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Are Differences in Acquiring Bank Profit Efficiency Priced in Financial Markets?

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Abstract We analyze 271 bank mergers for 1986–2001 to attempt to determine if differences among acquirers in profit efficiency are priced in financial markets. We find that the acquirer's pre-merger profit efficiency (as well as its experience in handling other mergers) has positive effects on the wealth of the acquiring bank's shareholders. We also find that more profit efficient acquiring banks produce lower abnormal returns for the target, suggesting that well managed (i.e., more profit-efficient) banks are less likely to overpay when they enter into a merger agreement. Financial market participants apparently take something akin to the econometric concept of profit efficiency into account when they make decisions about bank stock purchases and sales around merger announcement dates.

Key words Profit efficiency · cumulative abnormal return · Bank Mergers

JEL Classifications G1 · G34 · C24

1 Introduction

While the efficiency and valuation effects of the large number of recent US bank mergers have been investigated extensively, some interesting and important questions remain. For example, is the reported improvement in efficiency associated with bank mergers (e.g., Cornett et al., 2006) actually a continuation of a trend that

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began before the merger? Which bank is more efficient prior to the merger, the acquirer, as one would expect, or the target? Do investors expect that more efficient banks, and banks involved in previous mergers, will do a better job of increasing value? Are the positive wealth effects enjoyed by target bank shareholders less when better managed banks are the bidders? In other words, are differences in the efficiency of the acquirer priced in financial markets?

We attempt to answer these questions by applying profit efficiency (PROFEFF) analysis to 271 bank mergers covering the years 1986–2001. We examine the relationship between profit efficiency and short-term shareholder wealth effects. Profit efficiency deals with how well a bank is operating relative to the best-practice frontier. By definition, a more profit efficient bank is better managed than others because it is doing more to extract profits from its existing resources. In contrast to simple profitability ratios, PROFEFF is a sophisticated, econometric financial performance measure that takes asset composition, liability composition, capitalization and other factors into account.[1] It is thus well suited for answering the questions posed.

We find that the improvement in financial performance after mergers is a continuation of trends that began at least 3 years before the merger.[2] Paradoxically, targets are more profit efficient on average than acquirers prior to mergers. We find that the acquirer's PROFEFF has a positive effect on the returns experienced by the acquiring bank's shareholders. Interestingly and importantly, we also find that well managed (high profit efficient) banks pay less when they acquire other banks. This finding stems from the fact that the coefficient of the variable representing the acquirer's PROFEFF in the target abnormal return equation is negative and highly significant.

2 Literature review and evaluation

The bank merger literature can be broadly classified into two main streams—the first examines operating gains while the second focuses on shareholder wealth effects. Spindt and Tarhan (1993) find that scale economies associated with mergers of mainly small (less than $100 million in assets) banks lead to operating gains.[3] Cornett and Tehranian (1992) find that cash flow returns improve for large bank mergers. In contrast, a number of studies find no operating gains from bank mergers (e.g., Linder and Crane, 1992; Rhoades, 1993; Berger and Humphrey, 1992; Pilloff, 1996). Similarly, studies of shareholder wealth effects of bank mergers also come to opposing conclusions. For example, Cornett and Tehranian (1992) find positive

[1] Specifically, profit efficiency considers asset composition as reflected in revenues, and liability composition (interest expenses), and productivity (non-interest expense) differences among banks and also considers industry trends (e.g., Berger and Mester, 1997).

[2] Mergers and acquisitions are used interchangeably in this paper even though some acquisitions are not mergers.

[3] Wheelock and Wilson (1999) document that in the 1990s smaller banks had a particularly difficult time adopting productivity enhancing technical changes. Similiarly, Stiroh (2000) finds that the optimal bank size seems to have increased in the 1990s era of deregulation, technological change, and financial innovation.

consolidated wealth increases while Hannan and Wolken (1989) and Houston and Ryngaert (1994) find no average wealth creation.

Cornett and Tehranian (1992) examine 30 bank mergers occurring between 1982 and 1987. They find that the merging banks outperform the banking industry in terms of both operating performance and market performance. The source of the higher returns appears to be higher revenue and productivity, although the ability of the merged bank to attract more deposits also plays a role. Cornett and Tehranian's study is restricted to bank mergers where the target has significant size (purchase price greater than $100 million) to ensure that the acquisition will have a significant impact on the acquiring firm's operating performance. They also find that announcement period abnormal returns and financial performance are correlated, suggesting that market participants have some ability to anticipate the improved financial performance. However, they do not examine mergers after 1987, and their measure of operating performance is not profit efficiency.

In a recent comprehensive study, Cornett et al. (2006) examine operating performance around bank mergers for the period 1990 to 2000 using 40 different financial ratios. Their study appears to be the most recent published or forthcoming study in this area. Their sample includes 134 bank mergers, of which 99 involve mergers between publicly traded acquirers and targets. Our study complements theirs and is different from theirs in a number of important respects. First, they eliminate mergers in which the acquiring bank was involved in another merger in a 3-year period. Our study includes all mergers that were announced in *The Wall Street Journal* in which both banks were publicly traded, with a control variable for "serial" acquirers, i.e., those banks involved in more than one merger. Over half of our mergers are serial mergers.

Second, we focus on profit efficiency for a 7-year period, including 3 years before the merger, which allows us to investigate whether improvements in performance represent a continuation of a trend that began before the merger. These improvements are not the focus of their paper. Third, our focus on an econometric financial performance statistic, profit efficiency, holds other variables affecting financial performance (e.g., asset composition, liability composition, leverage, input and output prices) constant. Pretax operating cash flow does not have that characteristic.[4]

Akhavein et al. (1997) also examine profit efficiency in bank mergers. They examine megamergers occurring between 1980 and 1990 and compare the profit efficiency of the merged bank with that of all US banks. They find that the average profit efficiency rank of the merging banks increased from the 74th percentile to the 90th percentile relative to the peer group of large banks. They find that this primarily reflects a shift in assets from securities to loans, made possible by the geographic diversification benefits of the merger in reducing the risk of the resulting bank's loan portfolio. They also find that gains are greater when either or both of the merging firms have poor performance (profit efficiency) prior to the merger. Further, they note that if the efficiency rank of the acquiring bank is 10 percentage points lower, then the predicted gain in ex-post efficiency for the consolidated bank

[4] Our use of profit efficiency also explains why we do not need to exclude banks involved in other mergers. A merger of two banks with different operating characteristics will change operating ratios, but it will not necessarily affect profit efficiency. For example, the profit efficiency metric compares the financial performance of high liquidity banks with that of other high liquidity banks.

is four percentage points higher. Although Akhavein et al. (1997) find a statistically significant increase in profit efficiency associated with US bank megamergers, like Berger and Humphrey (1992) they do not find any evidence of improvements in cost efficiency. Thus, consistent with Cornett and Tehranian (1992), they find that most of the gains occur on the revenue side. However, Akhavein et al. (1997) do not relate efficiency gains in bank mergers to shareholder wealth effects and do not examine bank mergers after 1990. In one of the more comprehensive studies of returns from bank mergers, covering 558 banks from 1980 to 1997, Becher (2000) finds that combined firm wealth effects are significantly positive.

Houston et al. (2001) evaluate analysts' reports and management statements on cost savings and revenue gains for a sample of the largest bank mergers occurring between 1985 and 1996. They find that stock market revaluations are not as large as the present value of management's estimated gains. They find some positive stock market revaluation of merger gains in the more recent mergers. They also report that while merger gains are related to estimates of cost savings, there is little evidence of wealth creation, with shareholders of the target firm generally gaining at the expense of shareholders of the acquiring firm. Once again, however, this study does not relate any underlying relative efficiency gains to stock price gains and does not examine bank M&As after 1996.

DeLong (2003) examines 54 large bank mergers between 1991 and 1996 and finds that bank M&As that increase the resulting bank's focus have positive shareholder wealth effects. Long-term performance of the merged bank is improved when there is a reduction in bankruptcy costs or when the acquiring bank is particularly inefficient. This study, however, does not examine relative profit efficiency.

While each of these studies of large bank mergers present useful and interesting results, none of them relate changes in profit efficiency resulting from bank mergers to shareholder wealth effects and only one (Cornett et al., 2006) examines the numerous bank mergers in the last half of the 1990s. Akhavein et al. (1997) report that, before their paper, there are no studies of the profit efficiency effects of bank mergers. They also report that the question of the sources of gains from bank mergers (revenue, cost or productivity) is a seriously under-researched area. In an attempt to fill this gap in the literature, Akhavein et al. (1997) study bank mergers during 1981–1989 and found that bank mergers result in an increase in profit efficiency.[5] Berger and Mester (2003) confirm these findings for 1991–1997. However, neither study relates shareholder wealth effects of bank mergers to efficiency gains. Other studies do examine shareholder wealth effects in bank M&As (e.g., Becher, 2000, Houston et al., 2001; DeLong, 2003) but do not relate them to changes in relative profit efficiency. Indeed, there do not seem to be any studies that examine the relationship between relative profit efficiency and shareholder wealth effects in bank mergers. In this paper we provide an approach to evaluating the relationship between the efficiency and private benefits of large bank mergers by relating changes in relative profit efficiency to short-term shareholder wealth effects. As noted, profit efficiency is extremely useful because it reflects both cost and revenue gains and adjusts for industry trends.

[5] Cornett and Tehranian (1992) confirm these results for 1982–1987 but do not use relative profit efficiency as a performance measure.

3 Data and methodology

Data The initial sample of bank mergers is constructed from Thomson Financial's *SDC Mergers & Acquisitions* database. Observations are included in the final sample if they meet the following criteria: (1) the acquisition is classified in the *SDC* database as a full acquisition rather than a partial acquisition of target subsidiaries; (2) the acquirer and target are both domestic bank holding companies, nationally chartered commercial banks, or state-chartered commercial banks having 4-digit Standard Industrial Classification (SIC) codes of 6712, 6021 and 6022, respectively; (3) the CUSIP of the merging banks, the merger announcement and completion dates are available from the *SDC* database; (4) the acquirer and target have common stock publicly traded on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) or NASDAQ with daily return data at the time of the acquisition available from the *CRSP* database; and (5) the acquirer and target have financial data available from Federal Reserve Y-9C (BHC) reports. After generating this list, the *Moody's Bank and Finance Manual* is used to verify that the listed institutions are indeed BHCs or banks. This procedure resulted in a final sample of 271 acquisitions that involve BHCs and banks over the period 1986–2001.

The sample used to estimate the profit efficiency frontier consists of *all banks* listed in the Bank holding Company (BHC) database on the Federal Reserve Bank of Chicago's web page (http://www.chicagofed.org).[6] Financial data for constructing the frontier, calculating the profit efficiency measures and for analyzing the merging banks are extracted from the Federal Reserve Y-9C (BHC) reports.

Rhoades (2000) reports approximately a total of 8,000 bank mergers, or about 400 mergers per year, for the period 1980–1998, a period which overlaps considerably with our sample period. Nonetheless, our sample is representative of mergers of larger, publicly traded banks. (In fact, as noted above, we attempted to include as many such mergers in our sample as possible.) Our 271 merging banks are publicly traded banks and hence much larger than the average US bank. In tables 1 and 2 we present data on the number of banks in our merger sample and the number of all banks in the Federal Reserve holding company database. It is clear that our banks are much larger than the average bank. For example, in 1987 our acquiring banks averaged $14.95 billion in total assets while the average bank in the Federal Reserve database averaged $1.91 billion. Similar results hold for virtually all years in the sample. Thus, the fact that the number of mergers in our sample is relatively small is a byproduct of the structure of the banking industry, which is dominated by larger publicly traded banks, which are the type of bank in our sample.

Profit efficiency[7] PROFEFF is an econometric financial performance statistic, which measures how actual financial performance compares to the best-practice frontier.[8] For a given bank, it is measured as a percentage of the PROFEFF of the

[6] It is important to use as wide a base as possible for estimating the efficient frontier as it should have the very best banks in terms of profit efficiency. Fortunately, such a frontier is likely to represent banks in a wide range of sizes as Wheelock and Wilson (1999) document that some banks in each size group are among the most efficient.

[7] This section is based in part on Akhigbe and McNulty (2003).

[8] See, Berger and Humphrey (1997) and its references for details on profit efficiency in financial institutions.

Table 1 Time and size distribution of bank merger sample and of all banks listed in the relevant Federal Reserve database

Year	Number of mergers			Acquirer asset size ($billions)				Target asset size ($billions)			
	Frequency	Cumulative number	Cumulative percent	Min	Max	Med	Mean	Min	Max	Med	Mean
1986	5	5	1.85	0.56	51.20	8.45	2.55	0.31	39.46	3.89	6.52
1987	8	13	4.80	0.58	55.42	9.49	14.95	0.83	44.58	4.51	9.77
1988	7	20	7.38	1.37	67.72	17.08	23.75	0.33	53.17	1.43	13.35
1989	7	27	9.96	4.27	71.11	21.61	27.37	0.36	11.77	4.84	5.32
1990	5	32	11.81	4.13	45.81	39.28	29.74	0.77	55.77	50.79	39.53
1991	19	51	18.82	12.33	100.00	31.37	38.88	0.11	64.98	11.40	19.81
1992	22	73	26.94	2.98	106.96	32.00	30.79	0.54	52.82	10.92	10.40
1993	24	97	35.79	2.45	50.38	23.50	24.91	0.56	54.09	4.02	2.22
1994	17	114	42.07	0.22	159.05	16.04	31.50	0.34	103.12	11.93	23.72
1995	23	137	50.55	0.18	60.19	25.67	29.21	0.21	52.51	9.77	12.20
1996	16	153	56.46	0.50	54.92	11.96	17.76	0.33	52.08	2.97	13.94
1997	46	199	73.43	0.19	104.73	3.75	22.26	0.13	73.08	2.06	14.00
1998	28	227	83.76	0.20	50.77	1.59	8.30	0.34	57.34	1.23	10.44
1999	24	251	92.62	0.25	58.34	6.55	9.58	0.18	24.78	1.08	2.97
2000	13	264	97.42	0.18	692.79	15.33	25.52	0.11	103.12	5.08	13.65
2001	7	271	100.00	0.19	542.15	18.21	28.32	0.12	101.40	4.01	14.20

Large bank mergers studied here consists of 271 acquisitions for the 16-year period (1986–2001) for acquiring and target banks listed on the Center for Research in Security Prices (CRSP) tapes. Asset size is for the bank holding company.

Table 2 Time and Size Distribution of All Banks Listed on the Federal Reserve Y-9C (BHC) reports for the 16-year period (1986–2001)

Year	Number	Min ($billion)	Max ($billion)	Median ($billion)	Mean ($billion)
1986	1324	0.01	196.12	0.22	1.92
1987	1388	0.01	203.61	0.21	1.91
1988	1420	0.01	207.67	0.22	1.92
1989	1482	0.01	230.64	0.24	2.11
1990	1613	0.02	216.98	0.25	2.34
1991	1620	0.02	216.92	0.26	2.36
1992	1631	0.02	213.70	0.25	2.41
1993	1618	0.02	216.57	0.26	2.59
1994	1357	0.02	250.50	0.32	3.39
1995	1390	0.02	256.85	0.33	3.59
1996	1434	0.03	336.09	0.34	3.68
1997	1513	0.03	365.52	0.33	3.88
1998	1602	0.03	668.64	0.32	4.43
1999	1704	0.04	716.94	0.32	4.92
2000	1783	0.04	902.21	0.33	5.29
2001	1892	0.04	1051.45	0.33	5.52

best-practice bank. For example, a PROFEFF measure of 0.80 means that a bank is 80% as profit efficient as the most efficient bank. The frontier and each bank's PROFEFF are estimated separately for each year using a non-standard, Fourier-flexible form, as follows:

$$\begin{aligned}\text{PREROA} = {} & \alpha_0 + \sum_{i}^{3}\beta_i Y_i + \frac{1}{2}\sum_{i}^{3}\sum_{j}^{3}\beta_{ij}Y_iY_j\sum_{m}^{3}\gamma_m W_m \\ & + \frac{1}{2}\sum_{m}^{3}\sum_{n}^{3}\gamma_{mn}W_mW_n + \sum_{k}^{3}\phi_k Z_k + \frac{1}{2}\sum_{k}^{3}\sum_{l}^{3}\phi_{kl}Z_kZ_l \\ & + \sum_{i}^{3}\sum_{m}^{3}\rho_{im}Y_iW_m + \sum_{i}^{3}\sum_{k}^{3}\phi_{ik}Y_iZ_k + \sum_{m}^{3}\sum_{k}^{3}\phi_{mk}W_mZ_k \\ & + \sum_{i=1}^{9}[\delta_i\cos X_i +_i \theta\sin X_i] + \sum_{i=1}^{9}\sum_{j=1}^{9}\left[\delta_{ij}\cos\left(X_i+X_j\right)\right. \\ & \left. + \phi_{ij}\sin\left(X_i+X_j\right)\right] + \sum_{i=1}^{9}\sum_{j=1}^{9}\sum_{k=j}^{9}\left[\delta_{ijk}\cos\left(X_i+X_j+X_k\right)\right. \\ & \left. + \phi_{ijk}\sin\left(X_i+X_j+X_k\right)\right] + \nu + \mu\end{aligned} \tag{1}$$

PREROA is operating profits (earnings before taxes, extraordinary items, and loan losses) as a percent of total assets. ***Y*** is a vector of three outputs which are defined at the bank level: (1) total loans (commercial, industrial and real estate loans), (2) retail deposits (demand deposits, time deposits and savings deposits) and (3) fee-based financial services (non-interest income). ***W*** is a vector of three market prices for inputs, which we observe at the county level: (1) the wage rate for labor;

(2) the interest rate for borrowed funds; and (3) the price of physical capital.[9] The ***Z*** vector is a set of three variables: (1) equity capital (defined at the bank level) to control, in a very rough fashion,[10] for the potential increased cost of funds due to financial risk; (2) A Hirschman-Herfindahl Index (HHI; defined at the county level) to control for differences in deposit market competition across geographic markets);[11] and (3) the average non-performing loan ratio (defined at the county level) to control for differences in economic conditions across markets. ***X*** is a set of nine variables that transform the output (***Y***) variables so that they fall on the interval from 0 to 2π.[12] We construct a separate frontier for each year 1986–2001 to evaluate the performance of the merging banks.

The Fourier function has been used in a number of efficiency studies (e.g., Berger and Mester (1997, 2003), DeYoung and Hasan (1998), DeYoung and Nolle (1996), McAllister and McManus (1993), Mitchell and Onvurall (1996)). The Fourier form is generally considered to provide a better fit than other functions (e.g., the translog) for banks with values of ***Y***, ***W*** and ***Z*** that differ substantially from the sample mean. The non-standard Fourier form assumes that banks have some control over output prices (e.g., DeYoung and Hasan, 1998, Humphrey and Pulley, 1997). This is a reasonable assumption for loans, deposits and fee-based services. Because output prices are not exogenous under these assumptions, profit is assumed to depend on input prices and output quantities.

Equation 1 is very similar to the function used by DeYoung and Hasan (1998) and Akhigbe and McNulty (2003), but our specification of input prices, output quantities and other exogenous (***Z***) variables is somewhat different from DeYoung and Hasan (1998). Both studies suggest that use of this function is appropriate because: (1) it avoids the difficulty in measuring output prices and (2) output quantities (rather than output prices) are allowed to explain a larger portion of the variation in profitability, which is consistent with what we know about banking practice. To the extent possible, all theoretically important determinants of profitability are included in the PROFEFF function. We also use some of the same variables used to construct the PROFEFF function as correlates in a later section. Other PROFEFF studies follow a similar approach.[13]

We employ the stochastic frontier approach proposed by Jondrow et al. (1982) and used by DeYoung and Hasan (1998) to measure each bank's divergence from the best-practice frontier. The stochastic frontier approach assumes that deviations from the frontier include inefficiencies (profit inefficiencies in our case) and random

[9] The wage rate equals total salaries and benefits (including compensation for managers) divided by the number of full-time employees. The price of capital equals expenses of premises and equipment divided by premises and fixed assets. The price of deposits and purchased funds equals total interest expense divided by total deposits and purchased funds.

[10] Hughes et al. (2001) deal with the effect of risk in efficiency studies and provides a more detailed discussion of the potential implications of incorporating risk considerations directly into the equations. While the context of their discussion is cost efficiency, the same general considerations apply to profit efficiency studies.

[11] The HHI was calculated using the FDIC's Summary of Deposits (branch office) data.

[12] The methodology for performing these transformations is described in Berger and Mester (1997), p. 917n.

[13] See Berger and Mester (2001) and DeYoung and Hasan (1998, p. 580n) for an explanation and further justification for this procedure.

errors.[14] We estimate the inefficiency term as the expected value of the profit inefficiency conditional on the residuals from each year's profit function.

Equation 1 reflects the non-standard Fourier of a hybrid form since it contains both a quadratic profit function and a series of trigonometric (Fourier) terms. Like DeYoung and Hasan (1998), because of software limitations and limitations on the number of observations, we estimate a slightly modified version of this function. Our function contains 18 trigonometric terms and 54 other terms for a total of 72 independent variables. This procedure of limiting the number of terms (especially the third-order terms) is consistent with other recent PROFEFF studies (e.g., DeYoung and Hasan, 1998, Berger and Mester, 1997, 2003).

We define POTENTIAL PREROA as the estimated profitability of the bank if it operated on the best-practice frontier. Since efficiency cannot be negative, we follow other PROFEFF studies (e.g., DeYoung and Hasan, 1998) and define:

$$\begin{aligned} &\text{PROFEFF} = (\text{ACTUAL PREROA}/\text{POTENTIAL PREROA}) \quad \text{if PREROA} > 0 \\ &\text{PROFEFF} = 0 \qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \text{if PREROA} < 0. \end{aligned} \tag{2}$$

POTENTIAL PREROA thus equals actual PREROA plus inefficiency. PROFEFF is an efficiency measure which ranges from 0 for banks experiencing losses to 1 for banks operating on the best practice frontier. We estimate a separate PROFEFF function (frontier) for each year. After estimating the frontier we estimate profit efficiency for banks involved in mergers each year for 3 years before and 3 years after the merger. This approach allows the regression coefficients and the efficiency measures to vary over time, thereby allowing maximum flexibility in the estimation procedure.[15]

Mergers do not impact the construction of the profit efficiency frontier. The frontier is constructed exactly as in previous profit efficiency studies (i.e., those noted above), most of which do not involve mergers. *All* banks in the holding company database are included in the frontier for the years that they are in existence. The construction of the PROFEFF frontier is a completely separate process from the analysis of the performance of the merging banks and is done prior to the merger analysis.

3.1 Short-term (merger announcement period) stock market returns

The event study methodology is used to measure the average daily abnormal returns associated with bank acquisition announcements. Our event date, t_0, is defined as the first report date of the bank acquisition in *The Wall Street Journal*. As in Brown and Warner (1985), for the target banks, abnormal returns for bank j for each date t in the event period t_{-11} to t_{+11} are calculated as:

$$AR_{jt} = R_{jt} - \left(a_j + b_j R_{mt}\right) \tag{3}$$

[14] Inefficiencies are assumed to follow an asymmetric, half normal distribution, and the random errors follow a symmetric normal distribution.

[15] As noted in Berger et al. (1995) and in Wheelock and Wilson (1999), the period of this study included significant technological and regulatory changes for US banks and so it is important to estimate the efficient frontier every year.

where AR_{jt} is the abnormal return, R_{jt} is the daily return, R_{mt} is the daily return on the CRSP value-weighted index, and the parameters a_j and b_j are obtained from the market model, estimated for each bank j, with daily returns for the period t_{-220} to t_{-20} relative to the announcement date. We measure the cumulative abnormal returns (CARs) over the 2-day event period $[-1, 0]$ consisting of days t=0 and t=−1, where day t=0 is the announcement date and t=−1 is the day prior to the announcement. We also measure cumulative abnormal share returns over three additional time intervals including $[-1, +1]$, $[-11, -2]$, and $[+2, +11]$. Following the methodology of Mikkelson and Partch (1989), the z-statistic used to test for statistical significance of standardized cumulative abnormal share returns is computed as the product of the square root of sample size and the average standardized cumulative abnormal returns.

Determinants of abnormal merger returns Next, we develop and estimate a regression model to explain the cross-sectional determinants of bank merger CARs. The principal variable of interest in these equations is the profit efficiency of the acquiring bank. We measure this variable in three ways, as follows:

ACQPROFEFF is the pre-merger profit efficiency of the acquiring bank for the 3-year period preceding the merger. We expect this variable to have a positive effect on acquirer abnormal returns because market participants should expect that better managed acquirers will do a better job of building wealth for the combined firm. We expect this variable will have a negative effect on target abnormal returns because well-managed banks are less likely to overpay when they acquire another bank. $ACQPROFEFF_{DIFF}$ is the average PROFEFF of the acquiring bank during the 3-year period after the merger less the same bank's average PROFEFF for the period 3 years before. $ACQTARPROFEFF_{DIFF}$ is the 3 year average pre-merger profit efficiency of the acquiring bank less 3 year average pre-merger profit efficiency of the target. We expect the same relationships outlined above for the second and third variable since these are simply other ways of expressing acquirer PROFEFF.[16]

Control variables In addition to the three profit efficiency variables, we include the following control variables in our regression equations, based on prior literature:

DEPOSIT (demand, savings and time deposits as a percent of total assets) Banks value these core deposits because they are a cheaper and more reliable source of funds than money market borrowings (e.g., Koch and MacDonald, 2003). Hence, an acquisition of a bank with higher levels of core deposits should be more valuable to an acquirer because of higher expected profitability, and the acquirer should thus be willing to pay more for the target bank. The effects on the stock price of the acquirer, the target, and the combined firm should thus be positive. However, it is possible that core deposits are already reflected in the target's stock price, so the second effect is more uncertain than the first.

Industry concentration (represented by HHI) An implication of the structure–performance hypothesis (e.g., Gilbert, 1984) is that an acquisition has greater

[16] Profit Efficiency has been increasing on average during this period (e.g., Akhigbe and McNulty, 2003) so well managed banks should be increasing their PROFEFF faster than the average bank.

potential for increased profitability for the acquirer if the target operates in a concentrated market. This study uses the Hirschman-Herfindahl index (HHI) for the target bank measured at the county level (based on FDIC branch office data) to represent the industry concentration level. We expect the HHI to have a favorable impact on the acquirer's stock price because of this potential for increased profitability. The effect on the target could also be positive, again unless market concentration is already reflected in the stock price.

Relative size of target (RELSIZE; asset size of target divided by that of acquirer) Palepu (1986) argues that the likelihood of acquisition decreases with firm size. This is because transaction costs are likely to be higher and there are fewer institutions with the ability to bid when targets are particularly large. Song and Walkling (1993) point out that in mergers involving small firms the bidders need fewer resources. Another consideration is that large mergers often involve significant operational risk for acquirers, such as the need to integrate two large and different computer systems. Analysts have also pointed to differences in the way the market scrutinizes small and large firms. Atiase (1985) and Slovin et al. (1991) discuss how these information signaling effects in a merger are inversely related to relative size. Since investors scrutinize larger target banks more closely, we hypothesize that less incremental information about these banks would be gained at the time of the merger announcement. Thus, for all of these reasons, shareholders of small banks should gain the most from bank mergers. Thus we expect the effect of relative size to be positive for the acquirer, and negative for the target.

INSTATE (equals 1 if the target and acquirer are in the same state; 0 otherwise) Market overlap mergers frequently generate more cost savings than market extension mergers. Thus, we expect the sign to be positive for the acquirer, the target and the combined firm. For example, the 1995 Chase–Chemical merger was estimated by management to generate up to $1.5 billion in cost savings (Rose, 1999), much of it from closing overlapping offices.

STOCK (equals 1 if the medium of payment is all stock and 0 if it is part or all cash) Travlos (1987) finds that the method of payment in a merger or tender offer creates a signaling effect. Managers offering all stock may reveal their notion that their stock is overvalued. If the acquirer pays a high premium for the target, which frequently happens, the target firm's shareholders will be better off if this payment is in the form of cash and hence worse off if it is in the form of stock. (As discussed throughout this paper, the stock of the acquirer frequently declines in value following the acquisition.) Thus, we expect the valuation effects to be negative for both the acquirer and the target.

SERIAL (a dummy variable equal to 1 if the bank has acquired other banks within a 5-year period; 0 otherwise) SERIAL is included to test the hypothesis of Brown (2000), a bank stock analyst, and others, that banks that acquire large numbers of other banks are motivated more by managerial enrichment than by an interest in enhancing shareholder returns. If market participants have similar sentiments, the coefficient of SERIAL would be negative for the acquirer. The expected sign would be unclear for the targets. However, there is an alternative hypothesis. Market participants may expect that banks that have acquired other banks have useful

experience in making mergers work. If this effect predominates, the expected sign would be positive for the acquirers and (possibly) the targets.

PREMIUM (purchase price less market capitalization of target divided by market capitalization of the acquirer) Ceteris paribus, if an acquirer pays a high premium, this will clearly be bad news for the acquirer's shareholders and good news for the target's shareholders. Thus, we expect a negative relation with the acquirer's returns and a positive relation with the target's stock price.

RNEAL (a dummy variable equal to 1 if the merger occurred after the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act and Act of 1994, and 0 otherwise) This legislation dramatically altered the incentives for bank mergers, and potentially the returns, since it provided for nationwide interstate branching by 1997. It also allowed banks to consolidate branches in various states into one organization, which allowed banks to operate more efficiently after a merger. The legislation increased competition in the bank merger market and made mergers more attractive, and thus more likely to occur. The number of potential bidders for each target increased, which should increase returns for a given target. However, this notion that bidders would have to pay more to acquire a given target would also imply lower expected returns for acquirers. Thus, we expect returns to be negative for the acquirers and positive for the targets.

Based on this discussion, the general model is as follows:

$$\begin{aligned}&\text{CUMULATIVE ABNORMAL RETURN} = \text{function}(\text{ACQPROFEFF},\\&\text{ACQPROFEFF}_{\text{DIFF}}, \text{ACQTARPROFEFF}_{\text{DIFF}}, \text{DEPOSIT}, \text{HHI}, \text{RELSIZE},\\&\text{INSTATE}, \text{STOCK}, \text{SERIAL}, \text{PREMIUM}, \text{RNEAL})\end{aligned} \tag{4}$$

where:

ACQPROFEFF	pre-merger profit efficiency of the acquiring bank;
$\text{ACQPROFEFF}_{\text{DIFF}}$	the average PROFEFF of the acquiring bank during the 3-year period after the merger less the same bank's average PROFEFF for the period 3 years before;
$\text{ACQTARPROFEFF}_{\text{DIFF}}$	3 year average pre-merger profit efficiency of the acquiring bank less 3 year average pre-merger profit efficiency of the target bank;
DEPOSIT	demand deposits and time and savings deposits relative to assets;
HHI	county Herfindahl index for the target bank;
RELSIZE	asset size of target divided by that of the acquirer;
INSTATE	a dummy variable which equals 1 if the target is in the same state as the acquirer, and 0 otherwise;
STOCK	a dummy variable which equals 1 if the medium of exchange is all stock, and 0 otherwise;
SERIAL	a dummy variable which equals 1 if acquirer has acquired other banks within the past 5 years, and 0 otherwise;

PREMIUM	purchase price less market capitalization of target divided by market capitalization of the acquirer;
RNEAL	a dummy variable which equals 1 if the merger occurred after passage of the Riegle-Neal Act of 1994, and 0 otherwise.

In order to understand the relationship between changes in PROFEFF and returns as completely as possible, and because the three measures of acquirer profit efficiency are closely related, we estimate three versions of this model, with the CAR as the dependent variable, by including the above three measures of acquirer PROFEFF. The first model includes ACQPROFEFF, the profit efficiency of the acquiring institution. The second include $\text{ACQPROFEFF}_{\text{DIFF}}$, and the third includes $\text{ACQTARPROFEFF}_{\text{DIFF}}$.

4 Empirical results

Tables 1 and 2 (discussed above) presents information about the 271 acquisitions in our sample. The pace of these large acquisitions has accelerated over time. Examining the sample acquisitions in successive periods, we note that twenty-seven mergers (10% of the total) were completed in the late 1980s, 110 (40% of the total) are from the period 1990 to 1995, and the remaining 134 (50% of the total) from 1996 to 2001. The mid and late 1990s were characterized by a large number of mega-mergers that are included in our sample. In 1994, 2000 and 2001 the maximum acquirer asset size is over $100 billion. The acquirers are larger than the targets on average in most years but not always; 1990 and 1998 are exceptions.

Table 3 shows PROFEFF measures for the acquirers and the targets. While a merger is usually thought to involve an efficient bank acquiring an inefficient one (e.g., Berger and Humphrey, 1992), the actual result in our more recent sample is the opposite. In the 3 years prior to the acquisition, the mean target PROFEFF is 0.7830, while that of the acquirers is only 0.7621 (a statistically significant difference of 0.0246, shown in the last line of table 3). Comparing the medians produces an even more dramatic difference, 0.8643 for the targets vs. only 0.8126 for the acquirers (a statistically significant difference of 0.0517).

However, much more than the targets, the acquirers had substantially improved their PROFEFF in the period prior to the merger. Specifically, the acquirers' PROFEFF gains were 6.38 percentage points (0.7925–0.7287, as shown in the first three lines of table 3) compared to the target's 1.36 percentage points (0.7874–0.7738). One possible explanation, which appears likely from these data, is that the acquisitions were part of an aggressive strategy of restructuring, cost control and growth.

Efficiency gains continued after the acquisitions. Specifically, mean post-merger PROFEFF minus pre-merger PROFEFF for the acquirers is 5.72 percentage points (0.0572). These results are consistent with Cornett et al. (2006) who report gains in pretax operating cash flow beginning 2 years before mergers (see, e.g., table 6 of their paper).

Table 4 shows the cumulative abnormal returns (CARs) for the 271 acquisitions for the acquirer, the target and the combined firm. In the 2-day window, prior day and announcement day, the average target CAR is −8.96%, which is significantly

Table 3 Profit efficiency measures surrounding the 271 merger announcements for acquirers and targets

Year	Acquirers		Targets	
	Mean	Median	Mean	Median
−3	0.7287	0.8194	0.7738	0.8947
−2	0.7650	0.8370	0.7989	0.8836
−1	0.7925	0.8452	0.7874	0.8834
0	0.8102	0.8594	–	–
+1	0.8160	0.8556	–	–
+2	0.8129	0.8535	–	–
+3	0.8289	0.8674	–	–
Pre-merger PROFEFF	0.7621	0.8126	0.7867	0.8643
Post-merger PROFEFF[2]	0.8193	0.8407	–	–
Post- minus pre-merger PROFEFF	0.0572*	0.0281*	–	–
Pre-merger PROFEFF (targets minus acquirers)[3]	0.0246*	0.0517*	–	–

The sample of bank mergers consists of 271 bank acquisitions during a recent 16-year period (1986–2001) involving acquiring banks listed on the Center for Research in Security prices (CRSP) tapes. Data for the banks involved in these 271 bank mergers are extracted from the call report data to calculate the profit efficiency (PROFEFF) measures. Pre-merger PROFEFF is the average for the 3 years before the merger. Post-merger PROFEFF is the average for 3 years after the merger. Pre-merger PROFEFF (targets minus acquirers) is 3-year average pre-merger PROFEFF for targets (e.g., 0.7867) minus the same figure for acquirers (e.g., 0.7621).

*Significant at the 1% level.

different from 0 at the 1% significance level. This contrasts with a significant −1.38% CAR for the same window for the acquirers. This result is consistent with Houston et al. (2001) and other studies of the effects of bank mergers.[17] For the combined firm the CAR for the 2-day window is a positive 0.79% which is statistically significant at the 5% level.

Table 5 presents descriptive statistics for the variables used in the regressions. The average acquirer has profit efficiency of 76.2%, which is another way of saying that these banks, on average, are 76% as efficient in generating profits as banks operating on the best-practice frontier. Targets on average are 76% as large as the acquirers, but the median is only 29.4%, indicating that a small number of large acquisitions are responsible for the high mean value. Serial has a median value of one, indicating that at least half of our acquisitions are by banks that had been involved in previous acquisitions.

Table 6 presents our regression analysis of the determinants of the acquirers' CARs. As noted, we present three models, one for each of the acquirer PROFEFF measures. As expected, Model 1 shows a significant positive relationship between announcement-period abnormal returns and the profit efficiency of the acquiring bank. This important finding indicates that efficiency does matter in determining the market's reaction to merger announcements. If the acquirer is efficient, the market reacts more positively, or (more likely) less negatively. The relationship is economically significant. For example, if ACQPROFEFF is 10 percentage points

[17] See, for example, Bliss and Rosen (2001), Table 2.

Table 4 Cumulative abnormal returns to target banks and acquirers in response to merger announcements

Number of events	Event period	CAR (%)	*z*-statistic	% Positive
CARs of targets in response to merger announcements				
271	(−11, −2)	3.08	7.58***	58*
271	(−1, 0)	8.960	56.84***	75*
271	(+2, +11)	−0.85	−1.44	38
CARs of acquirers in response to merger announcements				
271	(−11, −2)	−0.23	−1.04	47
271	(−1, 0)	−1.38	−11.05***	34*
271	(+2, +11)	−0.07	−0.72	43
Value weighted CARs of combined targets and acquirers in merger announcements				
271	(−11, −2)	−0.06	−0.52	49
271	(−1, 0)	0.79	2.31**	51
271	(+2, +11)	−0.49	−1.41	42

The sample consists of 271 bank mergers during 1986–2001 listed on the Center for Research in Security Prices (CRSP) tapes. Abnormal returns are calculated as the difference between the actual returns and the expected returns. Expected returns are generated from the market model parameters, estimated with daily returns from the period t_{-220} to t_{-20} relative to the offering date. Following the methodology of Mikkelson and Partch (1989), the *z*-statistic is computed as the product of the square root of sample size and the average standardized cumulative abnormal returns.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Table 5 Descriptive statistics for the variables used in the cross-sectional regressions

Variable	Minimum	Maximum	Std. dev.	Median	Mean
DEPOSIT	0.0652	0.7856	0.1137	0.6057	0.5961
HHI	0.0462	1.0000	0.1077	0.2074	0.2269
ACQPROFEFF	0.3953	0.9984	0.2160	0.8126	0.7621
$\text{ACQPROFEFF}_{\text{DIFF}}$	−0.3689	0.6517	0.1481	0.0281	0.0470
$\text{ACQTARPROFEFF}_{\text{DIFF}}$	−0.4203	0.9348	0.2517	−0.0571	−0.0209
RELSIZE	0.0049	5.8152	1.2629	0.2938	0.7622
INSTATE	0.0000	1.0000	0.4132	0.0000	0.2174
STOCK	0.0000	1.0000	0.4881	1.0000	0.6120
SERIAL	0.0000	1.0000	0.5000	1.0000	0.5288
PREMIUM	−0.0972	1.1772	0.3931	0.1061	0.0259

The variables are defined as follows: DEPOSIT=demand deposits and time and savings deposits relative to assets for the target bank; HHI=county Herfindahl index for the target bank; ACQPROFEFF=pre-merger profit efficiency of the acquiring bank for the 3-year period prior to the merger; $\text{ACQPROFEFF}_{\text{DIFF}}$=difference in the 3-year average pre- and post-merger profit efficiencies of the acquiring bank, $\text{ACQTARPROFEFF}_{\text{DIFF}}$=difference in the 3-year average pre-merger acquiring bank and target bank profit efficiencies; RELSIZE=natural log of the target's total assets divided by natural log of acquirer's total assets; INSTATE=a dummy variable equal to 1 if the target is in the same state as the acquirer, and 0 otherwise; STOCK=a dummy variable which equals 1 if the medium of exchange is stock, and 0 otherwise; SERIAL=a dummy variable which equals 1 if acquirer has acquired other banks within the past 5 years, and 0 otherwise; PREMIUM=purchase price less market capitalization of the target divided by the market capitalization of the target.

Table 6 Cross-sectional regression analysis of acquirer announcement period abnormal returns

Variable	Dependent variable (CAR(−1,0))								
	Model 1			Model 2			Model 3		
	Coefficient	*t*-statistic	Std-coeff.	Coefficient	*t*-statistic	Std-coeff.	Coefficient	*t*-statistic	Std-coeff.
INTERCEPT	−6.2797	−2.44**	0.0000	−6.7838	−2.70***	0.0000	−6.8922	−2.63***	0.0000
ACQPROFEFF	4.7244	3.45***	0.3456	–	–	–	–	–	–
$ACQPROFEFF_{DIFF}$	–	–	–	8.0384	4.14***	0.2949	–	–	–
$ACQTARPROFEFF_{DIFF}$	–	–	–	–	–	–	3.1372	2.06**	0.1625
DEPOSIT	3.2374	0.77	0.0682	7.6844	2.06**	0.1620	8.2586	2.10**	0.1741
HHI	3.3952	1.20	0.0891	4.1320	1.51	0.1085	4.8352	1.69*	0.1270
RELSIZE	0.0471	1.52	0.1074	0.0667	2.18**	0.1520	0.0589	1.85*	0.1342
INSTATE	−1.7706	−2.19**	−0.1761	−1.8833	−2.45	−0.1873	−2.2412	−2.74***	−0.2229
STOCK	−2.9983	−3.58***	−0.2536	−2.8400	−3.44*	−0.2402	−2.8648	−3.31***	−0.2423
SERIAL	1.2771	1.81*	0.1278	1.2944	1.86*	0.1295	1.4081	1.95**	0.1409
PREMIUM	−0.0016	−0.12	−0.0076	0.0033	0.24	0.0154	0.0010	0.07	0.0046
RNEAL	−1.6681	−2.17**	−0.1629	0.4079	0.56	0.0398	−0.4476	−0.58	−0.0437
Sample size	271			271			271		
R^2	0.3878			0.4074			0.3568		
Adjusted R^2	0.3503			0.3711			0.3175		
F-value	10.34***			11.23***			9.06***		

The dependent variable, CAR (−1,0) = the announcement period abnormal return for the acquiring institution; the independent variables are defined as follows: DEPOSIT = demand deposits and time and savings deposits relative to assets for the target bank; HHI = county Herfindahl index for the target bank; ACQPROFEFF = pre-merger profit efficiency of the acquiring bank for the 3-year period prior to the merger; $ACQPROFEFF_{DIFF}$ = difference in the 3-year average pre- and post-merger profit efficiencies of the acquiring bank, $ACQTARPROFEFF_{DIFF}$ = difference in the 3-year average pre-merger acquiring bank and target bank profit efficiencies; RELSIZE = natural log of the target's total assets divided by natural log of acquirer's total assets; INSTATE = a dummy variable equal to 1 if the target is in the same state as the acquirer, and 0 otherwise; STOCK = a dummy variable which equals 1 if the medium of exchange is stock, and 0 otherwise; SERIAL = a dummy variable which equals 1 if acquirer has acquired other banks within the past 5 years, and 0 otherwise; PREMIUM = purchase price less market capitalization of the target divided by the market capitalization of the target; RNEAL = a dummy variable which equals 1 if the merger occurred after the Riegel-Neal Act of 1994, and 0 otherwise.

*significant at the 10% level

**significant at the 5% level

***significant at the 1% level

higher, the average CAR is 47 basis points higher (0.10*4.72). In the second model, we find, as expected, that the coefficient of $ACQPROFEFF_{DIFF}$ is positive. Ceteris paribus, if the acquirer improves its PROFEFF by 10 percentage points, the CAR will be 80 basis points higher (0.10*8.03). The reader should evaluate this result, and the others, relative to an average CAR for this event window of −1.38%. This is thus a very important result because it indicates that market participants are apparently able to determine, in advance, which acquiring banks are more likely to bring about an improvement in efficiency, as measured by PROFEFF. In Model 3 we find that $ACQTARPROFEFF_{DIFF}$ is also a significant determinant of returns. Ceteris paribus, if the acquirer has PROFEFF 10 percentage points greater than the target, the CAR is 31 basis points higher (0.10*3.14). For the more common case where the target is more efficient, the CAR would be lower by the same amount.

The economic significance of acquirer profit efficiency is substantial, as indicated by the standardized regression coefficients. These coefficients measure the impact of a one standard deviation change in each independent variable on the dependent variable. For example, a standardized regression coefficient of 0.25 indicates that a one standard deviation increase in the independent variable is associated with a 25% increase in the dependent variable. The standardized regression coefficients indicate that in Model 1 and Model 2, acquirer profit efficiency is one of the most important determinants of abnormal returns with impacts of 29.5% to 34.6%. In Model 3 the coefficient is 16.3%. Relative to the other independent variables, acquirer PROFEFF is thus one of the most important determinants of cumulative abnormal returns.

The control variables that are significant in determining differences in acquirer CARs in Model 1 and Model 2 are INSTATE, which is negative, and STOCK, which is also negative. In Models 2 and 3 the DEPOSIT variable and RELSIZE are positive and significant. Relative size (RELSIZE) is also positive and significant in Models 2 and 3. The SERIAL variable is significant and positive in all three equations. The HHI is significant in Model 3, but only at the 10% level and only in Model 3. The dummy variable for the Regle–Neal Act is negative and significant only in Model 1, as expected.

We expected the sign of INSTATE to be positive, because of the cost savings involved with mergers among two banks in the same market. Apparently investors place more emphasis on the ability of acquirers to expand in new markets. Our results for STOCK are consistent with our expectations, based on Travlos (1987) and other studies that bidders experience lower abnormal returns when acquiring targets with stock. According to this signaling argument, stock payments for acquisitions suggest low confidence in the stock performance of the post-acquisition bank. The results for DEPOSIT confirm our expectations about the importance of core deposits. Returns may be higher for higher HHIs because acquisitions of banks in more concentrated markets have greater potential for profitability gains for the resulting institution. However, there is only weak support for this notion.

Our initial hypothesis, based on Brown (2000), that market participants might penalize serial acquirers such as Bank One (now part of JP Morgan Chase), First Union (now part of Wachovia) and Bank of America is not supported, because the SERIAL variable is positive and significant in all three models. We base this hypothesis on Brown's notion that mergers involving serial acquirers appear to be motivated more by the desire for managerial enrichment than by a desire to

enhance shareholder value. However, our results would be more consistent with the alternative notion that market participants value the experience of these institutions in managing previous bank acquisitions. The results indicate that investors place importance on two characteristics of the acquirer, its efficiency and its experience in managing previous acquisitions, when they evaluate bank mergers. Interestingly, our results are consistent with the recent findings of DeLong and DeYoung (2007) that investors are better able to value acquisitions when they can observe the effects of previous acquisitions.

Table 7 presents the same model with the abnormal returns of the target as the dependent variable. Again, ACQPROFEFF is highly significant. Target abnormal returns are lower when the acquirer is more profit efficient. This is another important result because it indicates that well-managed banks (those with higher profit efficiency) are less likely to overpay when acquiring other banks. The second acquirer PROFEFF variable, $ACQPROFEFF_{DIFF}$ is also negative and highly significant. This result is driven by the same factors as in Model 1. When the acquirer is attempting to improve its efficiency it is less likely to overpay. The difference in PROFEFF between the two banks is not significant (Model 3).

The control variables that are significant here are DEPOSIT (negative sign in Models 2 and 3), HHI (positive sign in Model 1) RELSIZE (negative sign in Models 2 and 3) INSTATE, STOCK (positive sign in all three equations) and RNEAL (positive sign in Model 1).

We expected the sign of DEPOSIT to be positive, and there is no ready explanation for these conflicting results. The positive relationship between HHI and the target's return is as expected. Market concentration has a positive impact on target valuation, at least according to Model 1. The sign of RELSIZE is also as expected. Smaller targets produce greater valuation effects, for the reasons discussed in detail in Section 3. INSTATE acquisitions are associated with positive returns for the target, consistent with expectations. STOCK transactions are expected to have a negative valuation effect for the target but the results show a consistently positive effect. The results are not that clear cut because the STOCK variable is set equal to 0 for mergers which involve both cash and stock as the medium of payment. According to Model 1, the passage of Riegle-Neal did have the expected positive effects on target returns.

These results clearly indicate a significant relationship between the econometric concept of profit efficiency and the market phenomenon of abnormal stock returns. This positive relationship indicates that around the merger announcement, the market expects that shareholders of acquiring banks with higher profit efficiency are more likely to benefit from the merger. In addition, shareholders of acquiring banks are more likely to benefit at the announcement when the acquiring bank improves its profit efficiency ex post and when there is a large difference between the acquiring bank and target bank's profit efficiency.

5 Summary and conclusions

There appears to be no study that examines the relationship between profit efficiency and stock market returns in bank mergers. To fill this gap in the literature we apply profit efficiency (PROFEFF) analysis to 271 bank mergers covering the

Table 7 Cross-sectional regression analysis of target announcement period abnormal returns

Variable	Dependent variable (CAR(−1,0))								
	Model 1			Model 2			Model 3		
	Coefficient	*t*-statistic	Std-coeff.	Coefficient	*t*-statistic	Std-coeff.	Coefficient	*t*-statistic	Std-coeff.
INTERCEPT	19.1464	2.25**	0.0000	20.8229	2.46***	0.0000	21.3705	2.46***	0.0000
ACQPROFEFF	−12.8971	−2.84***	−0.3136	–	–	–	–	–	–
$ACQPROFEFF_{DIFF}$	–	–	–	−18.4970	−2.83***	−0.2255	–	–	–
$ACQTARPROFEFF_{DIFF}$	–	–	–	–	–	–	−5.6397	−1.16	−0.0970
DEPOSIT	−7.7833	−0.56	−0.0545	−20.9376	−1.67*	−0.1467	−23.1611	−1.78*	−0.1623
HHI	13.2829	1.41	0.1159	10.6226	1.15	0.0927	8.5968	0.91	0.0750
RELSIZE	−0.1930	−1.87*	−0.1461	−0.2420	−2.35**	−0.1832	−0.2228	−2.12**	−0.1687
INSTATE	5.0591	1.89*	0.1672	5.7740	2.23**	0.1908	6.8956	2.55***	0.2279
STOCK	5.2893	1.91*	0.1486	4.9754	1.79*	0.1398	5.1589	1.80*	0.1450
SERIAL	−2.8195	−1.20	−0.0937	−2.9332	−1.25	−0.0975	−3.2158	−1.34	−0.1069
PREMIUM	−0.0360	−0.77	−0.0551	−0.0493	−1.05	−0.0754	−0.0445	−0.93	−0.0681
RNEAL	4.2882	1.68*	0.1391	1.0332	0.42	0.0335	1.3217	0.52	0.0429
Sample Size	271			271			271		
R^2	0.2575			0.2572			0.2234		
Adjusted R^2	0.2120			0.2117			0.1758		
F-Value	5.66***			5.66***			4.70***		

The dependent variable, CAR (−1,0) = the announcement period abnormal return for the target institution; the independent variables are defined as follows: DEPOSIT = demand deposits and time and savings deposits relative to assets for the target bank; HHI = county Herfindahl index for the target bank; ACQPROFEFF = pre-merger profit efficiency of the acquiring bank for the 3-year period prior to the merger; $ACQPROFEFF_{DIFF}$ = difference in the 3-year average pre- and post-merger profit efficiencies of the acquiring bank, $ACQTARPROFEFF_{DIFF}$ = difference in the 3-year average pre-merger acquiring bank and target bank profit efficiencies; RELSIZE = natural log of the target's total assets divided by natural log of acquirer's total assets; INSTATE = a dummy variable equal to 1 if the target is in the same state as the acquirer, and 0 otherwise; STOCK = a dummy variable which equals 1 if the medium of exchange is stock, and 0 otherwise; SERIAL = a dummy variable which equals 1 if acquirer has acquired other banks within the past 5 years, and 0 otherwise; PREMIUM = purchase price less market capitalization of the target divided by the market capitalization of the target; RNEAL = a dummy variable which equals 1 if the merger occurred after the Riegel-Neal Act of 1994, and 0 otherwise.

*significant at the 10% level

**significant at the 5% level

***significant at the 1% level

years 1986–2001. Profit efficiency deals with a bank's financial performance relative to a frontier of best practice banks. PROFEFF is a sophisticated, econometric financial performance metric that takes asset composition, liability composition, capitalization and other factors into account. Thus, we consider more profit efficient banks as better managed than others. Calculation of this single financial performance statistic for participants in bank mergers allows us to address the following questions:

Is the increased efficiency and improved financial performance after bank mergers found by other researchers a continuation of a trend that began several years before the merger? Which bank is more efficient prior to the merger, the acquirer, as one would expect, or the target? Can the valuation effects associated with bank mergers be attributed to differences in the profit efficiency of the acquirer? Do investors expect that more efficient banks, and banks involved in previous mergers, will do a better job of increasing value? Are the positive wealth effects that the target bank shareholders normally receive less when better-managed (high profit efficient) banks are the bidders? The last three questions can be summarized as follows: are differences in the efficiency of the acquiring bank priced in financial markets?

Our analysis indicates that we should answer this summary question affirmatively. We find that the acquirer's PROFEFF has a significant and positive effect on the returns experienced by the acquiring bank's shareholders. We conclude from this that better managed banks are expected to generate more value for shareholders through the merger. Interestingly and importantly, we also find that well managed (highly profit efficient) banks pay less when they acquire other banks. This finding stems from the fact that the coefficient of the variable representing the acquirer's PROFEFF in the target abnormal return equation is negative and highly significant.

We also find that the improvements in financial performance and efficiency after bank mergers are a continuation of trends that began at least 3 years before the merger. Contrary to expectations, targets are more profit efficient on average than acquirers prior to mergers. In addition, one of our control variables is a dummy variable for acquiring banks that had been involved in other mergers within a 5-year period. This control variable also has a significant and positive relationship to acquirer abnormal returns. Thus, acquiring banks involved in previous mergers are also expected to generate more value for shareholders through the merger. Financial market participants apparently take something akin to the econometric concept of profit efficiency into account when they make decisions about bank stock purchases and sales around merger announcement dates.

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