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The Risk Effects of Bank Acquisitions

by Ben Craig and João Cabral dos Santos

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Introduction

Since the early 1980s, the U.S. banking industry has seen a strong trend toward consolidation, partly because of state regulatory changes permitting out-of-state bank acquisitions. There were 6,157 bank mergers and acquisitions (M&As) between 1981 and 1994 (Rhoades [1996]). Consolidation of this magnitude has brought significant changes to the banking sector that are in themselves worth investigating. By identifying these changes, we also gain valuable information about the ongoing wave of M&As that began with enactment of the Interstate Banking and Branching Efficiency Act in 1994.[1] Moreover, M&As require regulators' preapproval, and information on the likely effects of such changes can be useful in the approval process.

A prime objective of research on bank M&As has been to identify motives for consolidation. Such motives as scale economies, scope economies, and managerial X-efficiencies have been studied extensively.[2] However, less attention has been given to the other two most frequently suggested motives for bank M&As: risk diversification, and the wish to become "too big (or too important) to fail."[3] The present paper contributes to the literature by evaluating the importance of the risk diversification motive. Our study considers only bank acquisitions, which differ from mergers in that the acquired bank continues to operate as an institution after being acquired; it does not lose its charter. This focus on acquisitions allows us to identify how each party—-the acquirer and the acquired bank—affects the risk of failure of the newly formed banking organization.

The paper proceeds as follows: The next section discusses the importance of the risk diversification motive and defines our contribution to the related literature. Section II presents

1 The Act defined nationwide standards for a bank holding company (BHC) to acquire a bank in any state. Moreover, beginning June 1, 1997, BHCs were allowed to convert their bank subsidiaries into a network of branches, provided that these banks' home states had not opted out of the Act's branching provision.

2 Useful reviews of the literature on economies of scale and scope are presented by Clark (1988) and Mudur (1992). Berger, Hunter, and Timme (1993) review the literature on X-efficiencies.

3 Hunter and Wall (1989) and Boyd and Graham (1991), among others, raise the possibility that banks seek to become larger in order to increase their deposit insurance subsidy by being considered too big (or too important) to fail.

the measures of risk and our method for identifying the acquisition effects. Section III describes our sample of bank acquisitions, and section IV presents the results. The paper closes with some final remarks on the policy implications of our study.

I. The Risk Diversification Motive

In the debate on the risk diversification motive for bank M&As, some argue that banks choose targets that allow for a significant reduction in their risk exposure. Others suggest that, because of the moral hazard created by deposit insurance, a merger or acquisition gives the acquiring bank a good opportunity to increase its deposit insurance subsidy either by increasing its risk exposure or by attempting to become too big to fail. Still others say that risk considerations play no significant role in banks' merger policies.

Despite the importance of this debate, little is known about the risk effects of bank M&As. On the one hand, the research on postmerger effects has concentrated on performance (profits and costs) and on the changes in asset management (composition of the bank's portfolio of assets) resulting from the merger or acquisition. On the other hand, research on the risk effects of acquisitions has focused on combinations of banks and nonbank financial firms.[4]

The indirect evidence on the importance of the risk diversification motive is somewhat mixed. For example, Lawrence (1967), Talley (1971), Ware (1973), and Hobson, Maston, and Severiens (1978) find that acquired banks tend to adjust the composition of their portfolios by switching out of U.S. government securities in to loans and state and local government securities. These studies report mixed effects on the acquired bank's capital–asset ratio. Rhoades (1987), Fraser and Kolari (1987), and Beatty, Santomero, and Smirlock (1987) find a negative relationship between the merger premium and the target bank's capital–asset ratio. Craig and Santos (1996) show that regardless of the acquired bank's characteristics, the acquiring institution changes the target bank's asset composition so that the resulting organization becomes a bigger version of the acquirer. When Rose (1989) asked managers of banks involved in mergers to indicate the motives for consolidation, risk reduction was one of the least frequently mentioned responses.

The only study we know that directly compares the importance of the risk reduction motive with the deposit subsidy enhancement motive is Benston, Hunter, and Wall (1995). They conjecture that acquirers seeking to reduce risk should be willing to pay a premium for target banks that will lower the risk of the new banking organization. Under this hypothesis, there should be a negative relationship between the purchase premium and the target's expected contribution to the risk of the new organization, which they proxy by the variance of the target's return on assets and the covariance between the acquirer's and the target's return on assets, both computed prior to the acquisition. If the acquirer uses the acquisition to increase its deposit insurance subsidy instead, it can accomplish this objective either by becoming too big to fail or by increasing its risk exposure. Under this hypothesis, the purchase premium should be positively related to the two measures of risk already mentioned and to the acquirer's risk (as measured by the variance of its return on assets), and negatively related to the ratio of the acquirer's book value of equity to its total asset value. Benston, Hunter, and Wall contend that their results are consistent with the hypothesis of reducing risk and inconsistent with that of enhancing the deposit insurance subsidy.

The present study follows a different route for evaluating the importance of the risk diversification motive for bank acquisitions. We conjecture that if it were an important motive, a reduction in risk should follow the acquisition. That is, the postacquisition risk of the newly formed organization should be lower than the preacquisition risk of the acquiring bank holding company (BHC).

In assessing the importance of risk diversification, we use several measures to compare the postacquisition risk of the newly formed banking organization with the preacquisition risk of the acquiring BHC. To determine the source of risk effects resulting from the acquisition, we also compare the same measures of risk before and after acquisition for both institutions. Furthermore, we compare the new banking organization's risk with that of the hypothetical banking organization that would result from the preacquisition aggregation of the acquiring and the acquired banks. The purpose of this comparison is to gain information on how consolidation has affected the banking industry's overall risk.

4 See, for example, Litan (1987), Santomero and Chung (1992), and Boyd, Graham, and Hewitt (1993).

We complement the above analysis by examining the dynamics of the risk effects caused by bank acquisitions, using a constant sample. That is, for a given time frame, defined around the acquisition date, we consider only acquisitions for which we have observations throughout the entire period, and then study the dynamics of the risk effects within that interval. Thus, we avoid two problems that are frequently encountered in the literature on postacquisition effects: having a sample whose composition changes over time, and having a sample of acquisitions that all occur at the same time.

II. Method and the Measurement of Risk

We identify the risk effects of bank acquisitions through a two-step procedure. First, we compute the risk for the banking organizations in our sample, both before and after the acquisition. We then normalize this measure by subtracting the mean of the same measure calculated for the set of all banks in the industry, excluding those in our sample. By doing so, we eliminate a time effect—that is, a shock to the risk that prevails in the entire industry during a given period. In the second step, we evaluate the acquisition effect by computing the difference (postacquisition minus preacquisition) between the two industry-normalized measures calculated in the first step. This procedure removes any individual effect, that is, any idiosyncratic risk associated with the banking organizations involved in the acquisition. We then test statistically for whether this difference is zero. A number significantly different from zero indicates that the acquisition caused a change in risk.

In this study, we consider three indicators that are generally adopted in the literature to measure a banking organization's risk. The first two are the standard deviation and the coefficient of variation of a bank's profitability. These measures are computed for both the return on assets (the ratio of net income to total assets) and the return on equity (the ratio of net income to equity capital). The third indicator is what has become known in the literature as the *Z*-score, a measure of a bank's probability of bankruptcy.[5] In addition, because of their importance in defining some of these risk indicators, we study an acquisition's impact on both the profitability (return on assets and return on equity) of the banking organizations involved and the covariance between the profitability of the acquiring and target banks.

The *Z*-score can be defined as follows: Let bankruptcy be the situation in which the bank's equity capital, E, is smaller than its losses, $-\pi$ (since π represents the bank's profits); that is, $E < -\pi$. In addition, let A be the bank's total assets, r the bank's return on assets, $r = \pi/A$, and k the negative of the equity-to-assets ratio, $k = -E/A$. Using these definitions, the bank's probability of bankruptcy can be written as

$$(1) \qquad p(\tilde{\pi} < -E) = p(\tilde{r} < k) = \int_{-\infty}^{k} \phi(\tilde{r})\, d\tilde{r},$$

where $p(\cdot)$ is a probability, $\tilde{\pi}$ and $\tilde{r}$ represent random variables, and $\phi(r)$ is the density function.

If $\tilde{r}$ is assumed to have a normal distribution, then the bank's probability of bankruptcy can be rewritten in terms of the standard normal density, $\Psi(\cdot)$, as

$$(2) \qquad p(\tilde{r} < k) = p(\tilde{r} < k) = \int_{-\infty}^{z} \Psi(\zeta)\, d\zeta,$$

where $\zeta = \frac{\tilde{r} - \rho}{\sigma}$ and $z = \frac{k - \rho}{\sigma}$, with ρ being the true mean and σ the standard deviation of the random variable $\tilde{r}$.[6]

The *Z*-score, or sample estimate of $-z$ (because $z < 0$), is computed using the sample estimates of ρ and σ. As a result, based on quarterly accounting data, the *Z*-score is defined for each bank as

$$(3) \qquad Z = \frac{\sum_{i=1}^{n} 2n \frac{\pi_i}{A_i + A_{i-1}} + \sum_{i=1}^{n} n \frac{E_i + E_{i-1}}{A_i + A_{i-1}}}{\left[\sum_{i=1}^{n} \left(2 \frac{\pi_i}{A_i + A_{i-1}} - \sum_{i=1}^{n} 2n \frac{\pi_i}{A_i + A_{i-1}}\right)^2 \frac{1}{n-1}\right]^{\frac{1}{2}}},$$

where the stock variables, equity, and assets are measured at the midpoint of the period, and n is the number of periods considered in the sample.[7]

■ **5** For detailed analyses of this measure of risk, see Meinster and Johnson (1979) and Boyd, Graham, and Hewitt (1993).

■ **6** Because of Chebyshev's inequality, we know that regardless of the distribution of $\tilde{r}$, as long as ρ and σ exist, the upper bound to the bank's probability of bankruptcy is

$$p(\tilde{r} \le k) \le \left(\frac{\sigma}{\rho - k}\right)^2 = \frac{1}{z^2}.$$

■ **7** Because we consider only the acquisition of banks, and not BHCs, the computation of the *Z*-score for the target bank is straightforward. The same holds when the acquisition is made by a BHC that owns only one bank. When a multibank BHC makes the acquisition, the *Z*-score is computed for the hypothetical bank created as the sum of the banks in the acquiring BHC.

TABLE 1

Sample Composition

Number of Banks in the BHCs before the First Acquisition	Number of Banks in the BHCs after the Latest Acquisition									
	2	3	4	5	6	7	8	9	10	11
1	196	7	—	—	—	—	—	—	—	—
2	—	24	1	—	—	—	—	—	—	—
3	—	—	7	1	—	—	—	—	—	—
4	—	—	—	3	1	—	—	—	—	—
5	—	—	—	—	2	—	—	—	—	—
6	—	—	—	—	—	1	—	—	—	—
7	—	—	—	—	—	—	—	1	—	—
...	—	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	1

SOURCE: Authors' calculations.

The *Z*-score is an indicator of a bank's probability of bankruptcy in the sense that it estimates the number of standard deviations below the mean that the institution's profits would have to fall before its equity became negative. Thus, the smaller the value of *Z*, the larger the bank's risk of failure. Looking at the definition of *Z*, we observe that its value depends positively on the bank's profitability (measured by its return on assets) and capital–asset ratio, and negatively on the variability of the bank's profits (measured by the standard deviation of its return on assets).

In the second step of our procedure, we identify the acquisition effects by comparing before and after measures of risk and profitability for different banking organizations. By subtracting the preacquisition measure from the postacquisition measure, we can gauge the consequences of acquisition for the individual bank (or group of banks) affected. The individual differences are averaged and a standard t-test is used to check whether the means equals zero.

We account for the market effects on our risk measures by normalizing them with corresponding statistics for the banking industry as a whole. Each risk measure is computed as a deviation from the industry average for the same time period. Take, for example, the case of the *Z*-statistic in the 4 by 16 sample. As we did with the banks in our sample, we computed the *Z*-statistic for each bank outside our sample using quarterly data for the year before the acquisition quarter and for each of the four years after the acquisition. The average for the industry (which excludes the banks in our sample) is subtracted from the corresponding statistic for the acquisition pair. This removes effects that influence not only the acquisition pair, but also the industry as a whole. Thus, each measure of risk is expressed as a deviation from the industry average.

Because the sample sizes were large—173 or 201 acquisition pairs, depending on the time frame—standard central-limit-theorem results could be expected to hold fairly closely. It is important to note that the measures of risk all use sample means that are calculated separately for each period and each bank. Furthermore, the sample size is based on the number of individual pairs, not on the number of pair–quarter observations. While this procedure is robust to changing sample means or an unspecified stochastic process in the return (such as a first-order autoregressive process), our test is conservative in the sense that it tends to reject less often than a more fully specified statistical model. However, because our results generally rejected at a high level or did not reject at any reasonable level of significance, we report tests for the robust statistical model.

III. Sample Construction

Our study reports results only for acquisitions in which a bank continues to exist after being acquired by another banking organization. Furthermore, we restrict our sample to acquisitions made by one-tier BHCs, which own banks but do not own other BHCs. The data for this study were obtained from banks' quarterly Reports of Condition and Income (call reports) for the first quarter of 1984 through the last quarter of 1993.

Table 1 summarizes our sample of 256 bank acquisitions. Note that the largest number of acquisitions (196) was made by BHCs that had one bank and acquired a second during the sample period. Note also that several BHCs made more than one acquisition during our sample period. For example, there were seven BHCs that had one bank when the period began and later acquired a second bank and then a third.

Table 2 contains some descriptive statistics on the ratio of acquired banks' assets to those of the largest bank in the acquiring BHC. This information is arranged according to the number of banks in the acquiring BHC. For example, in nine acquisitions, BHCs with three banks acquired a fourth and, on average, the acquired banks' assets were 46 percent of those of the largest of the three banks in the acquiring BHC.

TABLE 2

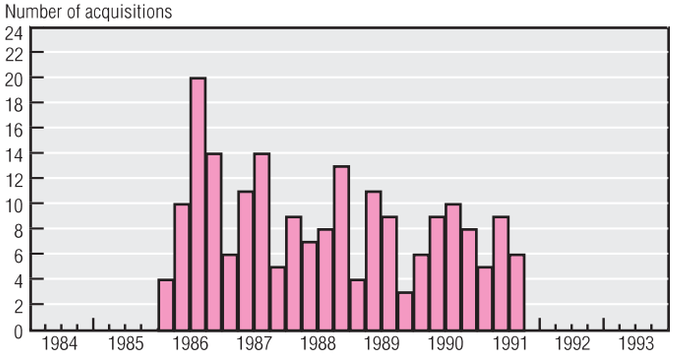
Acquired Bank's Assets/Assets of Largest Bank in Acquiring BHC

	Number of Banks in the Acquiring BHC									
	1	2	3	4	5	6	7	8	9	10
N[a]	203	32	9	5	3	1	1	1	—	1
Mean	0.56	0.63	0.46	0.18	0.31	0.49	0.11	0.06	—	0.06
Median	0.43	0.43	0.30	0.17	0.31	0.49	0.11	0.06	—	0.06
CV[b]	0.53	0.72	0.36	0.11	0.19	—	—	—	—	—

a. Number of acquiring BHCs.
b. Coefficient of variation.
SOURCE: Authors' calculations.

FIGURE 1

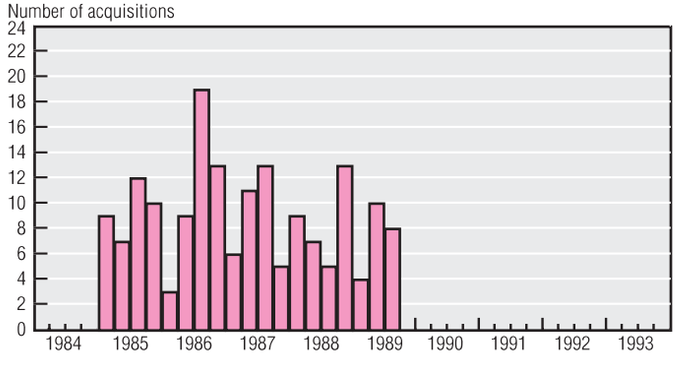
Distribution of Bank Acquisitions in the 8 by 8 Time Frame



SOURCE: Authors' calculations.

FIGURE 2

Distribution of Bank Acquisitions in the 4 by 16 Time Frame



SOURCE: Authors' calculations.

As expected, acquired banks are substantially smaller on average than their acquirers.

We conduct our tests on samples of bank acquisitions that are held constant within a given time frame, that is, an interval with a set number of quarters before and after the acquisition date. By constant sample, we mean a sample of acquisitions, each of which satisfies two criteria: first, availability of data on both parties involved in the acquisition throughout the entire time frame; second, structural constancy, meaning that the parties involved made no further bank acquisitions or sales during the period defined by the time frame.

This study employs two time frames. The first includes acquisitions for which we have the appropriate data for eight quarters before and eight quarters after the acquisition. In this case, we compare the risk measures for these two intervals. The second time frame includes four quarters prior to the acquisition and 16 quarters after it. Here, we compare the measures of risk for the four quarters prior to the acquisition with the same measures computed for the four quarters of the first year after acquisition, for the four quarters of the second year, and so on, through the fourth year after acquisition. This broader horizon allows us to identify the dynamics of the risk effects during the four years following the acquisition.

Given these conditions, we were able to consider 201 bank acquisitions in the 8 by 8 time frame and 173 in the 4 by 16 time frame. The temporal distribution of these acquisitions is presented in figures 1 and 2, respectively.

IV. Results

Before presenting the results of our tests on the risk effects of bank acquisitions, it is important to compare our sample of banks to the industry as a whole, before and after acquisition. The acquirers in our sample have a higher return on assets and a higher return on equity than the industry average in both periods. Acquired banks, however, according to both measures of profitability, are below the industry average before being acquired, but above it afterward. Furthermore, the improvement in their profitability increases with time.

With respect to risk, our sample of acquirers is made up of banks that appear safer than the industry average, both before and after making their acquisitions. This is clearest when risk is measured by the standard deviations of the return on assets and on equity. It is less clear when risk is measured by the *Z*-score, because

in some periods the acquirers do not differ statistically from the industry. The results are inconclusive when risk is measured by the coefficients of variation of the returns on both assets and equity. Target banks are riskier than the industry before being acquired, according to both the standard deviation measures and the *Z*-score. Afterward, their difference from the industry as a whole shrinks; in fact, they become relatively safer, according to the standard deviation measures of risk. As with the acquirers, no clear results are obtained from the targets' coefficients of variation.

The results of our tests for the effects of bank acquisitions are shown in the appendix (tables A1 to A4). In each time frame, every cell is associated with every measure of risk or profitability and each type of institution. The cell's first line represents the mean of the "after" minus the "before" difference for the statistic associated with that column. The former is defined as the postacquisition difference for that statistic between the sample and the control group, that is, the industry as a whole (excluding the banks in our sample). The "before" difference is defined the same way, but it is computed before the acquisition. The second line represents the *p*-value for the null hypothesis that the "after" minus the "before" difference is zero. The *p*-value is calculated using the standard *t*-distribution. For example, the cell in table A1 associated with acquired banks and the standard deviation of the return on assets, S_A, indicates that the mean of this measure of risk, after adjusting for the industry effect, was smaller (by an amount equal to 0.0011) for the period encompassing eight postacquisition quarters than the mean that existed for the same length of time before the acquisition. The hypothesis that this number is zero has a *p*-value of 7.94×10^{-9}, which means that no difference between the two measures would be rejected at any reasonable level of significance. It is evident that the standard deviation of the return on assets for the acquired banks decreases as a result of acquisition.

A detailed analysis of tables A1 through A4 reveals some clear results. First, the new banking organizations that emerge from acquisitions show improved profitability, which increases with time. Indeed, the profitability of these organizations ultimately exceeds that of the associated acquirers prior to acquisition. It also surpasses the preacquisition profitability of the hypothetical institutions that result from the aggregation of the acquirers and the target banks. The improvement is explained by the increased profitability of both the acquirers and the acquired institutions, but particularly by the latter. These patterns are observed for the returns on assets and equity.

Second, the variability of new banking organizations' returns is reduced (as measured by both the standard deviation of the return on assets and the standard deviation of the return on equity) as a result of acquisitions when compared to the corresponding preacquisition variability of both the acquirers' and the hypothetical institutions' returns. The variability of returns decreases over time and is observed for both the acquirers and the acquired. As in the case of profitability, the reduction is more pronounced for the latter.

Third, based on the *Z*-score, we observe that the new organizations which emerge from acquisitions have a lower probability of failure than the hypothetical preacquisition organizations. Furthermore, this improvement increases over time (recall that the larger the value of the *Z*-score, the smaller the bank's risk of failure). Acquired banks follow nearly the same pattern. However, acquisitions do not affect the *Z*-scores of acquirers in a statistically significant way. An identical conclusion is reached when the postacquisition *Z*-scores of new banking organizations are compared to the corresponding acquirers' preacquisition *Z*-scores.

Following the leads of other researchers, we have also examined changes in the coefficient of variation and in the covariance. While these results seem to contradict those of other measures, careful consideration of the statistical properties of the two measures leads us to urge caution in using them to evaluate the risk effects of acquisitions. In the case of the coefficient of variation, the lack of a clear result is seemingly related to the fact that random draws of a variable $1/t$, where t is a random variable from a student *t*-distribution, has a mean that quickly approaches a limiting Cauchy distribution. Our results were strongly influenced in ways that are typical of those caused by the Cauchy distribution's lack of statistical moments. Often, for example, computations of industry means for the coefficient of variation depended completely on the behavior of one or two huge outliers. Even trimming the industry means did not completely solve these problems. Our experience with the coefficient of variation provides a strong cautionary moral for researchers who forget that central-limit theorems depend on the existence

of finite moments greater than two. The coefficient of variation behaves too much like a Cauchy variable to depend on such statistical results. For handling this problematic variable, we advise using procedures that take the median as a basis for location estimation.[8]

Similar results were also obtained for the covariance risk measure, although it is unlikely that these are due to observations being drawn from a distribution with no finite moments. In this case, we did not normalize for industry averages. The industry as a whole consists of individual banks rather than pairs, so that an industry mean could not be subtracted. Given that the effects of acquisition on the covariance measure are slight, our results seem to be influenced most by random noise and therefore provide little in the way of information about small effects that may be due to acquisitions. Clearly, acquisition does not change the covariance measure enough to make it detectable using our methods.

In sum, we find that acquisitions have a positive impact on the profitability of participating institutions—particularly acquired banks—and that it increases over time. This improvement, in turn, reduces the variability of the institutions' profits in a similar fashion. These results, a priori, would appear to contribute to participating banks' reduced probability of failure, as measured by the *Z*-score. In fact, this is true for acquired banks and for the new banking organizations that result from acquisitions when these are compared to hypothetical preacquisition organizations. However, this reduction is not observed when the comparison is made with preacquisition acquirers' risk, nor is it seen for acquirers. These results may be explained by the difference in capitalization between acquirers and acquired banks. They seem compatible with a situation in which the capitalization of acquired banks is smaller than that of their acquirers prior to the acquisition, but is improved as a result of the acquisition.

What do our findings tell us about the risk diversification motive for bank acquisitions? They appear to disprove the notion that banks use acquisitions as a means of boosting their deposit insurance subsidy by increasing their risk exposure. In this respect, our results accord well with those of Benston, Hunter, and Wall (1995). However, our evidence is mute about the other frequently suggested route for increasing the deposit insurance subsidy—becoming too big to fail.

Although they indicate that acquisitions have increased the banking industry's profitability and reduced its risk, our findings do not seem to show that risk diversification is in itself a major force driving bank acquisitions. If that were the case, we would have observed a distinctly reduced risk for the new banking organizations that emerge with acquisitions. Our sample of bank acquisitions shows a clear reduction for some measures of risk, but no clear effect for others. Furthermore, when we compare the postacquisition risk measures of the newly formed banking organizations with the preacquisition risk of the corresponding hypothetical banking organizations, we find a more pronounced reduction than when we compare those same measures with the preacquisition risk of the associated acquirers.

V. Final Remarks

Recent consolidation in the banking industry is producing less risky organizations. At the same time, it is creating larger institutions for which the too-big-to-fail policy is potentially more valuable. The moral hazard of that policy creates a widely recognized distortionary subsidy. In the past, regulations limiting bank acquisitions, especially interstate M&As, made it difficult to exploit this subsidy. Recent deregulation allowing the development of nationwide banking has made it easier for banks to diversify their risks, but it has also made it easier for them to grow. In other words, the perception that banks could become too big (or too important) to fail is more pertinent than ever before. As a result, it is imperative that banking supervisory agencies avoid sending signals that might reinforce this perception.

■ **8** The problems associated with estimation in the presence of a random variable that lacks finite moments are well documented in the nonparametric estimation literature (see, for example, Scott [1992]).

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Appendix: Impact of Bank Acquisitions

TABLE A1

Impact of Bank Acquisitions on Risk and Profitability[a]

	Risk					Profitability	
	S_A[b]	CV_A[c]	S_E[b]	CV_E[c]	Z	R_A[b]	R_E[b]
Acquired	−0.0011	−2.1600	−0.0186	0.7040	26.30	0.0008	0.0157
	7.94e−09	0.2940	1.91e−07	0.5640	0.00027	1.06e−05	4.24e−10
Acquirer	−0.0003	0.4150	−0.0036	0.5960	−11.10	0.0003	0.0085
	0.00116	0.2860	0.00604	0.1460	0.22400	0.00051	2.73e−11
Both–Both[d]	−0.0005	3.8400	−0.0054	0.7620	32.80	0.0005	0.0099
	7.56e−07	0.3850	9.71e−06	0.5240	0.00490	3.27e−07	3.87e−17
Both–Acquirer[e]	−0.0004	0.1530	−0.0046	0.2410	10.80	0.0001	0.0059
	5.59e−05	0.6940	0.0002	0.5110	0.3530	0.1430	1.18e−07

a. Compares the measures of risk computed eight quarters after the acquisition with the same measures computed eight quarters before.
b. Represents the standard deviation of the return on assets, S_A, and of the return on equity, S_E.
c. Shows the coefficient of variation of the return on assets, CV_A, and of the return on equity, CV_E.
d. Compares the postacquisition risk of the newly formed banking organization (Both) with the preacquisition risk of the hypothetical bank resulting from the sum of the acquired and the acquirer.
e. Compares the postacquisition risk of the newly formed banking organization (Both) with the preacquisition risk of the acquirer.
SOURCE: Authors' calculations.

TABLE A2

Risk Effects Based on the Covariance of Returns[a]

	Return on Assets				Return on Equity			
8 x 8 Time Frame								
Covariance	2.22e−07				2.78e−05			
	0.05850				0.6690			
	Years after Acquisition							
	1	2	3	4	1	2	3	4
4 x 16 Time Frame								
Covariance	−6.03e−07	−1.29e−08	−1.12e−07	−1.37e−06	−9.56e−05	−1.98e−05	−1.98e−05	0.0002
	0.2710	0.9750	0.7630	0.1560	0.2370	0.7640	0.7350	0.1430

a. Compares the covariance between the returns of the acquired and the acquirer before and after the acquisition.
SOURCE: Authors' calculations.

TABLE A3

Impact of Bank Acquisitions on Risk[a]

	Years after Acquisition							
	1	2	3	4	1	2	3	4
	Acquired				Acquirer			
S_A	−0.0009	−0.0014	−0.0020	−0.0019	−0.0001	−0.0003	−0.0005	−0.0007
	0.00044	1.91e−06	4.06e−11	4.27e−10	0.27500	0.03300	4.59e−05	1.42e−05
CV_A	0.8950	1.4000	0.7060	0.2010	0.5060	0.8030	−0.0314	0.6810
	0.3120	0.09740	0.1540	0.63200	0.11700	0.11500	0.9380	0.1230
S_E	−0.0156	−0.0277	−0.0308	−0.0299	−0.0009	−0.0026	−0.0050	−0.0070
	0.00059	3.30e−06	4.77e−09	2.12e−08	0.51700	0.12200	0.00102	3.02e−05
CV_E	0.8490	1.2800	0.8760	0.5360	−0.8950	−0.4890	−1.790	−0.6070
	0.2690	0.0400	0.1910	0.33600	0.45000	0.6950	0.1610	0.6280
Z	20.200	51.100	85.700	66.000	−85.200	−65.30	−60.50	−28.00
	0.5460	0.0342	0.1010	0.00124	0.3010	0.4320	0.4610	0.7460
	Both–Both				Both–Acquirer			
S_A	−0.0003	−0.0005	−0.0007	−0.0008	−0.0002	−0.0004	−0.0006	−0.0007
	0.00931	−0.00027	8.36e−09	1.94e−08	0.1670	0.00573	1.03e−06	1.69e−06
CV_A	−0.5140	−1.0600	−0.2800	−0.6210	0.3260	−0.2280	0.5660	0.2300
	0.2170	0.0307	0.4890	0.1140	0.3810	0.6080	0.1090	0.48700
S_E	−0.0028	−0.0052	−0.0085	−0.0094	−0.0008	−0.0032	−0.0065	−0.0074
	0.03520	0.00139	2.09e−07	8.62e−08	0.5530	0.03380	1.09e-05	5.59e−06
CV_E	−0.5850	−0.7740	−0.1030	−0.3160	−1.360	−1.5500	−0.8830	−1.100
	0.2500	0.0439	0.7300	0.2160	0.2830	0.2020	0.4640	0.3590
Z	28.50	39.400	51.500	127.00	−73.40	−61.90	−51.80	24.300
	0.1040	0.0256	0.0155	0.00943	0.3790	0.4540	0.5330	0.8010

a. Compares the measures of risk computed four quarters before the acquisition with the same measures computed four quarters the acquisition, four quarters of the second year after the acquisition, and so on.
SOURCE: Authors' calculations.

TABLE A4

Impact of Bank Acquisitions on Profitability

	Years after Acquisition							
	1	2	3	4	1	2	3	4
	Acquired				Acquirer			
R_A	0.0007	0.0011	0.0017	0.0017	0.0002	0.0003	0.0005	0.0005
	0.00066	8.08e−06	3.67e−09	1.02e−08	0.06620	0.00133	4.67e−05	0.00028
R_E	0.0131	0.0224	0.0302	0.0309	0.0038	0.00791	0.0105	0.0123
	0.00028	4.74e−08	2.50e−11	3.76e−11	0.00016	6.98e−09	1.33e−11	7.35e−15
	Both–Both				Both–Acquirer			
R_A	0.0003	0.0006	0.0008	0.0008	−0.0001	0.0001	0.0001	0.0004
	0.0005	7.07e−07	6.88e−10	1.67e−08	0.25400	0.16500	0.00111	0.00773
R_E	0.0055	0.0109	0.0146	0.0160	0.0004	0.0058	0.0095	0.0108
	2.39e−06	2.37e−12	4.90e−17	3.40e−18	0.74000	8.52e−06	1.54e−10	1.95e−11

SOURCE: Authors' calculations.

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