The third section discusses results, and the final section concludes.

I. Prior Studies

The entire literature on the risk of nonbank financial activities is too extensive to review here, so I will confine my attention to studies and results that use one or both of the same measures of risk as are used in this paper: the variance of ROA and the probability of bankruptcy. (A third popular measure of risk is the coefficient of variation, the standard deviation of returns divided by the mean of returns.) In addition, I will review only results that pertain to the risk of one or more of the activities that are covered in this paper and that indicate the effect of those activities on BHC risk.[2]

Johnson and Meinster (1974) use data for the years 1954 through 1969 to calculate the variance of ROA of insurance agents, brokers, and service firms, real estate operators and lessors of buildings, real estate subdividers, developers, and operative builders, and real estate agents, brokers, and managers.[3] Johnson and Meinster use industry-level data, as opposed to

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[2]Numerous papers in the nonbank risk literature simply compare the risk of banking with the risk of nonbanking activities without examining how combining banking with those activities would affect BHC risk.

[3]The "other real estate category" used in this paper is a Standard and Poor's industry classification. According to Boyd, Graham, and Hewitt (1993), other real estate is an amalgam of industry classifications, including investment in apartment and nonresidential buildings, dealers, lessors of real property, and real estate agents and managers. Thus, other real estate corresponds roughly to a combination of Johnson and Meinster's real estate operators and lessors of buildings and real estate agents, brokers, and managers, plus

taking means or medians across individual firm-level rates of return, to calculate ROA. Using industry-level data can mask intra-industry variability, thereby exerting a downward bias on risk.

Johnson and Meinster do not calculate the effect of diversification into nonbank activities on banking organization risk. Rather, they simply compare the risk of banking to the risk of nonbanking industries. They find that insurance agents, real estate operators, real estate developers, and real estate agents all are riskier than banks.

However, Johnson and Meinster do provide sufficient information to allow the reader to calculate the effect of diversification on BHC risk. (The necessary statistics are the standard deviations of returns for the banking and nonbanking industry and the correlation between returns for the banking and nonbanking industries.) Johnson and Meinster's results suggest that the correlations between banking and nonbanking returns are low enough that diversification into insurance agency, real estate operation, and real estate agency would decrease the variance of ROA of the banking organization. However, diversification into real estate development would increase bank risk.

Using data on the actual investment advisory subsidiaries of BHCs for the 1971 through 1977 period, Boyd, Hanweck, and Pithyachariakul (1980) calculate the mean of ROA for each bank and each of its affiliated investment advisory subsidiaries, the standard deviation of ROA for each firm, and the correlation between bank and affiliated investment advisory firm ROA.[4]

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investment in apartment and nonresidential buildings.

[4]In the case of multi-BHCs, data were consolidated across all affiliated banks in the BHC. The authors do not say how many BHCs were represented in their sample, but there were 469

They then average means, standard deviations, and correlations across firms within the investment advisory industry and within BHCs to obtain return, risk, and correlation statistics. The authors use these statistics and the mean consolidated BHC capital-to-assets ratio to calculate the weight on investment advisory activities that would minimize the probability of bankruptcy of the BHC. They find a weight of .02 percent for investment advisory services, indicating that a very low level of investment in this activity can reduce BHC risk.

Campbell, Dietrich, and Weinstein (1985) use data for 1972 to 1983 to calculate scale values above which an expansion into life insurance or property and casualty insurance would increase the risk to the Federal Deposit Insurance Corporation (FDIC). The risk to the FDIC is measured by the variance of the residual from a market model regression of combined bank and insurance company stock returns.[5] The authors conclude that diversification into life insurance, property and casualty insurance, or a combination of the two by a bank would be risk reducing to the FDIC.

White (1986) uses data from 1931 on a sample of banks that failed in that year and a paired sample of banks of similar size from the same locales. He conducts a logit regression where the probability of failure is a function of various financial ratios, in addition to dummy variables indicating whether the bank had a security affiliate outside the bank and whether it had an important bond dealer department inside the bank. White finds that the presence of a securities affiliate had a statistically significant negative effect on the probability of bank

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commercial banks or groups of commercial banks.

[5]The authors' justification for looking at only residual variance is that the FDIC can eliminate all market risk through stock index futures.

failure and that the presence of a leading bond dealer department had no effect on the probability of failure.

Using accounting and market data for the years 1971 through 1984, Boyd and Graham (1988) simulate mergers between BHCs and nonbank firms in the following industries: property and casualty insurance, life insurance, insurance agents and brokers, real estate development, other real estate, and securities. They do this by repeatedly randomly selecting a BHC and a nonbank company and summing, period-by-period, the two firms' historical net income, asset, and equity series. They then calculate the probability of bankruptcy for firms in each hypothetical bank/nonbank industry by using the median values of the relevant statistics, taken across the mock combined firms in the hybrid industry. They compare these bankruptcy probabilities with the probability of bankruptcy for BHCs alone.

Based on accounting data, the authors find that combining BHCs with property and casualty insurance firms, insurance agents, real estate development firms, other real estate firms, or securities firms would increase the probability of bankruptcy, while combining BHCs with life insurance firms could reduce the probability of bankruptcy. Based on market data, the authors find that combining BHCs with real estate development firms or securities firms would increase BHC risk, while combining BHCs with property and casualty insurance firms, life insurance firms, insurance agents, or other real estate firms could reduce the probability of bankruptcy.

Kwast (1989) examines quarterly data for every quarterly reporting commercial bank that reported holding trading account assets in the current and previous quarter during the period 1976 through 1985. Kwast divides the sample into three periods, corresponding to

three monetary policy regimes: 1976.Q1 through 1979.Q3, 1979.Q4 through 1982.Q2, and 1982.Q3 through 1985.Q4. He assesses whether bank diversification into securities activities (trading account activities) increases or decreases risk, as measured by the standard deviation of the bank's ROA.[6] Returns for securities activities are measured using market values, while returns for non-securities activities are measured using book values. Kwast splits his sample along two lines: the percent of a bank's total assets held in the trading account and the bank's total assets.[7] The share disaggregation divides the sample into the top 25 percent, the next 50 percent, and the bottom 25 percent. The size disaggregation divides the sample into the top 15 banks, the next 25 percent, the next 50 percent, and the remainder. Kwast calculates whether or not diversification into securities activities increases risk for each of the seven subcategories of banks, as well as for the entire sample.

Kwast finds that, in some cases, there are potential diversification benefits from securities activities. For 1976.Q1-1979.Q3, diversification into securities activities can reduce bank risk for each of the eight groups of banks. For 1979.Q4-1982.Q2, securities diversification can decrease BHC risk for the middle group by share and the third group by size. For 1982.Q3-1985.Q4, securities diversification can decrease BHC risk for each group except the first two groups by size.

Rosen, Lloyd-Davies, Kwast and Humphrey (1989) investigate whether BHCs could

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[6]Unlike many studies, the return figure that Kwast uses is *gross* return on assets, i.e. the numerator, income, is not net of interest payments on debt.

[7]Kwast argues, for example, that small banks and large banks will have different types of securities in their trading accounts.

reduce their risk, as measured by the standard deviation of ROA, by engaging in direct equity investment in real estate. The authors use two types of real estate data: aggregate quarterly returns for 1980 through 1985 for real estate investment trusts (REITs) and individual institution annual returns on direct investment in real estate assets at thrift service corporations for 1980 through 1985. The authors find, using the REIT data, that BHCs can reduce their risk by investing up to 4 percent of their assets in real estate. Using the thrift service corporation data, the authors find that BHC diversification into direct real estate investment would increase risk.

Boyd, Graham, and Hewitt (1993) use annual accounting and market data on net income, assets, and equity for 1971-1987 for BHCs, life insurance companies, property/casualty insurance companies, insurance agencies/brokerages, real estate development firms, other real estate firms, and securities firms. Boyd et. al. simulate mergers between nonbank firms and BHCs by summing weighted net income and equity time series for randomly chosen individual nonbank companies and BHCs, thereby arriving at net income and equity for a set of hypothetically merged firms. They then use these data to compare the median probability of bankruptcy of the combined institutions to the median probability of bankruptcy of BHCs alone. The weighting scheme is constructed so that the weight can vary over time from the initial-period weight, as the growth rate of the nonbank firm in the data varies in relation to the growth of the BHC. The authors look for the initial-period weight that yields the minimum probability of bankruptcy for each of the nonbank industry-BHC combinations.

Using accounting data, Boyd et. al. find that mergers of BHCs with life insurance or

property/casualty insurance firms may reduce the probability of bankruptcy, but that mergers of BHCs with insurance agents likely would increase the probability of bankruptcy. Market data results reinforce the results obtained with accounting data for life insurance companies and property/casualty insurance companies. The market data results also indicate that mergers of BHCs with insurance agents can reduce the probability of bankruptcy. Using either accounting or market data, the authors find that mergers of BHCs with either type of real estate firm or with securities firms likely would increase the probability of bankruptcy.

Kwan (1997) examines quarterly data from 1990.Q2 through 1997.Q2 on the "Section 20 subs" of domestic BHCs to see how securities activities affect the risk of the BHC, as measured by the variance of ROA. He analyzes returns at the subsidiary level and at the activity level. At the subsidiary level, he uses returns for banks and returns for their securities affiliates. At the activity level, he uses returns on banking assets, returns on trading assets, and returns on securities underwriting.[8,9] In addition, Kwan estimates statistics using both pooled time series cross section observations and individual firm observations, and he groups firms according to whether or not their securities subsidiaries are primary dealers of government securities.

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[8]The bank's financial assets consist of banking assets and trading assets. Trading assets are those assets acquired with the intent to resell in order to profit from short-term price movements. Trading and underwriting of bank-eligible securities takes place at both the bank and the securities subsidiary, while trading and underwriting of bank-ineligible securities takes place only in the securities subsidiary. Kwan analyzes trading activity returns using both bank and securities subsidiary data. He analyzes underwriting returns using only securities subsidiary data.

[9]For underwriting activities, Kwan measures the rate of return by the return on the gross amount of securities underwritten.

Kwan's results based on pooled time series cross section data for banks and their securities affiliates indicate that BHCs overall, as well as BHCs that have primary dealer subsidiaries, can reduce risk by engaging in securities activities. However, it appears that BHCs that diversify into securities activities through non-primary dealer subsidiaries increase their risk by doing so.[10] His results based on individual firm data for banks and their securities affiliates suggest that BHCs overall, BHCs with primary dealer subsidiaries, and BHCs with non-primary dealer subsidiaries can reduce risk by diversifying into securities activities.

Kwan's results based on pooled time series cross section data for banking, trading, and underwriting indicate that, for all BHCs and for BHCs with non-primary dealer subsidiaries, diversification into trading increases risk. For BHCs with primary dealer subsidiaries, diversification into trading can decrease risk. For all three groups of BHCs, diversification into underwriting can decrease risk. Results based on individual firm data suggest that, for BHCs overall and for BHCs with primary dealer subsidiaries, diversification into trading decreases risk. For BHCs with non-primary dealer subsidiaries, diversification into trading increases risk. For all three groups of BHCs, diversification into underwriting can decrease risk.

Together, the above papers consider the risk effects of diversification into fourteen different nonbank financial activities that correspond to or overlap with the activities

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[10]Kwan interprets his results in this category differently. He finds that the correlation between bank and securities affiliate returns for banks with non-primary dealer affiliates is not statistically significantly different from zero. He therefore estimates the correlation as zero, thereby concluding that there are diversification benefits. However, the point estimate of the correlation is sufficiently large as to indicate the absence of diversification benefits.

considered in this paper. The purpose of this paper is to test the robustness of the literature's unambiguous results under a different methodology, as well as to refine our understanding of the possible reasons for why other results appear to conflict across studies.

For example, Johnson and Meinster (1974) suggest that diversification into real estate development increases the variance of ROA of BHCs. Boyd and Graham (1988) and Boyd, Graham, and Hewitt (1993) draw the qualitatively similar conclusion that real estate development increases the probability of bankruptcy, no matter whether you use accounting or market data. Does the result that real estate development increases BHC risk continue to appear so solid for the two time periods used in this study? For large BHCs as well as all BHCs? When the weight on real estate development assets is allowed to vary, but not to be influenced by the historical relative growth of real estate development firms? It is useful to ask the same questions with regard to life insurance underwriting; Campbell, Dietrich, and Weinstein (1985), Boyd and Graham (1988), and Boyd, Graham, and Hewitt (1993) all agree that diversification into life insurance underwriting unambiguously offers the potential to decrease the expected cost to the FDIC and the probability of bankruptcy of the BHC.

On the other hand, results with respect to securities activities appear to depend on the particular study being cited and, therefore, on any of a number of differences in approach. For example, Boyd and Graham (1988) and Boyd, Graham, and Hewitt (1993) find that securities activities unambiguously increase the probability of bankruptcy of the BHC. On the other hand, White's (1986) results suggest that such activities reduce bankruptcy probability. Possible explanations for the difference include the different time periods examined, the difference in methodology (merger simulations versus regression), and the different data

sources (unaffiliated securities firms versus affiliated securities firms). The majority of Kwan's (1997) results based on analysis at the securities affiliate level appear to support White's conclusion by showing that securities activities can decrease the variance of ROA, but the difference in risk measures clouds this interpretation. The difference in risk measures and the slightly different definition of securities activities also limits the degree to which Kwan's unambiguous results based on analysis at the securities underwriting level can be interpreted to support White's conclusion. This paper, by using a methodology, risk measure, and definition of securities activities that is the same as or similar to that of Boyd and Graham (1988) and Boyd, Graham, and Hewitt (1993), offers a different test of the robustness of their results than is provided by White or Kwan.

II. Methodology and Data

The methodology used in this paper is similar to the methodology used by Boyd and Graham (1988) in their study of the effect of BHC diversification into nonbank activities on the probability of bankruptcy of the BHC. I simulate mergers between individual BHCs and nonbank financial firms by forming all possible combinations of individual BHCs and individual nonbank financial firms. However, pairs without at least 20 quarters of non-missing data are discarded. The purpose of this pairing is to derive estimates of the correlations between BHC ROA and nonbank ROA. These correlations will then be used to test for the existence, over the full range of bank and nonbank portfolio weights, of diversification benefits and bankruptcy-reducing benefits.

As mentioned above, Boyd and Graham also pair BHCs with nonbank financial firms.

However, they sum, for each period, the net income of the BHC and its partner nonbank and the assets of the BHC and the nonbank, thereby arriving at ROA, for each period, of the hypothetically combined firm. They then calculate the probability of bankruptcy for each combined firm and use the median of these probabilities to estimate the bankruptcy probability for each bank/nonbank industry. The advantage of the method used in this paper is that, unlike Boyd and Graham's method, it does not constrain the portfolio weights on the BHC and nonbank to be determined by the relative sizes of the BHCs and nonbank firms in the sample.

Boyd, Graham, and Hewitt (1993) do permit their initial-period portfolio weights to vary over the full range, but changes in weights over time are tied to the relative growth rates of the BHCs and nonbank firms in the sample. In contrast, in this paper, portfolio weights do not vary over time.

I test for the existence of diversification benefits and for the possibility that diversification can reduce the probability of bankruptcy. I define a diversification benefit to be a decrease in the variance of ROA below what it is for BHCs alone. The variance of ROA for a portfolio of BHC and nonbank assets is:

(1) $$\sigma_p^2 = (1-w)^2\sigma_b^2 + w^2\sigma_{nb}^2 + 2\rho w(1-w)\sigma_b\sigma_{nb},$$

where w is the weight on nonbank assets, σ_b^2 is the variance of ROA of BHCs, σ_{nb}^2 is the variance of ROA of nonbanks, and ρ is the correlation between the ROAs for BHCs and nonbanks. Diversification into nonbanking activities will decrease portfolio variance if and only if the derivative of equation (1) with respect to w at w equals zero is negative. Therefore, a necessary and sufficient condition for there to be a diversification benefit is:

(2) $$\rho < \frac{\sigma_b}{\sigma_{nb}}.$$

In addition to testing whether diversification benefits exist, I derive the variance-minimizing weight on nonbank assets, as well as the range of weights on nonbank assets that reduces portfolio return variance below the variance for BHCs alone without necessarily minimizing it. The variance-minimizing w is:

(3) $$w^* = \frac{\sigma_b^2 - \rho\sigma_b\sigma_{nb}}{\sigma_b^2 + \sigma_{nb}^2 - 2\rho\sigma_b\sigma_{nb}}.$$

Equation (2) is a necessary and sufficient condition for w^* to be greater than zero. The necessary and sufficient condition for w^* to be less than one is:

(4) $$\rho < \frac{\sigma_{nb}}{\sigma_b}.$$

In our data, σ_b always is less than σ_{nb}, so (4) is always met. Therefore, the portfolio variance will have an interior minimum if and only if (2) is met. If (2) is not met, the portfolio variance will be minimized at w equal to zero.

Given that σ_b^2 is less than σ_{nb}^2, the range of variance-reducing weights is from zero to w' such that portfolio variance at w' is equal to σ_b^2. Setting the expression on the right-hand-side of equation (1) equal to σ_b^2 and solving for the non-zero value of w yields:

(5)
$$w' = \frac{2\sigma_b^2 - 2\rho\sigma_b\sigma_{nb}}{\sigma_b^2 + \sigma_{nb}^2 - 2\rho\sigma_b\sigma_{nb}} = 2w^*.$$

If and only if (2) is met, w' will be between 0 and 1. If (2) is not met, there are no variance-reducing weights between 0 and 1.

Bankruptcy is defined as the situation where losses exceed capital. As shown in Boyd and Graham (1988), an indicator of the upper bound on the probability of bankruptcy of a firm is $-(\bar{r}+k)/\sigma$, where $\bar{r}$ is the mean of ROA and k is the capital-to-assets ratio. Because k varies over time, one must estimate its central tendency. Estimating k by its mean, $\overline{k}$, an indicator of the upper bound on the probability of bankruptcy for a combined BHC/nonbank firm then is:

(6)
$$z = \frac{-[(1-w)\bar{r}_b + w\bar{r}_{nb} + (1-w)\bar{k}_b + w\bar{k}_{nb}]}{\sqrt{(1-w)^2\sigma_b^2 + w^2\sigma_{nb}^2 + 2w(1-w)\rho\sigma_b\sigma_{nb}}}.$$

A higher z corresponds to a higher upper bound on the probability of bankruptcy. Therefore, choosing w to maximize $-z$ corresponds to choosing w to minimize the upper bound on the probability of bankruptcy. The maximum of $-z$ is found at

(7)
$$w^{**} = \frac{1}{1 + \frac{\sigma_{nb}[\rho\sigma_b(\bar{r}_{nb}+\bar{k}_{nb}) - \sigma_{nb}(\bar{r}_b+\bar{k}_b)]}{\sigma_b[\rho\sigma_{nb}(\bar{r}_b+\bar{k}_b) - \sigma_b(\bar{r}_{nb}+\bar{k}_{nb})]}}.$$

In order to calculate the potential for diversification benefits, the range of variance-reducing weights, and the bankruptcy probability-minimizing weight, $\bar{r}$, $\overline{k}$, and σ have to be

estimated for BHCs and for each nonbank industry, and ρ has to be estimated for each BHC/nonbank combination industry.

The data are annual. Return on assets for firm *j* at time *t* is:

(8) $$r_{j,t} = \frac{\pi_{j,t}}{A_{j,t}},$$

where π is net income after taxes and interest payments and *A* is assets. The mean of ROA for firm *j* is then:

(9) $$\bar{r}_j = \frac{1}{n}\sum_{t=1}^{n} r_{j,t} \ ,$$

where *n* is the number of sample periods. The mean of the capital-to-assets ratio for firm *j* is:

(10) $$\bar{k}_j = \frac{1}{n}\sum_{t=1}^{n} \frac{E_{j,t}}{A_{j,t}} \ ,$$

where *E* is equity. The standard deviation of ROA for firm *j* is:

(11) $$\sigma_j = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n} (r_{j,t}-\bar{r}_j)^2} \ .$$

The correlation between ROA for BHC *j* and ROA for nonbank *k* is:

(12)
$$\rho_{j,k} = \frac{\frac{1}{n-1}\sum_{t=1}^{n}(r_{j,t}-\bar{r}_j)(r_{k,t}-\bar{r}_k)}{\sigma_j\sigma_k} .$$

Because of the presence of significant outliers, medians were used to estimate $\bar{r}_b$, $\bar{r}_{nb}$, $\bar{k}_b$, $\bar{k}_{nb}$, σ_b, σ_{nb}, and the ρ's for the various BHC/nonbank industries. Thus, the parameters $\bar{r}_b$, $\bar{k}_b$, and σ_b were estimated by taking the medians of $\bar{r}_j$, $\bar{k}_j$, and σ_j, respectively, across all BHCs in the sample with at least 20 quarters of data. Similarly, $\bar{r}_{nb}$, $\bar{k}_{nb}$, and σ_{nb} were estimated for each nonbank industry by taking the medians of $\bar{r}_j$, $\bar{k}_j$, and σ_j, respectively, across all nonbanks of that type in the sample with at least 20 quarters of data. The parameter ρ was estimated for each BHC/nonbank industry by taking the median of $\rho_{j,k}$ across all of the BHC/nonbank pairs of that type.

Book values of total assets, net income, and equity were obtained from Compustat.[11] Table 1 shows the number of firms of each type in the sample with at least 20 quarters of data in each time period. Large BHCs are those with total assets of $1 billion or more in 1979 dollars as of the beginning of each period.

III. Results

Table 2 shows estimated correlations and standard deviations for each of the two subperiods. Consistent with the change in Federal Reserve regulations, there were increases in

[11]Net income is income net of taxes, depreciation, and debt payments.

the correlations between BHC returns and securities activity returns between the earlier and later periods. In fact, for large BHCs, correlations of returns with securities brokers', investment advisors', and all securities firms' returns were negative in the first period and positive in the second period.[12] For BHCs as a whole, the same holds for securities brokers and all securities firms.[13]

Diversification Benefits

Table 3, panels A and B, show whether diversification benefits are possible, what the optimal weight on the nonbanking activity is, and what the range of improving weights on the nonbanking activity is. Panel A shows results for 1979-86 and panel B for 1987-97. Each panel gives separate results for combinations of all BHCs and nonbank firms and for combinations of large BHCs and nonbank firms.

In general, nonbank activities appear to offer diversification benefits. The only exception in the earlier period is real estate development, for large BHCs. The exceptions in

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[12]I use the term "securities brokerage" to refer to the business of firms with the SIC code for "security and commodity brokers" and those with the SIC code for "securities brokers and dealers." Thus, securities brokerage includes securities dealing, underwriting, and brokerage.

[13]For all BHCs/securities brokers, all BHCs/all securities firms, large BHCs/securities brokers, and all BHCs/all securities firms, the differences between the return correlations in the two periods are statistically significant. Distributions of the estimates of the correlations were simulated using the delete-n/2 jackknife technique. In the delete-n/2 jackknife technique, half of the sample is randomly chosen, without replacement, for calculating one observation of the estimator (in this case, the median). This procedure is repeated to arrive at a distribution of the estimator. Stromberg (1997) shows that the presence of significant outliers in the underlying data can heavily influence the bootstrapped estimate of the variance of the median, but is unlikely to affect the jackknifed estimate.

the later period are real estate development, for both groups of BHCs, and all security firms, for all BHCs. Unlike Johnson and Meinster (1974), then, this paper finds that, for BHCs in general, investment in real estate development can offer potential diversification benefits. However, the optimal weight even in the first period is near zero and is the second lowest among all the nonbank activities that provide some diversification benefits, exceeding, very slightly, only the weight for other real estate activities. Given that the results of this paper for real estate development for BHCs in general differ across time periods, the disagreement with the Johnson and Meinster result likely also is due to a difference in time periods.

This paper's other real estate category is closest to Rosen *et. al.*'s (1989) direct equity investment in real estate. The results of the two papers are similar in that both conclude that, at best, only very low levels of real estate investment would reduce the standard deviation of BHCs' ROAs.

The results show that combining securities brokerage and BHCs does offer diversification benefits.[14] This agrees with Kwan's (1997) results for all three groups of BHCs, based on analysis of individual data at the subsidiary level or of pooled or individual data at the underwriting activity level. The result holds for the earlier period and remains true for the later period, for both groups of BHCs, despite the increases in the correlations between BHC and securities broker returns and the slight increase in the risk of securities brokerage itself. This is either because the increases in the correlations and the stand-alone risk of

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[14]To the degree that the activities of the securities brokerage firms in my sample are similar to the trading account activities examined by Kwast (1989), the results of this paper support that author's results showing that securities activities are risk-reducing.

securities brokerage by themselves are not large enough to eliminate diversification benefits, or because their effect is offset (and, for large BHCs, more than offset) by the effect of the increases in the standard deviations of BHCs' returns.

The results do not support the speculation that large BHCs, being better diversified to begin with, would be less likely than BHCs overall to see diversification benefits from nonbanking activities. First, as seen in Table 2, it is only in the earlier period that large BHCs have lower standard deviations of ROA than all BHCs and even then only very slightly lower. Second, in the earlier period, real estate development is the only nonbank activity that presents potential diversification benefits to BHCs overall, but not to large BHCs. Although large BHCs do have a lower standard deviation of ROA than BHCs overall in the earlier period, this tiny difference by itself likely is not large enough to completely eliminate diversification benefits for large BHCs.[15]

In the later period, when large BHCs are riskier than BHCs overall, it is only for the all security firms category that diversification benefits are limited to large BHCs. The higher return correlation between security firms and all BHCs than between security firms and large BHCs contributes to this result.

Despite the existence of diversification benefits for most nonbank activities, many of the upper bounds on the range of improving nonbank weights are so small (less than 1 percent) that engaging in those activities in order to reduce overall BHC risk may be impractical. The exceptions for the earlier period are life insurance underwriting and securities brokerage. For

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[15]In addition, large BHCs' lower correlation with investment advice may also contribute to the existence of diversification benefits for large BHCs for that activity.

the later period, life insurance and casualty insurance have upper bounds above 1 percent for both groups of BHCs. In addition, for large BHCs, the weights on insurance agency activities, securities brokerage, and securities activities overall are above 1 percent.

Among the relatively highly weighted nonbank activities, life insurance stands out, with an upper bound of 9.5 percent in the earlier period and 57.8 percent, for large BHCs, in the later period. The relatively large maximum weights for life insurance appear to arise from life insurance having the lowest return variance, by far, of any nonbank activity. In the earlier period, securities brokerage has the second lowest return variance and the lowest correlation with BHCs. In the later period, casualty insurance has the second lowest return variance, the lowest correlation with all BHCs, and the second lowest correlation with large BHCs, of any nonbank activity. Insurance agency has a relatively high return variance, but, for large BHCs, this is offset in the later period by having the lowest correlation. Securities brokerage and all security firm returns are relatively highly correlated with BHC returns in the later period and fill the top two spots for the all BHC group correlations. However, their return variances are the third and fourth lowest, respectively, and low enough for large BHCs, with appreciably lower correlations with these activities than all BHCs, to see maximum weights for these activities that are above 1 percent.

Note that, for nearly all of the nonbank activities, optimal nonbank weights increase between the earlier and later periods. This is due to the increases in BHC risk and, in some cases, the additional influence of declines in the risk of the nonbank activity itself or declines in BHC/nonbank correlations. Optimal nonbank weights decline or stay constant over time only for real estate development and, for the all BHCs group, securities brokerage, investment

advice, and all security firms. For all four activities, return variance and correlations with BHCs increase over time. The effects of these changes are sufficient to dominate the effect of the increase in the risk of BHCs as a whole, but, except for real estate development, not the bigger increase in the risk of large BHCs.

Bankruptcy Probability Reducing Benefits

Table 4 presents the estimates of the mean ROAs for each industry for each period. Table 5 presents the estimates of the mean capital-to-assets ratios.

The bankruptcy probability minimizing nonbank weights are in Table 6. For each time period and for each group of BHCs, each nonbank activity presents some opportunity for reducing the probability of bankruptcy. This is true even for nonbank activities that had no potential for diversification benefits. In fact, for every nonbank activity except life insurance underwriting, the bankruptcy probability minimizing portfolio weight is higher than the return variance minimizing weight. This likely is due to BHCs having relatively low mean ROAs and the lowest mean capital-to-assets ratios.

However, again, not all optimal weights on nonbank activities are above 1 percent. In the earlier period, weights are above 1 percent for life insurance, casualty insurance, securities brokerage, and all security firms. In the later period, weights are above 1 percent for life insurance, casualty insurance, insurance agency, securities brokerage, and, for large BHCs, investment advice and all security firms.

Bankruptcy probability minimizing weights tend to be higher in the later period than the earlier period, due to the effects of the increases in BHCs' return variances more than

offsetting the effects of the increases in their mean returns and in their mean capital-to-assets ratios. (Tables 4 and 5.) The exceptions are real estate development, and, for the all BHCs group, securities brokerage, investment advice, and all security firms. These are the same categories which did not show increases in the optimal weights for minimizing the variability of ROA.

Not only are bankruptcy probability minimizing weights higher than return variance minimizing weights, there is not an exact one-to-one correspondence between rankings for the two types of weights. For example, in the first period, the first and second highest weights for all BHCs were for life insurance and securities brokerage, respectively, no matter whether return variance or probability of bankruptcy is the risk measure. However, the third highest return variance minimizing weight for all BHCs was for all security firms, whereas the third highest bankruptcy probability minimizing weight was for casualty insurance. As seen in the first column of Table 4, casualty insurance was slightly more profitable than all security firms in the first period, and this may have been a contributing factor. In addition, it is possible that the importance of the riskiness of an activity versus the correlation of its returns with BHC returns is different for minimization of the two types of BHC risk.

The results of this paper appear to strongly support the previous literature's consensus that diversification into life insurance underwriting can reduce BHCs' probability of bankruptcy. Like Boyd *et. al.* (1993) and Campbell, Dietrich, and Weinstein (1985), this paper also finds that moving into casualty insurance underwriting can reduce BHCs' probability of bankruptcy. Using accounting data, Boyd *et. al.* (1993) and Boyd and Graham (1988) find that insurance agency, real estate development, and other real estate would

increase the probability of bankruptcy, whereas this paper, which also uses accounting data, finds the opposite. However, even this paper finds very low optimal weights for these three activities. The different weighting scheme used in this paper may account for the difference in results. The results of this paper regarding investment advice are qualitatively similar to the results in Boyd *et. al.* (1980), which finds that very low levels of investment in investment advising can reduce the probability of bankruptcy.

The results of this paper regarding securities brokerage and securities activities overall support the conclusions reached by White and do not support Boyd and Graham's (1988) and Boyd *et. al.*'s (1993) conclusions. The contrasts with the latter two papers are strongest for the large BHCs for the later period, a period and subset not covered by those papers; for the earlier period and for all BHCs for the later period, optimal weights on the two securities areas are smaller and may be influenced by this paper's weighting scheme.

IV. Conclusion

This paper uses a new application of a simulated merger methodology to test for the existence of diversification benefits and bankruptcy probability reduction from investing in nonbank financial activities. I find that relatively substantial levels of investment in life insurance underwriting are optimal for reducing the standard deviation of BHC ROA. Appreciable levels of investment in life insurance underwriting, casualty insurance underwriting, and securities brokerage are optimal for reducing the probability of bankruptcy of the BHC. Thus, these results tend to agree with the literature's previous consensus or near-consensus regarding the attractiveness of life insurance underwriting and casualty insurance

underwriting for reducing BHC risk. Except for securities brokerage, this paper's support for extensions into other nonbank activities is spotty, depending on the size of the BHC or the time period, or relatively weak, with zero or near-zero levels of investment being optimal.

The conclusions of the previous literature on the riskiness of securities brokerage are mixed. While this paper will not settle the debate, the evidence presented favors the view that securities brokerage can be risk-reducing. But, it also highlights the sensitivity of the optimal nonbank weight on securities brokerage, an activity with relatively low return variance, to the correlation with BHC returns and the return variance of BHCs. In more recent years, when the returns of BHCs have been more highly correlated with securities brokerage returns, only the return variance of large BHCs has been high enough relative to its correlation with securities brokerage returns for nonnegligible weights for securities brokerage to be optimal for reducing the variability of ROA.

The analysis in this paper also highlights several other points. First, bankruptcy probability minimizing weights tend to be higher than return variance minimizing weights, and there is not an exact one-to-one correspondence between the rank of a nonbank activity's optimal bankruptcy probability minimizing weight and its return variance minimizing weight. Second, separating the analysis into different time periods seems to be important for two reasons: to take account of increases in correlations between BHCs' and securities firms' returns, which do in fact eliminate the pure diversification benefits of general securities activities for BHCs overall and to take account of the increase in the variance of returns of BHCs by themselves. The increase in BHC return variance tends to result in higher optimal nonbank weights. This is especially apparent for large BHCs. Finally, large BHCs do not

appear to be significantly better diversified than BHCs overall or less likely to benefit from investment in nonbank activities.

Table 1

Number of Sample Firms

	1979-86	1987-97
All BHCs	200	422
Large BHCs	151	126
Life Insurance	29	50
Casualty Insurance	33	103
Insurance Agents/Brokers	17	44
Real Estate Development	32	26
Other Real Estate	100	95
Security Brokers/Dealers	31	66
Investment Advice	7	24
All Security Firms	38	90

Table 2

A. 1979-86

	Median Standard Deviation of ROA	Median Correlation with All BHCs' ROA	Median Correlation with Large BHCs' ROA
All BHCs	.00139		
Large BHCs	.001329		
Life Insurance	.006319	.00677	.013004
Casualty Insurance	.023724	-.00667	.000177
Insurance Agents/Brokers	.047327	-.01345	.018999
Real Estate Development	.064692	.00249	.028265
Other Real Estate	.06591	-.00177	.005177
Security Brokers/Dealers	.020885	-.06344	-.03646
Investment Advice	.0541	.00043	-.01831
All Security Firms	.031128	-.04777	-.03216

Table 2

B. 1987-97

	Median Standard Deviation of ROA	Median Correlation with All BHCs' ROA	Median Correlation with Large BHCs' ROA
All BHCs	.002203		
Large BHCs	.003542		
Life Insurance	.005631	.01229	.012853
Casualty Insurance	.015217	-.08149	-.01804
Insurance Agents/Brokers	.049603	-.04081	-.04518
Real Estate Development	.144301	.04384	.059607
Other Real Estate	.088717	-.00843	.01715
Security Brokers/Dealers	.023812	.07167	.018726
Investment Advice	.060938	.02847	.024994
All Security Firms	.038591	.06251	.02003

Table 3

A. 1979-86

	Diversification Benefits Possible?	Optimal Weight on Nonbank	Range of Improving Weights on Nonbank*
Life Insurance			
All BHCs	Yes	.047619	0-.095238
Large BHCs	Yes	.047619	0-.095238
Casualty Ins.			
All BHCs	Yes	.00354	0-.00708
Large BHCs	Yes	.00354	0-.00708
Insurance Agents/Brokers			
All BHCs	Yes	.001337	.002674
Large BHCs	Yes	.000446	.000892
Real Estate Dev.			
All BHCs	Yes	.000478	.000956
Large BHCs	No	0	0
Other Real Estate			
All BHCs	Yes	.00046	0-.00092
Large BHCs	Yes	.00046	0-.00092
Security Brokers/Dealers			
All BHCs	Yes	.00905	0-.0181
Large BHCs	Yes	.006818	0-.013636
Investment Adv.			
All BHCs	Yes	.000683	0-.001366
Large BHCs	Yes	.001024	0-.002048
All Sec. Firms			
All BHCs	Yes	.004103	0-.008206
Large BHCs	Yes	.003083	0-.006166

Table 3

B. 1987-97

	Diversification Benefits Possible?	Optimal Weight on Nonbank	Range of Improving Weights on Nonbank*
Life Insurance			
All BHCs	Yes	.135135	0-.27027
Large BHCs	Yes	.288889	0-.577778
Casualty Ins.			
All BHCs	Yes	.032922	0-.065844
Large BHCs	Yes	.05668	0-.11336
Insurance Agents/Brokers			
All BHCs	Yes	.003639	0-.007278
Large BHCs	Yes	.008437	0-.016874
Real Estate Dev.			
All BHCs	No	0	0
Large BHCs	No	0	0
Other Real Estate			
All BHCs	Yes	.000888	0-.001776
Large BHCs	Yes	.001016	0-.002032
Security Brokers/Dealers			
All BHCs	Yes	.001773	0-.003546
Large BHCs	Yes	.019097	0-.038194
Investment Adv.			
All BHCs	Yes	.00027	0-.0054
Large BHCs	Yes	.002153	0-.004306
All Sec. Firms			
All BHCs	No	0	0
Large BHCs	Yes	.006684	0-.013368

Table 4

Median Mean ROA

	A. 1979-86	B. 1987-97
All BHCs	.007657	.009676
Large BHCs	.007285	.008543
Life Insurance	.022985	.012104
Casualty Insurance	.036977	.028082
Insurance Agents/Brokers	-.00243	.029974
Real Estate Development	.006119	-.01669
Other Real Estate	.016386	-.00398
Security Brokers/Dealers	.025072	.01244
Investment Advice	.146838	.089421
All Security Firms	.032709	.025338

Table 5

Median Mean Capital-to-Assets Ratio

	A. 1979-86	B. 1987-97
All BHCs	.058783	.081163
Large BHCs	.057716	.070164
Life Insurance	.206089	.127668
Casualty Insurance	.237138	.252898
Insurance Agents/Brokers	.310203	.377025
Real Estate Development	.289011	.328064
Other Real Estate	.368559	.394772
Security Brokers/Dealers	.254492	.191383
Investment Advice	.660774	.524335
All Security Firms	.310824	.293462

Table 6

Bankruptcy Probability Minimizing Nonbank Weights

	1979-86	1987-97
Life Insurance		
All BHCs	.142511	.188588
Large BHCs	.133931	.413377
Casualty Insurance		
All BHCs	.014322	.06884
Large BHCs	.013052	.16297
Insurance Agents/Brokers		
All BHCs	.004364	.010454
Large BHCs	.003198	.028284
Real Estate Development		
All BHCs	.001994	.00013
Large BHCs	.001337	.000925
Other Real Estate		
All BHCs	.002607	.002851
Large BHCs	.0023	.007202
Security Brokers/Dealers		
All BHCs	.021968	.012604
Large BHCs	.019166	.052051
Investment Advice		
All BHCs	.007951	.007794
Large BHCs	.007842	.024559
All Security Firms		
All BHCs	.012158	.007905
Large BHCs	.010809	.031501

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