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BANK HOLDING COMPANY MERGERS WITH NONBANK FINANCIAL FIRMS: EFFECTS ON THE RISK OF FAILURE

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I. Introduction

There has been much debate in recent years about permitting bank holding companies (BHCs) to enter financial lines of business outside commercial banking. Large BHCs have vigorously argued for lowering barriers to domestic entry into investment banking, all areas of insurance, and real estate investment and development. They contend that easing these entry restrictions would increase competition and restore competitive equity among financial institutions.

One of the principal issues in this debate is the effect that expanded powers would have on BHC risk. Critics argue that many of the sought-after activities are riskier than commercial banking. Thus, lowering entry barriers would increase BHC risk, increase the incidence of BHC banking affiliate failures, and increase the FDIC's exposure. Advocates of expanded BHC powers argue that risk of failure would decline because average profitability would rise, and the volatility of profits would fall due to asset diversification.[1]

Resolution of this issue is largely an empirical matter, yet surprisingly little work has been done. In this study, we investigate the risk effects of BHC entry into the securities, real estate, and insurance industries. The tests consist of simulating mergers between BHCs and firms in these lines of business, calculating risk measures for each of the hypothetical merged firms, and comparing their risk characteristics with those of actual unmerged BHCs.

In conducting these tests we remove a limitation in a previous study (Boyd and Graham 1988). In that study, the post-merger fractions of BHC and non-BHC ("nonbank") assets (or portfolio weights) are fully determined by the data. Thus, the risk effects of varying portfolio weights are not examined

(e.g., comparing a merger which results in 10 percent insurance assets and 90 percent BHC assets with one that results in 90 percent insurance assets and 10 percent BHC assets). This deficiency is corrected in the present study.

The rest of the paper proceeds as follows. Section II presents methodology: the risk measures employed, the sample, and the simulation procedure. Section III discusses the risk and return characteristics of the sample firms. Section IV briefly reviews the findings of the earlier study. Section V indicates the problem with the earlier study and explains how the simulation procedure is modified to overcome it. Then, it presents the results. Finally, Section VI summarizes and concludes.

II. Methodology

Measures of Profitability and Risk

All profitability and risk statistics are computed using both accounting and market data. The accounting profitability measure is the mean rate of return on average accounting equity,

$$(1) \qquad \bar{R} = \{ \sum_{j=1}^{n} [2\tilde{\pi}_j/(E_j+E_{j-1})] \}/n,$$

where π_j is net income after taxes, E is total equity, and the subscript j is time period. A tilde (~) is used to denote a random variable.

The market estimate of mean rate of return on equity is

$$(2) \qquad \bar{R}^m = \{ \sum_{j=1}^{n} [\tilde{P}_j-P_{j-1}+\tilde{D}_j]/P_{j-1} \} \ / \ n,$$

where P is the price per share of common stock, and D is cash dividends per share, both adjusted for stock splits and stock dividends.

The risk measure is a statistic indicating the probability of bankruptcy, which we call the Z-score. Define bankruptcy as the situation in which equity is insufficient to offset losses, or $\tilde{\pi} < -E$. Letting A = total assets, $\tilde{r} = \tilde{\pi}/A$, and $k = -E/A$, the probability of bankruptcy is then

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

where $p(\cdot)$ is a probability and $\phi(r)$ is the p.d.f. of r. Assuming that $\tilde{r}$ is normally distributed, we may rewrite (3) as

(4) $$p(\tilde{r} < k) = \int_{-\infty}^{z} N(0,1)dz,$$

(5) $$z = (k-\rho)/\sigma,$$

where ρ is the true mean and σ the true standard deviation of the r distribution. Thus, z is the number of standard deviations below the mean by which profits must fall in order to eliminate equity.

Even if $\tilde{r}$ is not normally distributed, z is an upper-bound on the probability of bankruptcy, as long as ρ and σ exist, as shown by the Bienaymé-Tchebycheff inequality:

$$p(\tilde{r} \leq k) \leq \{\sigma/(\rho-k)\}^2 \equiv 1/z^2.$$

Here, we use sample estimates for ρ and σ to construct the Z-score--the estimated value of -z (since z is always negative).

The accounting data Z-score is

(6) $$Z = \left(\{\sum_{j=1}^{n}[2\tilde{\pi}_j/(A_j+A_{j-1})]\}/n + \{\sum_{j=1}^{n}[(E_j+E_{j-1})/(A_j+A_{j-1})]\}/n\right)/S_r,$$

where S_r is the estimated standard deviation of r.[2]

The market data Z-score is defined as in (6), but with profits, assets, and equity restated in market terms. The market-based estimate of total profits is

(7) $$\tilde{\pi}_j^m = [(\tilde{P}_j-P_{j-1}+\tilde{D}_j)\cdot(c_j+c_{j-1})]/2P_{j-1},$$

where c is the number of common shares outstanding, adjusted for stock splits and stock dividends. The market value of total equity is

$$(8) \qquad \bar{E}_j^m = c_j \tilde{P}_j,$$

and total assets on a market basis is,

$$(9) \qquad A_j^m = E_j^m + L_j^a,$$

where L^a is the accounting value of total debt plus preferred stock, which we use as an estimate of market value.

Merger Simulations

We simulate hypothetical mergers between actual BHCs and firms in other financial industries using historical data. One BHC and one nonbank firm from a particular industry are randomly selected, with replacement. Nonbank firm data are scaled to produce a predetermined initial portfolio weight. Then, profits, assets, debt, and equity for each time period are consolidated. A time-series of annual rates of return is then generated; and, for each hypothetical merged firm, estimates of risk and return are obtained. For each possible pair of industries, this simulation procedure is repeated many times, and results are summarized by median values of $\bar{R}$ and Z. These median values are then compared with median values of $\bar{R}$ and Z for the sample of unmerged BHCs.[3]

The methodological assumptions that permit us to sum profits, debt, equity, and assets for the hypothetical merging firms are admittedly very simple. This approach necessarily ignores possible scope economies as well as merger costs and acquisition premia. However, subjectivity in analyzing mergers is avoided and simulations can be done on a large scale. The possible biases in this methodology are discussed in considerable detail in Boyd and Graham (1988).[4]

The Sample

The annual data come from Standard and Poor's COMPUSTAT tapes and span the years 1971-84. Besides BHCs, six financial industries are included. The sample is comprised of 15 property/casualty insurance firms, 30 life insurance companies, 5 insurance agent/brokers, 11 securities firms, 31 real estate development firms, 11 other real estate companies,[5] and 146 BHCs. Industry classifications are according to Standard & Poor's. The sample firms tend to be the larger ones in their respective industries, and all are publicly traded. Not all sample firms have data in all periods, but we require that each have at least five years of data.

III. Risk and Return Characteristics of Sample Firms

Table 1 shows median risk and return measures with both accounting and market data for each of the seven industries. In terms of either accounting or market returns on equity, BHCs are roughly in the middle, less profitable than some industries and more profitable than others. These results appear somewhat at odds with the argument that lower entry barriers are needed to restore BHCs' competitive position vis-a-vis nonbank financial firms. With either data, however, securities firms exhibit considerably higher rates of return compared to BHCs.

The median Z-scores computed with accounting data suggest that BHCs are least risky, followed by firms in the three insurance lines of business.[6] The median Z-scores computed with market data suggest that the insurance firms and BHCs are fairly close in terms of risk. By either Z-score measure, however, the securities and real estate industries exhibit the highest risk. Beta risk measures are also computed for purposes of comparison. The median betas suggest a risk ranking similar to the other risk measures--insurance and BHCs at the low end of the risk spectrum, and securities and real estate at the high end.

IV. Results From the Previous Study

Table 2 shows the median Z-scores for hypothetical firms created by 100 mergers between BHCs and firms in each of the other industries with no scaling of nonbank firms. For purposes of comparison median Z-scores for the sample unmerged BHCs (shown in Table 1) are included as a memo item in the last row of Table 2. These results are taken directly from Boyd and Graham (1988); and, therefore, will be discussed very briefly.

The accounting Z-scores suggest that only one merger combination results in lower risk than is exhibited by unmerged BHCs: combinations of BHCs and life insurance companies. The market Z-scores suggest that BHC risk could be reduced by combinations with firms from any of the three insurance industries and from the real estate development industry. With either measure, however, BHC combinations with securities or other real estate firms increase the risk of failure.[7]

V. Empirical Tests

Allowing the Portfolio Weights to Vary

A limitation of the Boyd and Graham (1988) study is that the simulation procedure takes the size of sample BHCs and nonbank firms as given. In effect the data fully determine the after-merger portfolio weights. This was intentionally done in order to simulate hypothetical, complete takeovers of one nonbank financial firm by one BHC. However, these tests do not indicate what the risk effects of such mergers could have been with different post-merger asset mixes. For example, in the BHC-securities mergers, the median ratio of securities assets to consolidated post-merger assets is 21 percent. But what if that ratio were different; say 5 percent, or 50 percent?

Here, we modify the simulation procedure to systematically control the post-merger portfolio weights. As before, we pick a BHC and a nonbank

firm at random, with replacement. Now, define A_b = total assets of a randomly selected BHC, and A_n = total assets of a randomly selected nonbank firm--as of the first year that both firms are in the sample. Define N = an initial portfolio weight of nonbank to consolidated assets for a particular simulation, $0 \leq N \leq 1$. Next, solve for the adjustment factor s, where

$$(10) \qquad s = \frac{N}{1 - N} \cdot \frac{A_b}{A_n}.$$

Profits, equity, and assets for the nonbank firm, from the first year onward, are multiplied by the factor s. The effect is to proportionally "shrink" or "blow up" the nonbank firm in order to achieve the desired post-merger ratio of nonbank to consolidated assets.[8]

The rest of the modified study design should be clear. First, we pick an industry pair--say BHCs and securities firms. Next, we choose an initial ratio of nonbank to consolidated assets, N. With this industry pair and initial asset mix, 1,000 mergers are simulated. Then we change the initial asset mix, N, but keep the same sample. Following this procedure we can trace out the risk effects of varying asset mix to a high degree of precision, limited only by the computer budget. In the work presented here, 23 values of N are employed, ranging from 0 to 99.99 percent. There are, of course, six industry pairs: BHCs and each of the six nonbank industries.[9]

Results

Risk results with the accounting data are shown in Figure 1. Each box represents a median Z-score and the associated median portfolio weight for 1,000 simulations with a particular industry pair, based on a given N. The dots represent the median Z-scores for 100 simulations from the earlier study.

What is most important in Figure 1 is the shape and location of the risk-portfolio weight (RPW) functions. First, note that all are quite smooth,

suggesting that 1,000 simulations are adequate to obtain reasonably stable results. Second, note that in all cases but one, the maximum Z-score occurs at the vertical axis. That, of course, is where the nonbank share of post-merger assets is zero (i.e., the unmerged outcome).[10] The one exception is BHC-life insurance mergers which exhibit an interior maximum at somewhere between 10 percent and 20 percent life insurance share. Z-scores are fairly level over this range (about 51); and there is no point in trying to precisely locate the maximum.

For the other five combinations, the Z-score declines everywhere with the nonbank share of post-merger assets. That is not to say, however, that these combinations are equivalent. For BHC combinations with real estate development and with other real estate firms, the dropoff in median Z-score is quite steep up to about 20 percent nonbank assets, after which it flattens out. Combinations with securities firms demonstrate the same general shape, but the initial falloff in Z-scores is less pronounced. The RPW functions for combinations with insurance agents and with property and casualty insurers are both considerably flatter.[11]

Risk results with the market data simulations are shown in Figure 2. The RPW functions with market data are mostly flatter than those with accounting data, indicating that market data risk outcomes are relatively less sensitive to choice of portfolio weights. With the market data, all three insurance industry combinations with BHCs exhibit Z-scores that are higher than the initial (unmerged) Z-score over the entire portfolio weight domain. Interior maxima are also observed. For BHC mergers with insurance agents and brokers, the maximum occurs at somewhere between 12 percent and 20 percent nonbank assets. For BHC combinations with property and casualty insurers it occurs at between 6 percent and 22 percent nonbank assets. And, for BHC

mergers with life insurance companies, a maximum median Z-score is obtained at between 12 percent and 22 percent nonbank assets.

Three combinations in Figure 2 exhibit median Z-scores that are decreasing over almost the entire range of nonbank share: BHC combinations with securities firms, with real estate developers, and with other real estate firms. With the securities mergers, it appears that there is an interior maximum at about 2 percent median nonbank share; and with the BHC-real estate combinations there are apparent interior maxima at about 1 percent. In all three cases, however, the interior maximum Z-score is little higher than the Z-score at the vertical axis. Thus, the risk-minimizing combinations are very close to unmerged BHCs--both in terms of portfolio weights, and in terms of risk. It is even possible that the apparent interior maxima reflect nothing more than noise in the simulation results.[12]

VI. Conclusions

If the sole policy objective were to minimize risk of failure, then our results suggest BHCs should not be permitted to acquire any significant fraction of firms in three lines of business: real estate development, other real estate, and securities. For these industry combinations, estimated risk with the market data is minimized by a nonbank asset share that is close to zero. If the accounting data are used, risk is minimized by holding a nonbank asset share at exactly zero. These conclusions also hold (both with accounting and market data estimates) if we use the median standard deviation of the rate of return on equity as an alternative risk measure to the Z-score.

For BHC combinations with life insurance firms, there is considerable evidence of potential risk-reducing diversification. With the accounting data estimates, risk is minimized by placing between 10 percent and 20 percent of post-merger assets in life insurance activities. With the market data

estimates, mergers are risk-reducing essentially over the entire range of portfolio weights; and the risk-minimizing fraction of life insurance assets is between 12 percent and 22 percent. Again, if the sole public policy objective were to minimize risk of failure, then our results suggest such mergers should be strongly encouraged.

The risk results of BHC mergers with property and casualty insurers or with insurance agents are less clear. According to the accounting data, risk is minimized by not going into these activities at all. But according to the market data, Z is higher for any combination with each of these activities. For property and casualty insurance, the risk-minimizing fraction of nonbank assets is between 6 percent and 22 percent. For insurance agents, it is between 12 percent and 20 percent.

Our tests unambiguously suggest that relatively speaking, BHC mergers with all three kinds of insurance firms are less risky than BHC mergers with securities firms or with firms in the two real estate industries. This conclusion holds quite generally. It holds whether Z-scores are computed with accounting or with market data. And it also holds true if we use the median standard deviation of the rate of return on equity as our risk measure, instead of Z. Finally, and perhaps most surprisingly, this conclusion holds for all positive post-merger fractions of nonbank assets.

We recognize that a variety of public policy objectives must be weighed in determining whether or not to permit BHC expansion into other business lines. These would include competitive effects, economies of scale and scope, the possibility of conflicts of interest, tied sales, etc. Our study has only investigated the risk effects of BHC mergers, not these other issues. In terms of risk effects, however, the public policy implications of this study are straightforward.

Footnotes

[1]Another argument given by expansion proponents is that a BHC's bank affiliates can be legally protected against adverse results occurring in nonbank affiliates. As argued in Boyd and Graham (1986, 1988) this view is fundamentally flawed. If the activities of bank and nonbank affiliates are not fully separated by law, bank affiliate resources most likely will be employed (by some device or other) to aid financially-distressed nonbank affiliates. On the other hand, if full legal separation is imposed, any advantage in combining bank and nonbank activities is eliminated.

[2]Actually, we examine two measures of risk. In addition to the Z-score risk measure presented here, we also study the median standard deviation of the rate of return on equity as an alternative risk measure. All conclusions of this study are supported by both risk measures, although for brevity only one is presented.

[3]We prefer the median rather than the mean for these purposes since the former is not heavily influenced by one or a few outlying values. However, in the vast majority of our results there is little difference between the two.

It is important to note that we first compute individual firm statistics and <u>then</u> aggregate. Risk measures are never computed using industry average (or total) returns. We are interested in the riskiness of an average firm, not the riskiness of the industry average. Although it is sometimes done (e.g., Rosen <u>et al</u> 1988), computing risk measures with industry data results in within-industry averaging. This will bias downward the estimated volatility of returns by some unknown amount.

[4]There are a number of sources of potential bias in these simulation results. Some tend to disfavor the mergers in the sense that they make them

appear more risky than is probably the case. Others operate in the opposite direction. For example, our simulation procedure ignores the possibility of scale and scope economies in combining BHCs and nonbank financial firms. Moreover, it has been argued that our procedure, of matching firms at random, is unfair in that intelligent managers of BHCs could do better than choosing their merger partners at random. Both features of the simulations arguably bias the results against mergers.

On the other hand, the simulations ignore acquisition premia and out-of-pocket merger costs. Moreover, they assume that acquisitions are entirely equity financed, and that there is no "double leveraging" by the parent of the acquiring BHC. Neither assumption is realistic, and both downward-bias the risk of simulated mergers. These biases and others are discussed in considerable detail in Boyd, Graham (1988). As explained there, it is our best guess that the net effect of all sources of bias is to make the hypothetical mergers appear less risky than is true. Admittedly, however, that judgement is highly subjective.

[5]Other real estate includes an amalgam of industry classifications including investment in apartment and nonresidential buildings, dealers, lessors of real property and real estate agents and managers.

[6]The Z-scores computed with accounting data are so large that, if the distributions of returns are normal, then the Z-scores imply infinitesimal probabilities of failure. However, this risk measure surely underestimates the true probability of bankruptcy for a variety of reasons. First, visual inspection of the return distributions suggests that they may not be normal. Second, our definition of bankruptcy is too restrictive: It requires a one-period loss that exceeds aggregate equity. Depositor runs, liquidity problems, and regulatory intervention are likely to occur under much less dire

conditions. Third, smoothing of accounting earnings is likely taking place, thus giving a downward bias to estimated profits volatility.

[7]Profitability of the hypothetical merged firms is simply a weighted average of the profitability of the two merger partners. Thus, for example, the median rate of return for BHC-securities firm mergers is higher than the median rate of return for BHCs alone. Since they are merely averages of the industry data, post-merger rates of return are not particularly interesting and for brevity these results are not reproduced here.

[8]The initial portfolio ratio, N, is a period 1 condition through which we scale the vectors of nonbank items before merging. The path of growth over time among the nonbanks is not disturbed, and therefore the nonbank share is free to vary with time. As a result, the nonbank share can differ substantially from the initial ratio after the first year. In the text and graphs, we report the actual median nonbank share over all sample periods. Separate scalings are computed for accounting and market data.

[9]Two other changes deserve mention. We noted in some tests done after publication of the 1988 study that median results (based on 100 simulations) occasionally varied from one experiment to another. In the present work all simulations are run 1,000 times per experiment, and this seems to have solved the instability problem.

Also, in the 1988 study, merger results for BHC-real estate development combinations were incorrectly reported as results for BHC-other real estate combinations, and vice-versa. This transposition was (fortunately) benign in terms of conclusions since both are relatively high-risk combinations. The correct numbers are shown in Table 2.

[10]The reader may observe that in Figures 1 and 2, the Z value at the vertical axis is not exactly the same for each industry combination, nor is it

exactly equal to the median Z-score for the unmerged, 146-firm, BHC industry reported in Table 1. There are two explanations. First, this Z-score is the median of 1,000 randomly selected BHCs, and not that of the 146 BHCs, each being represented once. Second, our methodology requires that merged firms have at least 5 years of data; therefore, some combinations are simply not admissible. With N set at zero, the resulting (merged) sample of 1,000 BHCs has characteristics which are slightly different than that of the 146-firm BHC sample. For the same reasons we should not expect the Z values, at the point where the share of nonbank assets is 100 percent, to exactly equal the Z-scores of the unmerged nonbank industries.

[11]In all cases but one, the median Z-score from the previous study (indicated by the dots) is very close to the one in this study. The exception is mergers between BHCs and property and casualty insurers. The "true" median Z-score (about 29) for that combination appears to be higher than previously reported (25.3). For that one pair of industries, it appears that results are sensitive to the number of replications. Nonetheless, the change is not large enough to alter any conclusion.

[12]With the market data, some Z-scores for these three combinations are as follows

Combination of Firms:	Z-score at 100% BHC Assets	Maximum Z-score	Approximate Percent of Nonbank Assets Resulting in Maximum Z-score
BHC - Securities	4.07	4.22	2%
BHC - Other Real Estate	3.76	3.82	1%
BHC - Real Estate Devel.	4.09	4.15	1%

Obviously, we could run a much larger number of simulations for each of these three combinations, doing a tighter grid search with portfolio weights near zero (nonbank share). And by doing so, we could theoretically "pinpoint" the exact maxima. That exercise, however, would imply a degree of precision unwarranted by our methodology. About all we can say is that for these combinations of industries, risk is minimized by a nonbank share of assets that is "close to zero."

Table 1

Risk and Return Characteristics of the Sample Firms[1]

Industry	Median Profitability: Accounting $\bar{R}$	Median Profitability: Market $\bar{R}^m$	Median Risk: Accounting Z	Median Risk: Market Z^m	Median Risk: Market Beta[2]	Number of Firms in Sample
Property/Casualty Insurance	13.4%	15.8%	24.6	4.12	0.57	15
Life Insurance	12.8%	14.6%	36.8	3.91	0.76	30
Insurance Agent/ Broker	20.0%	10.2%	16.0	4.04	0.31	5
Securities	16.5%	28.7%	13.3	1.95	1.69	11
Other Real Estate	0.7%	15.5%	13.0	1.89	1.40	11
Real Estate Development	10.0%	20.1%	8.7	1.74	1.77	31
BHC	13.1%	15.6%	43.4	3.92	0.83	146

Table 2

Median Z-scores for Hypothetical Mergers[1,3]

1 BHC Merged with 1 firm from:	Accounting: Median Z	Market: Median Z^m	Median Accounting Nonbank Share of Postmerger Assets
Property/Casualty Insurance	25.3	5.14	38%
Life Insurance	49.3	4.65	29%
Insurance Agent/Broker	33.3	5.47	9%
Securities	24.9	3.28	21%
Other Real Estate	28.8	3.60	6%
Real Estate Development	37.9	3.98	3%
BHC Alone (Sample Median)	43.4	3.92	0%

[1]The sample period spans 1971-1984.
[2]Beta coefficient of a firm's common stock.
[3]Based on 100 simulations per industry pair.

Source: Standard and Poor's Compustat Services, Inc.

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Figure 1

Merger Simulations: Accounting Z-Scores

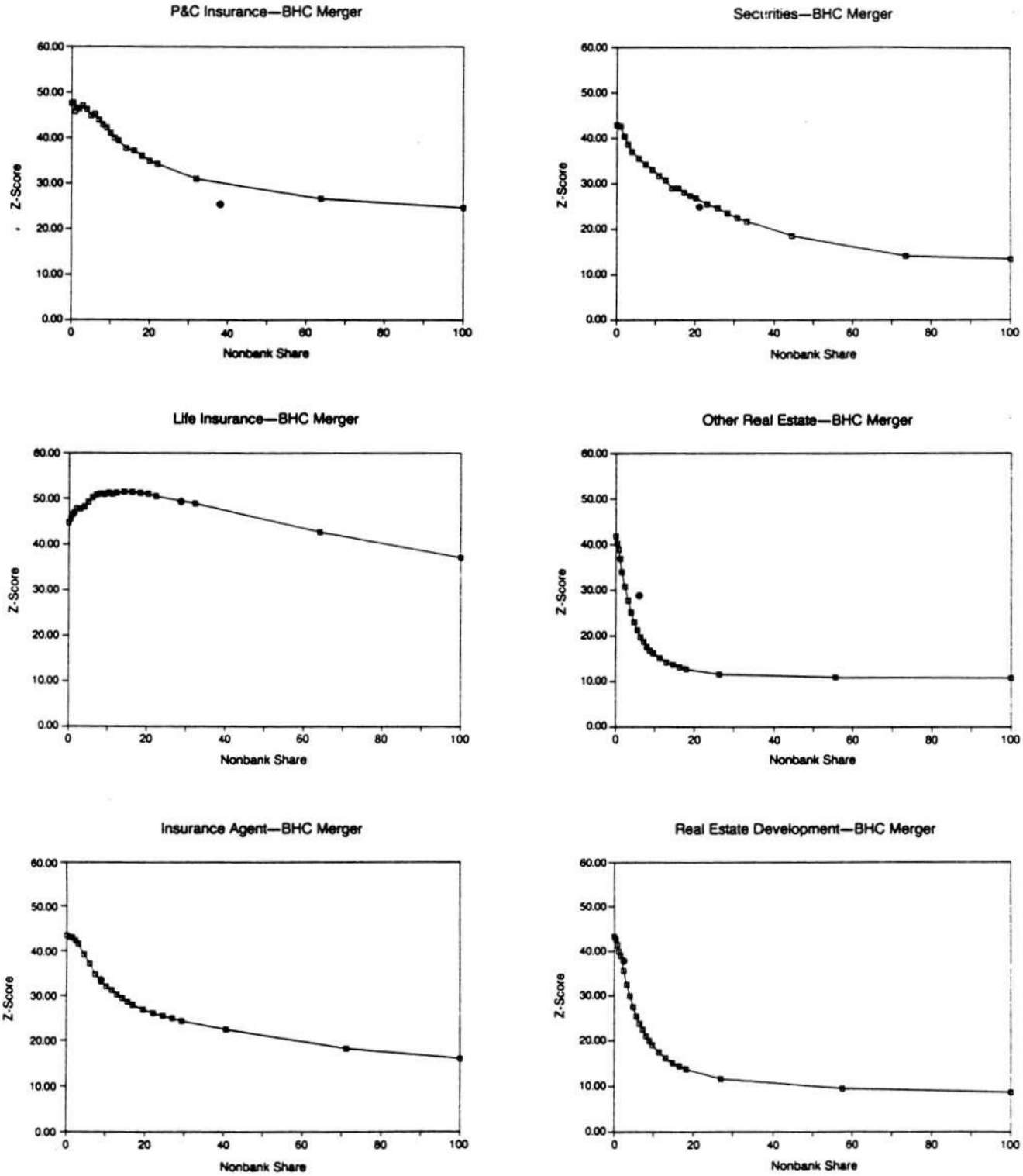
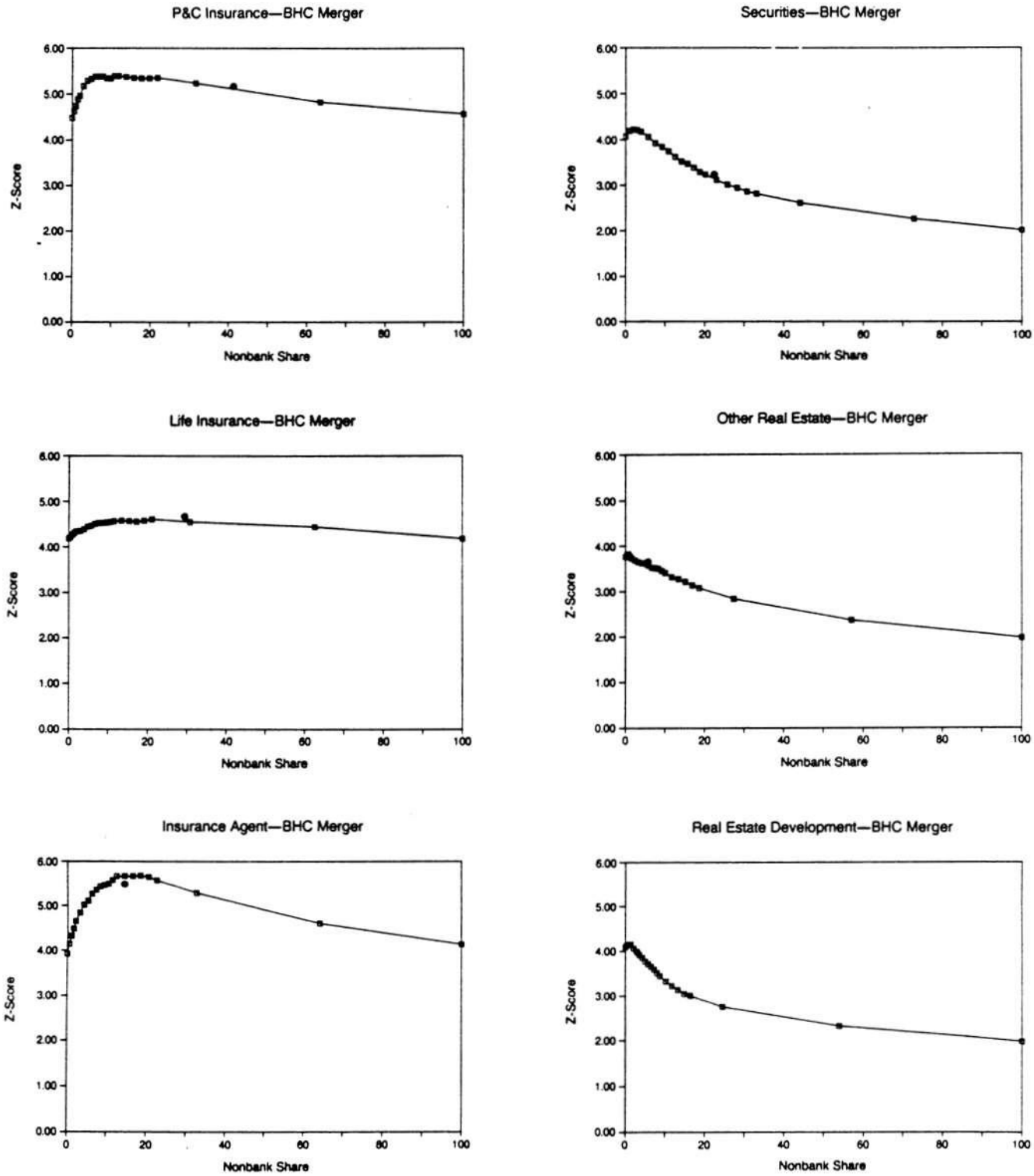


Figure 2

Merger Simulations: Market Z-Scores