Economic Review

BANK MERGER MOTIVATIONS

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Bank Merger Motivations: A Review of the Evidence and an Examination of Key Target Bank Characteristics

William C. Hunter and Larry D. Wall

Understanding the nature of the gains and losses resulting from bank mergers is becoming increasingly important in the United States. As Peter S. Rose (1989) reports, the average annual number of bank mergers in the 1980s is already triple that of the 1960s and double the average of the 1970s. These transactions must provide some benefit to the managers of the acquiring banks, or these managers would not make merger offers. Likewise, shareholders and managers of target banks must also benefit, or the offers would not be accepted. Whether the shareholders of acquiring banks and the public also gain from these mergers is less clear. Theoretically, bank managers are the agents of the bank's shareholders and, thus, should undertake only those mergers that benefit owners of the company's equities. However, regulatory limitations on bank takeovers may weaken the market for bank control and permit the man-

The authors are officers in charge of basic research and the financial section, respectively, of the Atlanta Fed's Research Department.

agers of some acquiring institutions to retain control of their banks even if their merger strategies are contrary to shareholders' interests. While the public can clearly benefit from mergers that enhance bank operating efficiency, the public interest could possibly be harmed, for example, by mergers that reduce competition among financial services providers.

One way to gain insight into the nature of the potential gains and losses associated with bank mergers is to analyze the managerial motives behind acquisitions. Knowing why mergers take place should help in analyzing their actual effect by focusing attention on those areas where bank managers believe the most important changes will occur. To determine what empirical support exists for the most commonly cited explanations for bank mergers, this article reviews the bank structure and performance literature that is most directly related to bank mergers. Existing research tends to support the hypothesis that acquirers are motivated by a desire to diversify their funding sources and earnings, and that the potential to gain from economies of scale often exists. However, the literature also

The authors' analysis of the financial profiles of 559 bank mergers during the period 1981-86 finds that the most valued characteristics in target banks include above-average profitability, faster deposit and asset growth, a higher ratio of loans to earning assets, and judicious use of financial leverage. These results are consistent with a survey of prior studies in suggesting that a variety of motives exist for bank mergers.
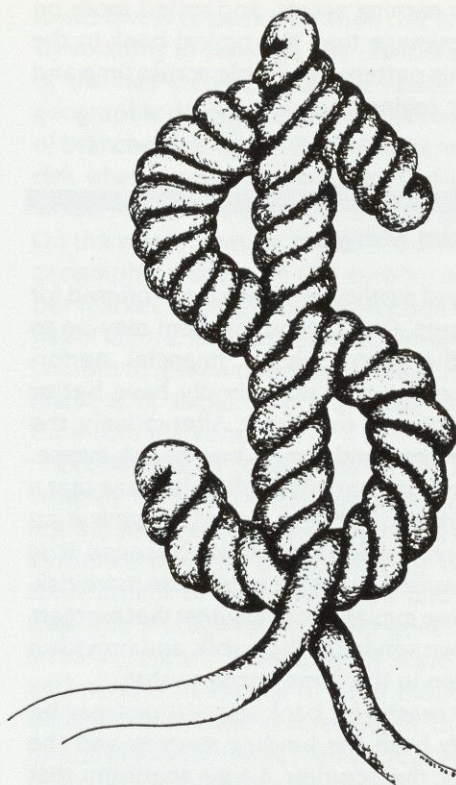
suggests that, in many cases, acquirers follow strategies that do not maximize shareholders' wealth.

Of the many questions addressed in the bank merger literature in recent years, no issue has been more intriguing to bank analysts than ascertaining which financial characteristics in potential merger partners are most highly valued by acquiring banks. This article also presents original research that examines the financial characteristics of the target banks in 559 U.S. bank mergers during the period 1981 through 1986. Using the multivariate statistical technique of cluster analysis—which investigates the structure of a data set in cases where there is a lack of a complete understanding of the various forces shaping the data—the examination sought to determine if a strategic profile exists for target banks. This pattern was defined in terms of financial characteristics highly valued by acquiring banks and systematically associated with attractive purchase prices. When determined, the profile was examined for stability across geographic regions and across time.

The research reported in this article also examines the financial characteristics of the acquiring banks to see if a strategic acquirer profile could be identified and, if so, whether this profile is also stable across geographic regions and time. Unfortunately, the results of the analysis of acquirer banks did not reveal any strong systematic pattern. Thus, the following discussion concentrates on the results obtained in the analysis of the target banks. Although it is reasonable to expect that bank strategic profiles will be independent of geographic location, regional differences in banking markets and regulation could render certain target bank characteristics more highly valued in one geographic region than another, at least in the short run.

The cluster analysis strongly suggests that a definite strategic profile of highly valued financial characteristics of merger targets existed during the designated period. As will be shown, target banks with the largest mean purchase-price-to-book-equity ratios were more profitable, had faster premerger growth in core deposits and total assets, showed a higher ratio

of loans to earning assets, and relied more on financial leverage than the typical bank in the sample. This pattern was stable across time and geographic regions.

Why Banks Merge

A variety of motivations have been offered for bank mergers. One reason for them may be to improve the target bank's financial performance. The acquirer may simply have better management than the target. Alternatively, the latter's managers and owners may be risk-averse, turning down potentially profitable loans that a larger, perhaps publicly traded, organization might more comfortably make because it is more diversified or willing to tolerate more risk. Both of these explanations suggest that mergers may improve service to the public and provide a net increase in the firms' market value.

Another reason for bank acquisitions may be to diversify both the funding sources and the earnings of the acquirer. Large acquirers that rely on purchased funds may be especially interested in buying banks that have significant core deposit funding bases. Although the deregulation of deposit interest rates has reduced the cost advantages of relying on core deposits, they are still highly valued because of their greater stability relative to purchased funds. Similarly, diversification of earnings, both geographically and by customer type, can reduce the overall credit riskiness of a bank's asset portfolio.

Shareholders may gain from a bank's diversification of both its funding sources and its loan portfolio. Banks that increase their reliance on core deposits are less likely to experience a disruptive bank run, which could terminate the option value of a bank's stock. Whether shareholders benefit from the diversification of a bank's loan portfolio depends on how diversified the individual shareholders are.[1] Those who maintain well-diversified portfolios or who own proportionate shares of individual banks that are combining may not be significantly affected by mergers. However, investors who own stock only in the acquirer and whose portfolios are not otherwise well diversified may benefit from such a risk-reducing merger.

Whether the public gains from the diversification associated with mergers is debatable. Regulators have historically taken the view that the banking system would be more stable if firms relied more on core deposits and less on purchased funds. However, an argument can be made that the tendency of purchased funds to be withdrawn when a bank encounters financial problems serves as an important source of market discipline. Thus, although banks that rely on core deposits may be more stable after the onset of financial problems, these firms can also follow riskier strategies than banks which depend on purchased funds. Additionally, industry concentration attendant upon mergers may pose other dangers. Although the benefits of asset diversification in reducing an individual bank's credit riskiness are undisputed, a banking system with a few large organizations may be less stable than one with more, smaller organizations, according to Sherrill Shaffer (1989). Losses that occur at one bank would not cause another independent bank to fail but could cause their joint failure if the two were merged.[2]

A third reason for bank mergers is that some acquirers may perceive gains solely from becoming a larger organization and being able to attain economies of scale. Another reason for expansion may be to become, as the current parlance has it, "too big to fail" or "too big to be acquired." For banks that are "too big to fail," the Federal Deposit Insurance Corporation (FDIC) is virtually certain to guarantee all deposits in the event of financial problems because of the risk presented to the banking system. Banks can also reduce the probability of receiving a hostile takeover offer by increasing their market capitalization above that of potential acquirers. Another important factor in bank size is that larger banks may pay higher salaries or provide more managerial perquisites.

Increased economies of scale can benefit both the general public and bank shareholders. The latter can benefit from a bank's becoming "too big to fail" insofar as depositors demand a lower risk premium; however, this gain comes at the public's expense through greater risk-bearing by the FDIC.

Both the public and bank shareholders can suffer from mergers that are motivated by a desire to become "too large to be acquired" because such transactions may reduce the over-

all efficiency of the banking system. The public and shareholders may also lose in mergers motivated by managers' desire for higher salaries and more perks. Unfortunately, distinguishing empirically among these motives for increased size is difficult, partly because the analysis of the targets' size cannot necessarily be used to support one explanation over another. An acquirer can obtain the same results with one big merger or several small mergers.

A fourth reason for taking over another bank is the acquirer's desire to increase its market power and reduce competition. If a less competitive environment translates into higher profits or reduced risk for the acquirers, their shareholders can benefit.[3] However, these gains come at the expense of the public, which must pay higher prices for bank services.

Thus, mergers may occur to improve the financial performance of the target, to diversify the acquirer, to provide the benefits associated with larger size, or to increase the acquirer's market power. These various explanations have different implications for both social welfare and the acquirer's shareholders.

Existing Evidence about Bank Mergers

The Effect of Size on Bank Risk. The notion suggesting that larger, more diversified banks are less likely to fail appears to be supported by evidence dating as far back as the 1920s and 1930s. Of the many banks that failed in this period, small banks failed at a disproportionally high rate. More recent evidence on the relationship between size and risk is provided in a paper by Nellie Liang and Stephen A. Rhoades (1988). They studied several measures of bank risk relative to the firm's total assets, geographic diversification, and average number of branches per market, as well as a series of other control variables.[4] When risk is measured by a bank's capital-to-assets ratio, the researchers found a positive and statistically significant relationship between risk and bank size—that is, the larger banks typically have lower capital-to-asset ratios. In contrast, increases in geographic dispersion and in the number of branches per market are associated with statistically significant,

lower levels of bank risk when risk is measured by volatility in earnings (the standard deviation of the net-income-to-assets ratio). However, geographic dispersion and the average number of branches are associated with increased bank risk when measured using the net-income-to-assets ratio and the capital-to-total-assets ratio. On the whole, though, the effect of increases in geographic dispersion and number of branches per market is a significant reduction in a bank's risk of failure, implying that acquiring banks may be able to lessen their risk by entering into new markets or expanding branching networks in their own markets.

Economies of Scale. Jeffrey A. Clark (1988) recently surveyed a number of economies-of-scale studies, virtually all of which, he notes, find evidence of scale economies for banks with total assets of less than $100 million. However, the studies he surveyed generally fail to show significant economies of scale for banks with assets in excess of $100 million. These economies-of-scale studies define the relevant unit of production as a loan or deposit account. In order to implement this definition of production, the studies use the Federal Reserve's Functional Cost Analysis (FCA) data set, which provides the most comprehensive sample of banks for which the number of loan and deposit accounts are available. However, bank involvement in the FCA program is voluntary, and many banks do not participate. In particular, the FCA sample has too few banks with assets in excess of $1 billion to estimate their cost function reliably. Thus, studies based on FCA data provide little information about the cost structure of larger banks.

An alternative method of examining bank production efficiency is through the intermediation approach, under which the relevant unit of output is defined in terms of dollars. By obviating the need to obtain data on the number of accounts, and given the comprehensive financial reporting that regulators require, researchers can select any domestic banks for inclusion in the sample. One of the authors of this article, William C. Hunter, and Stephen G. Timme (1988, 1989) analyzed economies of scale at very large banks using the intermediation approach. Their 1989 paper found significant economies of scale for banks with total assets in the $800 million to $5 billion range, with constant or slightly in-

creasing costs for larger banks. Although no research to date examines the scale economy question exclusively for banks in the $100 million to $800 million range, the evidence points to either constant costs or slight diseconomies of scale for these institutions.

Studies by Shaffer and Edmond David (1986) as well as Shaffer (1988) have examined economies of scale in large U.S. commercial banks. The 1988 study finds that, although large banks have statistically small scale economies, they can nevertheless be quite important economically.

Although empirical studies of scale economies in banking are extremely sensitive to researchers' statistical methodologies and data definitions, the bulk of the evidence suggests that, in most cases, the desire to improve production efficiencies through economies of scale appears to be a valid motivation for merging, especially for banks with total assets below $5 billion. However, on the basis of this evidence, it would not necessarily be irrational for larger banks, say in the $5 billion range for total assets, to make a series of acquisitions of smaller banks. Costs have been shown to be relatively constant for asset sizes up to about $25 billion. In addition, since most scale economies studies are unable to measure precisely the impact on bank production of such factors as increased consumer convenience and enhanced diversification, mergers between extremely large banking organizations may be justified on the basis of these variables.

Market Structure. Aside from the effect of bank size on riskiness and efficiency, another consideration in understanding merger motivations is the effect on banks' markets, particularly whether banks in more concentrated markets— those with relatively fewer institutions—were more profitable. The question of whether concentrated banking markets are less competitive than unconcentrated ones has received considerable attention.[5] However, many of the early studies of this "structure-performance hypothesis" are severely criticized by two researchers in the field, R. Alton Gilbert (1984) and Michael Smirlock (1985). One of their principal criticisms is that the studies assumed, without providing adequate support, that higher concentration caused greater profitability. Harold Demsetz (1973, 1974) argues that more efficient banks

would be more profitable and would be able to gain market share at the expense of less efficient banks. This efficient-market-structure hypothesis claims that a positive relationship between concentration and profits merely implies that a large efficiency gap exists between different banks in the same market.

Several studies explore the efficient-market-structure hypothesis. Smirlock, Gary Whalen (1987), and Douglas D. Evanoff and Diana Fortier (1988) used bank market share as a proxy for bank efficiency. All three studies found that market share has a strong positive effect on profitability. However, both Smirlock and Whalen concluded that concentration ratios are unrelated to profitability after controlling for market share, whereas Evanoff and Fortier uncover only

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limited evidence that concentration has an effect on profitability.

William G. Shepard (1986) criticizes the efficiency proxy mentioned above and argues that market share could instead be a measure of market power. Smirlock, Thomas Gilligan, and William Marshall (1986) respond that the relationship between market share and market power is ambiguous in theory and, thus, Shepard's criticism is not necessarily valid. Allen N. Berger and Timothy H. Hannan (1989) suggest that analysis of pricing data may shed more light on the relationship between market share and market power than would an analysis of profitability data. Concentration, they argue, should have an unambiguously positive effect on prices charged (or a negative effect on deposit rates) if the structure-performance hypothesis is correct, and should have an insignificant or negative effect on prices (a positive effect on deposit

rates) if the efficient-market-structure hypothesis is correct.[6] Berger and Hannan found a negative relationship between concentration and the rate paid on bank deposits between September 1983 and December 1985, which supports the argument that higher concentration causes a reduction in competition that in turn boosts bank profitability.

Berger and Hannan's results are supported by two other studies. Research by Alan J. Daskin and John D. Wolken (1989) produced a significant positive relationship between bank concentration and the rates charged for commercial and industrial loans. Randall J. Pozdena (1986) attacks the problem from a different angle, looking at the connection between market concentration and the entry of new banks and

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branches. If the structure-performance hypothesis is correct, high profits in concentrated markets may attract competition. However, if the efficient-market-structure hypothesis is correct, the relationship between concentration and market entry should be insignificant or negative since new competitors would have to compete with large, very efficient banks. Pozdena found a positive and significant relationship between market concentration and the entry of new banks and branches, thus supporting the structure-performance hypothesis.

Although the evidence appears to indicate a relationship between structure and performance, several recent studies highlight the nature of market factors other than concentration. Evanoff and Fortier determined that a significant positive relationship exists between concentration and profitability only in unit banking states. Jim Burke and Rhoades (1987)

concluded that small banks in rural markets were significantly more profitable than comparably sized banks in urban markets (metropolitan statistical areas) between 1980 and 1984. Tony Cyrnak and Rhoades (1989) found that banks in markets with three or fewer organizations are substantially more profitable than banks in markets with four or more organizations.

Characteristics of Targets and Acquirers. Analysis of the premerger characteristics of target and acquiring banks may provide information on several of the popular explanations for bank mergers. Five studies are of special interest.[7] Hannan and Rhoades (1987) analyzed the characteristics associated with being a target bank in Texas between 1970 and 1982.[8] Rose (1989) examines U.S. bank mergers from 1970 through 1985. His group includes 224 acquirers and 230 targets that could be successfully paired with comparably sized banks in the same county or standard metropolitan statistical area; holding company acquisitions appear to be excluded from the sample. Although the analysis of the performance of targets and acquirers is not the focus of their study, Benton E. Gup, David C. Cheng, Larry D. Wall (one of the authors of this article), and Kartono Liano (1989) provide descriptive data on 559 mergers that occurred between 1981 and July 1986.[9] One important limitation of this analysis of descriptive data is that statistical tests of the differences in means are not provided for the acquirers and targets. Randolph P. Beatty, Anthony M. Santomero, and Smirlock (1987) analyzed 149 matched target and acquiring banks covering acquisitions from 1984 and the first three quarters of 1985. They provided statistical tests of significant differences in key financial ratios for targets and acquirers using 1982 financial data. Rhoades (1985a) examined the size and location of all acquisitions in the United States between 1960 and 1982.

Analysis of the financial performance of the target and acquiring banks prior to acquisition provides mixed evidence on the hypothesis that mergers are undertaken to improve the efficiency of poorly managed institutions. Rose (1989) found that target banks were less profitable and less efficient in terms of dollars of assets per employee than were their acquirers. Beatty, Santomero, and Smirlock concluded

that acquirers have a higher return on equity, but the researchers suggest that this better performance may be due to generally higher risk profiles. Hannan and Rhoades, in their study of Texas banks, found that profitability was not an important determinant of whether a bank would be acquired. Additionally, Gup, Cheng, Wall, and Liano, using a larger and more recent sample, discovered that targets are not necessarily less profitable than acquirers if profitability is measured by return on assets.

Evidence of the relationship between the probability of being an acquisition target and the acquirer's potential to improve the target's performance by expanding its loan portfolio is not conclusive. Hannan and Rhoades found that the loan-to-asset ratio had an insignificant effect on the probability of being acquired. However, Rose (1989) showed that target banks had significantly lower loan-to-asset ratios than acquiring banks. Gup, Cheng, Wall, and Liano determined that targets have a retail-loan-to-total-loan ratio that is higher than that of acquiring banks.

According to Beatty, Santomero, and Smirlock, acquirers have lower percentages of U.S. Treasury securities, a lower proportion of investment securities, higher percentages of net loans, and higher debt-to-equity ratios. Gup, Cheng, Wall, and Liano found that acquirers experienced somewhat greater core deposit growth rates, but these researchers do not directly examine the level of core deposits. None of the five studies addressed specifically the issue of earnings diversification.

Rhoades (1985a) found that the overwhelming majority of banks acquired between 1960 and 1982 had assets of $50 million or less. The number of targets with assets under $50 million represent 84 percent of the nearly 4,400 banks sampled. The average size of bank mergers may have increased over time as bank asset sizes increased with inflation. However, 275 of the 422 targets in 1982 had assets of less than $50 million and only 3 had assets of $1 billion or more. These findings are consistent with the hypothesis that mergers are sought to achieve economies of scale in that they may lead to greater efficiencies in the target. The results also suggest that attempts to become "too big to fail" were not a significant factor in most mergers prior to 1983.

According to Hannan and Rhoades, concentration had a significantly negative effect on intramarket acquisitions. However, this result should not necessarily be taken to indicate that acquirers place little value on opportunities to increase concentration. The researchers' study suggests that antitrust limitations on bank mergers would discourage takeovers in highly concentrated markets.

Determinants of the Prices Paid in Bank Mergers. Several studies provide insight into the characteristics that acquirers value most in merger partners by examining the determinants of the ratio of the purchase price to book value of the target's equity. Rhoades (1987) analyzed the determinants of the purchase price in 1,835 mergers between 1973 and 1985. Donald R. Fraser and James W. Kolari (1987) examined

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pricing of 217 mergers in 1985. Beatty, Santomero, and Smirlock studied pricing in 264 bank mergers between the beginning of 1984 and the third quarter of 1985. Robert J. Rogowski and Donald G. Simonson (1989) looked at pricing in a sample of 168 mergers in selected states during the 1980s. Cheng, Gup, and Wall (1989) examine pricing for 135 mergers in selected southeastern states. The authors of this article also have a study in progress that examines 61 mergers between December 1981 and July 1986 where market-value data are available for both target and acquirer.[10]

The studies of purchase price provide little evidence to support the notion that acquirers engage in mergers with the express intention of improving the target's financial performance. One way of examining this issue is to determine the relationship between the price paid and the

target's profitability. Available evidence indicates that the financial performance of the target is not consistently related to its purchase price. For example, Rogowski and Simonson, as well as Rhoades (1987), failed to find a consistently significant and positive relationship, while such a linkage was indicated by Fraser and Kolari; Beatty, Santomero, and Smirlock; and Cheng, Gup, and Wall. If one interprets this group of findings as indicating no relationship between premerger profits and the purchase price, one could speculate that acquirers are looking to the target's postmerger profitability, which is unrelated to its premerger profits. This interpretation suggests that acquirers are planning on significantly changing the profitability of the target. However, even if the empirical evidence is accepted as supporting a positive rela-

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tionship between purchase price and profits, this evidence does not necessarily preclude the possibility that acquirers expect to improve the target's management. Premerger profitability may be positively correlated with postmerger profitability even if the acquirer expects to improve the target's management.

Another method of analyzing the acquirer's potential to improve the efficiency of the target would be to look at how efficient the acquirer's operations are. Acquiring banks with high profitability and high market-to-book-value ratios may be considered to have relatively more efficient management. Cheng, Gup, and Wall found that the market-to-book ratios of acquirers have a significantly positive effect on the purchase price but that the acquirer's profitability has a negative effect. The implications of these findings are not clear.

The studies also yield conflicting results on the ability of acquirers to adopt more aggressive loan policies. The research of Rogowski and Simonson indicated a significantly positive relationship between the loan-to-earning-asset ratio and the purchase-price ratio, whereas Beatty, Santomero, and Smirlock found a negative relationship.

Preliminary results of a study by the authors of this article support the hypothesis that potential diversification of the acquirer's earning assets has a significantly positive effect on the purchase price. The research found that the target's variance of return on assets and the covariance between the target and the acquirer's return on assets have a significantly negative effect on purchase price. The study also concluded that the acquirer's variance of return on assets has a significantly positive effect on purchase price.

Cheng, Gup, and Wall provide some support for the hypothesis that acquirers are seeking more core deposits. Their research revealed a positive relationship between the core deposit growth rate of the target and the purchase price.[11] Two studies support the hypothesis that size advantages may influence merger decisions. Hypothesizing that the acquirer's ability to add new services to a target is a positive function of the ratio of the acquirer's total assets to the target's total assets, Rogowski and Simonson found a significantly positive relationship, which is supported by Cheng, Gup, and Wall.[12]

Conflicting results are obtained for the effect of concentration on merger pricing. Studies by Rhoades (1987) and Rogowski and Simonson indicated that concentration had an insignificant effect on purchase price. On the other hand, Beatty, Santomero, and Smirlock found a significantly positive relationship.

Effect of Mergers on Bank Shareholders. In addition to studies of the characteristics of merging firms and research regarding the prices paid in mergers, numerous tests examine the change in the acquirer's stock-market valuation after the merger announcement. If acquiring banks are maximizing shareholder values and shareholders are acting in a rational manner, the acquirer's takeover announcement should yield stock returns significantly in excess of expected returns (positive abnormal returns) on the day of the announcement. If acquirers are maximizing

management's interest at the expense of shareholders, abnormal returns should be significantly negative. These studies could also be interpreted as offering evidence as to whether the mergers provide gains to the combined organizations. However, the presence or absence of other gains can be masked by the target's purchase price. For example, negative abnormal stock returns for the acquiring organization do not necessarily imply that the merger will decrease or merely maintain efficiency. The gains resulting from improved efficiency could be more than offset by the excessive purchase price paid by the acquirer.

Several studies have examined the stock market's reaction to the acquisition of nonfailing banks. A.S. Desai and R.D. Stover (1985) examined 18 bank and nonbank mergers between 1976 and 1982 and determined that acquirers earn significantly positive abnormal returns. Walter P. Neely (1987), on the other hand, looked at 26 mergers occurring between 1979 and 1985 and found that acquirers earned significantly negative abnormal returns.

Jack W. Thrifts and Kevin P. Scanlon (1987), analyzing 17 interstate acquisitions, determined that acquirers of large institutions—that is, those whose assets amounted to more than 20 percent of the acquirers'—experienced insignificant abnormal returns but that acquirers of small targets (those whose assets were less than 20 percent of the acquirers') realized significantly negative abnormal returns. Thrifts and Scanlon's conclusions are interesting when combined with the finding that prices paid for targets are a positive function of the ratio of acquirer-to-target total assets. The implication of these results is that acquirers may be overpaying for their relatively small acquisitions.

David A. Dubofsky and Fraser (1989) examined 101 mergers from 1973 through 1983 and reported significantly positive abnormal returns prior to 1981 but significantly negative abnormal returns thereafter. Wall and Gup (1989), studying 23 mergers between June 1981 and December 1983, found significantly negative abnormal returns during the announcement week.

Hannan and Wolken (1989) have extended prior studies to consider the target's abnormal returns, the acquirer's abnormal returns, and the combined value of both of these amounts for a selected set of mergers in 1982 through 1987. The study finds statistically significant positive abnormal returns for targets and significantly negative abnormal returns for acquirers, but their combined abnormal returns are insignificant. The study concludes that no available evidence shows that bank mergers produce synergies or other types of gains. However, the conclusion of no synergistic gains depends on the implicit assumption that the target bank's price prior to the merger announcement is solely a function of the bank's stand-alone value. If the price of the target exceeded its stand-alone value due to expectations that the target would be purchased at a premium, then measured abnormal returns may underestimate the gains produced by the merger.

Summary of Existing Studies. The various studies surveyed in this article yield some insights into the possible motives for bank mergers. The research produced results consistent with the following:

- acquiring banks may be able to realize economies of scale, at least to the extent of improving the target's efficiency;
- banks may be able to boost their profitability by increasing market concentration; and
- acquiring bank managers do not always follow a shareholder-wealth-maximizing strategy in their acquisitions policy.

Also, the types of target banks likely to attract the highest purchase prices are those whose core deposits are growing rapidly and whose portfolios offer greater potential for reducing the acquirer's risk. A clear positive relationship is also apparent between the purchase price and the ratio of the target's assets to those of the acquirer. The larger this ratio, the higher the price paid. However, stock market reactions suggest that banks are overpaying for small merger partners. The acquisition of core deposits may be a motivation for merger activity, though this hypothesis was not directly tested.

Some research led to mixed results on the matter of bank acquisitions and the purchase prices paid in those transactions. Whether acquiring banks enhance the target's profitability is unclear, as is the evidence that acquirers seek to expand the target's lending activity. In addition, research does not show conclusively that an acquirer's ability to add services to a target is a positive function of the ratio

of the target's assets to the acquirer's. Examinations of purchase prices yield mixed results as to whether one motivation to engage in merger activity is the acquirer's desire to increase market concentration.

Research has also indicated that several popular hypotheses lack empirical support. One is that targets are poorly managed and that the acquirer will improve the situation. Another is that the probability of a bank's being acquired is related to its profitability relative to its acquirer: target banks' profitability is not unambiguously less than that of acquirers.

Overall, the literature yields mixed or negative evidence on several merger hypotheses, owing in part to the methodologies employed in these studies. While most research treats bank mergers as homogenous events, different mergers may be motivated by a variety of different goals. The following section of this article recognizes that not all takeovers and mergers are necessarily motivated by the same factors and that actual bank merger and acquisition decisions are the result of a complex multidimensional process that analysts are only beginning to comprehend.

An Examination of Key Target Bank Characteristics

Methodology. This section evaluates the characteristics that acquiring banks seem to value most highly in merger partners. As should be clear from the review of the bank mergers literature, the economic forces that lead banks to become involved in merger activities are part of a complex process. While researchers know a great deal about the factors and processes that influence a bank's decision to become involved in a merger, this knowledge is in no way complete. Thus, a statistical analysis of the merger data set using cluster analysis, an atheoretical methodology, may provide valuable insights into the acquisition process and the financial characteristics acquirers appear to value most in takeover decisions.

A complete description of the cluster analysis technique is beyond the scope of this article; the interested reader should refer to the detailed exposition of clustering techniques in

John A. Hartigan (1975). In simple terms, cluster analysis belongs to a class of statistical procedures that search a data set and attempt to find simpler representations of the underlying characteristics of the data. Cluster analysis looks for interactions among variables by forming clusters or groups of variables on the basis of their statistical similarity. Regarding the analysis performed in this article, the cluster technique can be thought of as a statistical procedure designed to categorize or assign banks into groups based on the criterion that the members of the group are most alike in terms of their underlying characteristics, where they are taken as a set instead of individually.[13]

The analysis presented here is similar to that contained in Gup, Cheng, Wall, and Liano. Both studies utilize the same basic data set and both examine regional differences in bank characteristics. However, unlike Gup, Cheng, Wall, and Liano, this study does not evaluate the marginal contribution of acquirer and target bank characteristics to the purchase-price-to-book-value-of-equity ratio of the target in a merger, holding other factors constant. Instead, this analysis attempts to delineate the set of characteristics which—when taken as a whole, allowing all factors to vary—are associated with higher purchase-price-to-book-value-of-equity ratios of target banks in mergers. That is, the research presented here attempts to identify the set of financial characteristics that emerge strategically from bank merger and acquisition decisions. Thus, in principle, the clustering procedure should shed light on the optimal mix of the key financial characteristics valued highly by acquiring banks and that tend to be systematically associated with attractive acquisition prices. In applying cluster analysis directly to bank characteristics, the data are allowed to define any strategic profiles that might exist over five possible groupings.

Sample and Data Sources. The sample consists of 559 U.S. bank mergers that took place from 1981 through 1986. Information on these mergers was obtained from various issues of *MergerWatch* published by Cates Consulting Analysts, Incorporated. *MergerWatch* compiles selected financial data on all bank mergers in the United States where the acquiring bank has total assets of $100 million or more and the target bank has total assets of $25 million or

more. Based on publicly available bank merger data, the *MergerWatch* reports captured approximately 92 percent of all acquiring banks and 30 percent of all target banks during the 1981-86 period.

The *MergerWatch* data base provides a host of financial and accounting variables on the banks involved in each merger. Data on the terms of the merger, the costs to the acquirer, and the benefits to the target are included. In addition, detailed financial and accounting data for both the acquirer and target banks are presented. In addition to nonfinancial data, the statistics include return on assets; dividend payout ratios; and past five-year growth rates of assets, deposits, income, and equity. To be included in the sample the merging banks had to be in the *MergerWatch* data base from its inception through July 1986 and had to have a complete set of merger-related data.

For each target bank in the sample, the following variables were examined: the ratio of the purchase price paid in the merger to the book value of equity of the target; the ratios of book-equity capital to total assets, retail loans to total loans (retail-loan mix), loans to earning assets, and net income after taxes to book equity (ROE); the five-year growth rate in total assets; and the five-year growth rate in core deposits.

The mergers in the sample were classified into six geographic subregions: Central (Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin); Northeast (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Puerto Rico, Rhode Island, and Vermont); Southeast (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia); Midwest (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota); West (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming); and Southwest (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). To obtain a sufficient number of mergers for the last three regions listed above, this article aggregates the Midwest, Southwest, and West regions into a single West subregion.

Empirical Findings. Before describing the findings of this research, it should be noted that one shortcoming associated with cluster analysis and related procedures is that it is generally not possible to present a robust overall summary statistical measure reflecting the goodness of fit of these models as is the case with other statistical procedures like regression analysis.[14] As a consequence, this study compares the percentage differences between the means of the variables examined for the target banks in the clusters with the largest purchase-price-to-book-value-of-equity ratios with those of the other clusters. In order to identify any significant regional differences, this comparison was also conducted on a regional basis for the clusters with the largest purchase-price-to-book-value ratios. Questions regarding the stability of cluster profiles were addressed by conducting an annual comparison of cluster profiles over the 1981-86 period.

Table 1 presents the means and standard deviations of the variables used in the empirical analysis for the entire sample (the national sample) and for the four geographic subregions. As can be seen in that table, the mean purchase-price-to-book-value-of-equity ratio was the highest for mergers in the Southeast subregion and lowest in the Central subregion. The average purchase-price-to-book ratio in southeastern acquisitions over the 1981-86 period was about 14 percent higher than that of the national sample and about 32 percent higher than that associated with mergers in the Central subregion. Banks in the West subregion enjoyed the fastest rates of growth in both total assets and core deposits over the five years prior to being acquired. The five-year growth rate in these banks' total assets exceeded the average for the national sample by 36 percent, and their growth rate in core deposits outpaced the national sample average by 22 percent. Target banks from the Southeast subregion exhibited the second-fastest rates of growth in total assets and core deposits over the sample period, while targets from the Central subregion posted the slowest rates of growth.

In terms of profitability, as measured by return on equity, target banks located in the West subregion posted the highest return, 16.3 percent, while the sample banks from the Central subregion had the lowest return on equity, 12.4 percent.

Table 1 also reveals that target banks from the Southeast subregion were the best capitalized,

Table 1.
Means of Sample Data, 1981-86
(standard deviations in parentheses)

Variable	National	Northeast	Southeast	Central	West
Purchase Price to Book Ratio	1.67 (0.55)	1.57 (0.58)	1.90 (0.51)	1.44 (0.42)	1.79 (0.58)
Equity to Assets	7.90 (1.91)	7.70 (2.13)	8.40 (1.85)	8.00 (1.84)	7.30 (1.51)
Core Deposit Growth	10.60 (6.33)	9.00 (5.15)	12.60 (6.53)	8.40 (4.79)	12.90 (7.85)
Retail Loan Mix	54.10 (16.14)	57.90 (15.14)	55.70 (15.56)	56.60 (14.07)	41.00 (15.59)
Loans to Earning Assets	59.60 (10.70)	62.10 (10.33)	57.30 (11.30)	57.00 (9.75)	64.10 (9.15)
Asset Growth	11.50 (6.73)	9.50 (4.65)	13.30 (6.59)	8.90 (4.55)	15.60 (9.39)
Return on Equity	14.10 (4.00)	13.20 (3.65)	15.10 (4.05)	12.40 (2.77)	16.30 (4.73)
Number of Observations	559	152	161	155	91

Source: Calculated at the Federal Reserve Bank of Atlanta from data compiled by *MergerWatch*, 1981-86.

with an average equity-to-assets ratio of 8.4 percent, while the banks from the West subregion were the most leveraged (equity-to-assets ratio of 7.3 percent). In terms of portfolio mix, target banks from the West subregion had the largest percentage of earning assets in the form of loans but also had the smallest proportion of these loans in the retail category. In contrast, target banks from the Central subregion had the smallest percentage of earning assets in the form of loans, of which close to 57 percent were in the retail category.

To determine whether a strategic target bank profile existed during the period under study, a cluster analysis was performed on the sample banks based on a maximum of five permissible clusters.[15] The analysis was conducted for each of the four geographical subregions. The mean values and standard deviations for each of the financial variables included in the analysis are given in Table 2.

An examination of Table 2 suggests that a definite and stable strategic profile existed for the cluster groups with the largest mean purchase-price-to-book ratios. In each of the subregions, the top-ranked cluster with respect to this ratio (cluster 4 in the Central subregion and cluster 1 in each of the three other subregions) exhibited higher profitability as measured by return on equity, faster preacquisition growth—measured by average annual growth rates in core deposits and total assets over the five years immediately preceding acquisition—and more leverage (measured by the ratio of equity capital to assets) than the banks making up the other clusters.

A comparison of percentage differences in cluster means shows that the purchase-price-to-book ratio of the top-ranked cluster in each subregion was on average about 13 percent higher than that of the next-highest-ranked cluster in each subregion and about 33 percent higher than the lowest-ranked cluster.[16] In terms of profitability, the top-ranked cluster in each subregion posted mean return-on-equity ratios that were on average 14 percent higher than the mean of the next-highest-ranked cluster and 23 percent higher than the mean of the lowest-ranked cluster. The mean core deposit growth at the top-ranked cluster in each subregion was on average 107 percent higher than the mean associated with the next-highest-ranked cluster and 149 percent greater than the mean of the lowest-ranked cluster. In all sub-

Table 2.
Target Bank Cluster Means by Region, 1981-86
(standard deviations in parentheses)

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
Panel A: Central								
1	7	1.44 (0.39)	10.60 (3.06)	8.60 (3.30)	61.80 (9.92)	30.00 (9.16)	9.90 (3.20)	13.80 (3.49)
2	97	1.45 (0.44)	7.70 (1.64)	7.90 (3.33)	52.20 (7.10)	58.80 (7.34)	8.40 (3.26)	12.20 (2.63)
3	1	1.12 N.A.	9.40 N.A.	47.60 N.A.	71.60 N.A.	70.60 N.A.	43.10 N.A.	7.10 N.A.
4*	11	1.55 (0.60)	7.00 (1.38)	9.20 (2.79)	26.50 (8.61)	62.10 (7.80)	8.40 (3.34)	13.90 (2.99)
5	39	1.40 (0.35)	8.30 (1.67)	9.10 (4.09)	72.70 (6.84)	56.40 (7.81)	9.50 (4.41)	12.70 (2.81)
Panel B: Northeast								
1*	36	1.76 (0.63)	6.90 (1.36)	11.00 (4.92)	57.40 (5.99)	69.80 (7.19)	11.40 (4.70)	13.50 (4.59)
25	48	1.45 (0.59)	8.00 (1.62)	6.90 (2.25)	71.60 (6.46)	64.10 (6.79)	8.70 (3.00)	12.60 (3.14)
35	21	1.40 (0.51)	7.20 (1.80)	6.70 (4.85)	31.40 (8.17)	64.40 (6.64)	10.50 (6.33)	12.10 (2.45)
45	33	1.56 (0.43)	8.30 (3.18)	7.40 (3.67)	50.30 (5.49)	57.50 (6.01)	8.40 (4.18)	13.00 (2.85)
5	14	1.49 (0.51)	9.00 (3.05)	6.90 (3.07)	70.10 (8.44)	41.20 (7.13)	7.30 (2.52)	13.30 (2.58)

regions except the Central, the top-ranked cluster posted mean preacquisition total asset growth rates that exceeded those of the next-highest-ranked cluster and those of the lowest-ranked cluster. These differences averaged 82 percent and 90 percent, respectively. The top-ranked clusters in all subregions employed more financial leverage than did any of the lower-ranked clusters. The mean equity-to-assets ratios for these clusters were on average 11 percent and 9 percent lower than the means of the next-highest-ranked and lowest-ranked clusters.

With respect to the asset portfolio variables, the mean loan-to-assets ratio of the top-ranked clusters showed a pattern similar to those noted above. The mean loan-to-assets ratio of the top-ranked cluster in each region exceeded the mean of the next-highest-ranked cluster by an average of 15 percent and that of the lowest-ranked cluster by an average of about 25 percent. On the other hand, the means of the retail-loan mix ratios did not exhibit any systematic pattern across clusters.

An interesting feature of the means of several of the financial variables, excluding those for clusters with insufficient membership, is that they vary directly with the mean purchase-price-to-book ratio across all clusters in a given region. Examples include the return-on-equity ratio and the core-deposit growth variable for the Southeast, West, and Northeast subregions; the asset-growth variable and the equity-to-assets ratio for the Southeast and West subregions; and the retail-loan mix variable for the Central subregion. Of these monotonic relationships

Table 2 continued

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
Panel C: Southeast								
1*	21	2.35 (0.57)	8.00 (1.34)	24.10 (7.53)	44.60 (10.35)	68.00 (7.87)	24.10 (6.58)	17.80 (4.00)
2	23	1.55 (0.39)	9.50 (2.42)	9.10 (3.37)	42.30 (10.00)	40.00 (9.27)	10.60 (3.67)	14.70 (3.25)
3	35	1.92 (0.51)	8.60 (1.46)	12.20 (4.97)	76.70 (7.65)	55.80 (9.76)	13.40 (5.94)	15.00 (2.98)
4	80	1.86 (0.50)	8.70 (1.58)	11.30 (4.65)	54.70 (8.44)	59.70 (7.45)	11.80 (4.97)	14.80 (4.15)
5	2	2.26 (0.04)	7.10 (1.70)	11.70 (6.51)	10.70 (14.37)	62.10 (3.81)	12.40 (8.00)	24.70 (13.55)
Panel D: West								
1*	4	2.16 (0.52)	6.90 (0.69)	45.10 (8.21)	44.70 (8.54)	69.00 (8.54)	44.40 (9.09)	19.90 (2.46)
2	10	1.90 (0.58)	7.70 (1.36)	12.30 (3.27)	69.80 (11.06)	61.70 (11.06)	14.20 (4.21)	16.70 (5.91)
3	2	1.47 (0.11)	11.20 (3.80)	41.50 (7.96)	24.30 (11.46)	70.70 (4.12)	41.50 (6.77)	13.50 (6.49)
4	46	1.81 (0.51)	7.70 (1.46)	12.00 (4.36)	45.50 (6.42)	65.40 (8.01)	13.80 (6.44)	16.60 (5.45)
5	29	1.78 (0.67)	7.90 (1.27)	9.70 (4.38)	24.70 (7.41)	62.60 (10.44)	13.30 (5.32)	15.20 (3.86)

*Denotes cluster with largest purchase-price-to-book ratio.

Note: All numbers in percentages except purchase-price-to-book ratio.

Source: See Table 1.

(those that vary in a consistent direction with the independent variables), the strongest clearly involve target bank profitability and core-deposit growth. These relationships augment and strengthen the conclusions concerning the importance of target-bank profitability and core-deposit growth in determining the purchase-price-to-book ratio in a merger. These results also support the findings reported in Cheng, Gup, and Wall of a positive and significant relationship between core-deposit growth and the purchase-price-to-book ratio using regression analysis. On the other hand, the conclusion regarding the relationship between the profitability of the target bank and the purchase-price-to-book ratio differs from those of Rogowski and Simonson as well as Rhoades (1987), and agrees with the findings of Fraser and Kolari; Beatty, Santomero, and Smirlock; and Cheng, Gup, and Wall.

Although the other variables do not vary monotonically with the purchase-price-to-book ratio, they do vary in a fairly systematic manner as earlier comparisons of mean percentage differences of financial characteristics among the top- and lower-ranked clusters indicate. With respect to the behavior of the asset growth rate, the loans-to-earning-assets ratio, and the retail loan mix variable, the evidence suggests that asset growth is a very important factor in merger pricing, especially when it takes place in an environment where loans rather than securities are the dominant earning asset of the bank. This conclusion is supported by Rogowski and Simonson, who found a positive and significant relationship between the loan-to-earning-asset

Table 3.
Annual Cluster Means, 1981-86

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
Panel A: 1981								
1	15	1.85	7.1	11.1	43.2	62.8	13.6	15.3
2*	4	2.60	7.3	11.8	17.4	54.0	15.0	16.0
3	12	1.45	8.1	9.9	74.7	69.1	11.8	13.7
4	11	1.63	8.7	9.8	64.0	46.6	10.0	15.5
5*	2	2.60	6.6	39.5	49.5	72.0	44.4	18.7
Panel B: 1982								
1	17	1.40	7.8	6.6	41.7	59.8	8.4	15.2
2	11	1.59	8.8	8.5	70.3	48.1	10.0	15.3
3	32	1.59	7.6	8.1	61.7	67.8	9.8	13.1
4	11	1.34	8.4	10.6	81.8	63.0	11.7	14.9
5*	10	1.72	6.8	10.7	26.7	68.7	14.0	16.8
Panel C: 1983								
1*	16	1.99	8.2	20.0	54.4	62.6	22.8	16.5
2	30	1.40	7.6	8.2	37.9	65.4	11.3	14.3
3	16	1.55	9.0	7.3	37.9	48.2	9.2	14.4
4	11	1.52	8.2	7.1	69.6	46.0	9.5	14.3
5	41	1.53	7.7	9.6	67.1	63.9	10.8	13.6
Panel D: 1984								
1	18	1.35	8.4	8.5	52.7	39.1	8.9	13.4
2	23	1.54	8.2	9.5	74.0	59.6	10.0	12.2
3*	10	2.21	8.2	25.7	52.3	66.5	27.9	18.3
4	26	1.69	7.3	10.9	34.7	62.0	13.2	15.6
5	55	1.50	7.9	8.4	53.7	62.1	8.8	13.3
Panel E: 1985								
1*	17	1.86	7.3	12.0	28.4	66.1	11.2	15.1
2	77	1.75	7.4	10.8	53.5	61.7	10.3	13.5
3	31	1.63	9.4	9.4	66.4	45.5	10.3	13.1
4	1	1.12	9.4	47.6	71.6	70.6	43.0	7.1
5	3	1.80	9.8	38.9	26.4	70.9	39.0	13.4
Panel F: 1986								
1	11	1.97	8.3	11.9	72.3	60.5	12.1	14.8
2*	6	2.24	8.1	15.9	24.3	63.0	12.2	15.6
3	9	1.97	8.4	9.2	67.4	39.0	9.2	14.1
4	32	2.01	7.8	11.4	50.8	62.7	10.6	12.2
5	1	1.79	10.4	16.3	40.8	10.4	15.3	7.8

*Denotes cluster with largest purchase-price-to-book ratio.

Source: See Table 1.

ratio and the purchase-price-to-book-equity ratio. Since the retail loan mix variable does not exhibit any systematic behavior in the cluster analysis, one cannot conclude that there is a predictable relationship between the composi- tion of the loan portfolio and the purchase- price-to-book-equity ratio. Clearly, this rela- tionship will vary depending on the mix of the loan portfolio of the acquiring bank. As the behavior of the portfolio mix variable indicates,

the strategic profile of the top-ranked target bank clusters appears to be independent of the particular customer base served by these banks. The loan portfolio of the top-ranked cluster in the Central subregion is consistent with the profile of a wholesale bank, that of the Northeast subregion is consistent with a retail bank profile, and those of the Southeast and West regions reflect a loan portfolio that is more balanced than those of the other two subregions.

The stability of the financial profile of banks in the top-ranked clusters across geographic subregions lends credibility to the notion that the financial characteristics of potential merger partners are key determinants of acquisition prices. Geographic location is not unimportant in the pricing process, as the best-performing clusters in the analysis are associated with the West and Southeast subregions. However, without quality management in each of the dimensions identified by this analysis, any location advantages—due perhaps to the structure of local banking markets and regulation—may not be realized by the target bank shareholders.

The stability of the strategic target bank profile over time can be assessed using the data in Table 3, which presents the results from annual cluster analyses and shows that the same basic strategic profile emerges each year. Over the six-year period the top-ranked cluster, with respect to the purchase-price-to-book-equity ratio, systematically exhibited higher profitability and faster premerger growth in core deposits and total assets and tended to con-centrate its earning assets in loans as opposed to securities while judiciously using more financial leverage than banks in the other clusters.

Summary

A review of the literature is consistent with the hypothesis that banks which acquire other banks are motivated most by the desire to diversify their earnings and growth potential and, in many cases, to achieve economies of scale in the production of financial services. With respect to the other commonly cited motivations, including the desires to improve the efficiency of the target bank and to increase market power, strong support is not found.

A cluster analysis of the financial characteristics of a sample of 559 target banks indicates that the strategic profile of the most valued merger partner characteristics consists of the following items: higher-than-average profitability (as measured by the return on equity), faster growth in core deposits and total assets, and a higher ratio of loans to earning assets, all augmented by the judicious use of financial leverage. This profile was found to be stable across geographic subregions, time, and bank customer bases. Based on the literature review and empirical findings, if the shareholders of target banks are to obtain the greatest benefit from any proposed merger, having quality management in each of the dimensions of the strategic profile is apparently a prerequisite.

Notes

[1] Loan participations can also help, but the gain is limited by moral hazard problems.

[2] Consider two banks, both with $10 billion in assets and $500 million in capital. Assume one of the banks suffers a $1,100 million loss and the other earns a $60 million profit. If the banks are separately owned, the bank suffering the loss will fail and the other bank will continue in operation. If the two banks are merged together and no synergies are present, both firms will fail.

[3] Shareholders may not gain if management use the increases in potential profits to increase their perks.

[4] Geographic dispersion is measured by the sum of squares of the percentage of an organization's deposits from each market it serves.

[5] See, for example, the survey by Rhoades (1982).

[6] Berger and Hannan discuss the potential for a negative relationship to exist between price and concentration under the efficient-market-structure hypothesis but con-clude that a negative relationship would be inconsistent with the argument that the efficient-market-structure hypothesis explains the positive relationship between profitability and concentration.

[7] In addition to the study cited below, Rhoades (1986) examines bank mergers. Rhoades's analysis is not reviewed in this article because his sample period ends in 1978. Phillis and Pavel (1986) examine interstate bank mergers. Their principal finding is that participants in the interstate takeover market tend to have more offices than spectators (banks not active in the market) and that acquirers tend to be larger than targets.

[8] Their sample consisted of 1,046 banks, and they used multinominal logit.

[9] Cheng, Gup, and Wall (1989) and Rogowski and Simonson (1989) also provide descriptive data on bank mergers, but their data sets are smaller and largely overlap that analyzed in Gup et al. (1989).

^{10}Gup et al. (1989) find significant regional differences in the pricing of bank mergers. Their study is not reviewed here because they note that collinearity problems may interfere with the interpretation of the coefficients on variables examined in their study.

^{11}Cheng, Gup, and Wall also provide controls for net income growth, total asset growth, earning asset growth, and equity growth. They use principal components regression to control the collinearity problems that may arise from using all of these variables in the same regression.

^{12}Cheng, Gup, and Wall find a significantly negative coefficient on the ratio of target-to-acquirer total assets.

^{13}The exact clustering algorithm used in this article is the Fastclus procedure available in the SAS software package developed by the SAS Institute. Fastclus is a non-hierarchical clustering algorithm. The procedure allows the analyst to define a maximum number of clusters to which the banks are to be assigned, and the assignment of banks to clusters is done independently of the results of any previous assignments resulting from a different specification of the maximum number of clusters. The procedure produces clusters that are discrete in the sense that each bank is assigned to one and only one group. The data in this article were examined using a maximum cluster size of five groups to avoid problems associated with having too many groups with only one or two members.

The output of cluster analysis is very sensitive to the exact numerical algorithm used by the procedure for assigning observations to groups. Thus, it is not surprising that the output of two different clustering procedures using different algorithms but applied to the same data set will produce different groupings. Many algorithms will also produce different final outputs depending on the number of iterations performed on the data and on the values used to initialize the clustering algorithm. Note that this variation is the case for the procedure used in the cluster analysis. However, these differences appear to be minor in most cases. See Hartigan (1975) for a more complete discussion.

^{14}In addition, there are no robust statistical tests of differences in the group means produced by clustering algorithms. Altman et al. (1981) describe tests that are similar in spirit to classical t-tests of mean differences. However, this procedure requires that there be equality of the variances for each pair of means tested.

^{15}There is generally no universally agreed-upon procedure for deciding on the maximum number of clusters into which the sample observations should be divided. Our choice of five clusters was made on the basis of minimizing the number of clusters composed of outliers, that is, clusters with only one or two members. Outlier problems were encountered when the limit on the maximum number of clusters exceeded five.

^{16}In the calculations of percentage differences in cluster means which follow, cluster 1 was excluded from the Central subregion, cluster 5 from the Southeast subregion, and cluster 3 from the West region, when appropriate, due to the lack of a sufficient number of cluster members.

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Money and the Economy: Puzzles from the 1980s' Experience

William Roberds
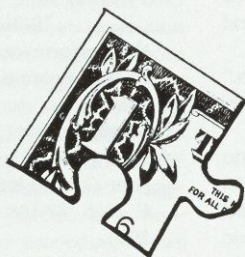
During much of the 1980s the nation's real output grew less than many expected—given the size of the money supply and the historical pattern of velocity, or average amount of GNP created per dollar of money supply— posing obvious problems for monetary policy. The author shows how explanations for this change have so far fallen short, but he concludes that, over time, new guides to monetary policy may emerge.

The decade of the 1980s has seen a remarkable change in the statistical relationship of money to the overall economy. Specifically, shifts in certain components of the money supply used to be considered useful indicators of future movements in economic variables such as prices and real output.[1] On the basis of the 1980s' experience, however, many economists have called into question the utility of the various monetary aggregates in predicting the future course of the economy.

The breakdown of the traditional statistical relationship between money and the economy— often called "the velocity puzzle"—has also caused economists to reconsider the roles of the various money-supply measures as indicators of and targets for monetary policy. Since a stable statistical connection between money and the economy is often seen as a prerequisite for a meaningful targeting process, this issue clearly is important to policymakers.

By surveying the literature dealing with the 1980s' velocity puzzle, this article attempts to outline the present state of economists' thinking on this issue. The first section offers a brief illustration of how the relationship between

money and the economy has changed. The second section provides a critical assessment of various explanations for these changes. The third section considers possible policy implications of the altered money/income relationship, especially its implications for the monetary targeting process.

The Velocity Puzzle of the 1980s

The velocity of money is defined as the ratio of nominal or current-dollar gross national product (GNP) to money. Roughly speaking, velocity can be thought of as the average amount of GNP created per dollar of the money supply. Alternatively, the inverse of velocity can be viewed as the average amount of money required to create one dollar of GNP. Chart 1 shows the postwar history of velocity for the M1, M2, and monetary base measures of the money supply, which are defined in the box on page 32. From the most basic viewpoint, the velocity puzzle of the 1980s can be characterized as too little GNP, given the level of the money supply and the historical patterns of velocity shown in Chart 1. Of the three velocities depicted in the chart, M1 presents the most puzzling case. Before the 1980s, M1 was widely seen as the most useful of the aggregates

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The author is a senior economist in the macropolicy section of the Atlanta Fed's Research Department.
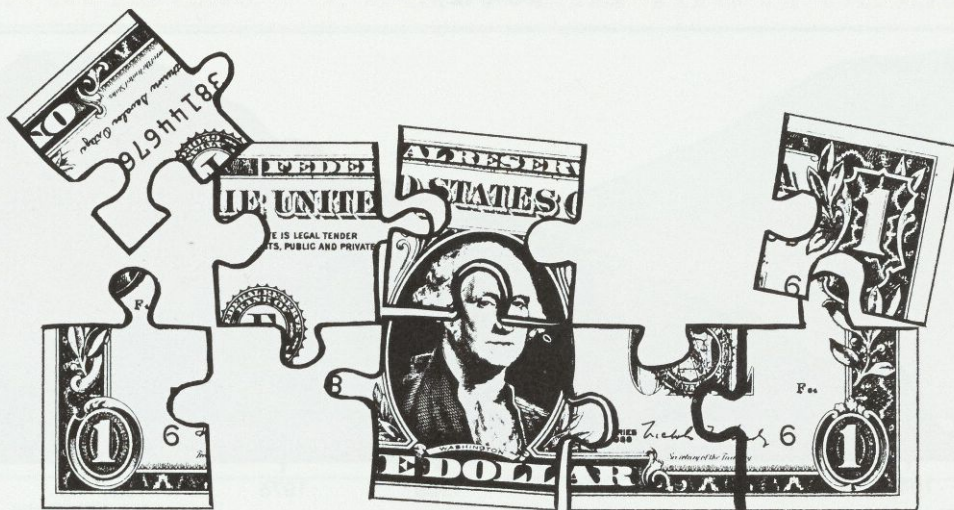
for predicting movements in GNP. The velocity of M1 rose at a fairly steady annual rate of about 3 percent from 1950 to 1980. In contrast, during the 1980s the velocity of M1 has fallen about 1 percent a year on average. The situation with the monetary base has been similar, though not as dramatic. After rising at an annual rate of 3 percent throughout most of the postwar period, base velocity leveled off during the 1980s. Finally, Chart 1 reveals that M2 velocity has also fallen during the 1980s. After fluctuating in a trendless pattern since the 1940s, the 1980s' drop in M2 velocity was quite large by postwar standards.

The fluctuations in velocity shown in Chart 1 contributed significantly to the overall uncertainty of economic forecasts during the 1980s. To understand this effect, consider a simple method for predicting GNP based on the quantity equation,
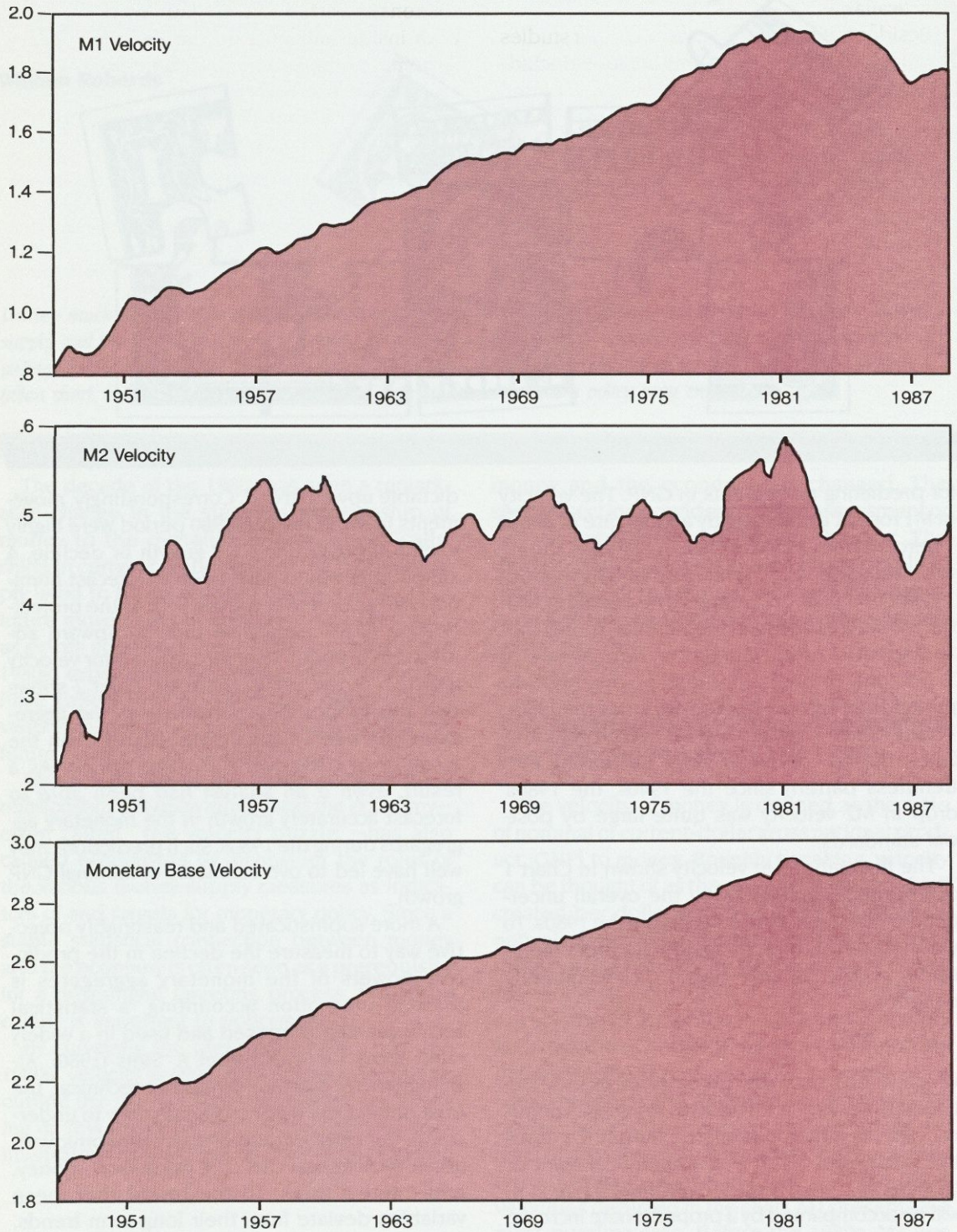
$$MV = PQ,$$

which states that the quantity of money (M) times its velocity of circulation (V) equals nominal GNP, or inflation-adjusted output (Q) times the price level (P). If V is roughly constant or changes at a steady pace over time, a rise in M will be accompanied by a proportionate increase in nominal GNP.[2] During most of the postwar period M1 velocity especially followed a pre-

dictable upward trend. Correspondingly, movements in M1 in the pre-1980 period were highly useful in predicting GNP growth or decline. A simple rule would have been to forecast nominal GNP growth over a given year as the projected rate of M1 expansion plus an upward adjustment of about 3 percent to allow for velocity growth. For the 1980s, however, Chart 2 shows that the proportionate increase in the aggregates has been substantially greater than the increase in GNP over the same period. As a result, even if an analyst had been able to forecast accurately growth in the monetary aggregates during the 1980s, such predictions may well have led to overestimates of nominal GNP growth.

A more sophisticated and reasonably objective way to measure the decline in the predictive powers of the monetary aggregates is through innovation accounting, a statistical technique first proposed and used in a widely cited study by Christopher A. Sims (1980). Although the details are somewhat technical, the idea behind the methodology is easy to understand. Consider a group of macroeconomic variables, such as real GNP, the price level, money, and interest rates. To the extent that these variables deviate from their long-term trends, innovation accounting seeks to demonstrate how much of this variation can be explained by

Chart 1.
Postwar Velocity in Measures of the Money Supply
(1948-88)

M1 Velocity

(Graph showing M1 Velocity from approximately 1948 to 1988, vertical axis from .8 to 2.0, horizontal axis with years 1951, 1957, 1963, 1969, 1975, 1981, 1987)

M2 Velocity

(Graph showing M2 Velocity from approximately 1948 to 1988, vertical axis from .2 to .6, horizontal axis with years 1951, 1957, 1963, 1969, 1975, 1981, 1987)

Monetary Base Velocity

(Graph showing Monetary Base Velocity from approximately 1948 to 1988, vertical axis from 1.8 to 3.0, horizontal axis with years 1951, 1957, 1963, 1969, 1975, 1981, 1987)

Each velocity represents nominal GNP divided by the indicated aggregate. Vertical scales are ratio scales.

Chart 2.
Proportional Increases in the Monetary Aggregates and GNP
(1980-88)

Legend: M1, GNP

(Y-axis: 1.12, 1.10, 1.08, 1.06, 1.04, 1.02, 1.00, .98)
(X-axis: 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988)

Legend: M2, GNP

(Y-axis: 1.10, 1.08, 1.06, 1.04, 1.02, 1.00, .98)
(X-axis: 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988)

Legend: Monetary Base, GNP

(Y-axis: 1.14, 1.12, 1.10, 1.08, 1.06, 1.04, 1.02, 1.00, .98)
(X-axis: 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988)
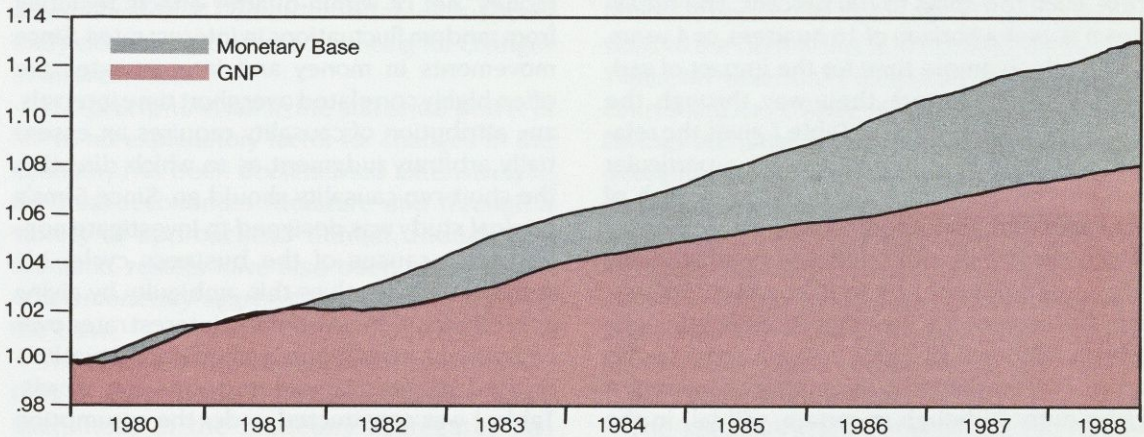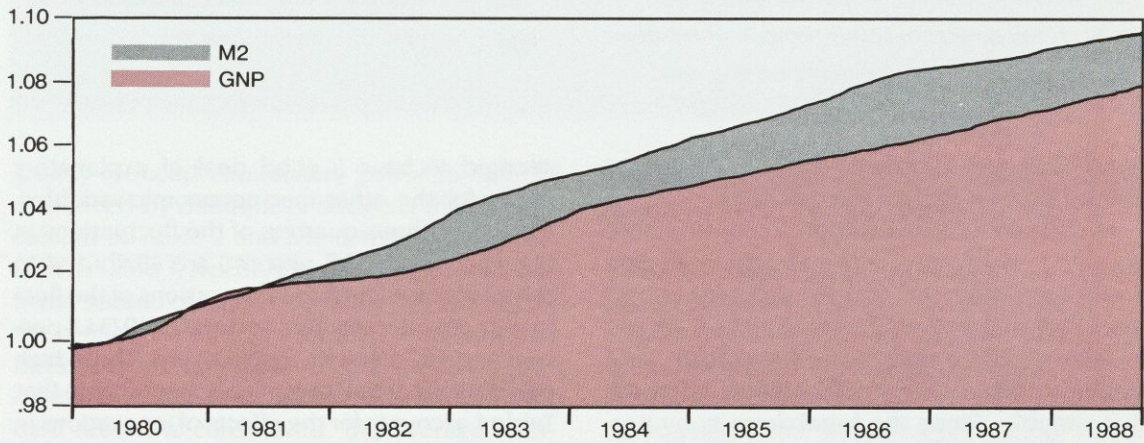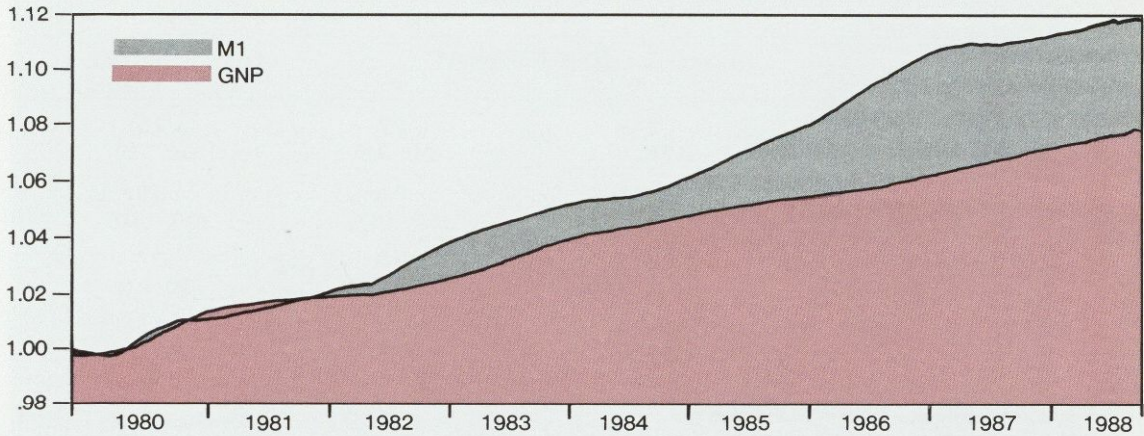
Each graph represents the cumulative increase in (the logarithm of) nominal GNP as compared to the indicated aggregate. To facilitate comparison, each series was scaled so that its 1980Q1 value is equal to one.

Source for Charts 1 and 2: See Roberds and Whiteman (forthcoming, 1989).

Table 1.
An Innovation Accounting Table for Macroeconomic Variables, 1948-1979Q3
(percent decomposition of variance at 16 quarters)

Variable Explained	By an Innovation in			
	i	m	p	y
i	60.0 (36.5, 83.5)*	34.8 (12.6, 57.1)	2.7 (0.0, 9.6)	2.5 (0.0, 7.5)
m	2.5 (0.5, 7.4)	87.1 (71.0, 103.3)	6.5 (0.0, 18.5)	3.9 (0.0, 13.0)
p	5.0 (0.0, 12.9)	78.8 (63.9, 93.6)	15.6 (2.5, 28.6)	0.7 (0.0, 2.0)
y	12.8 (0.0, 30.2)	44.1 (16.6, 71.5)	9.6 (0.0, 23.5)	33.5 (13.9, 53.2)

i = 3-month T-bill rate   p = GNP deflator
m = money supply M1   y = real GNP

* 80 percent confidence interval shown in parentheses.

Source: See Roberds and Whiteman (forthcoming, 1989).

purely random fluctuations—also known as *innovations*—in each of the variables.

An example of an innovation accounting table is Table 1, which applies this technique to data on interest rates, M1, prices, and real output from 1948 to the third quarter of 1979. Each row in Table 1 gives a percentage breakdown, for a single variable, of the sources of fluctuations in that variable. Since the breakdown is by percent, each row sums to 100 percent. The breakdown is over a horizon of 16 quarters, or 4 years, which allows ample time for the impact of various changes to work their way through the economy. Each column of Table 1 gives the relative importance of innovations in a particular variable for explaining fluctuations in each of the variables considered. Since each element of the column deals with a different variable, these elements need not sum to 100 percent. Reflecting the uncertainty inherent in estimating the effects reported in Table 1, each entry in the table is accompanied by a confidence interval. A given entry, although uncertain, will fall in the specified interval with 80 percent probability.

The second column in Table 1 gives an estimate, based on pre-1980 data, of the importance of the M1 measure of money in explaining movements in interest rates, prices, and output. Judging from the table, before the 1980s, M1

seemed to have a good deal of explanatory power for the other macroeconomic variables. More than three-quarters of the fluctuations in the price level (78.8 percent) are attributed to M1, as well as significant proportions of the fluctuations in interest rates and real GNP (34.8 percent and 44.1 percent, respectively). These high percentages are all the more remarkable in that Table 1 accounts for the effects of innovations in money, net of within-quarter effects resulting from random fluctuations in interest rates. Since movements in money and interest rates are often highly correlated over short time intervals, any attribution of causality requires an essentially arbitrary judgment as to which direction the short-run causality should go. Since Sims's original study was designed to investigate nonmonetary causes of the business cycle, his methodology resolves this ambiguity by giving precedence to innovations in interest rates over innovations in money as a source of fluctuations in the variables considered. In other words, Table 1 was constructed under the assumption that interest rates can affect the quantity of money within a single quarter but that the converse relationship does not hold.[3]

Table 2 presents an updated version of Table 1, using data through the end of 1988. The most striking feature of the updated table is the

Table 2.
An Innovation Accounting Table for Macroeconomic Variables, 1948-1988Q4
(percent decomposition of variance at 16 quarters)

Variable Explained	By a Random Shock in			
	i	m	p	y
i	67.0 (47.2, 86.7)*	10.3 (0.2, 20.4)	19.2 (0.0, 38.6)	3.5 (0.0, 11.6)
m	21.1 (0.7, 41.5)	69.4 (46.8, 92.0)	0.4 (0.0, 1.5)	9.1 (0.0, 23.4)
p	3.4 (0.0, 11.2)	14.4 (0.0, 31.6)	81.6 (62.5, 100.7)	0.5 (0.0, 3.5)
y	25.7 (4.6, 46.8)	13.4 (2.7, 24.1)	7.2 (0.0, 16.8)	53.7 (34.3, 73.2)

i = 3-month T-bill rate   p = GNP deflator
m = money supply M1   y = real GNP

* 80 percent confidence interval shown in parentheses.

Source: See Table 1.

greatly reduced explanatory power for M1, as evidenced by differences between the second column of Table 2 and the corresponding column in Table 1. Not only are the point estimates in the second column reduced in Table 2, but all the confidence intervals for the second column include or are very close to zero, except for the case of M1 itself. Thus, when the entire postwar data record is considered, the average measured effect of M1 on other variables is apparently close to zero after accounting for changes in interest rates.

The precipitous fall in the statistical power of M1 as an explanatory factor for changes in the economy has been documented extensively in the macroeconomics literature and through a variety of approaches.[4] Similar, though less dramatic, results have also been obtained for other monetary aggregates, including M2 and the base.

The almost universal conclusion seems to be that, at least in the short term, the predictive usefulness of the monetary aggregates has been drastically diminished during the 1980s. Studies of the velocity puzzle often disagree, however, as to the causes and consequences of this curtailment. The next section of this article considers various explanations for this phenomenon.

Explanations of the Velocity Puzzle

An Institutional Explanation. A commonly cited explanation of the velocity puzzle has been to attribute it to the changing composition of the M1 and M2 aggregates during the 1980s.[5] Throughout this decade, the rapid pace of deregulation and technological change in the financial sector has resulted in drastic alterations to the definitions of M1 and M2. Before the 1980s, M1 essentially consisted of checking accounts and cash, while M2 consisted of M1 plus savings accounts and small time deposits. With deregulation, M1 was revised to include other checkable deposits (or OCDs, essentially interest-bearing checking accounts), while M2 began to include money market deposit accounts (MMDAs) as well as certain types of money market mutual funds (MMMFs).[6] The rapid growth in the OCD, MMDA, and MMMF components during the 1980s can be seen in Chart 3.

The key distinction between the old monetary aggregates and the revised ones is that the new components of the aggregates represent, to a greater or lesser extent, interest-bearing accounts that can be drawn on for transactions purposes. Such accounts were not widely available before the 1980s. Either money could be

Chart 3.
Components of M2
(1959-89)

billions
of
dollars
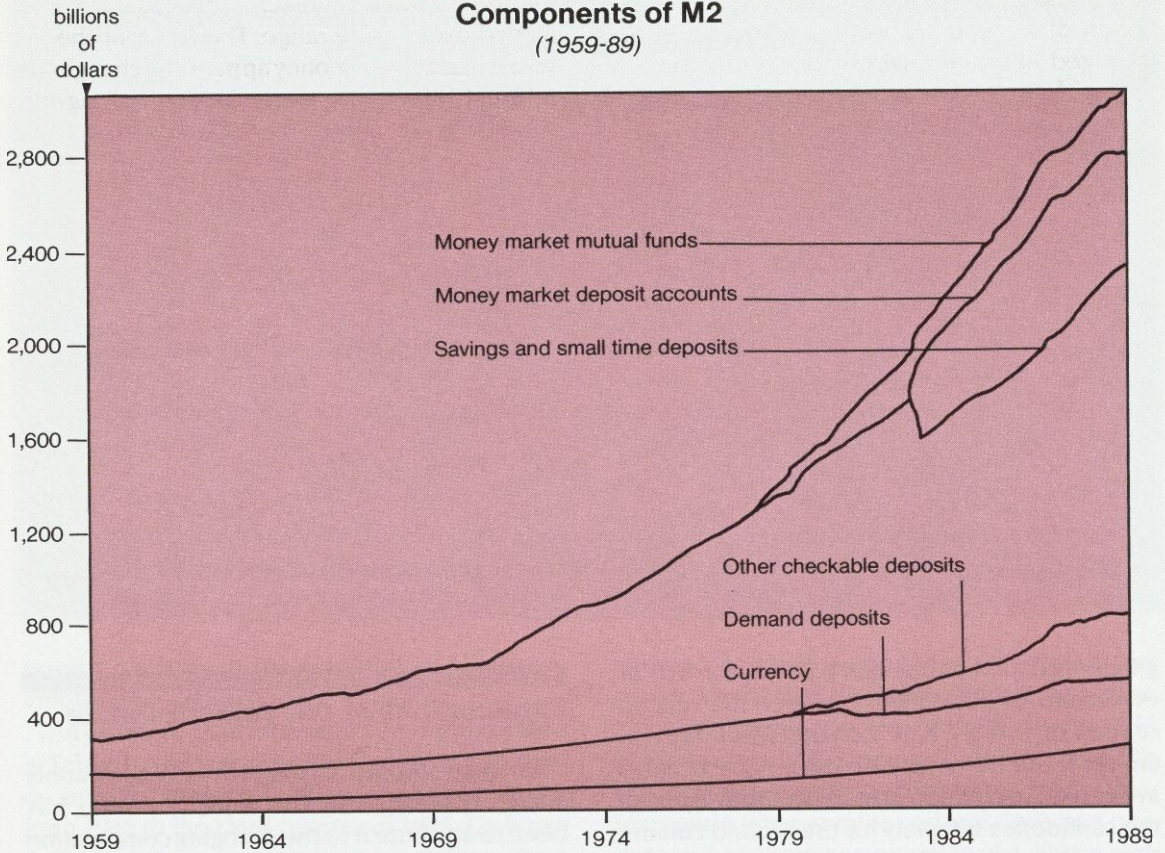
The graph shows the rapid growth of relatively liquid interest-bearing components (MMDAs, MMMFs, OCDs) during the 1980s.

Source: Board of Governors of the Federal Reserve System.

used for transactions or it paid interest, but both features were not available simultaneously in the same account. In this sense, deregulation and the redefinition of the aggregates has led to a blurring of the distinction between M1 and M2. Because components of M1 now bear interest, M1 has become more like the old M2; at the same time, M2 has become relatively more liquid and hence more like the old M1. In view of these developments, expecting the aggregates to behave in a manner consistent with the historical record compiled before the advent of deregulation seems unreasonable. The likelihood of a consistent statistical record is also lessened by the 1979 and 1982 shifts in Federal Open Market Committee (FOMC) operating procedure, as well as by changes in the emphasis

the FOMC has placed on the monetary aggregates.[7]

The argument that financial deregulation is the cause of the weakened link between money and the economy is a logical one, but at least two criticisms suggest that this explanation is at best incomplete: First, the argument is unsatisfactory in an empirical sense, because researchers have been unable to produce a "transactions-based" aggregate with the desirable statistical properties of pre-1980 M1 (as discussed later in this article). Second, the explanation falls short theoretically because one major cause of the 1980s' financial deregulation was the changed financial environment.[8] The late 1970s and the 1980s were characterized by high nominal and real interest rates, as well as

the significant changes in Fed operating procedure referred to earlier. Insofar as the regulatory changes that led to the revised composition of M1 and M2 were a response to the changed financial environment of this period, citing deregulation as a cause of the velocity puzzle amounts to little more than a restatement of the problem.

A Theoretical Explanation. A view of the velocity puzzle that is almost antithetical to the "deregulation" view is embodied in a recent article by Robert E. Lucas, Jr. (1988). Approaching the velocity issue from the standpoint of economic theory, Lucas argues that the only empirical implication of standard monetary theories for velocity is that it should increase over the long run as nominal interest rates rise.[9] Higher velocity occurs because people seek to economize on money balances as interest rates— usually seen as the opportunity cost of money— move higher. Lucas defends his viewpoint empirically by appealing to a graph similar to Chart 4. This chart graphs M1 velocity and interest rates, using quarterly data over the period 1948-88.[10] The data in the chart support Lucas's contention in that they clearly illustrate the general tendency of velocity to rise as interest rates rise. From the standpoint of theory, then, the velocity puzzle is not a puzzle at all. Movements in velocity over the long term reflect individuals' incentives to economize on money balances.

On the other hand, Chart 4 also illustrates some of the limitations of this line of argument in explaining velocity movements. One problem is, as Lucas points out, that short-term changes in velocity are not explained by economic theory. Over the short run, the dispersion of the data points in Chart 4 suggests that velocity may or may not rise with an upturn in interest rates. Further, various statistical studies have established that such deviations from the long-term trend can be quite persistent.[11] The end result is that economic theory does not currently yield satisfactory short- or intermediate-run forecasts.

A second problem that Chart 4 reveals is the extremely small response of velocity to interest-rate changes at high nominal interest rates, as seen by comparing the pre-1980 data in the chart with data points from the 1980s. Pre-1980 data suggest a high degree of responsiveness of velocity to interest-rate changes (often referred to as "interest elasticity of money demand"). In the 1980s, however, M1 velocity has shifted relatively little while short-term interest rates have moved over a wide range. The fact that the interest elasticity of money apparently changes as interest rates increase makes even long-run predictions of velocity more difficult than if this elasticity were constant across different interest rates. A standard explanation for this change in sensitivity is that some components of M1 actually paid interest during the 1980s, so that the opportunity cost of M1 was, on average, less than the short-term interest rate over this period. However, quantifying this explanation requires an approach that breaks M1 down into its various components. This approach is subject to its own limitations, which are described in detail below.

Statistical Explanations. Numerous studies have attempted to explain the velocity puzzle by consideration of various statistical models of the interaction between money and the economy. The general purpose of such research has been to uncover statistical relationships that are (1) consistent with both the pre- and post-1980 data record and (2) as useful in predicting the course of the economy as the pre-1980 relationship of interest rates and velocity.

One of the most thought-provoking of these analyses is that of Lawrence J. Christiano (1986). He argues that the statistical relationship of money to the economy has not changed in the 1980s, provided that one looks only at relationships between growth rates of the various time series under consideration.[12] While Christiano's argument is a technical one, the essence of his thesis can be seen in Chart 5, which plots quarterly changes in interest rates versus quarterly growth rates in velocity, from 1948 through 1988. In other words, Chart 5 displays the same data as Chart 4, except that each data point has been modified to represent a change from the previous quarter's value. Seen in this context, the 1980s' data do not appear inconsistent with earlier findings. Most of the pre-1980 data fall within the upper right-hand quadrant of the chart, indicating a positive correlation between increases in velocity and interest rates. At the same time, most of the 1980s' data are contained in the lower left-hand corner of the chart, showing that a fall in interest rates is generally associated with a fall in velocity. Again, the cor-

Chart 4.
M1 Velocity and Interest Rates
(1948-88)

M1 Velocity
(Log Scale)

| | 1948Q1-79Q4 |
| + | 1980Q1-88Q4 |

3-Month T-Bill Rate (percent per annum)
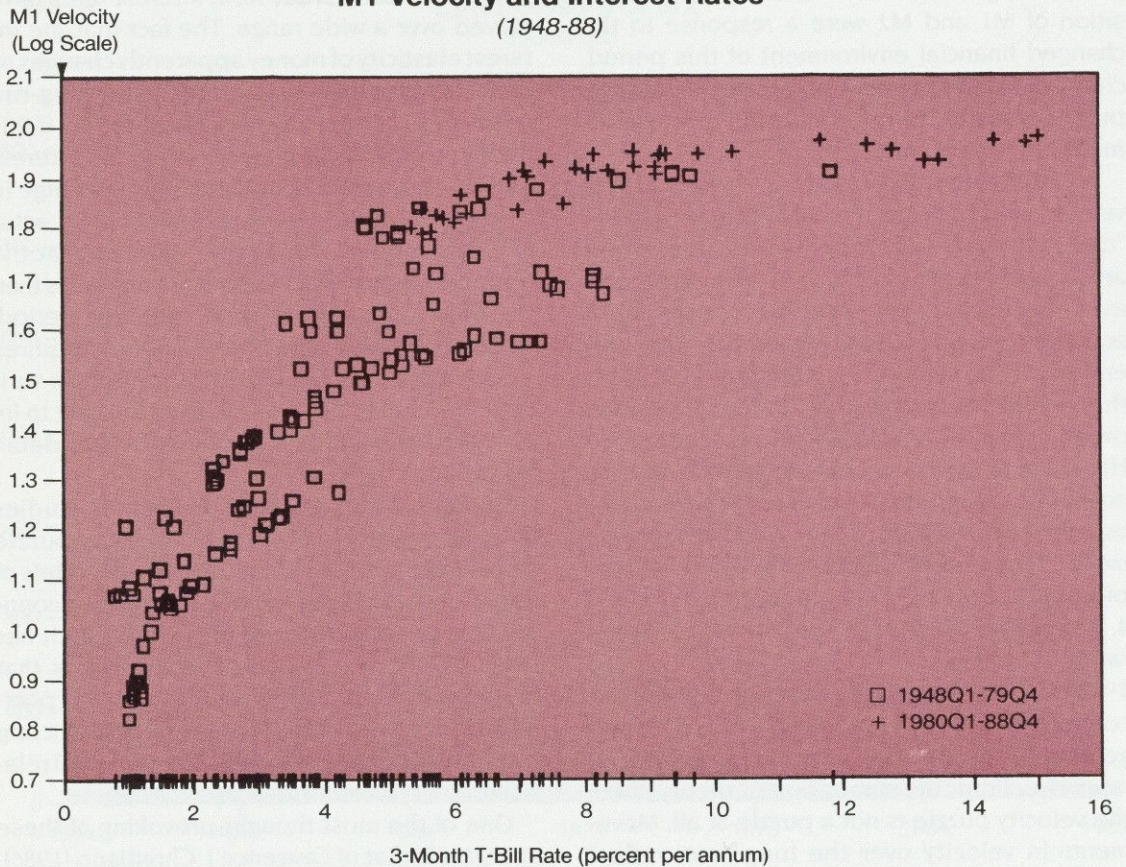
Over the long run, velocity rises with nominal interest rates. However, the sensitivity of velocity to interest rate changes has been greatly reduced during the 1980s.
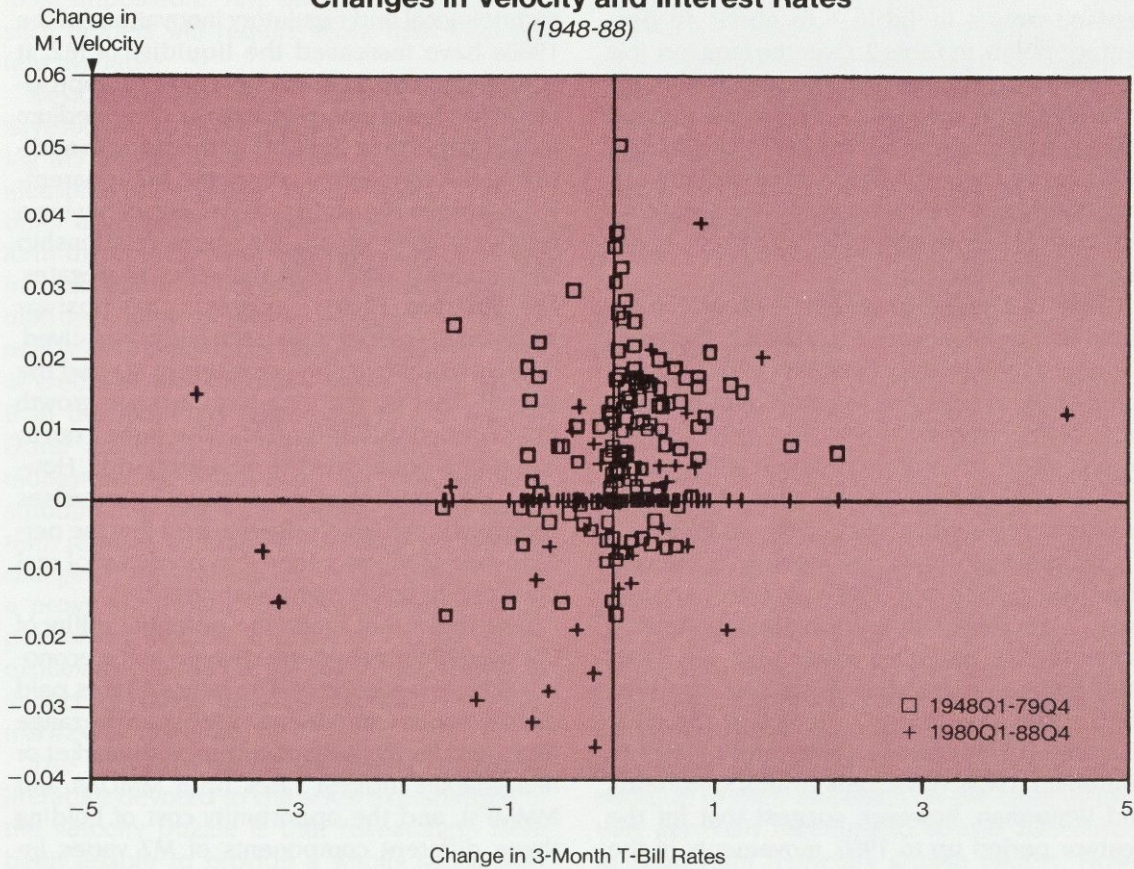
Source: See Chart 2.

relation is positive. Viewed from this perspective, the difference between the 1980s and earlier periods is not that the statistical pattern or correlation has changed, but only that the sign of the typical direction of interest rate and velocity movements has switched from positive to negative.

As was the case with the previous chart, Chart 5 also illustrates some of the shortcomings of the argument the graphic is intended to support. The dispersion of the data points in Chart 5 is even greater than for the relationship portrayed in Chart 4. The wider distribution suggests that the statistical link between changes in velocity and changes in interest rates is weaker than that of the relationship between

levels of these same time series. Thus, one factor contributing to the consistency of the pre- and post-1980 data in the case of growth rates is the less decisive pattern of the pre-1980 data. Another factor lessening the importance of Chart 5 is that it essentially discards much of the information contained in Chart 4. Specifically, Chart 4 suggests that rises in short-term interest rates will be matched over the long run by increases in M1 velocity, at least up to nominal interest rates of about 8 percent. At higher short-term rates, Chart 4 leads one to conclude that in the long run velocity will change relatively little across a wide range of rates. Making similar predictions from the information presented in Chart 5 would be considerably more difficult, if

Chart 5.
Changes in Velocity and Interest Rates
(1948-88)

Change in
M1 Velocity

□	1948Q1-79Q4
+	1980Q1-88Q4

Change in 3-Month T-Bill Rates

As in Chart 4, there is a positive correlation between changes in velocity and changes in interest rates.

Source: See Chart 2.

not impossible. In a strict mathematical sense, comparing various time series only in terms of growth rates (or period-by-period changes) inevitably weakens and can completely rule out the possibility of any predictable long-term patterns among the series considered.[13] To the extent that such patterns exist, and many economists believe that they do, it would seem important not to rule out their existence a priori. This consideration has led many researchers to discount the relevance of studies that consider only growth rates.

A Closer Look at the Monetary Aggregates. Much of the recent statistical research dealing with the relationship between money and the economy has deemphasized the role of M1 as a

useful predictive indicator. The consensus appears to be that the changed financial environment of the 1980s has altered the nature of M1 more fundamentally than that of the other aggregates.[14] Of particular concern is the increased short-run sensitivity of M1 to changes in interest rates. This phenomenon is evident in a comparison of the first numbers in the second rows of Tables 1 and 2. These figures represent the relative contribution of interest-rate innovations to unpredictable changes in M1, using data before 1980 only and all postwar data for Tables 1 and 2, respectively. In Table 1, the contribution of interest-rate fluctuations is estimated to be an almost negligible 2.5 percent, yet in Table 2 this figure is 21.1 percent. Reflect-

ing the increased uncertainty about this estimate, the confidence interval for the contribution of interest rates widens from about 7 percentage points in Table 1 to about 40 percentage points in Table 2. Over the long run, it is reasonable to surmise that the response of M1 to interest-rate changes will follow the general velocity pattern depicted in Chart 4. But Table 2 indicates that in the short run there will be much uncertainty over the response of M1 to interest-rate changes, even when the "short run" is defined as four years.

Given the severe problems with M1, much effort has been devoted to ranking the comparative usefulness and stability of other measures of the money stock. Unfortunately, while most of the studies in this area agree on the demise of M1, they often disagree widely as to which aggregate now represents the "best" indicator of the future path of the economy.

One aggregate that has received increased attention during the 1980s is the monetary base.[15] The relative stability of the relationship between the monetary base and the macroeconomy is supported in studies by Christiano (1986), Courtenay C. Stone and Daniel L. Thornton (1988), and the author and Charles H. Whiteman (1989). Additional results in Roberds and Whiteman, however, suggest that for the postwar period up to 1980, movements in the base were less useful in forecasting short- to medium-term fluctuations in real GNP and prices than were movements in M1 or M2. After 1980 the forecasting performance of the base appears roughly comparable with that of the other two aggregates.[16]

On balance, the statistical evidence on the usefulness of the base in predicting the economy seems close to neutral. As a predictive indicator, the base appears to be neither more nor less useful than other aggregates. Factors working in favor of the base are that (1) the base itself appears to be easier to predict than either M1 or M2, and (2) the overall relationship of the base to real GNP, prices, and interest rates seems to have been more stable than that of M1 or M2. At the same time, the extremely narrow composition of the base renders its potential use as a policy target somewhat controversial. Possible advantages and disadvantages of the base as a policy target are discussed in the next section.

A somewhat less controversial choice of successor for pre-1980 M1 is the "new" M2 measure of the money supply. In view of the fact that the technological and regulatory innovations of the 1980s have increased the liquidity of M2, it seems intuitive that M2 has come to approximate the idea of money as a transactions medium more closely than does M1 or the base. In addition to this conceptual advantage, M2 apparently possesses the statistical benefit of having a relatively more stable long-term relationship with nominal GNP than the other aggregates. For example, Chart 1 suggests that postwar shifts in M2 velocity have been fairly short-lived, relative to shifts in the velocities of M1 and the base.[17] That is, the long-term average growth rates of nominal GNP and M2 have turned out to be roughly equal over the postwar period. However, simulated short-run forecasting exercises reported in various studies suggest that the performance of M2 as a short-run predictor of real GNP and prices is somewhat erratic.[18]

One factor that limits the potential utility of M2 in predicting short-run changes in the economy is its heterogeneity. The interest rates paid on the various components of M2 span the range from zero (in the case of currency) to market or near-market interest rates (with MMDAs and MMMFs), and the opportunity cost of holding these different components of M2 varies inversely with the rate of interest paid. Further complicating the picture is the fact that interest rates paid on some of the components of M2 adjust at much slower rates than do market rates.[19] As a result, relatively small changes in market rates can result in relatively large changes in the composition of M2.

George Moore, Richard Porter, and David Small (1988) have attempted to circumvent this problem by constructing a disaggregated econometric model of the various M2 components. A major difficulty, though, in judging the performance of such models is that the data record for many of the newer M2 components is extremely short, while the number of effects that must be estimated is quite large. In addition to determining the sensitivity of each component to its own opportunity cost, such models also require an estimate of each component's sensitivity to changes in each of the other components' opportunity costs. The unfortunate fact that only about five years' worth of reliable data is avail-

able on M2 in its present form makes rigorous statistical testing of disaggregated models almost impossible. Any decisive evaluation of such models will require more data than are now available.

Besides the base and M2, various other studies have looked at other measures of money including M3 as well as a number of experimental measures of the money stock.[20] None of these other aggregates have been found to outperform the conventional aggregates significantly in terms of the ability to predict changes in the macroeconomy. Similarly, Benjamin M. Friedman (1988a) concludes that aggregate measures of credit or indebtedness perform no better than the monetary aggregates in this regard. Other attempted statistical "fixups" of the money-income relationship include the substitution of a long-term interest rate for short-term rates as an explanatory factor for velocity changes.[21] Several researchers have tried using a proxy for wealth such as consumption or permanent income in place of income as an explanatory factor for money.[22] The statistical impact of these adjustments can be summarized as marginal.

The bottom line on the rather extensive literature devoted to statistical explanations of the velocity puzzle is that researchers have been unable to provide a wholly satisfactory explanation for the 1980s' relationship between money and the economy; nor have they discovered a widely accepted substitute for the pre-1980 M1-GNP relationship.

Policy Implications

The general deterioration of the statistical link between money and income poses practical difficulties for monetary policy in general, especially for the process of targeting money-supply growth as a basis for monetary policy. Reflecting the increased uncertainty concerning the money-income relationship for M1, the FOMC has not set target ranges for this aggregate since 1986. Current policy instead places emphasis on the broader M2 and M3 aggregates, but short-term instability in the velocity of these aggregates resulted in a widening of their target ranges two years ago. In spite of the continued statistical uncertainty regarding the effects of monetary fluctuations, there has been little sentiment among economists for complete abandonment of monetary targeting. The consensus within the economics profession, both inside and outside the Federal Reserve System, continues to value the targeting process either as a "nominal anchor" for monetary policy or as a means of communicating Federal Reserve goals to the public.[23] There remains, however, considerable disagreement as to which aggregate should be targeted and the emphasis that should be placed on monetary targeting in the broader context of monetary policy.

Recent proposals for changing the current role of monetary targeting have been essentially "monetarist" in nature and have emphasized the role of the monetary base. These recommendations range from Milton Friedman's suggestion that the base be frozen at its current level to calls for "automatic pilots for monetary policy"—such as those put forth by Allan H. Meltzer (1987) and Bennett T. McCallum (1987, 1988)—that would adjust the base in a prespecified manner according to fluctuations in variables such as prices and nominal income.[24] A common feature of all these proposals, in addition to their emphasis on the base, is that they generally recommend stricter adherence to short-term monetary growth targets. However, proposals to target the base have generally met with strong criticism from other economists.[25]

The feature of the monetary base that distinguishes it from other monetary aggregates and makes its targeting so controversial is its extremely narrow definition.[26] As can be seen from the box on page 32, the monetary base consists of two components: currency in the hands of the nonbank public and reserves held by depository institutions. Monetarists see the narrowness of the base as an advantage. From their standpoint, this feature offers several potential advantages for monetary targeting purposes. First, the narrow definition of the base makes the design of monetary "rules" less subject to revision based on regulatory and technological changes in the banking system.[27] A second potential advantage of the base is its predictability. Because of its large currency component (about 75 percent), growth in the base has historically been smooth relative to M1

Components and Definitions of Major Monetary Aggregates

The Federal Reserve Board has a number of different ways to gauge the nation's stock of money; these measures are known as *monetary aggregates*. The compositions of the aggregates studied in this article are as follows:

Monetary base	Bank reserves + currency
M1	Currency + travelers checks issued by institutions other than banks + demand deposits + other checkable deposits
M2	M1 + money market deposit accounts + money market mutual fund balances + savings and small-denomination bank deposits + overnight repurchase agreements and overnight Eurodollars

Currency represents cash outside the Treasury, Federal Reserve Banks and branches, and the vaults of depository institutions.

Demand deposits are those funds on deposit at all commercial banks other than amounts owed to depository institutions, the federal government, and foreign banks and official institutions *minus* cash items in the process of collection and Federal Reserve float.

Other checkable deposits include negotiable orders of withdrawal (NOW) and automatic transfer service (ATS) accounts at depository institutions, demand deposits at thrift institutions, and credit union share draft accounts.

Money market mutual fund (MMMF) balances take into consideration both taxable and tax-exempt general-purpose and broker-dealer MMMFs.

Aside from time deposits in amounts less than $100,000, **savings and small-denomination time deposits** include retail repurchase agreements.

Excluded from the M2 measure are balances that are clearly being held for long-term purposes—such as amounts in individual retirement accounts and Keogh accounts—as well as liquid assets such as Treasury bills and commercial paper, the values of which are subject to market risk. M2 also excludes institution-only MMMF shares.

and M2.[28] A possible third benefit of base targeting, again resulting from its narrow definition, is its controllability. At least in theory, the Federal Reserve can exercise almost complete control over the currency and reserves components of the base through its open market operations. This controllability is seen as an advantage since reduction of uncertainty concerning policy actions is generally viewed as beneficial.

The narrowness of the monetary base also presents a number of potential problems from the standpoint of monetary targeting. Because of its narrow definition, movements of the base would be expected to be less informative in a statistical sense about the overall pace of economic activity than the broader monetary aggregates. For example, because of the base's disproportionate emphasis on currency, economic activities that involved the use of cash payments would receive disproportionate weight.[29]

As discussed above, the view that the base is less informative about the economy is corroborated by statistical evidence from most of the postwar period, though less so for the 1980s. Apart from the statistical evidence, the large cash component of the base is in itself a cause for worry. Recent surveys of consumer transactions patterns suggest that much of the currency supply may be employed in support of economic activity outside the United States, casting some doubt on the currency component of the base as a useful indicator of domestic economic activity.[30]

Another major problem with base targeting would arise if achieving a given base target became a major focus of short-term monetary policy. This problem results from the fact that historically the Federal Reserve has to some

extent accommodated short-run shocks to the demands for both the currency and reserve components of the base, rather than attempting to control these quantities with the degree of precision that some advocates of base targeting often recommend. One effect of the Fed's actions has been to dampen short-term fluctuations in interest rates.[31] With strict short-run targeting of the base, the accommodation of shocks would at times be sharply constrained, and experience suggests that short-run fluctuations in interest rates could then increase dramatically. Such variability in interest rates could result in significant social costs.

To summarize, a number of reasonable arguments can be made both for and against base targeting. Most of the proposals for base targeting would entail significant shifts in monetary policy. Accurate evaluation of the effects of such changes is at best problematic, as emphasized by Lucas (1976) and many others. In the context of current policy, the ambiguity in the postwar statistical record makes building a strong case either for or against base targeting difficult. In terms of velocity Chart 1 shows that base velocity has not displayed the same sort of stable long-term behavior as has M2 velocity. Although the more stable behavior of the base over the short term is an appealing property for a monetary target, many economists feel that evidence of such stability is not great enough to outweigh the disadvantages of the monetary base as a target variable.

Conclusion

Despite the reams of economic research that have been devoted to explaining the 1980s' velocity puzzle, economists' understanding of this phenomenon remains incomplete. What's more, no viable alternative has emerged to replace pre-1980 M1 as a predictive guide for monetary policy. Nonetheless, the tenor of this research is not entirely negative. The experience of the 1980s has provided useful data on the stability of the various aggregates' relationship to the economy in the face of significant changes in regulatory and monetary policy. Of particular interest is the continued evidence of long-term stability in M2 velocity and, to a lesser extent, in the velocity of the monetary base.

Given the 1980s' experience, further changes in the statistical link between money and the economy should be expected. The rapid pace of technological change presages an increase in the fungibility of most financial assets over the long term, as well as the creation of new types of financial instruments as different or improved technology becomes available. The 1980s also provide data on very large flows in and out of the various components of "new" M2 and M3, attesting to the continued strong incentives for such financial innovation. The behavior of all the monetary aggregates in today's changing financial environment should provide fresh evidence that will be helpful in sorting through the empirical puzzles of the 1980s.

Notes

[1] See, for example, Sims (1980).

[2] Another way of looking at this equation is to say that a rise in the real money supply, M/P, will be accompanied by a proportional increase in real output, Q.

[3] An alternative assumption would be that, though output, prices, and interest rates can influence money within-quarter, the reverse relationship is not true. This approach is more typical of the literature but no less arbitrary than the approach taken above.

[4] See almost any article dated after 1981 in the reference list at the end of this article, particularly the "overview" articles by Poole (1988) and Friedman (1988a).

[5] See, for example, Cox and Rosenbloom (1989), Judd and Trehan (1987), Roth (1985), and Stone and Thornton (1987).

[6]On the redefinition of the aggregates, see Simpson (1980). These definitions have been further revised as new types of accounts have become available through deregulation. Roth (1985) discusses these revisions in some detail.

[7]On changes in FOMC operating procedure during the last decade, see Heller (1988).

[8]See, for example, Kane (1981).

[9]Standard monetary theories for velocity include "cash in advance" models or, alternatively, "money in the utility function" models. See McCallum and Goodfriend (1988) for an alternative derivation of some of Lucas's results.

[10]The corresponding graph in Lucas's article uses annual data over the period 1900-1985, in which the real income component of velocity has been smoothed.

[11]See Lucas (1988) or Small and Porter (1989).

[12]Haraf (1986) reaches a similar conclusion.

[13]Engle and Granger (1987) formally demonstrate this effect in certain special cases. Specifically, they show that the statistical patterns between certain types of time series generally cannot be represented only in terms of changes in those series.

[14]See, for example, Roth (1987) or Judd and Trehan (1987).

[15]See, for example, Shadow Open Market Committee (1988), McCallum (1987, 1988), or Milton Friedman's discussion in Darby et al. (1987).

[16]This conclusion is supported by qualitatively similar results in an unpublished study from the Board of Governors of the Federal Reserve System (1988a).

[17]This finding is supported by Wenninger (1988), who reviews M1 and M2 velocity over the period 1915-87. At a more formal level, Roberds and Whiteman (1989) find evidence that long-run stability (that is, stationarity) in the postwar data for M2 velocity is greater than for M1 or base velocity. These results are consistent with one of the main conclusions of Friedman and Schwartz (1982): that an assumption of constant M2 velocity works well in explaining long-term movements in money (or income) for the United States and United Kingdom over the period 1867-1975.

[18]Roberds and Whiteman (1989) find that the information content of M2, as well as the predictability of M2 itself, has actually fallen for these two variables since 1980. Judd and Trehan (1987) find that the short-term predictability of M2

has decreased since deregulation; Small and Porter (1989) similarly report "large quarterly forecast errors" in forecasting M2.

[19]See Small and Porter (1989).

[20]Judd and Trehan (1987), for example, look at M3; for studies of experimental measures of the money stock, see, for instance, Lindsey and Spindt (1986).

[21]In other words, substituting a long rate for the short rate in graphs such as Chart 4. See Poole (1988) for a discussion.

[22]See Mankiw and Summers (1986) or Stone and Thornton (1987).

[23]See Friedman (1988a) or Kohn (1989) for explorations of the targeting process as an anchor for monetary policy. "Nominal anchor" means that monetary growth targets must receive some consideration in the monetary policy process. Standard arguments as to why open market operations should not be undertaken without reference to such a "nominal anchor" are given in Sargent (1987): 96-99, and McCallum (1986). See Canzoneri (1985), Rogoff (1985), or Federal Reserve Bank of Minneapolis (1985) for discussions of the targeting process as a communications tool.

[24]See Darby et al. (1987): 28, for a suggestion to freeze the base at its current level.

[25]See, for example, Friedman (1988b).

[26]Much of the discussion below derives from McCallum (1988), Friedman's (1988b) comments on McCallum's paper, and an appendix to Board of Governors of the Federal Reserve System (1988b).

[27]McCallum (1988): 176.

[28]Board of Governors of the Federal Reserve System (1988b): 531.

[29]A dollar of currency counts as a dollar in the monetary base, but a dollar in a bank account counts only fractionally.

[30]See Avery et al. (1987).

[31]On recent Federal Reserve policy, see Board of Governors of the Federal Reserve System (1988b): 532-33, and Heller (1988). Also see Miron (1986), Canova (1988), and Barro (1989), all of whom associate the disappearance of interest-rate seasonals in the United States with the founding of the Federal Reserve.

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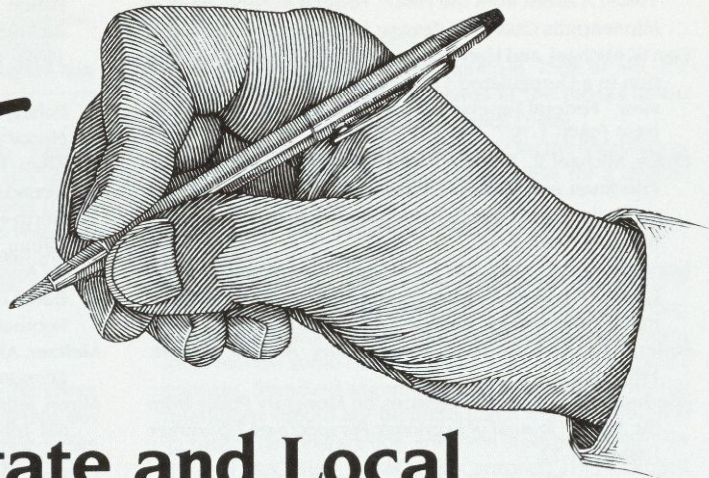
Measuring State and Local Fiscal Capacities in the Southeast

Aruna Srinivasan

Public officials, from members of Congress to city council members, are vitally concerned with the ability of state and local governments to raise revenues. Known as *fiscal capacity,* this ability varies widely among tax jurisdictions. The differences can be traced primarily to variations in the income and wealth of individuals and businesses in the respective areas.

Since the federal government allocates grant money on the basis of fiscal capacity, obtaining a reliable measure is crucial to ensuring equitable treatment of states and localities. Federal grant formulas use per capita income as a standard measure of the states' fiscal capacities. However, per capita income is recognized as being a seriously flawed measure of the ability to collect funds.

Interstate differences in fiscal capacity have been discussed throughout this century, but they attracted increasing attention since World War II with the growth of transfers from the

federal government to states and localities. In the 1980s federal grant programs have been cut back, but interest in fiscal capacity measures remains. According to the Advisory Commission on Intergovernmental Relations, "[W]hen research [in fiscal capacity measurement] first began . . . in the 1960s, a major impetus was to find better measures by which to distribute growing amounts of federal aid to states and localities. Today, with federal revenues making up a declining percentage of total state-local revenues, the intergovernmental concerns are with better targeting of federal aid and the need to provide states with information on how their fiscal systems compare that will enable them to make informed tax policy and economic development decisions."[1] Interest in fiscal capacity measures currently reflects both the federal government's desire to distribute funds equitably and the states' concern about obtaining their fair share under grants-in-aid and other programs.

Fiscal capacity measures can also help (1) compare the mix of taxes and other revenue sources used by state and local governments, (2) moni-

The author is an economist in the financial section of the Atlanta Fed's Research Department.

tor fiscal trends in states over time, and (3) formulate regional policies to counter the effects of the more episodic, regionally focused economic downturns of recent years.[2]

This article describes commonly used capacity indexes and evaluates them in terms of certain general criteria. The essential finding is that fiscal capacity measures currently used in federal formulas for distributing grants are flawed; however, several significantly improved measures of fiscal capacity could readily be implemented. The indexes are then used to compare revenue sources for the states located wholly or partly in the Sixth Federal Reserve District—Alabama, Florida, Georgia, Louisiana, Mississippi, and Tennessee.

Measures of Fiscal Capacity

Two concepts are basic to any model of fiscal capacity measurement: individuals' and businesses' ability to pay taxes and a government's ability to collect revenues. In general, the latter is a function of the composition of taxable resources, the types of business activity within the taxing jurisdiction, personal income, property in the area, and the government's ability to shift tax burdens between individuals and businesses as well as between residents and nonresidents. On the other hand, ability to pay taxes is largely determined by income and wealth.

Overall, a government's revenue-raising ability depends primarily on the resources available for taxation and the accompanying tax rates. Table 1 lists the major "own" sources of revenues (that is, nontransfer revenues) for states and localities, the percentage of actual collections from these sources in 1987, and the components of the revenue bases underlying the sources. Taxes are, by far, the most important source of own revenue for states and localities.

The primary focuses of state taxes are consumption and income, and for localities, property. At the state level, tax bases and taxation rates vary widely. In the Southeast, for example, Florida and Tennessee have no state income tax. Thus, a comparison of revenue bases across states is more complex than adding up billions of dollars in property values, millions of dollars in income, and so forth. Since fiscal capacity is

defined in terms of potential ability, in order to establish a capacity norm the same set of tax rates and the same definition of revenue bases should be used in all states. This information can be abstracted from state and local government data.

Fiscal capacity indexes that measure taxpaying ability are typically pegged to some measure of overall economic resources such as total income, total product, or combinations of income and product. The components of income used in these indexes do not, however, correspond exactly to the tax bases defined in Table 1. Depending on the composition of taxable resources and the ability to shift tax burdens to nonresidents, some elements of income may be entirely omitted from the bases in Table 1. On the other hand, income measures also include some bases that are not routinely taxed by state and local governments. For ability-to-pay indexes, the per capita components are summed for each state and then indexed as a percentage of the national average. Fiscal capacity indexes falling into this category include per capita personal income, gross state product, and total taxable resources.

While these income series measure individuals' ability to pay taxes and other levies, revenue indexes reflect the government's ability to collect revenue by attempting to analyze the composition of resources as well as their levels. The major revenue indexes are the representative tax system, the representative revenue system, and export-adjusted income measures. The components of the capacity measures in the revenue indexes are commonly used tax bases including some or all of the items listed in Table 1.

Criteria for Evaluating Fiscal Capacity Measures

At least three major criteria are used to evaluate income and revenue measures of fiscal capacity. Comprehensiveness is an important quality: all resources that contribute to a government's ability to raise revenues should be considered. For instance, the measure should account for all the major tax and nontax revenues that state and local governments can use,

Table 1.
Composition of State and Local Revenue Sources, 1987

Revenue Source	State-Local Collections in 1987 (Percent of Total)	Components of Revenue Base
General Sales Taxes	19.6	Retail sales and receipts of selected service industries
Selective Sales Taxes	8.5	Consumption of fuel and alcoholic beverages; revenues of public utilities; insurance premiums
License Taxes	2.8	Motor vehicle and corporation licenses; automobile and truck registrations
Personal Income Taxes	16.1	Individual income (includes interest, dividends, intangibles, etc.)
Corporation Income Taxes	4.3	Corporate profits
Property Taxes	24.2	Value of residential property, farm real estate, commercial real estate, and public utilities
Severance Taxes	1.4	Value of oil and gas, coal, and nonfuel mineral production
User Charges	17.4	Personal income
Other[1]	5.7	
Total	**100.0**	

[1]Includes estate and gift taxes, rents and royalties, and mineral leasing.

Source: Adapted by the Federal Reserve Bank of Atlanta from the Advisory Commission on Intergovernmental Relations (1989).

and the measure should focus on all taxpayers, not just individuals residing in the area under study.

A second characteristic of a good fiscal capacity measure is the power to distinguish between the level and composition of an area's fiscal resources. The amount of a particular resource in two states may be the same, but the two states could have significantly divergent capacities if the resource is taxed differently. Resource mobility is also important. Some tax bases such as coal fields are immobile and hence more easily taxable; other subjects of taxation, such as computer operations and other back-office functions of financial institutions, can be picked up and moved with comparative ease.

A fiscal capacity measure should also be able to distinguish between revenues raised from residents and nonresidents. This distinction is important because states can "export" taxes to nonresidents in a number of ways, thereby reducing their own citizens' fiscal burden for any given level of revenue raised. For example, severance taxes, which impose a levy on income or production of a natural resource, are ulti-

mately passed on to consumers in the purchase price of the final good. At least some of these consumers may be nonresidents. Hotel room taxes represent another way to export taxes by levying a tax directly on a product or service purchased mostly by nonresidents.

Per Capita Personal Income

The advantages and disadvantages of the major fiscal capacity indexes have been the subjects of an ongoing debate about measuring capacity. Nowhere is this controversy more obvious than with personal income. A state's most obvious source of tax revenue is the income of taxpaying residents. The U.S. Census Bureau's personal income estimate measures money income and includes gross wages and salaries, proprietors' income, pension benefits, and government transfers, as well as interest and dividends. For state fiscal capacity measurements, the transfer component of personal income is redundant to the extent that it includes

transfers from state and local governments. Income transfer among state residents does not increase total income and thus should be counted only once in the capacity measure.

The principal weakness of personal income as a capacity measure is its lack of comprehensiveness. Measuring fiscal capacity with personal income fails to account for taxes not levied directly on personal income, such as corporate income, property, and sales taxes. Some of these taxes account for a larger proportion of state and local taxes than does personal income. In addition, by focusing on resident income, personal income as a capacity measure ignores tax exportation and thereby understates the fiscal capacity of tourist-rich states like Florida and energy-rich states such as Louisiana.

Gross State Product

The U.S. Commerce Department's Bureau of Economic Analysis recently introduced a comprehensive series of gross state product estimates. Gross state product is the total value of goods and services produced in a state over a given period of time.[3] One method of calculating gross state product is to measure the market value of all final goods and services produced and then subtract the value of imported (that is, out-of-state) goods and services. However, there are certain intractable problems associated with adjusting estimates at the state level for the value of imported goods and services. The currently used method to compute gross state product is more practical; it sums income derived from production of the year's output and expresses the total in per capita terms. As discussed below, except for two qualifications, both methods should yield identical results. The primary income components in gross state product are employee compensation, proprietors' income, rental income, and interest income.

The two qualifications regarding the equality of the market value of output and income are related to depreciation and indirect business taxes, both of which must be added to income in estimating gross state product.[4] Although gross state product, when measured by income, accounts for a substantial portion of the taxable

resources available to states, this measure also includes some items such as federally imposed business taxes that are not subject to taxation by states and should therefore be excluded. Adjustment for these items is part of the process of transforming gross state product into another fiscal measure, total taxable resources.[5]

Gross state product, whether measured as total output or income "produced," generally does not equal income received by a state's residents or personal income. Some residents receive earnings from jobs in neighboring states, and some receive transfer payments from other governments, including the federal government. Gross state product is incomplete because it neglects these two components of resident income, which supplement ability to pay taxes. The gross state product measure also neglects wealth. The major attraction of gross state product, however, is that it captures taxable income received by nonresidents, thus resulting in a more comprehensive fiscal capacity measure than personal income.

Total Taxable Resources

Total taxable resources is an income measure that tries to address the shortcomings of gross state product measures (see Table 2). It is the unduplicated sum of gross state product and resident income expressed in per capita terms. Thus, total taxable resources includes elements of residents' income not produced in the state as well as income produced in the state but received by nonresidents. Additionally, to calculate total taxable resources, some other adjustments are made: federal indirect business taxes are deducted from gross state product, and transfer payments from shared federal-state grants-in-aid programs are excluded from personal income.

The three income indexes discussed above—per capita income, gross state product, and total taxable resources—have the common disadvantage of weighting components equally on a per-dollar basis and not discriminating on the basis of resource composition. Consider, for instance, two states with the same average per capita income but different proportions of wealthy and below-average-income families. If the state with

Table 2.
Components of Total Taxable Resources,
Personal Income, and Gross State Product

Component	Total Taxable Resources	Per Capita Personal Income	Gross State Product
Earnings of Residents Labor Compensation and Proprietors' Income (in-state)	X	X	X
Earnings of Residents Labor Compensation and Proprietors' Income (out-of-state)	X	X	
Earnings of Nonresidents Labor Compensation and Proprietors' Income (in-state)	X		X
Depreciation	X		X
Cash Transfers (from all governments)	X	X	
Indirect Business Taxes	X		X

relatively more wealthy families could levy higher-than-average taxes on that group, the incomes of wealthier families should necessarily be given more weight per dollar in measuring fiscal capacity.

The Representative Tax System and the Representative Revenue System

The representative tax system and the representative revenue system provide both absolute and relative measures of states' ability to raise tax revenues. Each system assumes that every state applies identical rates to each of the commonly used tax bases. Both systems can be used to compare states' tax effort, which is a gauge of actual revenues relative to hypothetical tax capacity. The representative tax and revenue systems give individual measures of revenue bases. By measuring fiscal capacity on a disaggregated basis, policymakers can see how states are underutilizing or overworking particular revenue sources relative to the national average. The thorny matters of comprehensiveness and exportability also influence the design and use of the representative tax and revenue systems, but in a different way from personal income.

Tax Capacity. The representative tax system defines *tax capacity* as the dollar amount of revenue that each state would raise by applying a nationally uniform set of tax rates, based on all states' average behavior, to a common set of tax bases.[6] The representative revenue system expands this definition to include nontax revenue sources such as user charges, as well as rents and royalties. Estimates of all bases commonly subject to state and local levies are used in the representative tax and revenue systems' calculations of tax capacity and are listed in Table 1. The seven tax bases in this table are broken down into 26 subcategories to obtain the representative tax system total. Rents and royalties, mineral leasing, and user charges are added to the representative tax system total to derive the representative revenue system figure.

Tax Effort. A state's tax effort index is calculated by dividing the state's actual tax collections by its estimated tax capacity and multiplying by 100. The result may be interpreted as a measure of how much that state chooses to exploit its potential tax bases relative to other states. A state with a tax effort beneath the national norm will have an effort index under 100. Differences in tax effort may result from such factors as differing needs, varying preferences for government spending, or differences in the degree to which the base is taxed.

As with tax capacity, tax effort can also be measured for each tax or nontax revenue base. Because the representative tax system and rep-

Table 3.
Indexes of 1986 State Fiscal Capacity and Effort
(U.S. average = 100)

State	Per Capita Personal Income Index	Rank	Gross State Product* Index	Rank	Total Taxable Resources* Index	Rank	Representative Tax System Index	Rank	Representative Revenue System Index	Rank	Tax Effort Index	Rank
Alabama	77	43	78	46	78	46	74	49	75	48	86	41
Florida	100	20	88	39	94	27	105	15	102	15	77	49
Georgia	92	29	97	21	94	26	94	27	92	32	89	38
Louisiana	76	47	95	24	86	38	90	35	94	29	91	34
Mississippi	66	51	70	51	68	51	65	51	65	51	97	24
Tennessee	82	39	88	38	84	41	84	42	82	42	84	44

*Gross state product and total taxable resources are measured on a per capita basis.

Source: Advisory Commission on Intergovernmental Relations (1989).

resentative revenue system measures use standardized rates applied to standardized bases, the resulting tax effort measures allow state-by-state comparisons that statutory tax rates do not. Sales tax effort in each state, for example, is measured relative to retail sales, excluding food and drugs, whether or not a state actually exempts these items from the tax. A simple comparison of statutory sales tax rates can also give misleading estimates of revenue-generating capacity because variation in the composition of the various states' sales tax bases is not considered.

The representative tax and revenue systems also offer a more accurate measure of fiscal capacity than income-based measures because they capture states' opportunities to export taxes.[7] In the representative tax and revenue system measures, the tourist trade, for example, is included in a state's total retail sales figure, which is used to calculate the base for general sales taxation. In contrast, as mentioned earlier, per capita personal income ignores tax exportation and thereby understates the fiscal capacity of states where exported taxes are significant.

The representative tax and revenue systems are generally considered reasonable starting points for capturing the taxability of a state's resources, as these indexes account for the resources' composition as well as their dollar levels. However, some aspects of the implementation of the representative tax system and

the representative revenue system, such as measurement of the bases and rates, are controversial (David A. Wildasin [1987]). A common criticism of the representative tax system is that by using the national average rate of taxation, substantial departures from actual fiscal conditions may occur for states where tax rates are far removed from the norm. States with higher-than-average existing tax rates are likely to have somewhat more capacity than is indicated by the average rate applied to their actual bases, and states with low rates are likely to have somewhat less capacity.[8] For instance, in a state with no income tax, such as Florida, the adoption of such a levy would induce some residents to consider moving and some nonresidents to reevaluate relocation into the state. Thus, the total income of the state could actually decrease. As a result, the actual capacity would be lower than that estimated for the representative tax system.

Applying Fiscal Capacity Measures to the Southeast

Although southeastern states on average have the lowest fiscal capacity in the country, they also exhibit below-average fiscal effort. Table 3 presents estimates of five fiscal capacity indexes for 1986, a measure of tax effort for the

Export-Adjusted Income

Export-adjusted income is an important theoretical approach to measuring fiscal capacity developed by Stephen M. Barro (1984). Export-adjusted income is based explicitly on the concept of the state-local budget constraint, which embodies the trade-off between disposable income and taxes used to finance public services; more of one means less of the other. Under this approach, states' ability to shift tax burdens to nonresidents determines their ability to transform resident income into government spending. Because opportunities for exporting taxes vary across states, a dollar reduction in residents' disposable income based on a change in state-local tax policy does not translate one-for-one into an extra dollar of government spending. This in-

equity may occur because governments mix tax and nontax instruments (state college tuition, for instance) in such a way as to shift a significant proportion of the burden to nonresidents. This practice has limits, however, because given sufficient incentive nonresidents will spend their money elsewhere.

Although export-adjusted income represents an important theoretical advance in measuring capacity, estimating this measure raises numerous theoretical issues and data requirements that are difficult to resolve. The most recent data available are for 1981, and these are still vulnerable to the objection that the approach is devoted solely to exportability and ignores the composition of resident income.

states in the Southeast, and their national rankings in each of these categories.[9] (The export-adjusted income measure discussed in the box above is omitted because it was last estimated in 1981.) From the table, one can see that the southeastern states generally have low fiscal capacity relative to the nation. For each tax capacity measure studied, Mississippi ranks last in the country, and Alabama ranks near the bottom. These states' economies are dominated by traditional manufacturing and agriculture, sectors that in 1986 were still recovering from the economic downturn of the early 1980s.

Georgia and Tennessee, while generally above the lowest-ranking states, also have fiscal capacities below the national average. In the Southeast, only Florida displays any above-average capacity indexes, and those are just slightly above the mean. Florida's large tourist sector and the consequent exporting of sales taxes to nonresidents are reflected in a representative tax system index that exceeds the per capita income index. Louisiana's energy sector and the severance tax burden placed as a result on nonresidents account for the 14-point difference between that state's per capita income index (76) and its representative tax system index (90).

Although tax capacity is below the national average in all southeastern states except Florida, tax effort indexes are also lower than the nation's, implying that these states still have room

to raise revenue, by amounts ranging from 3 percent in Mississippi to 23 percent in Florida, without surpassing the national average. The absence of a state income tax in Florida is a major factor underlying its below-average fiscal effort.

While shifts in fiscal capacity can result from economic conditions, fiscal effort changes may be induced by adjustments to tax policies as well as by economic factors. Thus, even if the dollar value of their revenue collections have remained in step with the national average, some states may have either rising fiscal efforts simply because revenue capacities have declined or declining fiscal efforts as capacities have risen. The link between changes in fiscal capacity and fiscal effort is demonstrated in Table 4, which presents swings in the fiscal capacity and effort indexes between 1982 and 1986 for the six southeastern states. The per capita income and representative tax system measures show the same general patterns in changes in fiscal capacity, but the representative tax system figures generally reflect larger index point movements. This situation results because the tax bases included in the representative tax system, such as severance taxes and other business taxes, respond more sharply to economic fluctuations than does personal income. However, both measures display the differential in fiscal capacity that has developed in the 1980s. While diversified, service-based

Table 4.
Changes in Fiscal Capacity and Tax Effort, 1982-86

State	Per Capita Personal Income	Representative Tax System	Tax Effort
Alabama	0	0	−1
Florida	1	1	5
Georgia	6	10	−7
Louisiana	−13	−23	10
Mississippi	−4	−6	5
Tennessee	2	7	−2

Source: Advisory Commission on Intergovernmental Relations (1987b).

economies like Georgia's have benefited, Louisiana's, which relies on the energy sector, has been hurt.

The majority of the change in fiscal effort in Georgia and Tennessee from 1982 to 1986 is due to the change in the states' tax bases and revenues resulting from economic growth. For example, in the case of Georgia, the state's base has gone up by more than the national average, resulting in increased fiscal capacity from 1982 through 1986. The change in revenues, though, was less than the change in the base, leading to a decline in Georgia's fiscal effort. Some of the change in southeastern fiscal effort indexes is a result of modifications in state taxes over the period. Many of these changes occurred in 1983, when states found themselves short on revenues. More recently, in fiscal years 1988 and 1989, Florida and Georgia increased their general sales tax rates. This move obviously affects fiscal effort because general sales taxes represent the largest single source of revenue for most state-local systems in the Southeast. The recent trend of increasing sales tax rates for selected items such as motor fuels is another example of changes that can affect fiscal effort (Tax Foundation [1988]).

Aside from comparing fiscal effort and capacity among states, other major applications of fiscal capacity indexes are evaluating the mix of revenue for states, assessing the degree to which a state uses a particular revenue source, and determining which source might be drawn on more heavily if tax effort is to be increased. Charts 1 through 6 compare 1986 capacity and revenue utilization for four selected revenue bases—general sales, property, personal income, and severance taxes in the six southeastern states. Estimated fiscal capacity per capita, actual revenue collections per capita, and the U.S. average fiscal capacity per capita are shown for each of these revenue bases. *Capacity per capita* is the revenue that could be collected from the base when the representative tax rate is applied, divided by the population. If the first bar (capacity) is longer than the second bar (revenue), the state is raising less revenue from that source than a state with the average tax rate would collect given the same base. If the revenue bar stretches further than the capacity bar, the state is taxing that base more heavily than average.

By this measure, southeastern states generally raise more revenue from general sales taxes and less from income and property taxes than the average state. This disparity is most apparent in Florida and Tennessee, where personal income taxes are virtually nonexistent. Although southeastern states rank in the bottom half of the country in property tax capacity, their efforts are also below average.

Conclusion

Several alternative measures of fiscal capacity have been proposed recently, providing approaches other than per capita personal income for gauging fiscal capacity. The representative

Chart 1.
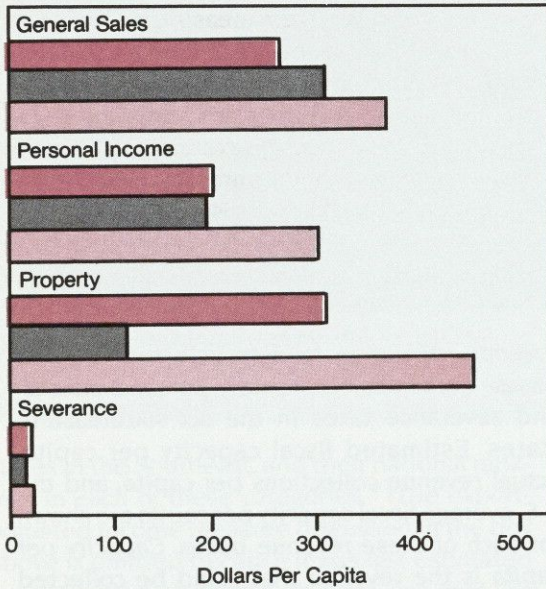## Capacity and Revenue for
Selected Revenue Bases,
Alabama, 1986

General Sales

Personal Income

Property

Severance

0   100   200   300   400   500
Dollars Per Capita

Chart 2.
Capacity and Revenue for
Selected Revenue Bases,
Florida, 1986

General Sales

Personal Income

Property

Severance

0   100   200   300   400   500
Dollars Per Capita
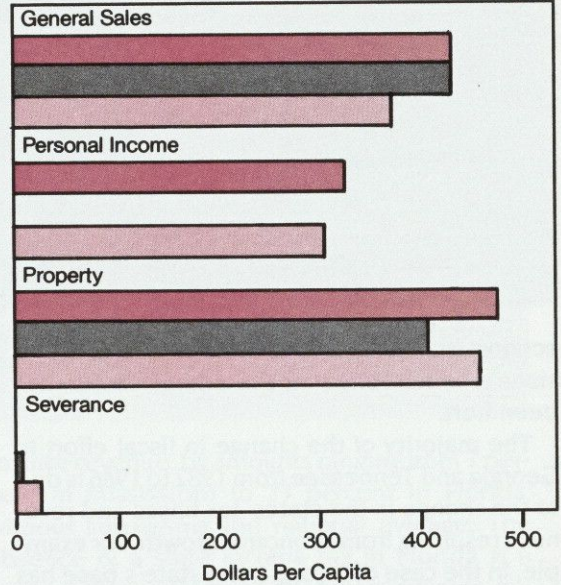
Chart 3.
Capacity and Revenue for
Selected Revenue Bases,
Georgia, 1986

General Sales

Personal Income

Property

Severance

0   100   200   300   400   500
Dollars Per Capita
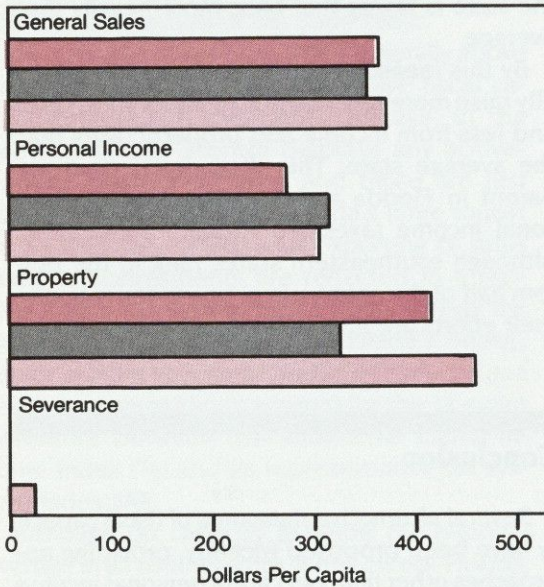
Chart 4.
Capacity and Revenue for
Selected Revenue Bases,
Louisiana, 1986

General Sales

Personal Income

Property

Severance

0   100   200   300   400   500
Dollars Per Capita
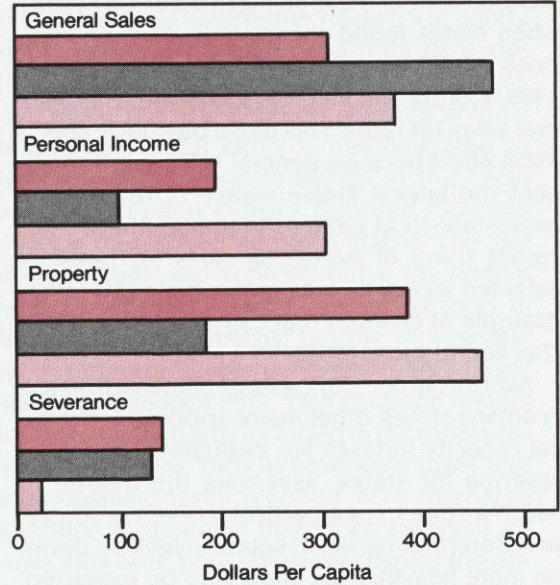
Chart 5.
Capacity and Revenue for Selected Revenue Bases, Mississippi, 1986

General Sales

Personal Income

Property

Severance

Dollars Per Capita

tax system, representative revenue system, and total taxable resources measures have been shown to be more useful than per capita income. The total taxable resources measure is preferable to other income measures because of its comprehensiveness, and preferable to the representative tax system measure because the concept of total taxable resources deals with the tax exportation problem. However, serious implementation problems are associated with the recently developed indexes, and much work remains to be done if they are to be used more in public policy-making decisions.

Chart 6.
Capacity and Revenue for Selected Revenue Bases, Tennessee, 1986

General Sales

Personal Income

Property

Severance

Dollars Per Capita

Capacity

Revenue

U.S. Average Capacity

Source: Advisory Commission on Intergovernmental Relations (1989).

Notes

[1] Advisory Commission on Intergovernmental Relations (1989): 1.

[2] See Advisory Commission on Intergovernmental Relations (1987b).

[3] See Donovan (1989) for more discussion on gross state product.

[4] Indirect business taxes include sales, excise, property, and severance taxes; these taxes are de facto income to governments. Business income is, of course, an important source of tax revenue to state and local governments. Gross state product measures business income in its entirety.

[5] The process of transforming gross state product into total taxable resources is elaborated on in U.S. Department of the Treasury (1985).

[6] Advisory Commission on Intergovernmental Relations (1987b).

[7] Conversely, the representative tax system and representative revenue system also account for some types of tax importation, or the payment of taxes by the residents of one state to the government of another state.

[8] The representative tax system's average tax rate is computed by dividing total collections nationwide by the national total base for that tax.

[9] While the capacity estimates are generally consistent over time, they inevitably have some error associated with them. For this reason, small changes in capacity, such as movements of a few index points, should not be regarded as significant.

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Book Review

Breaking Up the Bank: Rethinking an Industry under Seige

by Lowell L. Bryan.
Homewood, Ill.: Dow Jones-Irwin, 1988.
209 pages. $42.50.

Breaking the Bank: The Decline of BankAmerica

by Gary Hector.
Boston: Little, Brown, 1988.
363 pages. $18.95.

It is tempting to argue that Gary Hector's *Breaking the Bank* and the first third of Lowell Bryan's *Breaking Up the Bank* tell the same story. In a detached and analytical manner befitting a senior partner at McKinsey and Company, Bryan analyzes the wrenching changes that beset American banks, particularly large ones, in the late 1970s and the 1980s; he also describes how the hangover from earlier decades of protected stability dimmed banks' vision and muddled their action. In *Breaking the Bank*, Gary Hector, a business journalist on leave from *Fortune* while writing this book, unintentionally wraps Bryan's analysis in the flesh and blood of Bank of America (B of A), describing the course the bank's management pursued through the perils encountered by most banks, large and small, during the seventies and eighties. Arguably, B of A's unusual circumstances magnified the impact of many of that era's dislocations; the bank's size alone made front-page news of its problems.

From the 1930s through most of the 1970s, Bryan writes, commercial banks and thrifts in the United States operated in an insulated environment: a government insurance subsidy and markets that were often protected made it difficult for financial institutions not to make a profit, so expanding existing lines of business and undertaking new ventures were always correct strategies.

In an analysis reminiscent of many other recent accounts, Bryan explains that the 1970s brought the beginnings of economic volatility (especially in interest rates), advances in the efficiency of data communication and processing, innovations in financing techniques, and changes in the rules under which insured depository institutions operate. These developments greatly modified the nature of the markets in which banks sell their wares. With this evolution came pressure for substantial changes in the ways banks must do business in order to earn a reasonable profit and provide relatively safe and liquid deposit accounts to their customers.

Using his bank management expertise, Bryan concentrates on three aspects of the banking system that, in his view, broke up over the past two decades: (1) growth-oriented, multiproduct institutions, which had been allowed by pro-

tected markets to cross-subsidize some of their operations (without knowing the extent of subsidy to individual products); (2) banks' market share in important services such as business lending and consumer accounts, which has recently suffered major losses; and (3) a legal and regulatory system that provided an insurance subsidy for banks yet limited their ability to adjust to changing technology and competitive pressures.

The author argues that competition has forced banks to pay market rates on deposits, causing institutions to shift expenses away from fixed assets (branches) that had been set out to garner deposits when banks could not compete on the basis of interest payments. The largest institutions have also lost their least risky customers, who now borrow in the commercial paper market. Even the smallest banks face increased competition on both sides of their balance sheets. Bryan asserts that, in replacing lost business and meeting new competition, banks have taken on more risk without fully recognizing that they were doing so. Loans to less developed countries (LDCs) demonstrate this tendency, but Bryan contends that LDC debt is not the only risky means by which banks have tried to restore lost revenues.

Bryan concludes his analysis of banks' problems over the past two decades by describing a system that has produced bloated organizations with insufficient knowledge of their own operations to control their expenses or risk. These inefficient institutions are, according to the author, substantially aided by a government subsidy in the form of deposit insurance and significantly hindered by government regulations concerning activities and geographic dispersion.

In *Breaking the Bank*, Hector chronicles the hard times of Bank of America during an era identified by Bryan as a crucial period for U.S. banking. Hector's story of Bank of America generally ignores the economic developments that shaped events at the bank and, in doing so, limits the reader's perspective on the institution's problems. However, between the lines, the reader can discern an institution that carried Bryan's model to its "logical" extreme in a large, growing state economy where statewide branching had long been allowed. In Hector's view, B of A's large branching system, its dependence on consumer deposits, and its willingness to skimp on controls in its drive for expansion, as well as its cumbersome and sometimes ineffective bureaucracy, were particularly exaggerated.

Breaking the Bank begins with a long and fascinating paean to A.P. Giannini, Bank of America's founder. Energetic, creative, dedicated to his own business philosophy, and a prominent front-runner who remained close to his customers throughout a long, stormy career, Giannini is a fine subject for Hector's colorful style. Looking through Bryan-colored glasses, however, one may view Giannini as an entrepreneur whose innovation was to recognize and follow closely the incentives that the markets and the regulatory and insurance system presented.

Giannini's successors—including Tom Clausen and Sam Armacost—inevitably faced the kind of changes that Bryan describes and were, at first, not particularly successful in their responses. Hector upbraids these men unmercifully for running into problems that Giannini did not encounter, as well as for responding inadequately to them.

The author, however, seems to have put on blinders when he sat down to write *Breaking the Bank*. A look at annual reports of other large California banks reveals numerous similarities to B of A. Many of the problems of rising operating expenses connected with large branching systems, loan quality—especially foreign loans—and inadequate controls haunted those institutions, too.

Whether B of A's managers were less competent than the people who ran other large banks, as Hector implies and as the successful adjustment by some (but not all) large California competitors suggests, or whether B of A simply faced magnified problems is not considered by Hector; nor is the answer easily discernible. That Wells Fargo and Security Pacific, in particular, adjusted more successfully is grounds enough for Hector to disparage Bank of America. One is curious how the journalist might have written the Crocker story or might now write the First Interstate story.

Ironically, B of A has had considerable success since about the time Hector's book was published. That success, though, has not been based primarily on the plan for reorganizing banks and banking set forth by Bryan's more general and prescriptive work. In the second

and third parts of *Breaking Up the Bank*, Bryan proposes solutions for many of the problems faced by larger institutions in particular; these proposals link both private and public actions.

Bryan introduces his plan of action for banks with a discussion of structured securitized credit. His presentation of concepts, which reasonably categorizes and classifies credit functions and offers clear explanations of interrelationships, makes worthwhile reading.

Extending his argument that markets have shaved interest margins to the extent that buy-to-hold strategies will no longer be profitable for banks, Bryan proposes that credit process functions be divided into separate units. Some banks would choose to specialize in particular functions, such as funding or underwriting. Other banks, Bryan explains later in the book, would continue to perform the range of credit functions, depending on functional separation of duties within the organization for increased efficiency. In any case, funding, underwriting, credit enhancement, servicing, and various types of risk taking would be separately managed functions, adding their value and earning their way individually or in a rather loosely knit holding company.

Bryan's proposal is based on a somewhat unorthodox idea drawn from his long experience observing banks from within: banks have been induced to go into a wide variety of businesses, which has led to more complex management problems than many banks can handle. In a sense these institutions suffer from diseconomies of scope resulting from the old regulatory and deposit insurance system. These diseconomies are perpetuated by continued regulation and the ingrained complexity of managing change.

When applied, however, Bryan's advice seems to turn his analysis on its head. While smaller, less complex banks are urged to simplify, larger banks are advised to reorganize and stay together. The author encourages small banks to find a functionally limited role in the credit process and specialize. Indeed, he suggests, many small banks may find it most advantageous to join larger banks and operate as specialized deposit-gathering or lending branches. Large banks may find their niches also, but Bryan believes that many of the larger firms may be strong enough to perform all functions. For such banks the author suggests holding company organizations with functionally separate subsidiaries operating with considerable independence. Clearly, according to Bryan's advice, for many of the country's regional and money-center banks "breaking up the bank" is to be followed by putting it back together again. If smaller banks follow the suggestion that they sell out, the reorganized large banks would be even larger and more complex.

The reader may be perplexed by Bryan's advice for large banks. The author's proposals do not seem to require that structured securitized credit be adopted. Organizing on a functionally separate basis has been possible for some time, but most banks have not done so. Bryan's suggested division of functions does not seem to eliminate complexities in the interre-

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". . . Bryan proposes that credit process functions be divided into separate units. Some banks would choose to specialize in particular functions, such as funding or underwriting."

---

lationships banks must manage. Rather, separating functions into more or less independent units threatens to reduce both efficiencies gained from shared costs and synergies developed from shared knowledge of company operations and goals. Moreover, separation may well reduce internal support for important but seemingly nonproductive general overhead such as interest-rate and credit risk controls, research and development, and marketing.

Further, Bryan's suggestions for private action are probably much too narrow. Accepting, for the sake of argument, his diagnosis that banking is plagued by bloated and unknowing bureaucracies, it is still not clear that securitization and parallel functional division are the only ways, or even important ways, to deal with banks' problems. Bryan's proposal simply divides in a different manner the functions most banks cur-

rently perform. Whether this division is always the most efficient one is not yet clear. Bank of America, for instance, has achieved more than a modicum of success by segregating and eliminating functions in other ways. Management there has shaped the bank into an institution that more and more resembles a mega-superregional rather than a money-center bank. Securitization has played a part, but not an overwhelming one, in the transformation.

For now, all one can acknowledge is that Bryan has suggested an approach that the market has accepted for certain institutions in some situations. One can neither doubt his method's usefulness nor accept it, as Bryan appears to do, as a cure-all for private institutions' difficulties. Alternatives, like B of A's strategies for regaining efficiency, may work better in some cases.

"Whether this division is always the most efficient one is not yet clear. Bank of America, for instance, has achieved more than a modicum of success by segregating and eliminating functions in other ways."

The public policies Bryan proposes for the banking system would give banks the flexibility to adapt to the changing order, particularly through securitization. Bryan's suggestions range from technical amendments to bankruptcy laws and Securities and Exchange Commission (SEC) rules to changes in bank powers, capital requirements, and accounting rules.

Bryan acknowledges the necessity for much of the nation's rather complex bank regulatory network: depositors and the financial system both must be protected from risk. He argues, though, that depositor and systemic risk protection need extend only to demand deposits and other consumer and small business deposits in order to provide sufficient safeguards.

To achieve these safeguards, Bryan advances a version of the narrow bank, a concept most often associated with Robert Litan's 1987 book,

What Should Banks Do? Issuing only a limited variety of deposits and holding only low-risk assets, institutions of this type would protect the nation's transactions deposits and payments system. Other financial institutions, functionally (and presumably less intensively) supervised and regulated, would make and securitize loans funded as needed by uninsured deposits or any other instrument the market would accept. This arrangement could rid the system of many of the inhibiting and costly regulations that now burden it, and each institution could seek its niche(s).

The arguments of narrow bank proponents have not been enthusiastically embraced by bankers or politicians. In its favor, the narrow bank draws an unambiguous line between bank activities that are insured and those that are not. If the public believes that the line is fixed, the public will follow incentives to monitor the condition of institutions offering uninsured assets and thus help to limit risk. Since credit risk in the narrow bank is limited by the assets it can hold, such an institution addresses Bryan's concern for the safety of demand and other small deposits. The narrow bank concept also allows the regulation of the rest of the system to be reduced, thus permitting more flexibility to institutions in general.

The author's plan, however, would let holding companies that own narrow banks own other financial institutions also. The plan relies on "firewalls" to separate the risks of safe, narrow banks from those of riskier institutions. The efficacy of these firewalls is doubtful, though. Bank regulators already look to the holding company, and by implication its subsidiaries, as a source of financial strength to individual bank entities, particularly if such strength will save public funds. For this reason and others, the public may perceive risk even in a narrow bank when its parent or siblings have trouble. Further, even in a system with narrow banks, large institutions may require rescue in order to protect credit and payment flows.

As do many other narrow bank proposals, Bryan's leaves several questions unanswered: Are there enough safe assets to back the narrow banks' safe liabilities? How would interest-rate risk be addressed? Would narrow banks need a subsidy to operate profitably? Can such a subsidy be justified on the basis of the public

benefits of safe transactions deposits? Would important economies of scope be lost in the separation of transactions deposits and safe investment functions from other typical banking functions? Is protection of money alone sufficient? Could interruption of credit flows (eliminated from the narrow bank by definition) be the key danger brought to the economy by systemic failure?

Bryan's suggestion for private action by banks might also have negative public impacts. His proposed reorganization would result in fewer, larger banks, he believes. Diversification gains have their limits, however, and significant public fear exists that large financial institutions may fold. Bryan himself contends that even today the failure of a large nondepository financial institution, such as a large investment bank, would require government intervention. Under his system, with larger institutions such intercession may be even more likely. Pressure to extend government insurance coverage beyond the narrow bank, whether de facto or de jure, would likely occur under Bryan's system.

All in all, both Bryan and Hector write worthwhile but incomplete books. Bryan contributes eyes- and hands-on experience in bank management and a useful explanation of securitization to the public discussion of banking problems and their solutions. Hector's narrow focus and his admiration for Mr. Giannini lead him to flagellate latter-day Bank of America managers for being in the wrong place at the wrong time, but *Breaking the Bank* offers a colorful tale and a between-the-lines case study of Bryan's abstractions. Both books should aid our understanding of the complexities involved in solving a set of problems that has developed over several decades. Each book, in its own way, underlines the difficulties of reforming private institutions and public policy on the fly and warns against simple solutions.

B. Frank King and Sheila L. Tschinkel

The reviewers are, respectively, vice president and associate director of research and senior vice president and director of research at the Atlanta Fed.

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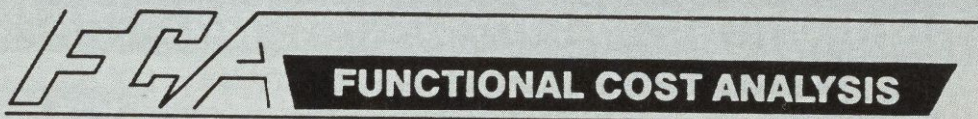
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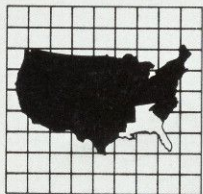
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