Federal Reserve Bank of Chicago

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REVISED September 28, 2005

WP 2004-17

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Abstract: We offer a new explanation for why academic studies typically fail to find value creation in bank mergers. Our conjectures are predicated on the idea that, until recently, large bank acquisitions were a new phenomenon, with no best practices history to inform bank managers or market investors. We hypothesize that merging banks, and investors pricing bank mergers, "learn-by-observing" information that spills over from previous bank mergers. We find evidence consistent with these conjectures for 216 M&As of large, publicly traded U.S. commercial banks between 1987 and 1999. These findings are consistent with semi-strong stock market efficiency.

JEL Codes: G14, G21, G28, G34
Key Words: mergers, learning, information spillover, banks, market efficiency

The authors thank Yakov Amihud, Allen Berger, Rob Bliss, Eli Brewer, Kenneth Daniels, Paul Halpern, Beverly Hirtle, Wenying Jiangli, Morris Knapp, David Marshall, Hamid Mehran, Art Murton, Don Morgan, Rich Rosen, Wei-Ling Song, Kevin Stiroh, Dan Sullivan, Greg Udell, and Haluk Unal for their helpful comments, and Susan Yuska for her assistance with the data.

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Information Spillovers in the Execution and Valuation of Commercial Bank M&As

"You can observe a lot just by watching."
Lawrence Peter (Yogi) Berra

Under the semi-strong efficient markets hypothesis, stock prices react positively (negatively) to public events and announcements that informed market participants expect will increase (decrease) long-run firm value. However, realized long-run outcomes need not be consistent with short-run market reactions. One reason is that the public information set about the firm—including information idiosyncratic to the firm, its competitors, its customers, its production technology, or its regulation—may change unexpectedly after the event in a way that exacerbates, mutes, or reverses the impact of the short-run event on long-run firm value. Another reason is that the event being priced in the short-run may itself be poorly understood by market participants. Indeed, if the information necessary to value the event is not in the public information set—say, because the event is a new kind of phenomenon—then even in the absence of post-event informational surprises, the initial reaction of a semi-strong efficient market may be an inefficient long-run predictor of firm value.

Mergers and acquisitions (M&As) of large banking companies over the past two decades have been difficult to value, as well as difficult to execute, for both of the above reasons. First, the banking industry experienced a series of substantial and unpredictable strategic shocks during the 1980s and 1990s. Examples include the rapid commoditization of consumer credit markets (home mortgages, credit card loans, auto financing), the disappointing performance of a thought-to-be-promising business model (Internet banking), a large merger that forced Congress' hand on repealing Glass-Steagall restrictions earlier than expected (CitiCorp-Travelors), and slower-than-expected geographic integration (there is still no banking company with full service branches in all 50 states). It is reasonable to expect, however, that the frequency and magnitude of these types of informational shocks will diminish over time as the

industry approaches a structural, technological, and regulatory equilibrium, thus stabilizing the informational environment in which bank mergers are valued and executed.

Second, because decades of strict regulation had prevented commercial banks from operating across state lines and product market boundaries (e.g., insurance, brokerage, securities underwriting), M&As involving large, publicly traded banking companies were a relatively new phenomenon in the 1980s and into the 1990s. There was little reliable information available to the market, or even to the merging banks themselves, regarding which types of mergers would create the most value or which banking companies would be good at planning and executing mergers—in other words, there were no established best practices for merging two large banking companies. As more commercial bank mergers occurred over time, however, one might expect such information and best practices to emerge, and that this information would eventually spillover from one bank to other banks, and from these banks to investors. Stated differently, it is reasonable to expect that banks would learn how to better plan and execute mergers by observing previous bank mergers, and it is similarly reasonable that investors would learn how to better value bank mergers as they observed and evaluated more of them. It is this potential for "information spillover" and "learning-by-observing" in which we are most interested in this study.

An intensive process of mergers and acquisitions has transformed U.S. commercial banking from an industry best characterized by thousands of small, traditional, privately held firms shielded from geographic and product market competition, to an industry now characterized by increasingly large and technologically progressive banks in vigorous competition to sell a wide range of financial services. This massive industry consolidation was expected to enhance efficiency by eliminating banks that were operating below efficient scale, exposing local banks to competition from other markets, and reallocating assets away from inefficient bank managers. But academic studies have found little systematic evidence that the stock market expects bank mergers to create value, that bank mergers improve financial performance in the long-run, or that the market can predict post-merger financial performance. Some plausible explanations have been offered for these empirical findings, for example: managerial hubris and

other principal-agent problems, an ongoing industry disequilibrium that makes executing and evaluating bank mergers difficult, and accounting conventions idiosyncratic to the banking industry that cloud performance measurement.

We offer a new explanation for these empirical findings. We argue that mergers of large, publicly traded commercial banks in the 1980s and 1990s were difficult to plan, execute, and value because these mergers were in many ways a new phenomenon. When regulatory restrictions on inter-state banking and non-banking financial activities were rolled back in the 1980s and 1990s, M&As became a vehicle for commercial banks to expand into new geographic markets and new financial products such as brokerage, insurance, and investment banking. But these acquiring banks had no best-practices guidelines for planning and executing these increasingly large and complex acquisitions, and capital markets had no experience evaluating these new kinds of deals. Under such circumstances, it is not surprising that many and perhaps most commercial bank M&As would perform poorly; nor is it surprising that investors would have difficulty pricing bank M&As.

We also argue that these circumstances will eventually change, in large part due to information spillover. We hypothesize that commercial banks will learn how to better plan and execute M&As, not necessarily or only by participating in repeated acquisitions themselves, but by observing the previous mistakes and successes of other acquiring banks. Note the distinction here between "learning-by-observing" and "learning-by-doing." The former, which we study in this paper, is predicated on the spillover of external information generated by other merging banks. The latter, which we do not study in this paper, is predicated on the generation of private, internal information via repeated acquisitions by the same bank. Similarly, we also hypothesize that investors will learn how to better evaluate bank mergers by observing the successes and deficiencies of previous bank acquisitions.

If these information spillover hypotheses are correct, then the typical commercial bank merger of, say, the mid-1990s or late-1990s would have been more likely to create value than the typical commercial bank merger of the 1980s, because bank managers would have benefited from observing a larger number

of previous commercial bank M&As in the new deregulated and technologically advanced banking environment. These information spillover hypotheses also suggest that the stock market would have been a more accurate predictor of the long-run performance of commercial bank M&As announced during the 1990s than those announced during the 1980s. Note that these patterns would be consistent with the extant academic findings that the financial performance of the *average* bank merger announced during the 1980s and 1990s has been poor, and that the ability of the stock market to predict post-bank-merger performance during the 1980s and 1990s has *on average* been poor.

We present four formal hypotheses: about value creation by bank M&As and how this value creation is related to information spillover from previous bank M&As, and about stock market valuations of bank M&As and how these valuations are related to information spillover from previous bank M&As. We draw a distinction between "learning-by-doing" and "learning-by-observing." The former concept has been thoroughly studied in the management literature and is driven by the internal experiences of firms. In contrast, the latter concept (upon which we focus here) is fueled by information generated outside of the firm—for example, by the performance of recent M&As between other banks. We test our four hypotheses using data from 216 M&As between publicly traded commercial banking companies in the U.S. between 1987 and 1999. These empirical tests are based mainly on the inter-relationships among three M&A-related variables: the abnormal stock market returns for the combined banks upon merger announcement, the long-run change in the financial performance of the combined banks, and the volume of other (unrelated) bank M&As in the years prior to the merger announcement.

We find strong and persistent evidence consistent with the notion that managers of merging banks learn-by-observing previous bank mergers, and persistent albeit somewhat weaker evidence that market investors learn-by-observing previous bank mergers. Our results suggest that the value to bank managers and market investors of the information present in previous mergers decays relatively quickly—sometimes after just a single year—consistent with the rapid pace of change in bank regulation, banking technologies, industry structure, and merger profile in the U.S. during our sample period. These findings

help explain why many academic studies have rejected the notion that bank M&As have created value. More broadly, our findings imply that the stock market is a poor evaluator of phenomena that are incompletely understood by market participants. Note that if this "incomplete understanding" is characterized as a deficiency in the stock of public information (which seems reasonable), then the inability of investors to accurately price commercial bank M&As observed in previous studies becomes quite consistent with the theory of semi-strong market efficiency.

I. Experience Effects

Asher (1956), Arrow (1962), Alchian (1963), Hartley and Corcoran (1978) and others developed the concept of experience effects to explain efficiency differences across British and U.S. airframe manufacturers after the second world war. The concept is typically expressed as follows: holding production technology and firm size constant, as a firm accumulates experience using the technology, unit costs will fall. Experience is usually measured by accumulated production volume over time starting from the initial unit produced, and experience effects are often characterized as "learning curves." Ghemawat (1985) collected information on 97 such learning curves from firms in various industries. For over 80 percent of the firms in his sample, a doubling of experience (that is, a 100% increase in accumulated production between time *s* and time *t*) was associated with between a 10% to 25% decline in unit costs.

While it seems intuitive that increased experience will improve outcomes, in some cases experience can actually impede understanding, progress, and profits. Merlo and Schottor (2001) construct an experiment to test whether subjects learn better by doing or by observing, and find that "observers" outperform "doers" in determining the unique Nash equilibrium in a multi-round tournament. Doers focus on each round individually, and receive either positive or negative reinforcement for the actions they take, while observers have the luxury of considering potential payoffs from hypothetical decisions. Jovanovic and Nyarko (1996) model the influence of learning-by-doing on technological choice. Agents

who invest their human capital to learn a technology tend to be reluctant to switch technologies, even when new technologies promise greater output. In the realm of finance, Gervais and Odean (2001) model how traders and investors overemphasize their successes and thereby become overconfident, and that this overconfidence can lead to lower profits. Griliches (1979) argues that measures of learning that are based on accumulated experience over time can overstate a firm's knowledge, because knowledge gained in the past depreciates over time.

In addition to the knowledge they accumulate from their own activities, Griliches (1979) points out that firms also accumulate knowledge via "information spillover" from the activities of competitors, suppliers, customers, universities, and government. In this study we characterize the experience gained from spillover as "learning-by-observing" to distinguish this external experience channel from the more familiar concept of learning-by-doing in which the creation and exploitation of new information is internal to the firm. For example, because investors are external to the firms they are attempting to value, the stock market cannot learn-by-doing but can learn-by-observing private information that spills over into the public sphere. Pastor and Veronesi (2003) model the market's valuation process in the presence of learning about firm profitability. Starting with the straightforward theoretical result that market-to-book ratios are positively related to earnings uncertainty, they hypothesize that market-to-book ratios should decline over firms' lifetimes as information about the firms' potential earnings streams becomes more certain. They find empirical support for these predictions, especially for young firms and for firms that do not pay dividends.

There are numerous channels through which useful information can spill over from one firm or industry to another firm or industry. Consulting firms can be great clearinghouses for knowledge; Ofek and Sarvary (2001) show that consulting firms leverage their knowledge from previous projects when they embark on new projects. In contrast, investment banks are probably a less important source for the spillover of unbiased, value-relevant information; Rau (2000) finds investment bankers are more interested in closing the deal than in creating mergers that perform well. A less formal channel is "the

industry buzz" which travels through trade publications (e.g., the *American Banker*), industry networks, and professional/social circles. Information can spill over via labor mobility, and in the longer term via regulatory filings. In the semiconductor industry there is evidence linking technology spillover to engineers changing employers (Irwin and Klenow 1994) and also to patent filings (Almeida and Kogut 1997). In the banking industry, the location of regional and headquarters offices in close proximity to each other within large cities is likely to increase the frequency and speed of information spillover among banks, clients, and personnel through both formal and informal channels.[1] Moreover, the recent consolidation of the U.S. banking industry has likely intensified these information flows as managers move from bank to bank as a result of merger-induced reassignments, buyouts, or overhead reductions. If anything, information spillover in the banking industry may be of higher quality than in other industries: extensive quarterly regulatory filings provide an especially detailed source of financial and operating information and may make it relatively easier for industry analysts to validate qualitative information (i.e., "the buzz") about commercial banking companies.

There has been little systematic investigation of experience effects at financial institutions. Remolona and Wulfekuhler (1992) argue that finance companies that entered niche markets (such as leasing) earlier than their commercial bank competitors benefited from "dynamic scale economies in information because of their early entry and accumulated experience." However, the authors did not estimate the impact of this accumulated experience on costs or productivity (i.e., a learning curve). DeYoung (2005) argues that newly chartered Internet banks may face two learning curves: an learning curve related to the general banking experience accumulated as the new bank matures, and a technology-specific learning curve related to the experience accumulated as the bank implements a new (Internet) business model. He finds strong evidence of the former but little evidence of the latter.

There is mixed evidence regarding experience effects at acquiring banks. DeYoung (1997) finds that mergers in which the acquiring bank has recent experience with acquisitions are more likely to generate post-merger gains in cost efficiency. Zhang (1997) finds that abnormal returns tend to increase

with experience for banks making FDIC-assisted acquisitions of insolvent banks, but not for banks making non-assisted acquisitions. Leshchinkskii and Zollo (2004) find that acquisition experience is positively correlated to post-merger financial performance, but only for acquiring firms that carefully codified their experiences in manuals and systems. In contrast to these studies, Beitel, Schiereck, and Wahrenburg (2002) find lower market returns upon announcement of bank acquisitions in which the bidders were experienced acquirers.

II. Bank M&A Performance

One of the puzzles in the empirical finance literature in recent years is the lack of systematic evidence that bank M&As enhance firm value. For example, in their review of the literature on bank mergers and cost efficiency, Berger, Demsetz, and Strahan (1998) concluded that these studies "show very little or no cost X-efficiency improvement...on the order of 5% or less (p.162)." These were surprising findings, because the geographic-expansion M&As of the 1980s and 1990s were widely expected to generate scale economies and remove poorly run target banks from the industry. Some plausible explanations have been offered for these unexpected results: merger-induced cost reductions were offset by the increased costs associated with changes in post-merger risk profiles and business strategies (Demsetz and Strahan 1997; Hughes, Lang, Mester, and Moon 1999); cost savings were hidden by accounting conventions (Kwan and Wilcox 1999); some bank mergers focused on revenue gains rather than cost reductions (Akhavein, Berger, and Humphrey 1997); and some bank mergers were driven by managerial hubris rather than efficiency motives (Bliss and Rosen 1999).

James and Wier (1987), Cornett and De (1991), Houston and Ryngaert (1994), Becher (2000), DeLong (2001), Houston, James, and Ryngaert (2001), Rosen (2003) and others have studied the initial market reaction to the announcement of bank mergers. The following stylized facts have emerged from these studies: abnormal returns to target firms are large and positive; abnormal returns to acquiring banks are marginally negative; and combined abnormal returns are insignificant. A handful of other studies

found mixed evidence when testing whether abnormal market returns are good predictors of post-merger financial performance. For example, Cornett and Tehranian (1992) find a positive correlation between initial market reaction to bank mergers and the long-run financial performance of the merged firms, but Pilloff (1996) and Hart and Ipilado (2002) find no such evidence.[2] Other studies (e.g., DeLong 2003b) have tested whether strategic bank mergers—that is, combinations of two banks with similar geographic footprints or similar activity mixes—perform better than average in the long-run, but find little evidence.

Some observers have argued that the planning, implementation, and evaluation of bank mergers during the 1980s and 1990s was unusually difficult because the banking industry was in disequilibrium during this time period. Flannery (1999) cautions that rapid and repeated changes in regulatory and technological environments make it difficult for the market to gauge the value-creating effects of bank mergers. At the extreme, Pilloff and Santomero (1998) argue that in such an environment every bank merger must be viewed as an idiosyncratic case. This is consistent with Halpern (1983) who, early on in the study of value creation by M&As, suggested that it is difficult to make generalizations about mergers. Although this view implies that there has been little useful information spillover for bank mergers, opportunities for learning-by-observing should be increasing as the industry disequilibrium dissipates and regularities concerning successful bank mergers emerge.

III. Hypotheses

We hypothesize that commercial banks have learned, by observing recent bank mergers, how to better plan and execute mergers in an evolving, post-deregulation banking environment. This broad hypothesis is consistent with an academic literature that finds lackluster financial performance *on average* for bank M&As over the past two decades. It posits that bank mergers announced following periods of relatively light bank M&A activity would be less likely to create value, while bank mergers announced following periods of relatively heavy bank M&A activity would be more likely to create value. We also hypothesize that the stock market has learned, by observing recent bank mergers, how to better identify

value-enhancing bank mergers. This broad hypothesis is consistent with extant academic evidence that investors have been unable to accurately value bank M&As over the past two decades *on average*. It posits that market valuations would be especially poor for bank mergers announced following periods of relatively light bank M&A activity, and would be relatively more accurate for bank mergers announced following periods of relatively heavy bank M&A activity.

We formalize these two broad hypotheses into four explicit, empirically testable hypotheses. The first of these is called the "efficient mergers" hypothesis:

H1: Bank mergers improve the long-run financial performance of the combined banks.

As discussed above, this hypothesis does not receive systematic support in the existing bank merger literature. We test H1 here to see if we can replicate the general findings of the previous literature using our merger data set, and to establish a focal point for the hypothesis tests that follow. The second hypothesis is an inter-temporal variant of H1, and is called the "bank learning-by-observing" hypothesis:

H2: Bank mergers are more likely to improve the long-run performance of the combined banks if a substantial number of other banks have merged in the recent past.

Implicit in H2 is the proposition that bank managers learn by observing the experiences of recent bank mergers *via* information spillover, and this information makes them more likely to repeat the successes, and less likely to repeat the mistakes, of those mergers.

Even if the average bank merger does not create value in the long-run, an efficient stock market should be able to identify which bank mergers will perform relatively well or relatively poorly. The third hypothesis concerns the ability of the stock market to correctly value bank mergers, and is called the "efficient markets" hypothesis:

H3: The stock market is able to identify value-enhancing mergers upon their announcement.

As discussed above, there is little empirical support for this hypothesis in the extant bank merger literature. We test H3 here to see if we can replicate the general findings of the previous literature using our merger data set, and to establish a focal point for our final hypothesis test, which is called the "market learning-by-observing" hypothesis:

> *H4: The stock market will be better able to identify value-enhancing bank mergers if a substantial number of other banks have merged in the recent past.*

Implicit in H4 is the proposition that investors learn by observing the post-merger successes and failures of recent bank mergers, resulting in merger valuations that are more likely to reflect the long-run financial performance of the combined banks. Also implicit in H4 is the presumption that the stock market is semi-strong efficient—that is, the spillover of private information from previous mergers adds to the stock of public information, and thereby facilitates more correct valuations of current mergers.

IV. Bank Merger Data Set

We test these four hypotheses for 216 mergers and acquisitions of publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999. Although thousands of U.S. commercial banks merged or were acquired during the 1980s and 1990s, only a small percentage of those mergers combined two publicly traded banking companies. We constructed an initial data set of 616 mergers that were announced and completed between publicly-traded banking companies between 1987 and 1999. These mergers were identified from the Thomson Financial Securities Data (formally Securities Data Company, or SDC) database.[3] From this initial sample, 206 mergers were excluded because stock return data for either the acquiring firm (11 mergers) and/or the target firm (195 mergers) were not available in the Center for Research in Stock Prices (CRSP) database. We excluded 65 more mergers because stock market data were incomplete for either the acquirer (14 mergers) or the target (51 mergers). An additional 128 mergers were excluded from our sample for a variety of reasons: either

the acquiring or target firm was not a commercial bank or bank holding company (35 mergers), we could not observe one full calendar year of pre-merger accounting data for both merger partners (23 mergers), we could not observe three full calendar years of post-merger accounting data for the merged bank (67 mergers) often because an acquirer became a target itself (33 mergers), or the target firm was a failing bank (3 mergers). The 216 deals in our final data set are listed in order of announcement date in the appendix to this paper.

Table I displays some descriptive information for our merger data set. Accounting data for acquiring banks and target banks comes from the Y-9C Reports that bank holding companies submit to the Federal Reserve, or from the Call Reports that banks submit to the Federal Deposit Insurance Corporation for the handful of banking companies in our data that are not organized as holding companies. The number of mergers per year, the size of the acquirer, and the size of the target all exhibit increasing trends over time. These data reflect the evolving industry conditions during our sample period—in particular, an industry-wide focus on recapitalization rather than growth during the poor banking environment early in the sample period, and the fruits of industry deregulation that permitted banking companies to grow in size and geographic scope later in the sample period. There are no discernable trends in the percentage of mergers with strategic geographic focus (proxied by the degree to which the deposit markets of the acquiring and target banks substantially overlap) or strategic activity focus (proxied by the degree to which the stock returns of the acquiring and target banks are positively correlated).[4]

V. Measuring stock market valuation

We use an event study methodology to measure the initial stock market reaction to each of the 216 merger announcements. A daily market model is estimated using ordinary least squares (OLS) regression techniques:

$$R_{i,t} = \alpha_i + \beta_i * R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where $R_{m,t}$ is the daily return on the Datastream Index for U.S. Banks, i = (1,216) indexes the mergers, and t = (-300, -50) indexes days prior to the merger announcement. The dependent variable $R_{i,t}$ is either the daily market return on the acquiring bank ($R^A_{i,t}$), the daily market return on the target bank ($R^T_{i,t}$), or the daily return on the combined market values of the acquiring and target banks ($R^P_{i,t}$), all of which were calculated using CRSP data. We calculate the combined return $R^P_{i,t}$ as follows:

$$R^P_{i,t} = ln[(MV^A_{i,t} + MV^T_{i,t}) / (MV^A_{i,t-1} + MV^T_{i,t-1})] \quad (2)$$

where $R^P_{i,t}$ is the day t market return on a portfolio consisting of the acquiring and target banks, *ln* is the natural log operator, and $MV^A_{i,t}$ and $MV^T_{i,t}$ are the market values, respectively, of the acquiring and target banks on day t. As demonstrated by DeLong (2001), constructing pro forma combined returns in this fashion is more accurate than the typical procedure which uses asset-weighted or equity-weighted averages of the acquirer and target returns (e.g., Houston and Ryngaert 1994). The cumulative abnormal returns (*CAR*s) around the event date are calculated by summing the estimated daily abnormal returns from ten days before the merger announcement to one day after the announcement:

$$CAR_i = \sum_{t=-10}^{+1} [R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i * R_{m,t})] \quad (3)$$

We also estimated the acquirer, target, and combined *CAR*s using three alternative event windows (-5 days to +5 days, -10 days to +10 days, and –10 days to +5 days).

Table II displays summary statistics for acquirer, target, and combined *CAR*s. Consistent with the large body of merger literature that precedes us, the merger announcements simply redistributed wealth

from acquirer shareholders (statistically significant *CAR*s ranging from –2.39% to –3.16%) to target shareholders (statistically significant *CAR*s ranging from 13.92% to 16.43%) in the short run with no creation of new shareholder wealth (statistically non-significant combined *CAR*s). The results are robust across the four different event window definitions, and as such we will use the –10 day to +1 day *CAR* values throughout the remainder of this study. Table III reports chronological subsample averages for these *CAR*s for the first 108 mergers (in column b) and the second 108 mergers (in column c) in our data. These averages suggest that bank mergers remained purely redistributional over time and did not create value on average. We tested this more formally by regressing combined, acquirer, and target *CAR*s on an intercept and a linear time variable. These estimated regression lines are super-imposed on the *CAR* scatter diagrams in Figures 1, 2, and 3. None of these time trends has a statistically significant slope coefficient. Overall, the market reaction to bank M&As became neither more favorable nor less favorable over the course of our 1987-1999 sample period.

VI. Measuring post-merger financial performance

We measure the long-run change in financial performance, Δ*post-merger performance*, for the merging banks in seven dimensions of performance: ROA (return-on-assets), ROE (return-on-equity), Interest Margin (net interest income-to-assets), Cost Efficiency (noninterest expense-to-operating income), Loans-to-Assets, Core Deposits-to-Assets, and Noninterest Income Ratio (noninterest income-to-operating income). As described below, Δ*post-merger performance* is based on industry-adjusted data: it measures the pre-merger (one year prior) to post-merger (three years after) change in the financial ratios of the merging banks after first normalizing those financial ratios to average industry-wide levels in those years. This approach largely inoculates Δ*post-merger performance* from inter-temporal changes in recorded financial performance caused by industry-wide phenomena or economy-wide phenomena that systematically affect the banking industry.

There are three compelling reasons to measure long-run post-merger performance based on accounting ratios rather than market returns. First, accounting ratios capture *actual* financial performance over a period of time, while market returns are forward-looking measures of expected earnings. Second, accounting ratios allow us to analyze important components of financial performance (e.g., cost efficiency or core deposit funding) in addition to overall financial performance (e.g., ROA and ROE). Third, on eof our goals is to test conjectures about the stock market's ability to predict future financial performance (hypotheses *H3* and *H4*); to this end, using short-run market returns (*CAR*s, which measure investor expectations based on current information) to predict long-run buy-and-hold returns (*BAHR*s, which compare investor expectations based on different information sets at two different points in time) simply comes up short.

We follow a four-step process to calculate Δ*post-merger performance*. First, we observe the financial statements of the acquiring and target banks at the end of the calendar year preceding the merger announcement date, combine these statements to create pro forma financial statements for a hypothetical combined bank, and calculate hypothetical pre-merger financial ratios for the pro forma combined bank. Second, we calculate post-merger financial ratios for the actual combined banks using financial statements three full calendar years after the merger announcement date. Berger, Saunders, Scalise, and Udell (1998) argue persuasively that it takes three years for merged banks to achieve the bulk of the merger-induced changes in financial and operational performance. Third, we normalize both the pre-merger and post-merger financial ratios by subtracting off the same-year, industry-average financial ratios.[5] Fourth, we take the difference between the normalized pre-merger financial ratios and the normalized post-merger financial ratios. Table IV displays sample and subsample averages for Δ*post-merger performance* for the seven different performance dimensions.

Column (a) in Table IV provides our basic test of Hypothesis 1 (efficient mergers). Consistent with the previous literature on bank merger performance, overall post-merger financial performance as measured by ROA and ROE does not improve on average, and ROA actually declines by a small but

statistically significant amount. Post-merger Noninterest Income Ratio also declines on average, although this is not necessarily an indication of poor financial performance: DeYoung and Rice (2004) conclude that well-managed banks focus more closely on traditional intermediation-based activities such as lending, and expand more slowly into noninterest activities than their less well-managed peers. Neither Cost Efficiency nor the Interest Margin improve post-merger; the former result is interesting given that cutting duplicative and wasteful overhead costs was the primary stated motive for many of these bank mergers. There is a substantial increase (equal to about 5 percent of assets) in Loans-to-Assets. While this increase may or may not indicate improved asset allocation (i.e., loans-to-assets can be *too* high, depending on the risk-return profile of the marginal loan and the cost and stability of loan funding), it is consistent with Akhavein, Berger, and Humphrey's (1997) conclusion that revenue efficiency increased with bank megamergers during the 1990s chiefly due to post-merger shifts in acquired banks' assets from securities to loans. There is also a substantial improvement (equal to about 2½ percent of assets) in Core Deposits-to-Assets. Core deposits (defined here as deposits in transactions accounts and non-brokered time deposits less than $100,000) represent a relatively inexpensive and stable funding source, and are held by customers likely to purchase additional products from the bank. This is somewhat of a surprise, given the well-documented depositor run-offs following the First Union-CoreStates merger, the Bank of America-Security Pacific merger, and other large bank mergers during the 1990s.[6]

Columns (b) and (c) in Table IV display subsample averages for the first half and second half of the mergers. These data suggest that, as time passed during the sample period, banks got better at achieving post-merger financial performance gains. Post-merger performance was statistically better in the second half of the sample in terms of ROA, ROE, Cost Efficiency, and Core Deposits-to-Assets. Figures 4 through 10 plot each of the long-run financial performance measures against time, and include a linear OLS trend line. The trend lines are statistically positive for ROA, ROE, and Core Deposits-to-Assets and statistically negative for Cost Efficiency, all of which indicate that bank merger performance improved over time. As discussed above, the statistically negative change in Noninterest Income Ratio

over time may also indicate improving merger performance over time as well. Although many of these results are consistent with the learning-based explanation of merger performance posited in Hypothesis 2 (bank learning-by-observing), these are uncontrolled tests and thus cannot rule out other explanations.

VII. Regression frameworks

We test the remainder of our hypotheses using multivariate regression techniques. Equation (4) provides our test of Hypothesis 2 (bank learning-by-observing):

$$\Delta post\text{-}merger\ performance_i = a + b \cdot LBYO_i + c \cdot time_i + d \cdot LBYO_i \cdot time_i + f \cdot controls_i + e_i \qquad (4)$$

where the dependent variable Δ*post-merger performance* is the change in industry-adjusted accounting performance (e.g., ROA, ROE, cost efficiency) for merger *i* (*i*=1,216) during the three years following the merger, as described above. The residual term *e* captures the unexplained variance in Δ*post-merger performance* and is assumed to be randomly distributed around zero for merger *i* and unrelated to the other right-hand-side terms. The variables in the *controls* vector are described in detail below. The two main right-hand-side variables are *LBYO* and *time*.

LBYO is our proxy for learning-by-observing, or more exactly, observable information spilling over from previous bank mergers from which bank managers and bank investors can potentially learn. As we discuss more fully below, *LBYO* can be thought of as an information-state variable. We calculate *LBYO* a number of different ways. Our base definition is *LBYO(3)* which is equal to the cumulative number of mergers involving either traded or non-traded commercial banking companies in the U.S. during the 1,095 days (three years) prior to the merger in question. This presumes that it takes three years for bank managers and investors to fully validate the information that spills over from previous bank mergers; while this is a somewhat arbitrary choice, it is consistent with the conventions used in many of the bank merger studies discussed above (e.g., Berger, Saunders, Scalise, and Udell 1998).

We augment our base definition *LBYO(3)* with three alternative definitions. First, we re-calculate *LBYO(3)* using different pre-merger learning-by-observing windows—as short as one year and as long as seven years—resulting in the following set of alternative measures: *LBYO(1)*, *LBYO(2)*, *LBYO(4)*, *LBYO(5)*, *LBYO(6)*, and *LBYO(7)*. Second, we construct a full set of *LBYO* variables based on non-cumulative learning-by-observing windows. *LBYO(y1)*, *LBYO(y2)*, ..., *LBYO(y7)* measure, respectively, the number of mergers that occurred within the year prior to the merger in question (1 to 365 days); within the second year prior to the merger in question (366 to 730 days), etc. Finally, we construct a weighted version of *LBYO* that includes the number of bank mergers observed in each of the previous seven years, with the more recent years receiving heavier weights based on a logistic distribution. The resulting variable, *weighted_LBYO*, accounts for the possibility that information observed further in the past degrades, either because it becomes less relevant to current circumstances or because it is forgotten. Figure 11 plots *LBYO(1)*, *LBYO(3)*, and *weighted_LBYO* against time for each of the 216 M&As in our data set, and illustrates that the information state represented by these variables does not increase monotonically during our sample period, but rather has several high and low points.

The variable *time* measures elapsed calendar time in years starting at the beginning of our sample period (*time*=1 for mergers announced in 1987; *time*=2 for mergers announced in 1988; etc.). We include *time* to separate general effects associated with the passage of time (e.g., regulatory change, technological progress) from the information spillover and learning effects more specific to bank mergers (*LBYO*). As seen above in Table 4 as well as in Figures 4-10, our Δ*post-merger performance* measures exhibit systematic increases and decreases over time, and by including *time* we hope to neutralize these general inter-temporal effects. Because these effects are unlikely to be linear, we also estimate alternative regressions in which *time* is replaced by a series of four technology trend variables—*cell phones* per capita, *computers* per capita, *ATM transactions* per capita, and *cashless transactions* per capita—all of which increase non-linearly over time, and hence may prove to be more flexible proxies for general time effects. Moreover, because these technology variables reflect changes in the speed at which information

travels, the efficiency with which information can be processed, and the manner in which banks produce financial services, they are likely to be related to the changing capabilities of bank managers and investors to plan, implement, and evaluate M&As.[7]

Hypothesis 2 (bank learning-by-observing) predicts a positive relationship between *LBYO* and Δ*post-merger performance*, i.e., a merger will tend to perform better as information spillover from recent mergers increases. We include the interaction term *LBYO*time* to account for the possibility that learning from information spillover may accelerate over time, or that the benefits from information spillover may diminish over time. Thus, any combination of b>0 and $d \gtreqless 0$ in equation (4) would be consistent with bank learning-by-observing.

Equation (5) provides our tests of Hypothesis 3 (efficient markets) and Hypothesis 4 (market learning-by-observing):

$$CAR_i = a + b \cdot \Delta post\text{-}merger\ performance_i + c \cdot LBYO_i + d \cdot \Delta post\text{-}merger\ performance_i \cdot LBYO_i + f \cdot controls_i + e_i \quad (5)$$

where as described above the dependent variable *CAR* is the cumulative abnormal return for the combined banks around the merger announcement date. Although the dependent variable *CAR* pre-dates the independent variable Δ*post-merger performance*, this specification is a natural way to test our hypotheses about merger pricing and information spillover. In a full information (strong efficient markets) world investors will know upon announcement how a merger will impact the financial performance of the merging firms (i.e., ΔROA, ΔROE, ΔInterest Margin, ΔCost Efficiency, ΔLoans-to-Assets, ΔCore Deposits-to-Assets, and ΔNoninterest Income Ratio) and will price the merger accordingly based on this knowledge. Thus, causation will run from Δ*post-merger performance* to *CAR*, where our measures of Δ*post-merger performance* are noisy proxies for actual investor knowledge upon merger announcement.

These measures are "noisy proxies" because we only get to observe them after three years, by which time unpredictable events may have enhanced or worsened actual merger performance. In a partial information (semi-strong efficient markets) world this causation will be somewhat weaker: in addition to being noisy, the ex post realizations of Δ*post-merger performance* also reflect merger-specific information that investors did not know at the time of the merger and hence could not have accurately priced. Thus, we are testing whether the strength of the causation running from Δ*post-merger performance* to *CAR* is at least partially explained by changes in the information-state variable *LBYO*.

Hypothesis 3 (efficient markets) predicts a positive relationship between *CAR* and Δ*post-merger performance* with no role for the information-state variable *LBYO*. If the stock market is efficient ***and*** investors are fully informed about the phenomenon they are pricing (strong efficient markets), then investors will be able to accurately price a new merger regardless of the amount of information spilling over from other recent mergers. Thus, we would expect b>0, c=0, and d=0 in equation (5). The volume of and/or experiences conveyed from other recent mergers has no impact on investors' information state under this hypothesis.

Hypothesis 4 (market learning-by-observing) predicts that the relationship between *CAR* and Δ*post-merger performance* will grow increasingly positive with increases in the information-state variable *LBYO*. If the stock market is efficient ***but*** investors lack full information about the phenomenon they are pricing (semi-strong efficient markets), then investors will be better able to price a new merger when there is relevant information spilling over from other recent mergers. Thus, we would expect d>0 as investor valuations more closely reflect actual merger value in high-information states. The implications of this hypothesis for coefficients b and c are less direct. Because risk-averse investors should be willing, ceteris paribus, to pay higher prices in high-information states (due to reduced uncertainty), we may observe a positive relationship between *CAR* and *LBYO* even in the absence of improved post-merger performance (c≥0). The expected sign for coefficient b is ambiguous. If investor

information is only somewhat incomplete, then we may still observe a positive relationship between *CAR* and Δ*post-merger performance* even in the absence of information spillover ($b \geq 0$). But if investor information is substantially incomplete and there is a substantial amount of uncertainty—a distinct possibility for combinations of unrelated firms in a newly deregulated industry environment—then investors might interpret increased profitability as a signal of increased risk, resulting in a negative relationship between *CAR* and Δ*post-merger performance* ($b < 0$). Thus, any combination of $b \gtreqless 0$, $c \geq 0$, and $d > 0$ would be consistent with the market learning-by-observing hypothesis.

A. Control variables

We include a vector of *controls* on the right-hand-side of equations (4) and (5) to help explain the variation in the dependent variables not related to our main hypothesis tests. Our control variables include the following:

- *Target equity-to-assets*. Post-merger financial performance will likely be hampered when the target bank has depleted levels of capital. Large numbers of banks became insolvent during the first part of our sample period (roughly 1987-1993), and although we exclude failing-target mergers from our data, target bank capital levels ranged as low as 2.35% in our data. Because banking conditions improved greatly during the course of our sample period, we also interact this variable with *time*.[8]
- *Activity focus*. Post-merger performance gains may be more likely when the target and acquiring banks have similar pre-merger business strategies (DeLong 2003b; Altunbas and Ibánez 2005). To measure business strategy similarities, we calculated the correlation between the pre-merger stock returns of the target and acquiring banks (Mørck, Shleifer, and Vishney 1990). *Activity focus* is a dummy variable equal to one for mergers in which this correlation was above the sample median. In alternative specifications, we replaced this dummy variable with the raw correlation on which it is based, with no material changes in the results.

- *Geographic focus*. Post-merger performance gains may be more likely when the target and acquiring banks have overlapping geographic footprints. To measure geographic overlap, we calculated the percentage of combined-bank deposits drawn from MSAs in which both the target and acquiring banks operated prior to the merger. *Geographic focus* is a dummy variable equal to one for mergers in which this measure was above the sample median. In alternative specifications, we replaced this dummy variable with the raw market overlap on which it is based, with no material changes in the results.
- *Learning-by-doing (LBYD).* We include a learning-by-doing variable to separate the potential effects of passive learning-by-observing from the potential effects of active, internal learning-by-doing. We define *LBYD* as the number of other bank acquisitions made during the previous 1,095 days (three years) by the acquiring bank.
- *Post-merger growth*. Post-merger financial gains may be less likely when the acquiring bank is growing rapidly (either *via* internal growth or by making additional acquisitions), which can divert management's attention from integrating the target bank into its new organization. *Post-merger growth* is the percentage growth rate of post-merger bank assets divided by the percentage growth rate of total industry assets over the three years following the merger. To reduce the influence of large outlying values we truncated *post-merger growth* at -30 and +30, which affected about 5% our observations.
- *log acquirer assets*. Post-merger financial performance may be affected by the size of the acquiring bank. For example, large acquiring banks may have already achieved scale-based improvements in operating costs and portfolio diversification prior to the acquisition. *log acquirer assets* is the natural log of the acquiring bank's total assets prior to the merger.
- *Equal size*. Post-merger performance gains may be less likely in so-called 'mergers of equals' in which control of the post-merger bank is in question. *Equal size* is a constructed variable that ranges

continuously from near zero for disparate-sized targets and acquirers, to one for equal-sized targets and acquirers (DeYoung 1997).

- *Megamerger*. Post-merger financial performance may be different in so-called 'megamergers' in which both the target and acquiring banks are large (Akhavein, Berger, and Humphrey 1997). *Megamerger* is a dummy variable equal to one for mergers in which both the target and acquiring banks have more than $1 billion in assets.
- *CEO tenure* and *CEO stock*. Post-merger financial gains may be less likely when acquiring bank managers are entrenched (Bliss and Rosen 1999). *CEO tenure* is the number of years the CEO of the acquiring bank has held that position, and *CEO stock* is the percentage of acquiring bank shares held by the CEO. Values were missing for *CEO tenure* and *CEO stock* for a small number of mergers. We substituted the sample median values in these cases.[9]
- *Percent stock.* Post-merger performance could be related to whether the acquirer paid for the target with stock or cash. Myers and Majluf (1984) and Eckbo, Giammarino, and Heinkel (1990) argue that an acquirer will pay for a merger with stock when the acquirer knows its stock is overvalued. Investors, realizing this strategy, drive down the price of the acquirer's stock. *Percent stock* is the percentage of payment the acquirer makes in stock.
- *Pooling.* Accounting measures of post-merger performance could reflect the type of accounting the acquirer uses to incorporate the target into its books. The pooling method superimposes the target's balance sheet upon the acquirer's balance sheet. The purchase method treats the target like any capital good, and differences between the purchase price and the target's market value must be amortized. Acquirers usually prefer the pooling method since fewer expenses occur to depress future earnings. (See DeLong 2003a for a discussion of the two methods.) *Pooling* is a dummy variable equal to one for mergers that use the pooling method.

- *Hostile.* The attitude of the target's management at the time of the merger could influence post-merger performance. Hostile takeovers could create more value than friendly ones, because hostile takeovers may be able to get rid of poor managers more easily than friendly takeovers (Jensen and Ruback 1983). On the other hand, hostile takeovers could create animosity among the employees of the merging partners, thereby hindering post-merger performance. *Hostile* is a dummy variable equal to one for unfriendly takeovers. Hostile takeovers are rare in the banking industry – only 3 of the 216 M&As in our data were hostile.

- *Hot market*. Post-merger financial performance may be related to so-called 'hot markets,' periods of time when investors respond especially positively to bank merger announcements. During a hot market, management may be more likely to make acquisitions that would not be acceptable to investors in less optimistic market environments (Rosen 2003). *Hot market* is equal to the average *CAR* for the previous five mergers in our data. For the first five mergers in our data, we set *hot market* equal to the mean value of *CAR*.

- *State M&As* and *ΔHHI*. Post-merger financial performance may be related to the regulatory and competitive environments faced by the merging banks. *State M&As* is the percentage of all banks that were acquired in the target bank's home state during the year of the merger, and is included to capture (inversely) state-level regulatory barriers to entry and expansion by merger. *ΔHHI* is the change in the Herfindahl index (weighted by the deposit shares of the acquiring and target banks) caused by the merger, and is included to capture the increase in potential market power due to the merger.

- *GDP growth*. Merging banks may perform better-than-average during certain phases of the business cycle due to cyclical variation in interest rates, the supply of deposit funding, the demand for financial services, inter-bank competition, etc. To partially control for these phenomena we include *GDP*

growth, the percent change in U.S. gross domestic product during the year in which the merger was announced.

Summary statistics for all of the dependent and independent variables used our the regression tests are provided in Table V.

VIII. Results for bank learning-by-observing

Table VI displays the results from ordinary least squares (OLS) estimation of equation (4). The estimated coefficients on *LBYO(3)* and *LBYO(3)*time* provide the tests of Hypothesis 2 (bank learning-by-observing). We find evidence consistent with bank learning-by-observing in four of the seven regressions. The coefficient on *LBYO(3)* is statistically positive and the coefficient on *LBYO(3)*time* is statistically negative in the ΔROA, ΔROE, and ΔInterest Margin regressions. These coefficients are also statistically significant in the ΔEfficiency Ratio regressions, albeit as expected with the opposite signs. The implied improvements in financial performance tend to be economically significant as well. A ten percent increase in *LBYO(3)* evaluated at the sample means generates an estimated 0.0004 increase in ΔROA; using the average pre-merger acquiring bank ROA of 0.0108 as a benchmark, this corresponds to a substantial 3.7% improvement in post-merger profitability. Similarly, a ten percent increase in *LBYO(3)* is associated with a 2.3% increase in ROE, a 1.3% increase in Interest Margin, and a 1.5% improvement in Efficiency Ratio.[10] Thus, our findings imply non-trivial information spillover-related improvements in post-merger bank performance.

The estimated coefficients on *LBYO(3)* are approximately 9 to 11 times the size of the estimated coefficients on *LBYO(3)*time*, which indicates robust bank learning-by-observing early in the sample period that gradually diminished over time. The bottom panel of Table VI shows the estimated derivatives of Δ*post-merger performance* with respect to *LBYO(3)*, evaluated for each value of *time* (1 through 13). The derivatives for ΔROA, ΔROE, ΔInterest Margin, and ΔEfficiency Ratio remain

statistically different from zero for *time* ≤ 6, implying that the existence of bank learning-by-observing in these performance dimensions had run its course (on average) by the mid-1990s. The ΔNoninterest Income derivatives are an exception to this pattern, and do not become statistically negative until *time* ≥ 10. This time lag implies that bank learning-by-observing regarding noninterest-based activities occurred late in the sample period, with a negative sign that is consistent with recent findings that risk-adjusted returns from nontraditional fee-based activities (e.g., investment banking, securities brokerage, insurance) may be less favorable than was initially expected by commercial banks (DeYoung and Rice 2004).

Tables VII and VIII provide robustness tests for the specification of *time* and *LBYO*. Table VII displays selected coefficient estimates from specifications of equation (4) in which the linear *time* trend variable is replaced by the non-linear per capita technology time trends for *cell phones*, *computers*, *ATM transactions*, and *cashless transactions*. The results are robust to the base case from Table VI, and continue to offer strong support for Hypothesis 2 in the ΔROA, ΔROE, ΔInterest Margin, and ΔEfficiency Ratio regressions.

Table VIII displays selected coefficient estimates from specifications of equation (4) in which the base case *LBYO(3)* variable is replaced by alternative definitions for the information-state variable. In Panel 1 the information set is assumed to include mergers from the previous seven years, with mergers in more recent years weighted more heavily. These tests generate robust results in support of Hypothesis 2 for ΔROA, ΔROE, ΔInterest Margin, and ΔEfficiency Ratio, and in addition they provide support of bank learning-by-observing for ΔCore Deposits-to-Assets. In Panel 2 the (unweighted) information sets are assumed to include mergers over various times periods prior to the merger; moreover, the value-relevance of information from previous mergers is sometimes assumed to degrade quickly (e.g., *LBYO(1)*) and is sometimes assumed to be long-lasting (e.g., *LBYO(7)*). The results suggest that information value degrades most quickly in the ΔLoans-to-Assets regressions, which provide support for Hypothesis 2 only when the information set is limited to mergers occurring within the past year (*LBYO(1)*). In contrast,

information has quite long-lasting value in the ΔROA, ΔROE, and ΔEfficiency Ratio regressions, where information sets as short as one year (*LBYO(1)*) and as long as six years (*LBYO(6)*) provide support for Hypothesis 2.

In some areas of financial performance only information from older mergers appears to be useful. For example, the coefficients on *LBYO(4)* through *LBYO(7)* in Panel 2 provide support for Hypothesis 2 in the ΔCore Deposits-to-Assets regressions, and the coefficients on *LBYO(4)* through *LBYO(6)* provide support for Hypothesis 2 in the ΔInterest Margin regressions. These results are consistent with the post-merger depositor run-off phenomena discussed above: if it took previous merging banks several years to figure out how to attract inexpensive core deposits back to the bank, then any lessons learned from observing those previous mergers would be delayed as well. The results from the ΔNoninterest Income Ratio regressions also are consistent with delayed learning—in this case, the sign of the learning-by-observing coefficient switches from positive to negative as the information set includes older mergers.

The results shown in Table IX suggest that previous mergers do not generate a continuous stream of observable useful information, but rather generate useful information at two separate junctures: during the initial post-merger year, and then again about three years later. The table displays the results obtained from re-estimating the Table VIII, Panel 2 regressions after replacing the cumulative learning-by-observing variables *LBYO(1)* through *LBYO(7)* with the non-cumulative (individual year) learning-by-observing variables *LBYO(y1)* through *LBYO(y7)*. The coefficient on *LBYO(y1)* is statistically significant for six of the seven performance measures (all but ΔCore Deposits-to-Assets), which implies that previous mergers generate useful information relatively quickly *and* this information can be observed and implemented by other merging banks. The results also imply that previous mergers yield a second round of useful, observable information after about three-to-four years. The coefficients on *LBYO(y3)* and/or *LBYO(y4)* are statistically significant for ΔInterest Margin, ΔEfficiency Ratio, ΔLoans-to-Assets, and ΔNoninterest Income Ratio. These results are consistent with the conventional wisdom that it takes three years for merged banks to achieve the bulk of the merger-induced changes in financial and operational

performance (Berger, Saunders, Scalise, and Udell 1998). Note that this second round of information is not associated with statistically significant increases in profitability—the (non-risk adjusted) profit enhancements from wider interest margins, improved cost efficiency, and increased loans-to-assets were apparently offset by reductions in noninterest income. As above, the evidence here implies that for some areas of financial performance previous mergers only slowly generate useful information (e.g., core deposit funding, noninterest income).

Returning to the Table VI regressions, a number of the control variables have statistically significant and economically sensible coefficients. M&As in which the combined banks share the same geographic market (*geographic focus*, Δ*HHI*), acquiring banks that make additional acquisitions in the years following the merger (*post-merger growth*), and M&As in which the acquiring bank was large (*log acquirer assets*) all tend to make smaller post-merger improvements in financial performance. In contrast, M&As in which both banks were relatively large (*megamergers*) tended to make larger post-merger improvements. Acquiring banks led by CEOs with large ownership stakes (*CEO stock*) tended to make post-merger progress in intermediation activities (ΔLoans-to-Assets, ΔInterest Margin), while acquiring banks led by CEOs with long job tenure (*CEO tenure*) were better able to hold on to core depositor relationships post-merger. The estimated derivatives with respect to *target equity-to-assets* (evaluated at the mean value of *time*) imply that post-merger performance improvements are more likely when the acquired bank has been poorly run or suffered from bad luck in the recent past. M&As announced during economic expansions (*GDP growth*) were less likely to improve post-merger interest margins and more likely to lose core depositors—these results are consistent with pro-cyclical narrowing of interest margins due to increases in short-term rates, increases in deposit demand, and increased inter-bank competition for lending opportunities.

It is worth emphasizing that the coefficient on *LBYD*, the learning-by-doing variable, is statistically significant only in the ΔLoans-to-Assets regressions. So while the data strongly support the possibility that banks benefit by observing other previous mergers, we find relatively little evidence here

to suggest that banks learn from their own previous mergers. This counter-intuitive finding in all likelihood reflects the fact that the banks in the best position to learn-by-doing—that is, banks that perform a lot of mergers—have noisy financial statements because they are perpetually digesting other banks, which makes it difficult to measure improved financial performance for any single merger in our empirical framework.

IX. Results for market learning-by-observing

Table X displays the results from ordinary least squares (OLS) estimation of equation (5). The estimated derivative with respect to *Δpost-merger performance* (displayed near the bottom of the table along with its p-value) provides a test of Hypothesis 3 (efficient markets) and the estimated coefficient on the interaction term *LBYO(3)*Δpost-merger performance* provides the test of Hypothesis 4 (market learning-by-observing).

We find very little evidence consistent with Hypothesis 3. The estimated derivative *∂CAR/∂Δpost-merger performance* is statistically significant only when post-merger performance is measured by ΔCore Deposits-to-Assets. Evidently, market investors were able to distinguish *ex ante* between bank mergers that had favorable versus unfavorable impacts on core deposit funding, but on average were not able to assess the impact of bank mergers on other dimensions of financial performance. The fact that this derivative test yields statistically non-significant results in the first two columns on Table X—where *Δpost-merger performance* is defined by the broad profitability measures ΔROA and ΔROE—suggests that market investors were not on average able to efficiently price bank mergers during our 1987-1999 sample period.

In contrast, we find relatively broad evidence consistent with Hypothesis 4 that market investors learn-by-observing. The positive coefficients on the interaction terms in the first two columns of Table X indicate that the correlations between *CAR* and *ΔROA* and between *CAR* and *ΔROE* are more positive for

mergers that occur during high information states. For example, in the average information state indicated by the median value of *LBYO(3)* = 0.7030, a one-standard deviation increase in *ΔROA* is associated with a trivial change in *CAR* of −0.0007 (only about 7/100ths of a percentage point).[11] But in the relatively high information state indicated by the 75th percentile value of *LBYO(3)* = 0.9895, a one-standard deviation increase in *ΔROA* is associated with an economically meaningful increase in *CAR* of +0.0072 (about 7/10ths of a percentage point). We obtain similar results using the regression results in the second column of Table X: in the relatively high 75th percentile information state, a one-standard deviation increase in *ΔROE* is associated with an economically meaningful increase in *CAR* of +0.0033 (about 3/10ths of a percentage point). The interaction term *LBYO(3)*Δpost-merger performance* is not statistically significant in the remaining five columns of Table X—thus, not surprisingly, our results on average indicate that an informed market prices mergers according to their impact on overall profitability (ΔROA, ΔROE) rather than their impact on the various components of profitability, some of which may be important in some mergers but relatively unimportant in other mergers.

A handful of the control variables bear statistically significant coefficients in these regressions. All else equal, market investors paid less for mergers of equals, a rational response given the anecdotal evidence that these mergers undergo difficult post-merger transitions. Ironically, investors paid less during "hot markets"—this likely indicates that bank merger pricing occurs in waves, so that mergers occurring near the end of, or just after, a so-called "hot market" (by our definition) period have lower than average prices. Consistent with the equation (4) results, investors paid less during economic expansions. Finally, investors paid more for hostile takeovers, although this result should be discounted given the small number (three) of hostile takeovers in our data.

For robustness, we re-estimated the equation (5) tests using alternative definitions for the information-state variable *LBYO*. The results are displayed in Table XI. In the first panel the *LBYO* variable is excluded entirely; this specification provides a simplified test of Hypothesis 3 (efficient markets). Again, we find evidence consistent with this hypothesis only for ΔCore Deposits-to-Assets.

The remaining four panels define the information state using, respectively, *LBYO(1)*, *LBYO(2)*, *LBYO(3)*, and *weighted LBYO*. As above, these regressions yield evidence consistent with Hypothesis 4 (market learning-by-observing) for the broad ΔROA and ΔROE performance measures, as well as some weak evidence in support of this hypothesis for the ΔEfficiency Ratio performance measure. Finally, the results here suggest that recent mergers contain relatively more valuable information for investors as well as for bank managers: the coefficient magnitudes for the interaction variables *LBYO*Δpost-merger performance* decline systematically as we include older information in the information-state variable.[12]

X. Conclusions

In this study we examine the long-run financial performance of 216 M&As of publicly-traded U.S. banking companies announced and completed between 1987 and 1999, as well as the ability of the stock market to predict this long-run performance. On average, these data are broadly consistent with the previous literature on bank merger and stock market performance: the typical bank merger did not improve post-merger financial performance, and investors were unable to accurately predict the future performance of the typical bank merger. However, when we analyze these data in a statistical framework that allows for the possibility that banks and investors can learn from observing the best and worst practices of previous bank M&As, we find evidence of improved post-merger financial performance as well as evidence of more accurate stock market predictions of this performance.

Our framework is based on two broad conjectures about information, merger execution, and merger valuation. We hypothesize that bank managers can "learn-by-observing" information that spills over from recent bank mergers, and we distinguish this passive learning from the more traditional notion of active "learning-by-doing." Although we find no systematic evidence of the latter, we do find persistent evidence consistent with the possibility that merging banks learn-by-observing. More exactly, we find that improvements in post-merger financial performance are positively associated with the quantity of observable bank mergers announced and in-process during the previous several years.

Similarly, we hypothesize that investors will become better able to accurately value bank mergers by observing the financial performance of previous bank mergers. Indeed, we find evidence consistent with this conjecture that the stock market learns-by-observing. More exactly, we find that the correlation between short-run market reactions and long-run post-merger financial performance is positively associated with the quantity of observable bank mergers during the previous several years. These results are statistically strong for broad measures of post-merger financial performance like ROA and ROE, and statistically non-significant for more narrow measures of post-merger financial performance like noninterest income, loan-to-asset ratios, and interest rate margins—a sensible result consistent with investors that price bottom line impacts rather than individual operational improvements at the post-merger bank.

Both of these broad conjectures are predicated on the fact that the large and often complex commercial bank mergers of the late-1980s and the 1990s were a relatively new phenomenon. To make these mergers productive, managers and consultants had to first develop a set of best merger practices, which could only be based on the accumulation of information spillovers from previous bank mergers. Lacking a track record of previous bank merger performance, investors could only base their evaluations on the accumulation of observable information about what kind of bank mergers tended to do well or do poorly. Importantly, while it took time for banks to develop best merger practices and for investors to develop a deep information set about bank mergers, our statistical results are not merely proxies for the passage of time, as we obtain our results in regression tests that control for time, relevant measures of technological advance, business cycles, and other time-related arguments. Moreover, our strongest results occur in the first year after previous mergers are observed, which suggests that (a) best practices for bank M&As is a moving target that evolved with changes in technology, competitive strategy, and market conditions during the 1980s and 1990s and (b) knowledge spillover intensifies with "event density" in a fashion similar to the informational benefits generated by "geographic density" documented in the urban economics literature (see footnote 1).

Our findings help explain why extant academic studies have rejected the notion that bank mergers create value. Furthermore, our findings suggest that the stock market may be a poor evaluator of new phenomena that are poorly or incompletely understood by market participants, and we note that this "failing" of the market is consistent with a semi-strong theory of market efficiency.

Finally, we stress that our findings should be interpreted with caution. While our tests indicate that the data are consistent with our hypotheses about experience effects and information spillover, we emphasize that our main test variable is only a proxy for these phenomena. We do not directly observe the transformation of accumulated experience and/or information spillover into applied knowledge. In addition, our hypotheses are not derived from a formal underlying theory of learning in the banking industry.

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Endnotes

[1] The idea that a dense economic landscape makes knowledge more likely to spill over between firms in the same industry dates to Alfred Marshall (1890). Carlino (2001) provides an overview of how urban characteristics impact knowledge spillovers, product innovation, and local economic growth.

[2] This mixed evidence for bank mergers parallels the evidence for mergers in general. For example, Healy, Palepu, and Ruback (1992) found statistically significant gains in post-merger operating performance, while Agrawal, Jaffe, and Mandelker (1992) found statistically significant stock market losses over a five-year post-merger period.

[3] Although this database includes mergers announced and completed as far back as 1979, in the years prior to 1987 only a small number of bank mergers met our sample selection criteria.

[4] These distinctions are based on the *geographic focus* and *activity focus* variables defined below in section VI.

[5] The industry averages are asset-weighted and hence are dominated by the performance of large banks, which is appropriate for the merging banks in our sample.

[6] For example, see comments made by Nancy Bush, "Bank Mergers: Hit or Myth?," *Proceedings from a Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, May 2004.

[7] The technology trend variables were constructed based on annual OECD (Organization for Economic Cooperation and Development) data for the U.S. during the merger announcement year. We did not include any Internet-related time series, because the Internet was not widely accessible until relatively late in our 1987-1999 sample period. For example, the first commercial online Internet service (Delphi) was not introduced until 1992 and the first graphical web browser (Mosiac) was not introduced until 1993 (Howe 2004). Banks did not offer Internet services until 1995, when Wells-Fargo first offered online account access to their customers and Security First Network Bank became the first Internet-only bank (DeYoung 2005).

[8] Between 1987 and 1993, the annual failure rate of U.S. commercial banks varied between 0.5% and 1.5%. Since then the annual failure rate has never exceeded 0.1%. In alternative specifications we replaced *target_equity-to-assets* with a *pre-1994* dummy. However, the statistical fit in these regressions was poor, and the results suggested colinearity among this dummy, *time*, and *LBYO*.

[9] We thank Hamid Mehran for access to these data.

[10] We calculate the percent change in *ROA* associated with a ten per cent increase in *LBYO(3)* as follows:

$$\%\Delta ROA = (.02843 - .00290*7.8935)*(.7263*.10)/(.0108) = 3.70\%,$$

where .02843 and .00290 are the coefficient estimates for *LBYO(3)* and *LBYO(3)*time* from equation (4); 7.8935 and .7263 are the mean values of *time* and *LBYO(3)* from Table 5; and .0108 is the pre-merger (one year prior) value of *ROA* for the average acquiring bank in our sample. We calculate the percent changes in the other performance measures in a similar fashion:

$$\%\Delta\text{ROE} = (.32817 - .03621*7.8935)*(.7263*.10)/(.1377) = 2.28\%.$$

$$\%\Delta\text{Interest Margin} = (.02329 - .00212*7.8935)*(.7263*.10)/(.0384) = 1.25\%.$$

$$\%\Delta\text{Efficiency Ratio} = (-.45976 + .04169*7.8935)*(.7263*.10)/(.6313) = -1.50\%.$$

[11] We calculate the percent change in *CAR* associated with a one standard deviation increase in ΔROA in the median information state as follows:

$$\%\Delta CAR = (-4.3783 + 6.0207*.7030)*(.0046) = -.0007.$$

where -4.3783 and 6.0207 are the coefficient estimates for ΔROA and $LYBO(3)*\Delta ROA$ from equation (5); .7030 is the median value of *LBYO(3)* from Table 5; and .0046 is the standard deviation of ΔROA from Table 5. For the 75th percentile information state the calculation is as follows:

$$\%\Delta CAR = (-4.3783 + 6.0207*.9895)*(.0046) = .0073.$$

[12] We also estimated equation (5) using the following alternative specifications, none of which altered our main results (results not shown): adding the time trend variable to the right-hand-side of the equation, adding any of our four technological change variables to the right-hand-side of the equation, and replacing the continuous *LBYO* variables with dummy variables equal to 1 if merger occurred during an "above-median" information state.

Table I

Data for 216 M&As between publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999.

Year	Number of Mergers Announced	Mean Assets of Acquirer ($ billions)	Mean Assets of Target ($ billions)	Number of Geographic Focus Mergers	Number of Activity Focus Mergers
			All mergers		
1987-1999	216	$28.5	$7.4	108 (50.0%)	108 (50.0%)
			By year of merger announcement		
1987	13	$22.7	$4.7	2 (15%)	6 (46%)
1988	8	$17.2	$6.1	4 (50%)	7 (88%)
1989	12	$14.8	$2.2	7 (58%)	2 (17%)
1990	4	$6.3	$1.3	1 (25%)	2 (50%)
1991	21	$41.0	$10.5	11 (52%)	15 (71%)
1992	18	$28.4	$4.0	8 (44%)	11 (61%)
1993	20	$24.9	$2.8	10 (50%)	10 (50%)
1994	14	$37.9	$2.9	10 (71%)	4 (29%)
1995	20	$43.4	$14.7	11 (55%)	11 (55%)
1996	19	$11.7	$1.0	12 (63%)	6 (32%)
1997	29	$34.7	$6.9	14 (48%)	11 (38%)
1998	24	$27.7	$18.3	12 (50%)	14 (58%)
1999	14	$25.3	$7.9	6 (43%)	8 (57%)

Sources: Thomson Securities Data, Federal Reserve Y-9 Reports, Federal Deposit Insurance Corporation Reports of Condition and Income (Call Reports).

Notes: Asset amounts are reported in 2002 dollars. A merger has Geographic Focus if the merging banks' geographic markets overlap more than the sample median. A merger has Activity Focus if the correlation between the merging banks' stock returns exceeds the sample median.

Table II

Cumulative abnormal returns (CARs) to stockholders upon merger announcement. Means with standard deviations in parentheses. Data for 216 M&As between publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999.

Event Window	Mean CAR for Combined Banks (Z-Score)	Mean CAR for Acquiring Banks (Z-score)	Mean CAR for Target Banks (Z-score)
-10 days to +1 day	0.30% (5.21)	-2.39%*** (5.11)	16.43%*** (16.20)
-10 days to +5 days	-0.39% (5.92)	-3.16%*** (6.03)	15.05%*** (24.44)
-10 days to +10 days	-0.26% (6.92)	-3.09%*** (7.36)	14.96%*** (24.57)
-5 days to +5 days	-0.47% (5.24)	-3.15%*** (5.65)	13.92%*** (22.89)

Sources: Authors' calculations.

Notes: ***, **, and * indicate statistically significant differences from zero, respectively, at the 1, 5, and 10 percent levels of significance in two-sided tests.

Table III

Subsample averages for cumulative abnormal returns (*CAR*s) to stockholders upon merger announcement. Means with standard deviations in parentheses. Data for 216 M&As between publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999. *CAR*s are expressed in percentages and are measured over the –10 to +1 day event window.

	(a) **Full sample (N=216)**	**(b)** **First half of sample (n=108)**	**(c)** **Second half of sample (n=108)**	**(d)** **Difference (c) – (b)**
combined CAR	0.30 (5.21)	0.22 (5.23)	0.39 (5.22)	0.17 (5.22)
acquirer CAR	-2.39*** (5.11)	-2.04%*** (4.71)	-2.73*** (5.47)	-0.69 (5.11)
target CAR	16.43*** (16.20)	14.89%*** (16.17)	17.98*** (16.15)	3.09 (16.16)

Sources: Authors' calculations.

Notes: The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Table IV

Change in long-run financial performance ratios (Δ*post-merger performance*) for merged banks. Means with standard deviations in parentheses. Data for 216 M&As between publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999. The Δ*post-merger performance* is measured on a window from -1 to +3 years around the merger completion date and is based on industry-adjusted performance ratios.

	(a) **Full sample** **(N=216)**	**(b)** **First half of sample** **(n=108)**	**(c)** **Second half of sample** **(n=108)**	**(d)** **Difference** **(c) – (b)**
ΔROA	-0.05* (0.45)	-0.17*** (0.50)	0.06 (0.37)	0.23*** (0.44)
ΔROE	-0.62 (6.19)	-2.08*** (7.43)	0.84* (4.77)	2.92*** (6.24)
ΔInterest Margin	0.03 (0.44)	0.06 (0.44)	-0.01 (0.43)	-0.07 (0.44)
ΔCost Efficiency	-0.47 (7.82)	1.37* (8.57)	-2.32*** (6.52)	-3.69*** (7.61)
ΔLoans-to-Assets	5.25*** (7.46)	4.58*** (7.07)	5.92*** (7.82)	1.34 (7.45)
ΔCore Deposits-to-Assets	2.64*** (7.32)	0.26 (7.19)	5.02*** (6.68)	4.76*** (6.94)
ΔNoninterest-Income Ratio	-0.12*** (0.50)	0.08** (0.44)	-0.32*** (0.48)	-0.40*** (0.46)

Sources: Authors' calculations.

Notes: The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Table V

Summary Statistics for Regression Variables. Data for 216 M&As between publicly traded U.S. commercial banking companies that were announced and completed between 1987 and 1999.

	Mean	Standard Deviation	Minimum	Maximum	Median
			Δpost-merger performance		
ΔROA	-0.00055	0.0046	-0.0192	0.0158	0.00006
ΔROE	-0.0062	0.0640	-0.2118	0.2650	0.0037
ΔInterest Margin	0.0003	0.0044	-0.0119	0.0134	-0.0002
ΔCost Efficiency	-0.0047	0.0782	-0.2855	0.3298	-0.0085
ΔLoans-to-Assets	0.0525	0.0746	-0.1476	0.3178	0.0556
ΔCore Deposits-to-Assets	0.0264	0.0732	-0.2187	0.2002	0.0280
ΔNoninterest Income Ratio	-0.0012	0.0050	-0.0153	0.0205	-0.0012
			market reaction		
CAR	0.0030	0.0521	-0.1019	0.2379	-0.0027
			information spillover		
LBYO(1) *in thousands*	0.2464	0.0852	0.0540	0.4370	0.2570
LBYO(2)	0.4927	0.1621	0.2060	0.7670	0.5170
LBYO(3)	0.7263	0.2465	0.3630	1.0710	0.7030
LBYO(4)	0.9398	0.3146	0.4900	1.3320	0.8430
LBYO(5)	1.1334	0.3483	0.6960	1.6130	0.9990
LBYO(6)	1.3051	0.3631	0.8670	1.8690	1.0980
LBYO(7)	1.4502	0.3737	0.8660	2.0660	1.2320
weighted LBYO	0.8082	0.2479	0.4776	1.1199	0.7439
			time and technological change		
time	7.8935	3.5164	1.0000	13.0000	8.0000
cellphones_pc	0.1231	0.0972	0.0050	0.3151	0.0926
computers_pc	0.3208	0.1027	0.1544	0.5163	0.2973
ATMtrans_pc *in thousands*	0.0325	0.0084	0.0161	0.0414	0.0318
cashless_pc *in thousands*	0.3057	0.0358	0.2420	0.3632	0.2999
			control variables		
GDP growth	3.2704	1.3327	-0.2000	4.5000	3.6000
LBYD	3.9352	4.3504	0.0000	26.0000	3.0000
target equity-to-assets	0.0804	0.0211	0.0235	0.1756	0.0769
activity focus	0.4954	0.5011	0.0000	1.0000	0.0000
geographic focus	0.5000	0.5012	0.0000	1.0000	0.5000
log acquirer assets	$16.3733	$1.3838	$13.1001	$19.3936	$16.5518
equal size	0.7776	0.2470	0.0166	0.9959	0.8587
megamerger	0.5370	0.4998	0.0000	1.0000	1.0000
CEO tenure	7.1481	5.2789	0.0000	29.0000	6.0000
CEO stock	0.4788	1.3159	0.0100	12.2500	0.1600
post-merger growth	0.0488	0.1062	-0.3000	0.3000	0.0419
state M&As	0.0545	0.0440	0.0000	0.2131	0.0428
ΔHHI	-0.0013	0.0133	-0.0525	0.0757	-0.0006
hot market	0.0022	0.0188	-0.0401	0.0602	0.0018
percent stock	0.8668	0.3114	0.0000	1.0000	1.0000
pooling	0.5321	0.5001	0.0000	1.0000	1.0000
hostile	0.0139	0.1173	0.0000	1.0000	0.0000

Notes: Dollar-denominated variables expressed in 2002 dollars.

Sources: Federal Reserve Y-9 Reports, Federal Deposit Insurance Corporation Reports of Condition and Income (Call Reports), CRSP database, Thomson Financial Securities Data, and authors' calculations.

Table VI

OLS regression results for equation (4). Data for 216 M&As between 1987 and 1999.

Dependent Variable:	ΔROA	ΔROE	ΔInterest Margin	ΔEfficiency Ratio	ΔLoans-to-Assets	ΔCore Deposits-to-Assets	ΔNoninterest Income Ratio
constant	-0.00545	-0.01581	-0.00188	0.03088	0.25630**	-0.10889	-0.01387**
	(0.00606)	(0.08650)	(0.00592)	(0.10901)	(0.10589)	(0.10377)	(0.00661)
LBYO(3)	0.02843***	0.32817***	0.02329***	-0.45976***	0.12418	0.17272	0.00226
	(0.00683)	(0.09741)	(0.00666)	(0.11548)	(0.13521)	(0.11098)	(0.00810)
Time	0.00122**	0.01555*	0.00180***	-0.01882**	0.00724	0.01279	0.00119*
	(0.00053)	(0.00820)	(0.00051)	(0.00917)	(0.01015)	(0.00877)	(0.00063)
LBYO(3)*time	-0.0029***	-0.03621***	-0.00212***	0.04169***	-0.00972	-0.00700	-0.0017*
	(0.00073)	(0.01064)	(0.00073)	(0.01281)	(0.01432)	(0.01153)	(0.00092)
GDP growth	-0.00015	-0.00033	-0.00094***	0.00239	-0.00611	-0.00836*	0.000457
	(0.00030)	(0.00423)	(0.00029)	(0.00533)	(0.00518)	(0.00508)	(0.00032)
Target equity-to-assets	-0.12173***	-1.61234***	0.05592*	1.18157**	-0.17381	0.58846	-0.00502
	(0.03256)	(0.46458)	(0.03181)	(0.58547)	(0.56868)	(0.55733)	(0.03552)
trgt eqty-to-assts*time	0.01206***	0.16733***	-0.00797**	-0.10531	-0.01101	-0.07722	0.00336
	(0.00384)	(0.05482)	(0.00375)	(0.06908)	(0.06710)	(0.06576)	(0.00419)
activity focus	-0.00026	-0.00568	0.000642	-0.00671	-0.01824	-0.0083	-0.00054
	(0.00068)	(0.00977)	(0.00067)	(0.01231)	(0.01196)	(0.01172)	(0.00075)
geographic focus	-0.0011*	-0.01148	-0.00152***	0.0048	-0.01727*	-0.007	-0.00135**
	(0.00060)	(0.00855)	(0.00059)	(0.01078)	(0.01047)	(0.01026)	(0.00065)
LBYD	-3.7E-05	-0.00091	9E-05	0.000739	0.0033***	-0.00053	-3.3E-06
	(0.00007)	(0.00100)	(0.00007)	(0.00125)	(0.00122)	(0.00119)	(0.00008)
post-merger growth	-0.00925***	-0.10301***	-0.01676***	0.0871*	-0.10846**	-0.056	-0.00575*
	(0.00284)	(0.04054)	(0.00278)	(0.05109)	(0.04963)	(0.04864)	(0.00310)
log acquirer assets	-0.00034	-0.00584	-0.00073***	0.0093*	-0.01656***	-0.001	0.00055*
	(0.00027)	(0.00390)	(0.00027)	(0.00491)	(0.00477)	(0.00468)	(0.00030)
Equal size	0.00101	-0.00425	0.00176	-0.00249	0.02104	0.00724	0.00129
	(0.00145)	(0.02069)	(0.00142)	(0.02608)	(0.02533)	(0.02483)	(0.00158)
megamerger	0.00181**	0.02233**	0.000616	-0.03204**	0.02014	0.00448	0.000438
	(0.00080)	(0.01140)	(0.00078)	(0.01436)	(0.01395)	(0.01367)	(0.00087)
CEO tenure	6.46E-05	0.000569	4.32E-05	0.000166	0.000646	0.00226**	6.21E-05
	(0.00005)	(0.00077)	(0.00005)	(0.00097)	(0.00094)	(0.00092)	(0.00006)
CEO stock	5.12E-05	0.000177	0.000609***	0.00123	0.01456***	0.00603	-0.00037
	(0.00023)	(0.00334)	(0.00023)	(0.00421)	(0.00409)	(0.00401)	(0.00026)
percent stock	-0.00083	-0.01156	-0.00099	0.03339*	-0.00471	-0.0107	0.000458
	(0.00105)	(0.01501)	(0.00103)	(0.01892)	(0.01838)	(0.01801)	(0.00115)
pooling	0.000612	0.00583	0.000202	-0.02432*	-0.00176	0.00845	0.000184
	(0.00073)	(0.01042)	(0.00071)	(0.01313)	(0.01276)	(0.01250)	(0.00080)
hostile	0.000316	-0.05718	0.000169	-0.05406	-0.05486	-0.02158	0.00159
	(0.00251)	(0.03587)	(0.00246)	(0.04521)	(0.04391)	(0.04303)	(0.00274)
hot market	-0.01799	-0.31414	-0.02053	-0.11967	-0.1434	-0.0981	-0.01246
	(0.01642)	(0.23426)	(0.01604)	(0.29522)	(0.28676)	(0.28103)	(0.01791)
state M&As	0.0096	0.15955*	-0.00193	-0.17528	0.01419	-0.15463	-0.00934
	(0.00685)	(0.09768)	(0.00669)	(0.12309)	(0.11956)	(0.11718)	(0.00747)
ΔHHI	-0.05738***	-0.86394***	-0.00696	0.83954**	-0.21863	-0.40722	-0.05178**
	(0.02230)	(0.31819)	(0.02179)	(0.40099)	(0.38949)	(0.38171)	(0.02433)
adjusted-R^2	0.2418	0.2198	0.2176	0.1695	0.1405	0.1424	0.2532

Table VI (continued)
OLS regression results for equation (4). Data for 216 M&As between 1987 and 1999.

Dependent Variable:	ΔROA	ΔROE	ΔInterest Margin	ΔEfficiency Ratio	ΔLoans-to-Assets	ΔCore Deposits-to-Assets	ΔNoninterest Income Ratio
derivative of dependent variable with respect to LBYO, evaluated at value of time in left-hand column:							
time=1	0.0255***	0.2920***	0.0212***	-0.4181***	0.1145	0.1657	0.0006
time=2	0.0226***	0.2558***	0.0191***	-0.3764***	0.1048	0.1587	-0.0011
time=3	0.0197***	0.2196**	0.0170***	-0.3347***	0.0951	0.1517	-0.0028
time=4	0.0168***	0.1834*	0.0149**	-0.2930***	0.0854	0.1447	-0.0045
time=5	0.0139**	0.1472	0.0128**	-0.2513**	0.0757	0.1377	-0.0062
time=6	0.0110	0.1110	0.0107	-0.2096*	0.0660	0.1307	-0.0079
time=7	0.0081	0.0748	0.0086	-0.1679	0.0563	0.1237	-0.0096
time=8	0.0052	0.0386	0.0065	-0.1262	0.0466	0.1167	-0.0113
time=9	0.0023	0.0024	0.0044	-0.0845	0.0369	0.1097	-0.0130
time=10	-0.0006	-0.0338	0.0023	-0.0428	0.0272	0.1027	-0.0147*
time=11	-0.0035	-0.0700	0.0002	-0.0011	0.0175	0.0957	-0.0164**
time=12	-0.0064	-0.1062	-0.0019	0.0406	0.0078	0.0887	-0.0181**
time=13	-0.0093	-0.1424	-0.0040	0.0823	-0.0019	0.0817	-0.0198**

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Table VII

Selected OLS regression results from alternative specifications of equation (4) in which the *time* trend variable (top panel results repeated from Table VI) is replaced with technology trend variables *cellphones per capita*, *computers per capita*, *ATM transactions per capita*, and *cashless transactions per capita*. Data for 216 M&As between 1987 and 1999.

Dependent Variable:	ΔROA	ΔROE	ΔInterest Margin	ΔEfficiency Ratio	ΔLoans-to-Assets	ΔCore Deposits-to-Assets	ΔNoninterest Income Ratio
	base case (repeated from Table VI)						
LBYO(3)	0.02843***	0.32817***	0.02329***	-0.45976***	0.12418	0.17272	0.00226
	(0.00683)	(0.09741)	(0.00666)	(0.11548)	(0.13521)	(0.11098)	(0.00810)
Time	0.00122**	0.01555*	0.00180***	-0.01882**	0.00724	0.01279	0.00119*
	(0.00053)	(0.00820)	(0.00051)	(0.00917)	(0.01015)	(0.00877)	(0.00063)
LBYO(3)*time	-0.0029***	-0.03621***	-0.00212***	0.04169***	-0.00972	-0.00700	-0.00170*
	(0.00073)	(0.01064)	(0.00073)	(0.01281)	(0.01432)	(0.01153)	(0.00092)
	time trend replaced with cell phones per capita						
LBYO(3)	0.01191***	0.11191**	0.01322***	-0.20111***	0.07043	0.11488*	-0.00519
	(0.00308)	(0.04555)	(0.00336)	(0.05727)	(0.07342)	(0.06340)	(0.00412)
cellphones_pc	0.03353	0.27566	0.02629	-0.19270	0.08319	-0.40142	0.04673*
	(0.02717)	(0.37680)	(0.02585)	(0.46620)	(0.49101)	(0.42850)	(0.02702)
LBYO(3)*cellphones_pc	-0.07769***	-0.84599**	-0.05908**	0.85574*	-0.22160	0.22503	-0.06424*
	(0.02536)	(0.36547)	(0.02670)	(0.47473)	(0.56628)	(0.45733)	(0.03342)
	time trend replaced with computers per capita						
LBYO(3)	0.02175***	0.23480**	0.02863***	-0.35414***	0.11045	0.20149	0.00534
	(0.00759)	(0.11502)	(0.00760)	(0.13183)	(0.16075)	(0.13799)	(0.00931)
computers_pc	0.01280	0.11724	0.04358**	-0.13756	0.07377	0.14589	0.04030*
	(0.02524)	(0.37043)	(0.02124)	(0.41948)	(0.42949)	(0.38985)	(0.02304)
LBYO(3)*computers_pc	-0.06015**	-0.71508*	-0.07160***	0.82421**	-0.21182	-0.23183	-0.05581*
	(0.02433)	(0.36624)	(0.02359)	(0.41936)	(0.48903)	(0.40815)	(0.02926)
	time trend replaced with ATM transactions per capita						
LBYO(3)	0.04084***	0.45063***	0.01996	-0.57484***	0.14294	0.01661	0.02248
	(0.01212)	(0.17496)	(0.01288)	(0.22390)	(0.26784)	(0.21550)	(0.01586)
ATMtrans	0.57299***	7.19838**	0.71918***	-8.90339**	3.23072	4.59913	0.55083**
	(0.22354)	(3.39000)	(0.22477)	(3.83567)	(4.54691)	(3.74923)	(0.27475)
LBYO(3)*ATMtrans_pc	-1.02760***	-12.1106***	-0.53154	13.52462**	-3.20166	1.02867	-0.92837***
	(0.31299)	(4.50184)	(0.33826)	(5.68475)	(6.88744)	(5.49052)	(0.42183)
	time trend replaced with cashless transactions per capita						
LBYO(3)	0.07715***	0.90715***	0.07675***	-1.14544***	0.33541	0.40478	0.04408
	(0.02063)	(0.30979)	(0.02154)	(0.36491)	(0.44380)	(0.36275)	(0.02822)
cashless	0.07734	0.83816	0.17196***	-1.14135	0.64934	1.06337	0.13264*
	(0.06380)	(0.96932)	(0.05612)	(1.13571)	(1.17353)	(1.05466)	(0.06910)
LBYO(3)*cashless_pc	-0.23594***	-2.84398***	-0.22999***	3.34047***	-0.94708	-0.92624	-0.18238*
	(0.06709)	(1.00894)	(0.06965)	(1.19213)	(1.42071)	(1.15629)	(0.09173)

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Table VIII

Selected OLS regression results from alternative specifications of equation (4) using weighted and unweighted cumulative-year variations of the *LBYO* variable. Data for 216 M&As between 1987 and 1999.

Dependent Variable:	ΔROA	ΔROE	ΔInterest Margin	ΔEfficiency Ratio	ΔLoans-to-Assets	ΔCore Deposits-to-Assets	ΔNoninterest Income Ratio
	Panel 1: Previous mergers are weighted						
weighted LBYO	0.02849***	0.29580***	0.02744***	-0.53033***	0.17849	0.31557***	-0.01167
	(0.00737)	(0.10185)	(0.00668)	(0.11651)	(0.13060)	(0.11867)	(0.00805)
weighted LBYO*time	-0.00310***	-0.03586***	-0.00275***	0.05222***	-0.01630	-0.02429**	-0.00046
	(0.00074)	(0.01042)	(0.00069)	(0.01205)	(0.01318)	(0.01157)	(0.00086)
	Panel 2: Previous mergers are not weighted						
LBYO(1)	0.05579***	0.62069***	0.02337*	-0.79957***	0.50696**	0.19599	0.03743**
	(0.01346)	(0.19115)	(0.01329)	(0.29923)	(0.23053)	(0.25821)	(0.01642)
LBYO(1)*time	-0.00553***	-0.06557***	-0.00094	0.0735**	-0.05913**	-0.01124	-0.0067***
	(0.00166)	(0.02311)	(0.00178)	(0.03638)	(0.02902)	(0.03205)	(0.00210)
LBYO(2)	0.03505***	0.4132***	0.01410	-0.52488***	0.19091	0.1437	0.01936*
	(0.00916)	(0.13365)	(0.00919)	(0.17491)	(0.18592)	(0.15816)	(0.01185)
LBYO(2)*time	-0.00357	-0.0462***	-0.00062	0.04894**	-0.01857	-0.00134	-0.0038***
	(0.00107)***	(0.01542)	(0.00111)	(0.02053)	(0.02140)	(0.01820)	(0.00143)
	base case (repeated from Table VI)						
LBYO(3)	0.02843***	0.32817***	0.02329***	-0.45976***	0.12418	0.17272	0.00226
	(0.00683)	(0.09741)	(0.00666)	(0.11548)	(0.13521)	(0.11098)	(0.00810)
LBYO(3)*time	-0.0029***	-0.03621***	-0.00212***	0.04169***	-0.00972	-0.00700	-0.0017*
	(0.00073)	(0.01064)	(0.00073)	(0.01281)	(0.01432)	(0.01153)	(0.00092)
LBYO(4)	0.02342***	0.24309***	0.02251***	-0.42640***	0.15399	0.23325**	-0.01032
	(0.00567)	(0.07758)	(0.00518)	(0.09279)	(0.10310)	(0.09735)	(0.00654)
LBYO(4)*time	-0.00258***	-0.02945***	-0.00233***	0.04281***	-0.01418	-0.01870**	-0.00020
	(0.00056)	(0.00781)	(0.00053)	(0.00951)	(0.01052)	(0.00955)	(0.00069)
LBYO(5)	0.01855***	0.15940**	0.02073***	-0.37536***	0.14157	0.29357***	-0.01789***
	(0.00597)	(0.08205)	(0.00526)	(0.09326)	(0.09854)	(0.09537)	(0.00635)
LBYO(5)*time	-0.00211***	-0.02145***	-0.00221***	0.03858***	-0.01319	-0.02563***	0.00076
	(0.00055)	(0.00751)	(0.00049)	(0.00858)	(0.00930)	(0.00873)	(0.00062)
LBYO(6)	0.00968	0.06600	0.01478**	-0.31966***	0.10312	0.29726***	-0.02660***
	(0.00684)	(0.09273)	(0.00612)	(0.10261)	(0.10033)	(0.09802)	(0.00592)
LBYO(6)*time	-0.00128**	-0.01237	-0.00164***	0.03185***	-0.00979	-0.02518***	0.00143***
	(0.00060)	(0.00808)	(0.00052)	(0.00847)	(0.00827)	(0.00805)	(0.00047)
LBYO(7)	-0.00325	-0.05619	0.00358	-0.14226	0.03673	0.23578**	-0.02698***
	(0.00726)	(0.10068)	(0.00654)	(0.11857)	(0.09642)	(0.10422)	(0.00592)
LBYO(7)*time	-0.00037	-0.00412	-0.00079*	0.01793**	-0.00465	-0.01855***	0.00119***
	(0.00056)	(0.00775)	(0.00048)	(0.00830)	(0.00666)	(0.00727)	(0.00038)

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Table IX

Selected OLS regression results from alternative specifications of equation (4) using non-cumulative (individual year) variations of the *LBYO* variable. Data for 216 M&As between 1987 and 1999.

Dependent Variable:	ΔROA	ΔROE	ΔInterest Margin	ΔEfficiency Ratio	ΔLoans-to-Assets	ΔCore Deposits-to-Assets	ΔNoninterest Income Ratio
LBYO(y1)	0.05579***	0.62069***	0.02337*	-0.79957***	0.50696**	0.19599	0.03743**
	(0.01342)	(0.19115)	(0.01327)	(0.29923)	(0.23052)	(0.25821)	(0.01640)
LBYO(y1)*time	-0.00553***	-0.06557***	-0.00094	0.07350**	-0.05913**	-0.01124	-0.0067***
	(0.00166)	(0.02311)	(0.00178)	(0.03637)	(0.02902)	(0.03205)	(0.00210)
LBYO(y2)	0.00687	0.11547	-0.00254	-0.17009	-0.14405	0.24500	-0.00029
	(0.01931)	(0.28581)	(0.01612)	(0.36483)	(0.27011)	(0.29710)	(0.01523)
LBYO(y2)*time	-0.00092	-0.02118	0.00115	0.01302	0.01920	0.00269	-0.00253
	(0.00203)	(0.03013)	(0.00174)	(0.03766)	(0.03061)	(0.03106)	(0.00177)
LBYO(y3)	0.02200	0.31287	0.03242**	-0.53392*	0.09667	0.19644	-0.02955*
	(0.01622)	(0.22233)	(0.01546)	(0.30374)	(0.24765)	(0.29093)	(0.01562)
LBYO(y3)*time	-0.00271*	-0.03790*	-0.00388***	0.04905*	-0.00395	-0.00942	0.00067
	(0.00146)	(0.02037)	(0.00139)	(0.02678)	(0.02252)	(0.02532)	(0.00138)
LBYO(y4)	0.02505	0.12726	0.03497**	-0.61617**	0.44256*	0.45761	-0.05877***
	(0.01980)	(0.28187)	(0.01670)	(0.31599)	(0.25567)	(0.33581)	(0.01723)
LBYO(y4)*time	-0.00372**	-0.03063	-0.00468***	0.07942***	-0.04542*	-0.05710*	0.00437***
	(0.00175)	(0.02427)	(0.00143)	(0.02793)	(0.02366)	(0.02993)	(0.00157)
LBYO(y5)	-0.00550	-0.20730	0.02038	-0.05284	-0.02147	0.71470**	-0.02172
	(0.01720)	(0.25201)	(0.01783)	(0.31410)	(0.28151)	(0.32408)	(0.02059)
LBYO(y5)*time	-0.00153	-0.00667	-0.00426**	0.04080	-0.00739	-0.08985***	0.00241
	(0.00189)	(0.02665)	(0.00179)	(0.03142)	(0.02746)	(0.03183)	(0.00207)
LBYO(y6)	-0.01485	-0.03276	0.00173	-0.15021	-0.08692	0.17774	0.00274
	(0.02012)	(0.30819)	(0.01778)	(0.31267)	(0.23287)	(0.24777)	(0.01338)
LBYO(y6)*time	-0.00064	-0.01343	-0.00300*	0.04986	-0.01204	-0.05324**	-0.00026
	(0.00207)	(0.03102)	(0.00182)	(0.03151)	(0.02460)	(0.02550)	(0.00138)
LBYO(y7)	-0.00153	0.10270	0.00487	-0.19508	-0.00355	0.18717	0.01122
	(0.01476)	(0.22233)	(0.01225)	(0.24052)	(0.17720)	(0.19897)	(0.00854)
LBYO(y7)*time	-0.00102	-0.02039	-0.00196	0.06047*	-0.01168	-0.04801*	0.00138
	(0.00199)	(0.02820)	(0.00161)	(0.03153)	(0.02302)	(0.02653)	(0.00122)

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Table X

OLS regression results for equation (5). Dependent variable is *CAR*. The definition for the Δpost-merger performance variable changes across columns. Data for 216 M&As between 1987 and 1999.

Δpost-merger performance variable:	**ΔROA**	**ΔROE**	**ΔInterest Margin**	**ΔEfficiency Ratio**	**ΔLoans-to-Assets**	**ΔCore Deposits-to-Assets**	**ΔNoninterest Income Ratio**
constant	0.13173**	0.13319**	0.13088**	0.14147**	0.14680**	0.14374**	0.12900**
	(0.0612)	(0.0612)	(0.0620)	(0.0619)	(0.0645)	(0.0615)	(0.0624)
Δpost-merger performance	-4.37833**	-0.31143**	-1.90855	0.16846	-0.21588	-0.06408	1.51061
	(2.1451)	(0.1469)	(2.4820)	(0.1268)	(0.1689)	(0.1115)	(2.4635)
LBYO(3)	0.03056	0.03030	0.02423	0.03087	0.01858	0.00688	0.02534
	(0.0253)	(0.0255)	(0.0258)	(0.0247)	(0.0280)	(0.0270)	(0.0274)
LBYO(3)*Δperformance	6.02077**	0.36707*	3.41057	-0.15975	0.25856	0.23609	-2.03662
	(2.9800)	(0.2112)	(3.0096)	(0.1742)	(0.2099)	(0.1524)	(3.2540)
GDP growth	-0.01067***	-0.01087***	-0.01106***	-0.01142***	-0.01194***	-0.01084***	-0.01158***
	(0.0029)	(0.0028)	(0.0030)	(0.0029)	(0.0030)	(0.0030)	(0.0030)
target equity-to-assets	-0.23784	-0.25405	-0.13162	-0.19143	-0.10396	-0.13039	-0.10835
	(0.2567)	(0.2579)	(0.2513)	(0.2484)	(0.2445)	(0.2422)	(0.2497)
trgt eqty-to-assts*time	0.01263	0.01510	0.01024	0.01079	0.00721	0.00921	0.00801
	(0.0227)	(0.0230)	(0.0222)	(0.0219)	(0.0220)	(0.0213)	(0.0224)
activity focus	0.00688	0.00610	0.00801	0.00814	0.00765	0.01037	0.00751
	(0.0080)	(0.0081)	(0.0080)	(0.0078)	(0.0081)	(0.0081)	(0.0079)
geographic focus	-0.00373	-0.00440	-0.00358	-0.00415	-0.00383	-0.00215	-0.00414
	(0.0067)	(0.0066)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0068)
LBYD	-0.00033	-0.00035	-0.00023	-0.00028	-0.00002	-0.00016	-0.00026
	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
post-merger growth	-0.03408	-0.03962	-0.02581	-0.03808	-0.03866	-0.02267	-0.03172
	(0.0358)	(0.0349)	(0.0386)	(0.0365)	(0.0352)	(0.0353)	(0.0356)
log acquirer assets	-0.00290	-0.00295	-0.00283	-0.00359	-0.00352	-0.00326	-0.00278
	(0.0034)	(0.0034)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
equal size	-0.04679**	-0.04730**	-0.04820**	-0.04635**	-0.04568**	-0.04647**	-0.04739**
	(0.0221)	(0.0221)	(0.0223)	(0.0223)	(0.0214)	(0.0217)	(0.0223)
megamerger	-0.01200	-0.01090	-0.01310	-0.01041	-0.01155	-0.01358	-0.01262
	(0.0095)	(0.0094)	(0.0095)	(0.0096)	(0.0094)	(0.0096)	(0.0094)
CEO tenure	0.00048	0.00050	0.00039	0.00045	0.00045	0.00017	0.00038
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
CEO stock	0.00047	0.00067	-0.00047	0.00069	-0.00013	-0.00038	0.00043
	(0.0024)	(0.0023)	(0.0024)	(0.0023)	(0.0024)	(0.0021)	(0.0023)
percent stock	-0.01822	-0.01802	-0.01693	-0.01856	-0.01668	-0.01568	-0.01613
	(0.0129)	(0.0129)	(0.0128)	(0.0130)	(0.0123)	(0.0126)	(0.0130)
pooling	0.00147	0.00147	0.00281	0.00287	0.00157	0.00046	0.00216
	(0.0092)	(0.0092)	(0.0092)	(0.0092)	(0.0093)	(0.0090)	(0.0092)
hostile	0.10156**	0.09912**	0.09969**	0.10697**	0.09757*	0.10430**	0.10273**
	(0.0445)	(0.0447)	(0.0464)	(0.0436)	(0.0495)	(0.0478)	(0.0449)
hot market	-0.48608***	-0.50606***	-0.48702***	-0.47625***	-0.47793***	-0.48868***	-0.48156***
	(0.1823)	(0.1819)	(0.1805)	(0.1821)	(0.1825)	(0.1819)	(0.1794)
state M&As	-0.07013	-0.06346	-0.06969	-0.06088	-0.06840	-0.06150	-0.07302
	(0.0698)	(0.0686)	(0.0675)	(0.0691)	(0.0674)	(0.0668)	(0.0681)
ΔHHI	0.28727	0.22332	0.27314	0.24760	0.27952	0.31225	0.24173
	(0.3273)	(0.3148)	(0.3212)	(0.3142)	(0.3113)	(0.3048)	(0.3217)
adjusted-R^2	0.1455	0.1484	0.1373	0.1412	0.1395	0.1538	0.1325
∂CAR/∂Δperformance:							
for LBYO(3) = median	-0.1457	-0.0534	0.4891	0.0562	-0.0341	0.1019	0.0789
for LBYO(3) = 75th%	1.5792	0.0518	1.4662	0.0104	0.0400	0.1695**	-0.5046
for LBYO(3) = 90th%	1.8411	0.0678	1.6146	0.0034	0.0512	0.1798**	-0.5932

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Table XI

OLS regression results for equation (5) using weighted and unweighted cumulative-year variations of the *LBYO* variable. Dependent variable is *CAR*. The definition for the Δpost-merger performance variable changes across columns. Data for 216 M&As between 1987 and 1999.

Δpost-merger performance variable:	**ΔROA**	**ΔROE**	**ΔInterest Margin**	**ΔEfficiency Ratio**	**ΔLoans-to-Assets**	**ΔCore Deposits-to-Assets**	**ΔNoninterest Income Ratio**
	LBYO excluded from regression						
Δpost-merger performance	-0.27656	-0.07903	0.68675	0.05355	-0.02322	0.10620***	-0.28886
	(0.72691)	(0.05084)	(0.81422)	(0.04094)	(0.04464)	(0.04391)	(0.65166)
	LBYO variable = LBYO(1)						
Δpost-merger performance	-4.93889**	-0.40088***	-2.22855	0.19878*	-0.10399	-0.01823	1.40613
	(1.99423)	(0.15214)	(2.38312)	(0.11632)	(0.16142)	(0.09978)	(2.47251)
LBYO	0.06763	0.07110	0.02407	0.05870	0.03611	0.01884	0.03308
	(0.04955)	(0.04875)	(0.05085)	(0.04918)	(0.05611)	(0.05158)	(0.05295)
LBYO*Δperformance	19.39409***	1.43390**	11.13943	-0.61279	0.30089	0.51576	-5.89529
	(7.72297)	(0.62926)	(8.01328)	(0.47467)	(0.55089)	(0.38771)	(8.67702)
	LBYO variable = LBYO(2)						
Δpost-merger performance	-5.00903***	-0.37283***	-1.67775	0.24236**	-0.22624	-0.03320	2.28604
	(2.02171)	(0.14404)	(2.58069)	(0.12051)	(0.17885)	(0.10438)	(2.46041)
LBYO	0.05551*	0.05657*	0.03928	0.05061*	0.03109	0.02493	0.03772
	(0.03085)	(0.03103)	(0.03229)	(0.03011)	(0.03626)	(0.03375)	(0.03439)
LBYO*Δperformance	9.84350***	0.66106**	4.25685	-0.38962*	0.39483	0.27235	-4.38615
	(4.04819)	(0.30105)	(4.48075)	(0.24088)	(0.31945)	(0.20066)	(4.51200)
	LBYO variable = LBYO(3) (repeated from Table X)						
Δpost-merger performance	-4.37833**	-0.31143**	-1.90855	0.16846	-0.21588	-0.06408	1.51061
	(2.14513)	(0.14695)	(2.48199)	(0.12676)	(0.16891)	(0.11151)	(2.46345)
LBYO	0.03056	0.03030	0.02423	0.03087	0.01858	0.00688	0.02534
	(0.02527)	(0.02549)	(0.02106)	(0.02466)	(0.02799)	(0.02701)	(0.02739)
LBYO*Δperformance	6.02077***	0.36707*	3.41057	-0.15975	0.25856	0.23609	-2.03662
	(2.97995)	(0.21125)	(3.00964)	(0.17424)	(0.20992)	(0.15236)	(3.25399)
	LBYO variable = weighted LBYO						
Δpost-merger performance	-4.13028*	-0.32307**	-2.20281	0.12349	-0.22329	-0.07288	2.03168
	(2.31445)	(0.15838)	(2.74502)	(0.13824)	(0.18084)	(0.12865)	(2.70371)
LBYO	0.04077	0.03858	0.03806	0.04225	0.03207	0.02210	0.04033
	(0.02895)	(0.02913)	(0.02927)	(0.02793)	(0.03126)	(0.03041)	(0.03091)
LBYO*Δperformance	5.13042*	0.34831*	3.51097	-0.08888	0.24474	0.21894	-2.35741
	(2.83487)	(0.20119)	(3.16066)	(0.17204)	(0.20744)	(0.16184)	(3.34033)

Notes: Heteroscedastic-adjusted standard errors appear in parentheses. ***, **, and * indicate a significant difference from zero at the 1, 5, and 10 percent levels of significance, respectively, in two-sided tests.

Figure 1
Change in Combined Cumulative Abnormal Return. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

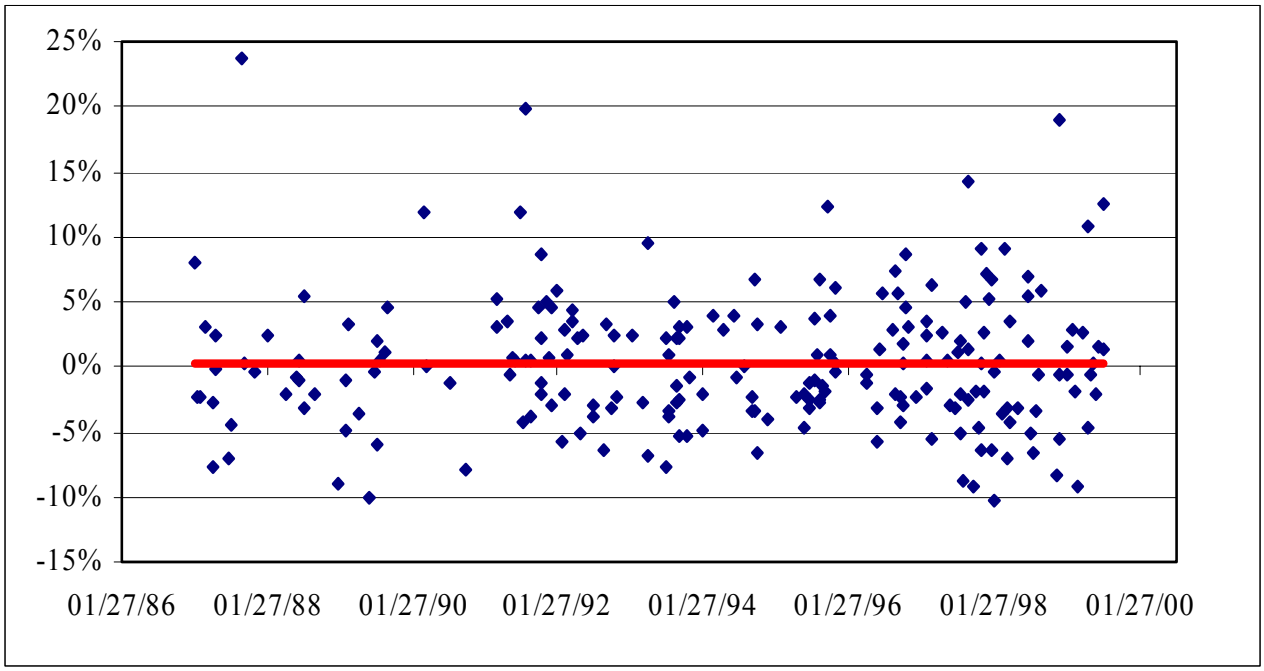


Figure 2
Change in Acquiring Bank Cumulative Abnormal Return. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

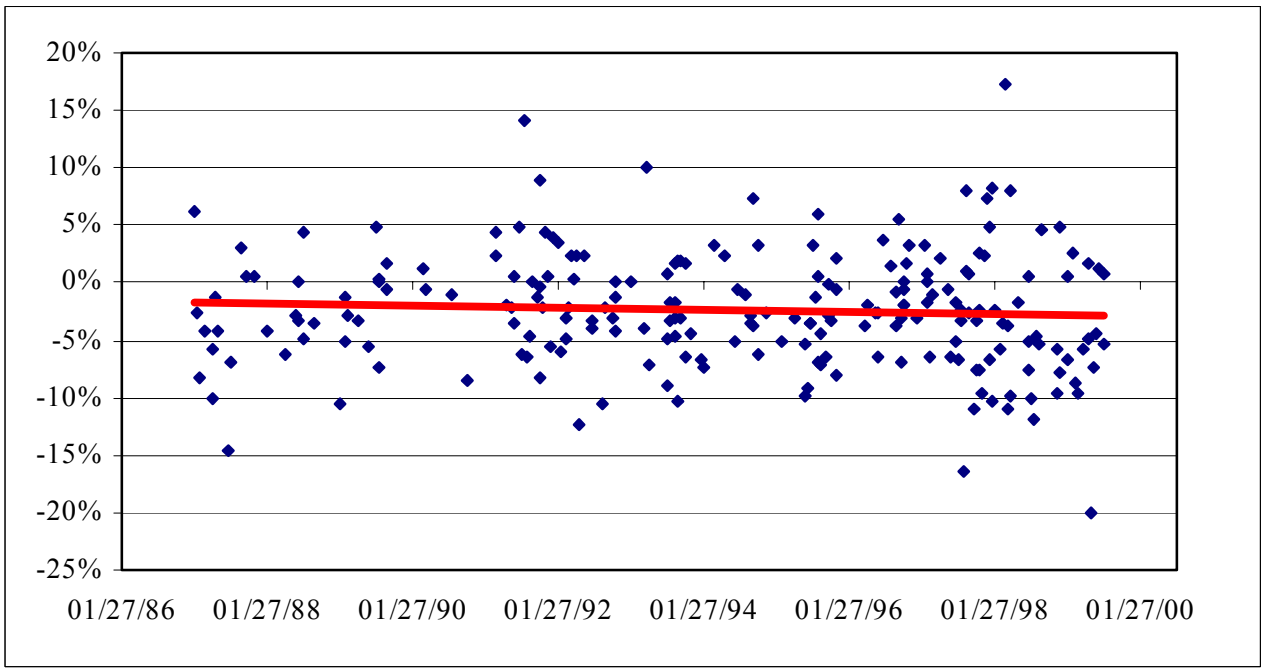


Figure 3
Change in Target Bank Cumulative Abnormal Return. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

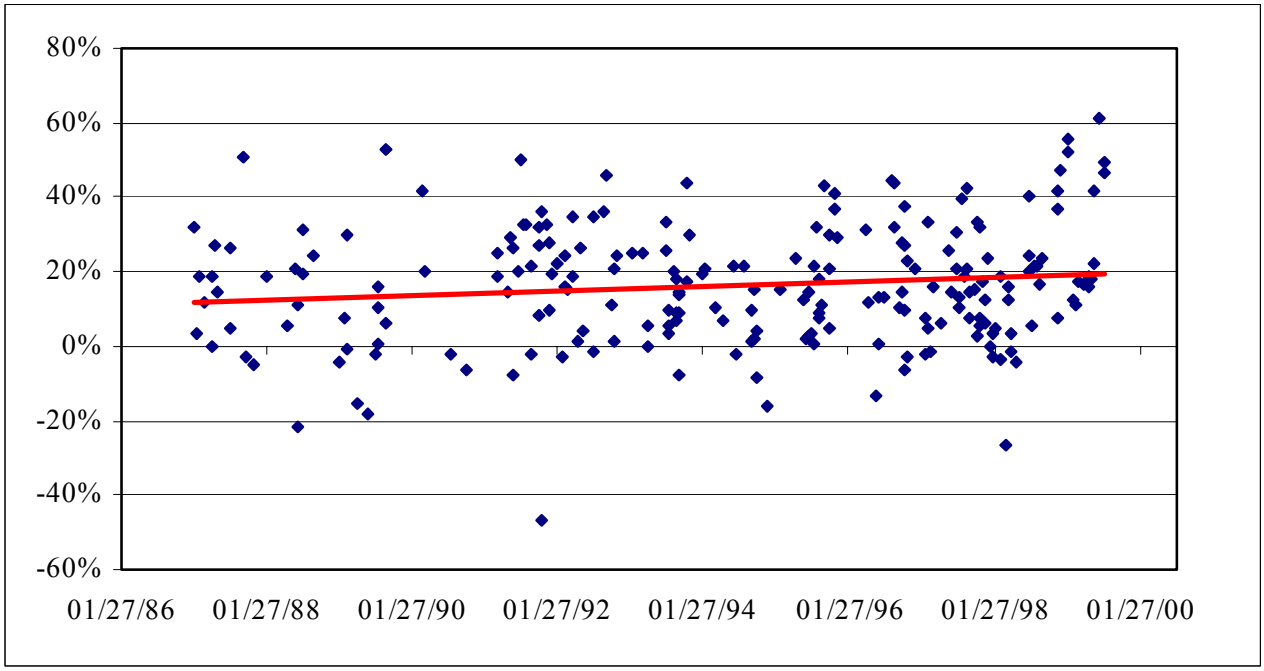


Figure 4
Change in Industry-Adjusted Return-on-Assets. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

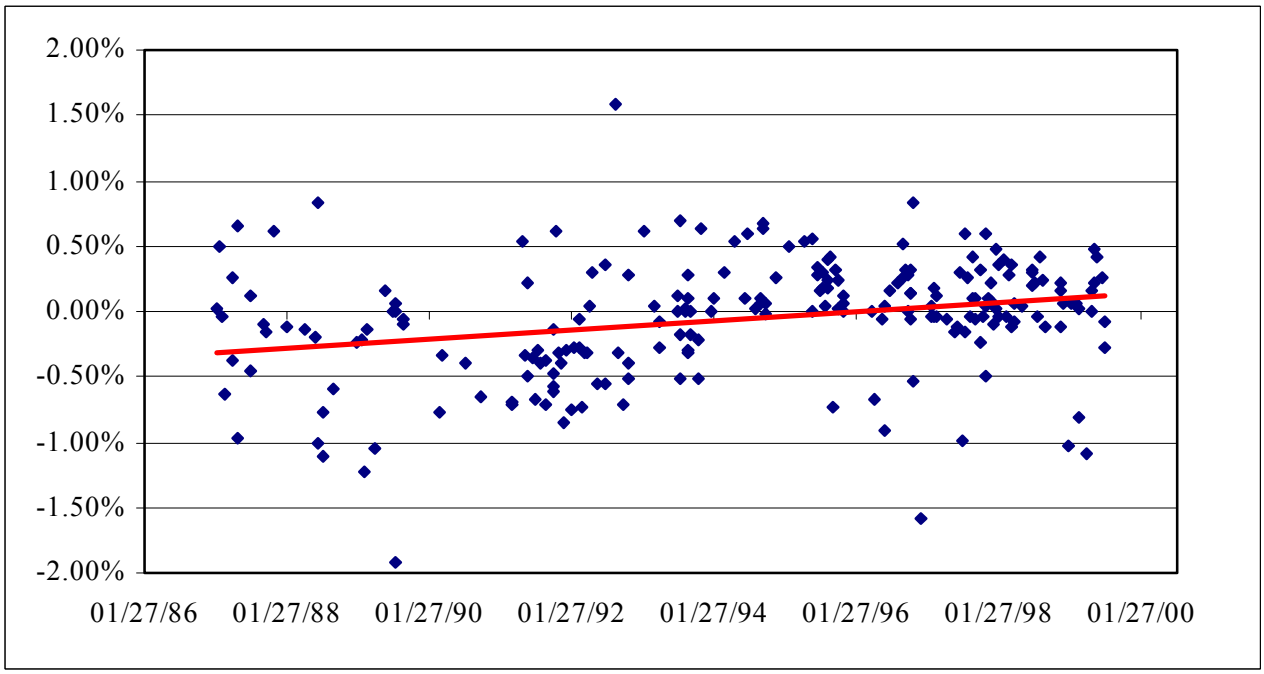


Figure 5
Change in Industry-Adjusted Return-on-Equity. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

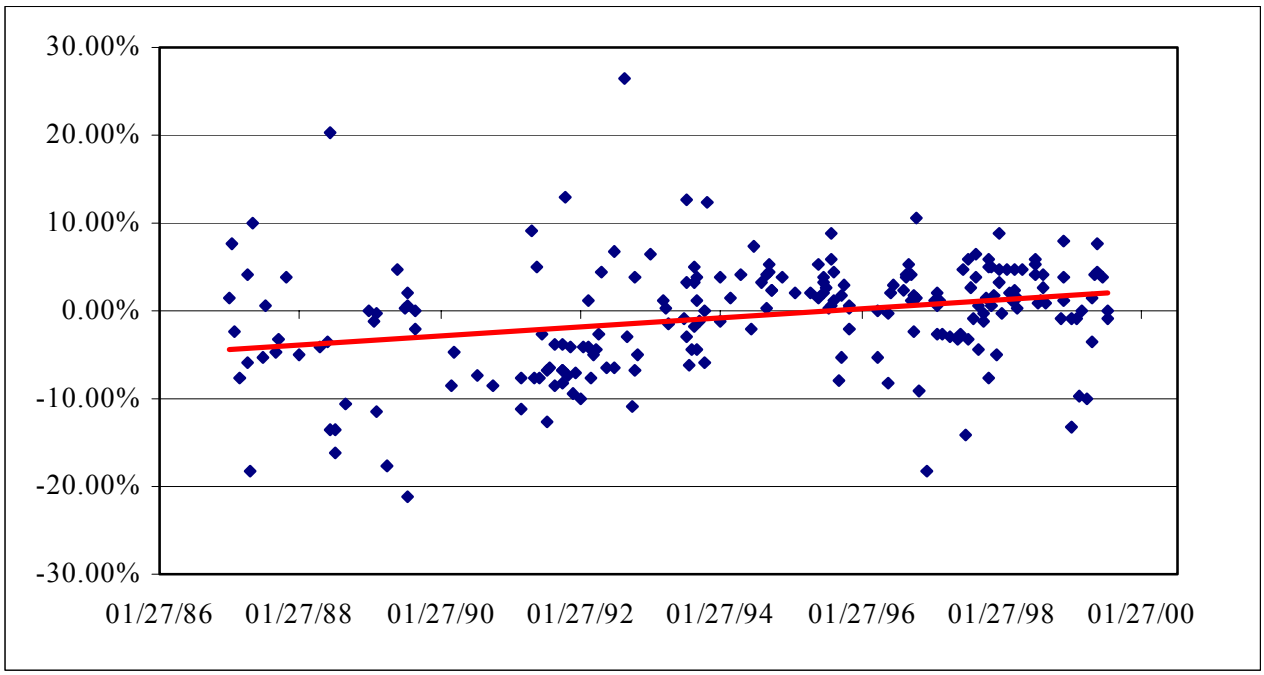


Figure 6
Change in Industry-Adjusted Cost Efficiency. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

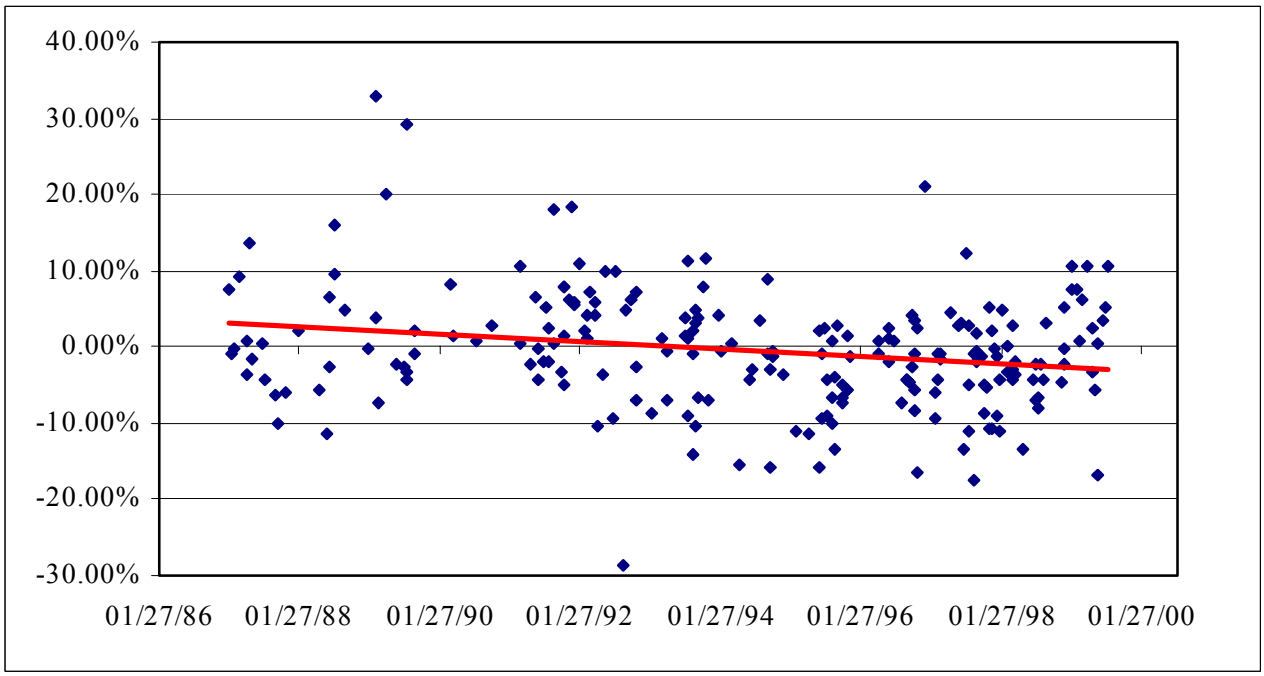


Figure 7
Change in Industry-Adjusted Loans-to-Assets. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

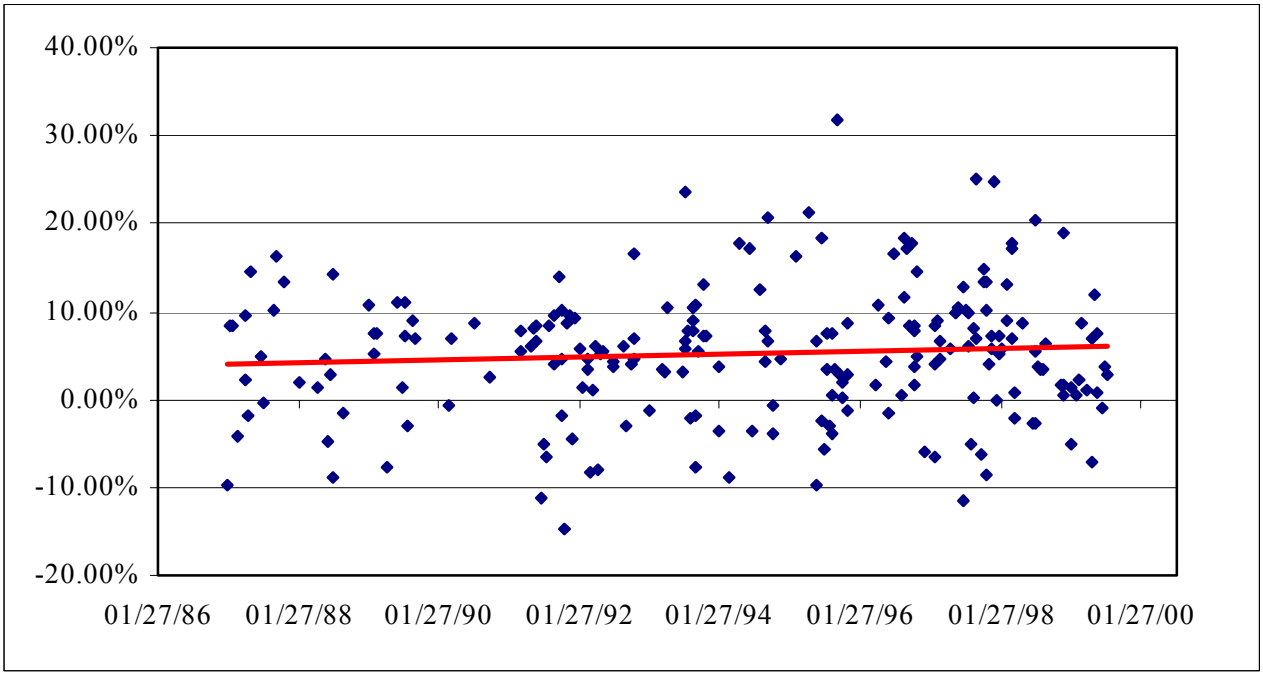


Figure 8
Change in Industry-Adjusted Core Deposits-to-Assets. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

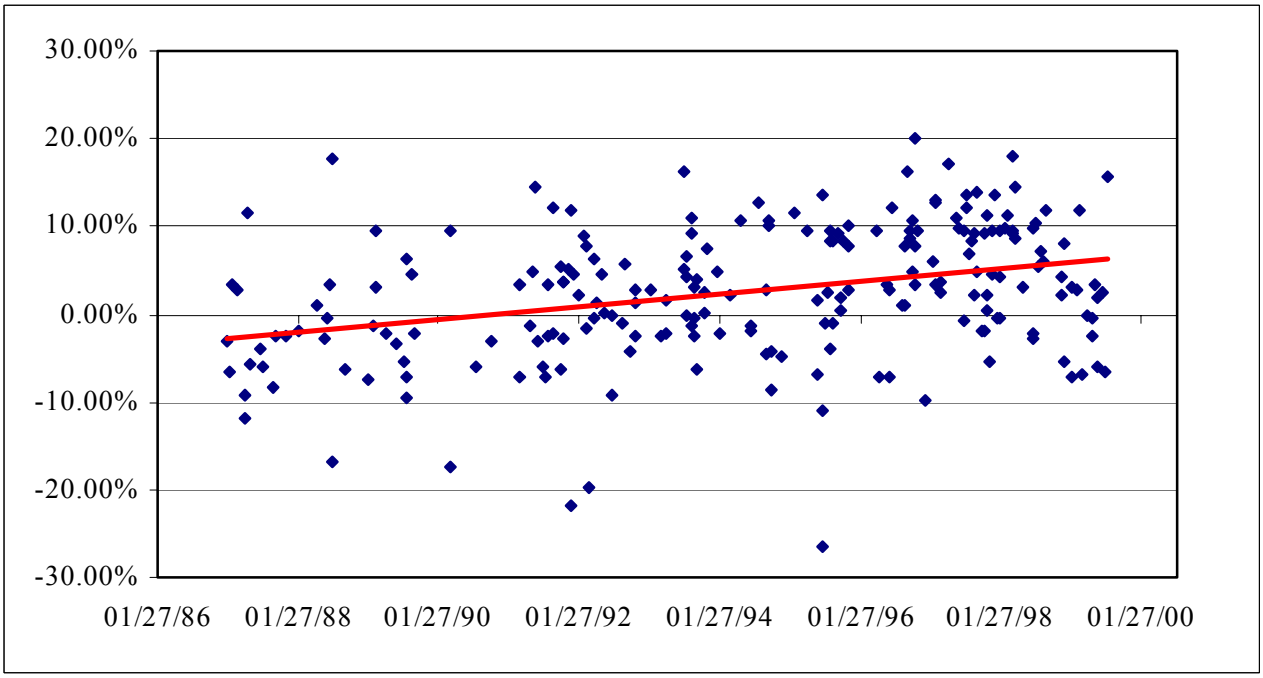


Figure 9
Change in Industry-Adjusted Noninterest Income Ratio. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

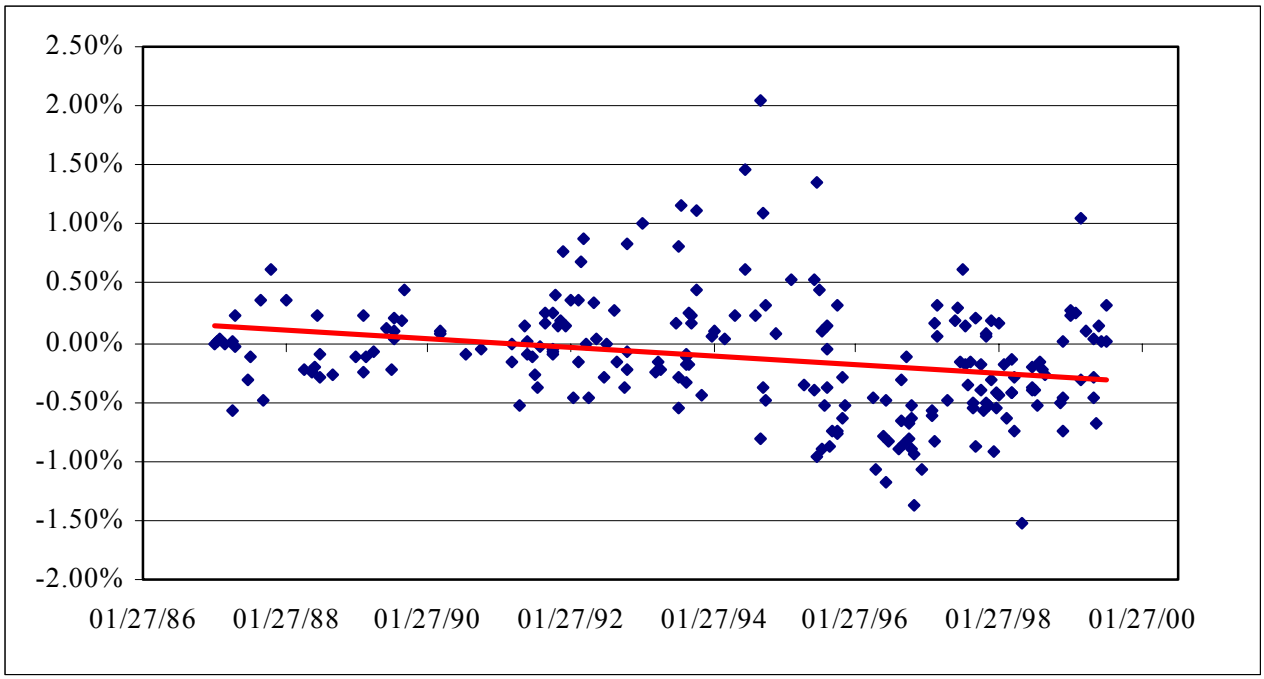


Figure 10
Change in Industry-Adjusted Interest Margin. Data for 216 U.S. banking M&As announced and completed between 1987 and 1999. Linear trend time calculated using ordinary least squares.

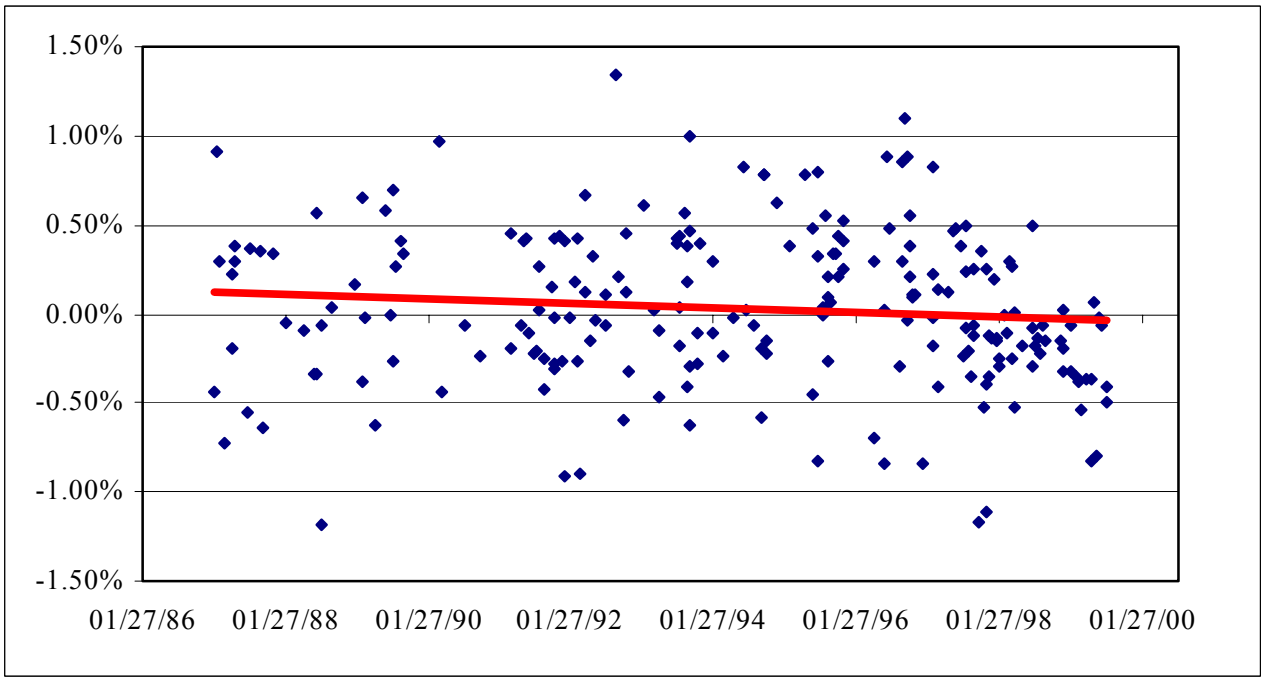
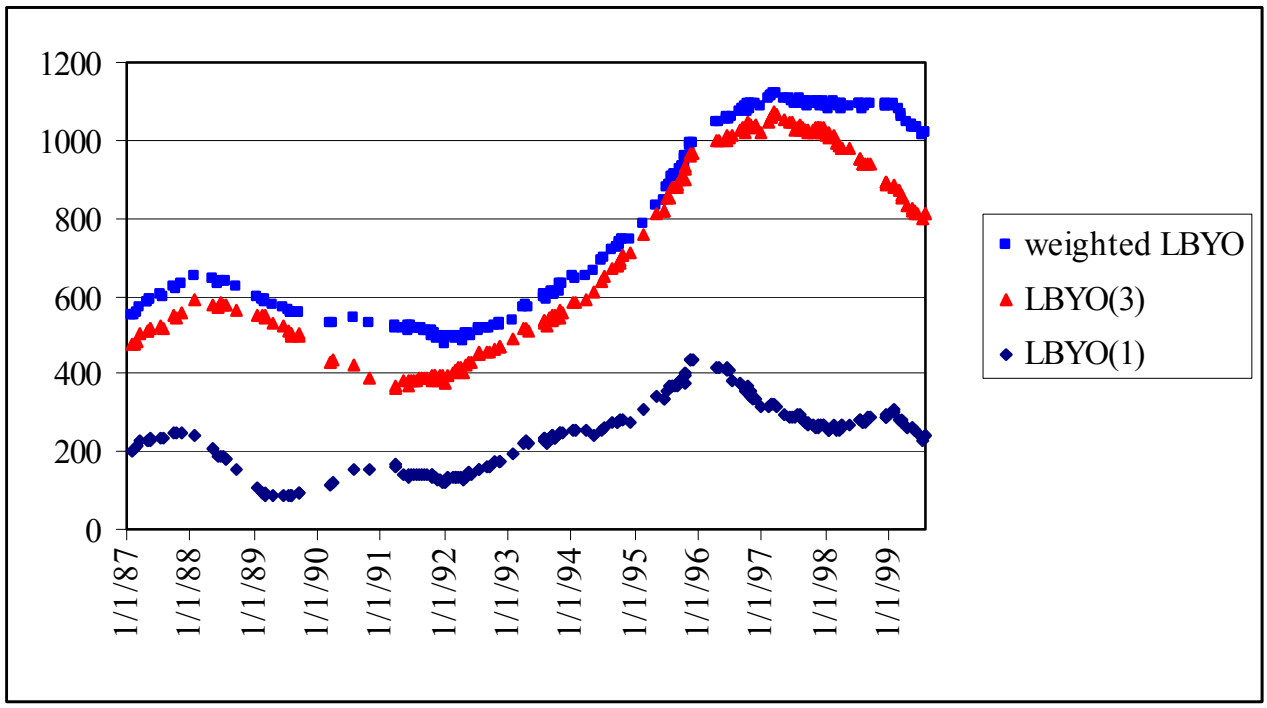


Figure 11
Learning-by-observing variable LBYO(3) plotted against time.



Appendix

announced	acquiring bank	target bank
01/27/87	FIRST CHICAGO CORPORATION	FIRST UNITED FINANCIAL SERVICES, INC.
2/9/1987	First of Amer Bk,Kalamazoo,MI	BancServe Group,Rockford,IL
02/24/87	SECURITY PACIFIC CORPORATION	RAINIER BANCORPORATION
03/18/87	FLEET/NORSTAR FINANCIAL GROUP, INC.	NORSTAR BANCORP INC.
04/27/87	SOVRAN FINANCIAL CORPORATION	COMMERCE UNION CORPORATION
4/27/1987	Old Kent Finl Corp,Michigan	Illinois Regional Bancorp,IL
5/14/1987	First Interstate Bancorp	Allied Bancshares,Houston,TX
05/19/87	U.S. BANCORP	PEOPLES BAN CORPORATION
07/21/87	UJB FINANCIAL CORP.	FIRST VALLEY CORPORATION
07/31/87	PNC FINANCIAL CORP.	CENTRAL BANCORPORATION, INC., THE
09/25/87	BANK OF NEW YORK COMPANY, INC., THE	IRVING BANK CORPORATION
10/09/87	FIRST UNION CORPORATION	FLORIDA COMMERCIAL BANKS, INC.
11/19/1987	Marshall & Ilsley,Milwaukee,WI	Central Wisconsin Bankshares
01/27/88	NATIONAL CITY CORPORATION	FIRST KENTUCKY NATIONAL CORPORATION
05/04/88	BOATMEN'S BANCSHARES, INC.	CENTERRE BANCORPORATION
6/16/1988	KeyCorp,Albany,NY(Key Corp,OH)	First Wyoming Bancorp,Cheyenne
06/28/88	SUMMIT BANCORPORATION, THE	SOMERSET BANCORP, INC.
7/6/1988	NCNB Corp,Charlotte,NC	First Republic Bank Corp
07/25/88	COMERICA INCORPORATED	ALLIANCE FINANCIAL CORPORATION
7/25/1988	Fleet/Norstar Financial Grp,RI	Indian Head Banks Inc, Nashua
09/22/88	PNC FINANCIAL CORP.	BANK OF DELAWARE CORPORATION
01/23/89	FIRST OF AMERICA BANK CORPORATION	MIDWEST FINANCIAL GROUP, INC.
2/21/1989	BANC ONE Corp,Columbus,Ohio	Metropolitan Bancorp Inc
2/28/1989	Banknorth Group Inc,VT	Howard Bancorp,Burlington,VT
3/7/1989	First Union Corp,Charlotte,NC	Florida Nat Bks of Florida Inc
4/25/1989	First Chicago Corp,Illinois	Ravenswood Financial Corp
06/19/89	SOCIETY CORPORATION	TRUSTCORP, INC.
7/25/1989	Jefferson Bankshares Inc,VA	Chesapeake Bank Corp
08/07/89	FIFTH THIRD BANCORP	FIRST OHIO BANCSHARES, INC.
8/7/1989	Huntington Bancshares Inc,OH	First Banc Securities Inc
8/10/1989	First Eastern Corp,PA	First National Bk,Wyoming,PA
09/15/89	CORESTATES FINANCIAL CORP	FIRST PENNSYLVANIA CORPORATION
9/21/1989	Wells Fargo Capital C	Central Pacific Corp
03/23/90	NORTH FORK BANCORPORATION, INC.	EASTCHESTER FINANCIAL CORPORATION
4/2/1990	Comerica Inc,Detroit,Michigan	InBancshares
8/6/1990	Firstar Corp,Milwaukee,WI	Banks of Iowa Inc
10/23/90	MAGNA GROUP, INC.	LANDMARK BANCSHARES CORPORATION
03/25/91	NBD BANCORP, INC.	FNW BANCORP, INC.
03/25/91	BANC ONE CORPORATION	MARINE CORPORATION
05/15/91	KEYCORP	AMERITRUST CORPORATION
6/3/1991	BANC ONE Corp,Columbus,Ohio	First Illinois Corp, Evanston
6/17/1991	First Union Corp,Charlotte,NC	Southeast Banking Corp,Miami
6/20/1991	Wachovia Corp,Winston-Salem,NC	South Carolina National
07/15/91	CHEMICAL BANKING CORPORATION	MANUFACTURERS HANOVER CORPORATION
07/31/91	BANKAMERICA CORPORATION	VALLEY CAPITAL CORPORATION

08/12/91	BANKAMERICA CORPORATION	SECURITY PACIFIC CORPORATION
08/19/91	ASSOCIATED BANC-CORP.	F & M FINANCIAL SERVICES CORPORATION
09/12/91	FIRST OF AMERICA BANK CORPORATION	SECURITY BANCORP, INC.
09/16/91	PNC BANK CORP.	FIRST NATIONAL PENNSYLVANIA CORPORATION, THE
10/21/91	UNITED BANKSHARES, INC.	SUMMIT HOLDING CORPORATION
10/28/91	COMERICA INCORPORATED	MANUFACTURERS NATIONAL CORPORATION
10/30/91	NATIONAL CITY CORPORATION	MERCHANTS NATIONAL CORPORATION
10/31/1991	CNB Bancshares Inc,IN	Indiana Bancshares Inc
11/8/1991	Chemical Banking Corp	Community National Bank,NY
11/27/91	BANC ONE CORPORATION	FIRST SECURITY CORPORATION OF KENTUCKY
12/11/91	PNC BANK CORP.	CCNB CORPORATION
12/20/91	FIRST CHICAGO NBD CORPORATION	SUMMCORP
12/30/91	BANC ONE CORPORATION	AFFILIATED BANKSHARES OF COLORADO, INC.
01/27/92	DAUPHIN DEPOSIT CORPORATIO	FB & T CORPORATION
02/14/92	CORESTATES FINANCIAL CORP	FIRST PEOPLES FINANCIAL CORPORATION
3/4/1992	KeyCorp,Albany,NY(Key Corp,OH)	Puget Sound Bancorp,Tacoma,WA
03/05/92	BOATMEN'S BANCSHARES, INC.	SUNWEST FINANCIAL SERVICES, INC.
03/18/92	FIRST CHICAGO NBD CORPORATION	INB FINANCIAL CORPORATION
4/7/1992	Synovus Financial Corp,GA	First Commercial Bancshares,AL
04/14/92	BANC ONE CORPORATION	VALLEY NATIONAL CORPORATION
5/1/1992	Westamerica Bancorp,California	Napa Valley Bancorp
05/18/92	BARNETT BANKS, INC.	FIRST FLORIDA BANKS, INCORPORATED
06/05/92	BANC ONE CORPORATION	KEY CENTURION BANCSHARES, INC.
7/17/1992	NationsBank Corp,Charlotte,NC	MNC Financial Inc
7/22/1992	BANC ONE Corp,Columbus,Ohio	First Community Bancorp Inc
9/9/1992	Bank of Boston Corp,Boston,MA	Multibank Financial Corp
09/21/92	FIRST UNION CORPORATION	DOMINION BANKSHARES CORPORATION
10/23/92	SUNTRUST BANKS, INC.	FLAGLER BANK CORPORATION, THE
11/09/92	FIRST BANK SYSTEM, INC.	COLORADO NATIONAL BANKSHARES, INC.
11/9/1992	Valley National Bancorp,NJ	Peoples Bancorp,Marietta,OH
11/12/92	HUNTINGTON BANCSHARES INCORPORATED	CB&T FINANCIAL CORP
1/29/1993	Bank of New York Co Inc,NY	National Community Banks Inc
04/02/93	NATIONAL CITY CORPORATION	OHIO BANCORP
04/21/93	HUNTINGTON BANCSHARES INCORPORATED	COMMERCE BANC CORPORATION
04/28/93	SOUTHTRUST CORPORATION	BMR FINANCIAL GROUP, INC.
7/23/1993	Boatmen's Bancshares,St Louis	First Amarillo Bancorp Inc
07/27/93	PNC BANK CORP.	FIRST EASTERN CORP.
8/2/1993	CoreStates Financial Corp,PA	Constellation Bancorp
08/05/93	ONE VALLEY BANCORP, INC.	MOUNTAINEER BANKSHARES OF W. VA., INC.
8/11/1993	BANC ONE Corp,Columbus,Ohio	Capitol Bancorp Ltd,Lansing,MI
9/1/1993	Omega Financial Corp	Penn Central Bancorp Inc
09/07/93	SUFFOLK BANCORP	HAMPTONS BANCSHARES, INC.
09/09/93	COMERICA INCORPORATED	PACIFIC WESTERN BANCSHARES, INC.
09/13/93	KEYCORP	COMMERCIAL BANCORPORATION OF COLORADO
09/20/93	MARSHALL & ILSLEY CORPORATION	VALLEY BANCORPORATION
09/21/93	BANKBOSTON CORPORATION	BANKWORCESTER CORPORATION
09/29/93	U.S. BANCORP	BOULEVARD BANCORP, INC.
10/01/93	KEYCORP	KEYCORP
11/02/93	OLD KENT FINANCIAL CORPORATION	EDGEMARK FINANCIAL CORPORATION
11/03/93	BANC ONE CORPORATION	LIBERTY NATIONAL BANCORP, INC.

11/19/93	CORESTATES FINANCIAL CORP	INDEPENDENCE BANCORP, INC.
1/18/1994	Keystone Finl,Harrisburg,PA	Frankford Corp
1/28/1994	BankAmerica Corp	Continental Bank Corp NA
3/21/1994	First Fidelity Bancorp,NJ	Baltimore Bancorp,Maryland
05/09/94	FLEET FINANCIAL GROUP, INC.	NBB BANCORP, INC.
07/01/94	UNION PLANTERS CORPORATION	GRENADA SUNBURST SYSTEM CORPORATION
07/12/94	MELLON BANK CORPORATION	KEYSTONE FINANCIAL INC.
08/22/94	OLD KENT FINANCIAL CORPORATION	FIRST NATIONAL BANK CORP.
09/22/94	MERCANTILE BANCORPORATION INC.	CENTRAL MORTGAGE BANCSHARES, INC.
9/22/1994	First Tennessee National Corp	Community Bancshares Inc,TN
10/5/1994	Comerica Inc,Detroit,Michigan	University Bank & Trust Co,CA
10/06/94	SYNOVUS FINANCIAL CORP.	NBSC CORPORATION
10/24/1994	Mason-Dixon Bancshares,MD	Bank Maryland Corp,Maryland
10/24/1994	Chase Manhattan Corp	US Trust Corp,New York,NY
12/12/1994	Centura Bank Inc,NC	First Southern Bancorp,NC
02/21/95	FLEET FINANCIAL GROUP, INC.	SHAWMUT NATIONAL CORPORATION
5/3/1995	Comerica Inc,Detroit,Michigan	Metrobank NA
06/19/95	FIRST UNION CORPORATION	FIRST FIDELITY BANCORPORATION
06/20/95	UNION PLANTERS CORPORATION	CAPITAL BANCORPORATION, INC.
07/10/95	PNC BANK CORP.	MIDLANTIC CORPORATION
07/19/95	BANK ONE CORPORATION	PREMIER BANCORP, INCORPORATED
8/2/1995	UJB Financial Corp	Flemington Natl Bank & Trust
08/07/95	U.S. BANCORP	FIRSTIER FINANCIAL, INC.
08/23/95	REGIONS FINANCIAL CORPORATION	METRO FINANCIAL CORPORATION
08/28/95	CHASE MANHATTAN CORPORATION, THE	CHASE MANHATTAN CORPORATION
08/28/95	NATIONAL CITY CORPORATION	INTEGRA FINANCIAL CORPORATION
09/05/95	BANK OF AMERICA CORPORATION	BANK SOUTH CORPORATION
09/11/95	SUMMIT BANCORP.	SUMMIT BANCORPORATION, THE
9/29/1995	Whitney Holding Corp,	First Citizens Bancstock
10/18/1995	Wells Fargo Capital C	First Interstate Bancorp,CA
10/23/95	REGIONS FINANCIAL CORPORATION	FIRST NATIONAL BANCORP
10/25/1995	Peoples Heritage Finl Group,ME	Bank of New Hampshire Corp
11/21/1995	BT Financial Corp,Johnstown,PA	Moxham Bank Corp
11/22/1995	F&M National,Winchester,VA	FB&T Financial Corp
11/27/1995	Compass Bancshares Inc,AL	CFB Bancorp Inc
4/22/1996	F&M National,Winchester,VA	Allegiance Banc,Bethesda,MD
4/29/1996	Hudson United Bancorp,NJ	Hometown Bancorporation Inc,CT
6/14/1996	Regions Financial Corp	Allied Bankshares Inc,GA
6/21/1996	Hudson United Bancorp,NJ	Westport Bancorp,Westport,CT
06/25/96	COMMUNITY FIRST BANKSHARES, INC.	MOUNTAIN PARKS FINANCIAL C
7/15/1996	North Fork Bancorp,Melville,NY	North Side Savings Bank,NY
8/29/1996	Summit Bancorp,Princeton,NJ	BMJ Financial Corp,New Jersey
9/16/1996	Crestar Finl Corp,Richmond,VA	Citizens Bancorp,Laurel,MD
9/16/1996	City National Bk,Beverly Hills	Ventura County Natl Bancorp,CA
09/30/96	CULLEN/FROST BANKERS, INC.	CORPUS CHRISTI BANCSHARES,
10/14/96	COMMERCE BANCORP, INC.	INDEPENDENCE BANCORP, INC.
10/16/1996	City National Bk,Beverly Hills	Riverside Natl Bk,Riverside,CA
10/28/96	FIRST VIRGINIA BANKS, INC.	PREMIER BANKSHARES CORPORATION
10/29/1996	Park National Corp,Newark,Ohio	First-Knox Banc Corp
11/01/96	HUNTINGTON BANCSHARES INCORPORATED	CITI-BANCSHARES, INC.

11/04/96	BB&T CORPORATION	UNITED CAROLINA BANCSHARES
11/12/96	WESTAMERICA BANCORPORATION	VALLICORP HOLDINGS, INC.
11/20/96	ZIONS BANCORPORATION	ASPEN BANCSHARES, INC.
12/30/1996	BANC ONE Corp,Columbus,Ohio	Liberty Bancorp Inc,Oklahoma
02/14/97	REGIONS FINANCIAL CORPORATION	NEW IBERIA BANCORP, INC., THE
02/19/97	UNITED BANKSHARES, INC.	FIRST PATRIOT BANKSHARES CORPORATION
02/25/97	PACIFIC CENTURY FINANCIAL CORPORATION	CU BANCORP
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07/21/97	FIRST UNION CORPORATION	SIGNET BANKING CORPORATION
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