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The New Bank-Thrift Competition: Will It Affect Bank Acquisition and Merger Analysis?

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THE Depository Institutions Deregulation and Monetary Control Act (MCA) enacted by Congress in March 1980 will significantly affect the competitive environment in which financial institutions operate. This act broadens both the asset and liability powers of savings and loan associations (S&Ls), mutual savings banks and credit unions, opening opportunities for these institutions that traditionally have been limited to banks. In light of these new powers and the increasing erosion of both legal and economic differences between thrift institutions and banking organizations, thrifts have become important competitors in markets for banking services—especially for transaction or checking accounts.¹ Logically, the presence of thrift institutions should carry greater weight in analysis of mergers between commercial banks and acquisitions of banks by bank holding companies (BHCs).

The following discussion reviews several provisions of the MCA that permit more intense bank-thrift competition, describes the current approach used by banking regulatory agencies to review applications for approval of bank mergers and BHC acquisitions, and discusses its validity in light of the new legislation. Finally, the article discusses some alternative approaches to the analysis of competition in local markets.

THE MCA PROVISIONS

The distinctions between thrifts and banks have become less rigid because of a long list of recent finan-

cial innovations and the geographic expansion of so-called “non-banking” institutions.² The MCA, in response to these developments, reduces even further the actual differences between banks and thrifts. Regulations that have attempted to control or constrain pricing and portfolio decisions of financial institutions are being liberalized. In essence, the act provides for a greater reliance on market forces to determine both the flow of deposits to financial institutions and the flow of credit from these institutions to borrowers. The major elements of the MCA that will affect bank-thrift competition are listed in table 1.³

An important change is the authorization of interest-earning “transaction” accounts at *both* banks and thrifts. This is achieved through the nationwide legalization of negotiable order of withdrawal (NOW) accounts, automatic transfer service (ATS) accounts and credit union share drafts.⁴ In some areas of the country (especially New England), depository in-

²See Jean M. Lovati, “The Growing Similarity Among Financial Institutions,” this *Review* (October 1977), pp. 2-11, and Harold C. Nathan, “Nonbank Organizations and the McFadden Act,” *Journal of Bank Research* (Summer 1980), pp. 80-86.

³For a more detailed discussion of the elements of the MCA see “The Depository Institutions Deregulation and Monetary Control Act of 1980,” *Federal Reserve Bulletin* (June 1980), pp. 444-53.

⁴ATS and NOW accounts represent a type of individual “checking” account. By providing for the automatic transfer of funds from a savings account to cover checks drawn against a zero-balance ATS account, individuals can earn interest on “checking” balances. NOW accounts are interest-earning savings accounts against which customers can write “negotiable drafts.” Similarly, credit union share drafts permit payable drafts drawn on a credit union member’s interest-earning share account. Share drafts, which resemble checks, are processed through the credit union’s account at a commercial bank.

¹The term “thrift institutions” in this article is defined as savings and loan associations, credit unions and mutual savings banks.

Table 1

Selected Provisions from the Depository Institutions Deregulation and Monetary Control Act of 1980

1. The phase-out of interest rate ceilings on deposits over a six-year period
2. The authorization to offer NOW (negotiable order of withdrawal) accounts (fundamentally, interest-earning checking accounts) at all federally insured depository institutions beginning December 31, 1980 to individuals and non-profit organizations
3. The authorization of share drafts at federally insured credit unions (effective March 31, 1980)
4. The authorization for mutual savings banks to offer demand deposits to business customers
5. Increased investment options for thrift institutions
 - For federal-chartered savings and loans:
 - a. consumer lending, commercial paper, and debt security investment of up to 20 percent of assets
 - b. issuance of credit cards
 - c. trust-fiduciary powers
 - For federally insured credit unions:
 - a. real estate loans
 - For federal mutual savings banks:
 - a. commercial, corporate and business loans, (up to 5 percent of assets)

stitutions had already offered interest-earning transaction accounts since the early 1970s. Accompanying these powers is the provision for the gradual phase-out of deposit interest rate ceilings.

In addition to these significant changes, the MCA allows S&Ls to engage in consumer lending, trust activities and credit card operations. The MCA authorizes thrifts to invest in, sell, or hold commercial paper and corporate debt securities (up to 20 percent of assets). Limited business and commercial loan powers have also been granted to federally chartered mutual savings banks.

The basic findings of the act are that the existing institutional structure has discouraged persons from saving, created inequities for depositors, impeded the ability of depository institutions to compete for funds and failed to achieve an even flow of funds among institutions. The act also states that all depositors are entitled to receive a market rate of return on their savings.

Credit market activity of thrifts over the past decade has developed by piecemeal expansion; these institutions evolved originally as special-purpose institutions whose asset-liability powers have been extended only by gaining legislative approval.⁵ Legislation in the 1970s has increasingly widened their powers and scope of business. *The new powers legalized in the MCA will affect further the traditional lines of business that have separated these institutions; banks and thrifts will now compete more directly for many lines of business.*

CURRENT METHOD OF ANALYZING COMPETITION

The Bank Holding Company Act of 1956 requires the Federal Reserve to consider the likely effects of proposed holding company formations and acquisitions on competition, the convenience and needs of the communities involved, and the financial and managerial resources and future prospects of the institutions involved.⁶ If the Board of Governors finds that a transaction will substantially lessen competition (or tend to create a monopoly or be in restraint of trade), the Board must deny the application unless the anti-competitive effects are judged to be clearly outweighed by "the convenience and needs of the community."

Legal Doctrine

The critical problem in antitrust law is selecting the specific industry and industry output (or "line of commerce") to use in analyzing competition between firms. In analyzing cases under the Bank Holding Company Act, the Federal Reserve has generally chosen "commercial banking" to be the relevant line of commerce. This definition is based on the Supreme Court's controversial Philadelphia National Bank decision in 1963.⁷

In this case, the Court concluded that commercial banks have an advantage over other financial institutions in attracting funds for loans and other services

⁵See Leonard Lapidus, "Commercial Banks and Thrift Institutions: The Differing Portfolio Powers," *Banking Law Journal* (May 1975), pp. 450-93, and Jean M. Lovati, "The Changing Competition Between Commercial Banks and Thrift Institutions for Deposits," this *Review* (July 1975), pp. 2-8.

⁶Competitive analysis is also done with respect to applications filed under the Change in Bank Control Act of 1978 and mergers filed under the Bank Merger Act of 1960.

⁷*United States v. Philadelphia National Bank*, 374 U.S. 321 (1963). Subsequent Supreme Court cases have upheld this decision. See *United States v. Phillipsburg National Bank and Trust Co.*, 399 U.S. 350 (1970); and *United States v. Connecticut National Bank*, 418 U.S. 655 (1974).

since only they can legally accept demand deposits. In addition, banks were said to enjoy "settled consumer preferences" for full-service banking. Thus, the "general store" nature of the banking business made it a distinct line of commerce, distinguishing banks from other financial institutions.

Banking agencies have relied on simple market share tests to judge the likely effects of mergers or BHC acquisitions on competition, using "concentration ratios" as a form of *prima facie* evidence of these effects on competition. A concentration ratio is a summary measure intended to represent the degree of market power that larger firms possess.⁸ This ratio is defined as the percentage of total industry activity (measured by output, employment, assets, etc.) accounted for by the larger firms. A *four-firm* concentration ratio (using total deposits as a proxy for output) for all the commercial banks in a local banking market, for example, may be 75 percent; that is, the four largest banks hold 75 percent of the total bank deposits in this market.⁹

Although other factors are analyzed in evaluating the competitive effects of mergers and acquisitions, concentration ratios continue to be the main factors in such analysis.¹⁰ The important issue is that the calculation of concentration ratios *using commercial bank organization deposit data alone* accepts the Court's

line of commerce definition and assumes that the aggregate of the many products and services supplied by banks represents a meaningful product line for analysis of market competition.¹¹

Economic Analysis of Line of Commerce Definition

The definition adopted by the Court in 1963 was based on a particular view of the market for bank services: namely, that many bank products are demanded jointly. In other words, it is possible to identify "clusters" or "bundles" of services demanded by customers for which banks compete.¹² Such demand may result because of transportation costs and transaction costs (including the cost of obtaining information) which makes it costly or impractical for customers to deal with more than one institution.

Banks, however, compete in many different product markets and in different geographic market areas. Commercial banks participate principally in markets for financial assets. Banks demand customer deposits which they invest in a variety of earning assets. Customers using demand accounts are, in turn, supplied a transaction service. Customers holding time deposits are provided an intermediation service—funds are invested in interest-earning assets. Banks also supply various types of credit, trust services, safe deposit services, correspondent services, etc. Each of these activities can be identified as an individual "output" of a bank. One can argue that each "output" is sold in

⁸For a discussion of concentration measures used in analysis of banking markets, see "Measures of Banking Structure and Competition," *Federal Reserve Bulletin* (September 1965), pp. 1212-22.

⁹See the appendix for a discussion of how the relevant geographic market is defined.

¹⁰This point is highlighted by the merger guidelines published by the Justice Department in 1968 which are frequently cited in bank merger and acquisition analysis. These guidelines indicate that the department will challenge a horizontal merger between firms in a concentrated industry (i.e., one with a four-firm concentration ratio greater than 75%) when the following market shares are involved:

Acquiring Firm	Acquired Firm
4%	4% or more
10%	2% or more
15%	1% or more

In nonconcentrated markets (i.e. ones with four-firm concentration ratios less than 75%) the Justice Department challenges mergers with the following shares:

Acquiring Firm	Acquired Firm
5%	5%
10%	4%
15%	3%
20%	2%
25%	1%

See *Merger Guidelines*, U.S. Department of Justice, May 30, 1968.

¹¹The use of such concentration ratios is not necessarily *ad hoc*. Their use has both theoretical and empirical support in the literature. Nevertheless, it is reasonable to conclude that the use of such ratios, essentially a result of data scarcity, has unfortunately guided research efforts as well. For a summary of the empirical evidence for banking, see Stephen A. Rhoades, *Structure and Performance Studies in Banking: A Summary and Evaluation*, Staff Economic Studies 92 (Board of Governors of the Federal Reserve System, 1977) and George J. Benston, "The Optimal Banking Structure: Theory and Evidence," *Journal of Bank Research* (Winter 1973), pp. 220-37. For a criticism of such "conduct/structure/performance" studies, see Yale Brozen, "Concentration and Profits: Does Concentration Matter?" *The Antitrust Bulletin* (Summer 1974), pp. 381-99. See also Harold Demsetz, "Industry Structure, Market Rivalry, and Public Policy," *Journal of Law and Economics* (April 1973), pp. 1-9.

¹²An alternative argument holds that banks have offered diverse services in the past because they have been prohibited from paying interest on demand deposits since 1933. Customers holding large demand deposit balances receive "implicit interest" in the form of other services offered below cost to depositors. In other words, competition resulted in institutions, faced with prohibition on *direct* payment of interest, offering *implicit* interest in the form of services, such as low or zero service charges, drive-in facilities, branches, and occasionally gifts (porcelain china, silverware and calculators, for example).

a distinct market defined in terms of specific groups of buyers (for example, by location of customer, or maturity and denomination of the particular loan). Therefore, choosing the appropriate measure of bank "output" is a difficult task.¹³

The above reasoning suggests that the usefulness of the line of commerce definition adopted in the Philadelphia case should be determined on empirical grounds. Although the "department store" or "cluster of service" approach may be valid in some instances, the concept is completely irrelevant for many readily identifiable bank "products." For example, an individual seeking a mortgage loan will choose an institution primarily on the basis of the price of the loan (the interest rate); the package of other services offered by competing institutions is not pertinent in this decision.

Measuring the extent of competition between different types of institutions in a product line must be based upon the degree of substitution between products of these institutions. In economic terms, the important issue is the magnitude of the "cross-elasticity" of demand between individual products offered by financial institutions.¹⁴ The higher the cross-elasticity between the products of banks and thrifts, the greater the substitution and the stronger the argument for including the outputs of these institutions in the same industry or the same product line. The cluster approach used by the Supreme Court assumes that the degree of substitution *between* lines of commerce (thrift output and bank output) is "small." For example, if institution A (say, a thrift) increases the (explicit or implicit) interest rate on savings deposits while institution B (a bank) keeps its rates unchanged, the volume of business transferred by local customers from bank B to thrift A rises with the magnitude of the cross-elasticity of supply. The other

services offered by bank B (for example, checking services), however, may preclude a significant transfer of business between institutions. Since *both* thrifts and banks can now offer transaction accounts, the degree of substitution between their respective outputs will increase.¹⁵

Bank regulatory agencies have emphasized the "locally limited" customer in analysis of bank mergers and acquisitions. As such, regulators have tended to stress the services provided to individuals and small business customers. Since most large commercial and industrial customers have access to national and regional markets, competition for these accounts is intense. Empirical estimates of the relevant cross-elasticities for retail and small business customers in local banking markets, however, are difficult to obtain. Regulatory ceilings on interest rates interfere with obtaining good estimates of these magnitudes. As previously mentioned, competitive forces have resulted in institutions competing by means other than the payment of explicit rates of interest. Institutions located in different market environments offer differentiated clusters of outputs. Differing degrees of branching restrictions across governmental jurisdictions, for example, may affect the form of implicit interest paid to consumers.

Even before the MCA, other structural changes since the last Supreme Court ruling on a merger case (1974) had cast doubt on the validity of the banking regulatory agencies' approach to competition. The asset and deposit liability growth of thrifts has outpaced that of banks over most of the periods from 1960-79 (tables 2 and 3). It is unlikely that the previous degree of substitution between the outputs of banks and thrifts has remained constant since the Philadelphia definition in 1963. Retail customers in local banking markets have reacted to significant financial developments in the 1970s. Inflation, interest rate ceilings, and new instruments such as money market certificates, money market funds, ATS accounts and telephone transfer accounts, have all contributed to an increased degree of substitution between services offered by banks and non-bank institutions. The nationwide legalization of thrift transaction accounts further weakens the argument that banks have a clear advantage in attracting customers.

¹³Researchers' views have varied considerably in their theoretical definitions of the appropriate banking output measure. See Stuart I. Greenbaum, "Competition and Efficiency in the Banking System - Empirical Research and Its Policy Implications," *The Journal of Political Economy* (Supplement: August 1967), pp. 461-79, and Michael A. Klein, "A Theory of The Banking Firm," *Journal of Money, Credit, and Banking* (May 1971), pp. 205-18.

¹⁴The "cross-elasticity" of demand is defined as a measure of the relationship between the demand for one firm's output when the price of another firm's output changes (when all other things remain the same). The cross-elasticity between goods 1 and 2 is given by the equation

$$e = \frac{\% \text{ change in quantity of good 1 demanded}}{\% \text{ change in price of good 2}}$$

If e is less than zero, the outputs are normally considered "complements." If e is greater than zero they are considered substitutes. The *degree* of substitution can be gauged by the magnitude of this coefficient: higher positive cross-elasticity coefficients correspond to greater degrees of substitution.

¹⁵Accumulated evidence prior to the MCA supports the view that customers already treat time and savings accounts of banks and thrifts as substitutes. For a review of the empirical evidence before 1970, see Gary G. Gilbert and Neil B. Murphy, "Competition Between Thrift Institutions and Commercial Banks: An Examination of the Evidence," *Journal of Bank Research* (Summer 1971), pp. 8-18.

Table 2

Distribution of Assets — Commercial Banks and Thrifts (billions of dollars)

	End of Period					Annual Growth Rates			
	1960	1965	1970	1975	1979	1960-1965	1965-1970	1970-1975	1975-1979
COMMERCIAL BANKS (insured only)									
Business loans	\$ 43.1	\$ 71.2	\$112.2	\$174.3	\$256.0	10.6%	9.5%	9.2%	10.1%
Mortgages	28.7	49.4	73.1	134.6	243.2	11.5	8.1	13.0	15.9
Consumer loans	26.4	45.5	66.0	106.0	186.4	11.6	7.7	9.9	15.1
U.S. Treasury and agency securities	60.4	59.2	61.6	117.6	136.8	-0.4	0.8	13.8	3.9
State and local securities	17.3	38.5	69.4	101.8	131.9	17.3	12.5	8.0	6.7
Other assets	80.4	111.6	194.1	310.4	441.2	6.8	11.7	9.8	9.2
TOTAL	256.3	375.4	576.4	944.7	1,395.4	7.9	9.0	10.4	10.2
SAVINGS & LOAN ASSOCIATIONS									
Mortgages	\$ 60.1	\$110.3	\$150.3	\$278.6	\$ 475.8	12.9%	6.4%	13.1%	14.3%
Investment securities	4.6	7.4	13.0	30.9	46.5	10.0	11.9	18.8	10.8
Other assets	6.8	11.9	12.8	28.8	57.0	11.7	1.6	17.5	18.6
TOTAL	71.5	129.6	176.2	338.3	579.3	12.6	6.3	13.9	14.4
MUTUAL SAVINGS BANKS									
Mortgages	\$ 26.7	\$ 44.4	\$ 57.8	\$ 77.2	\$ 98.9	10.7%	5.4%	6.0%	6.4%
U.S. government securities	6.2	5.5	3.2	4.7	7.6	-2.6	-10.5	8.5	12.6
State and local securities	.7	.3	.2	1.5	2.9	-13.8	-9.2	51.0	17.3
Corporate and other securities	5.1	5.2	12.9	28.0	37.1	0.4	20.0	16.8	7.3
Other assets	1.9	2.8	5.0	9.6	16.8	8.5	12.1	13.9	15.1
TOTAL	40.6	58.2	79.0	121.1	163.4	7.5	6.3	8.9	7.8
CREDIT UNIONS									
Loans outstanding	\$ 4.4	\$ 8.1	\$ 14.1	\$ 28.2	\$ 53.1	13.0%	11.7%	14.8%	17.2%
Other assets	1.3	2.5	3.8	9.9	12.7	14.3	9.4	20.8	6.6
TOTAL	5.7	10.6	18.0	38.0	65.9	13.3	11.2	16.2	14.7

SOURCES: *Banking and Monetary Statistics, 1941-1970; Annual Statistical Digests, 1971-1975 and 1974-1978; Federal Reserve Bulletin, March 1980 and October 1980.*

The presumed "settled consumer preference" for banks over competing institutions has become less and less evident.¹⁶ First, S&Ls have unique advantages over banks. They enjoy statewide branching privileges,

¹⁶The "settled consumer preference" notion adopted by the Court conflicts with economic theory. Microeconomic theory explains that a consumer's choice between the outputs of many banks is based on the relative prices of those outputs. All preferences are "settled," or stable, in that they are considered to be independent of price. Such stable preferences, however, do not preclude changes in response to changing relative prices.

for example, in some states that limit branching for banks. Second, new technology continues to alter the traditional methods of marketing financial services. Electronic banking is the most obvious example of the declining importance of locational convenience in banking—i.e., one-stop banking. Automated teller machines, automatic payroll check deposit, banking by mail and point-of-sale terminals expand the geographic scope of competition among depository institutions for what was once considered the locally limited customer.

Table 3
Composition of Deposits (billions of dollars)

	End of Period					Annual Growth Rates			
	1960	1965	1970	1975	1979	1960- 1965	1965- 1970	1970- 1975	1975- 1979
COMMERCIAL BANKS									
Demand	\$155.7	\$183.8	\$247.2	\$319.8	\$429.5	3.4%	6.1%	5.3%	7.7%
Time and savings	73.3	147.7	235.3	455.5	656.5	15.0	9.8	14.1	9.6
TOTAL	229.0	331.5	482.5	775.2	1,086.0	7.7	7.8	9.9	8.8
SAVINGS AND LOAN ASSOCIATIONS									
Savings capital	\$ 62.1	\$110.4	\$146.4	\$285.7	\$470.2	12.2%	5.8%	14.3%	13.3%
MUTUAL SAVINGS BANKS									
Time and savings	\$ 36.1	\$ 52.1	\$ 71.2	\$109.3	\$144.1	7.6%	6.4%	9.0%	7.2%
Other	.3	.3	.4	.6	1.9	5.4	4.8	6.6	35.1
TOTAL	36.3	52.4	71.6	109.9	146.0	7.6	6.4	8.9	7.4
CREDIT UNIONS									
Member savings	\$ 5.0	\$ 9.2	\$ 15.5	\$ 33.0	\$ 56.2	13.1%	10.9%	16.3%	14.2%

SOURCES: *Banking and Monetary Statistics*, 1941-1970; *Annual Statistical Digests*, 1971-1975 and 1974-1978; *Federal Reserve Bulletin*, March 1980 and October 1980; and *National Fact Book of Mutual Savings Banking*, 1976 and 1980.

Legal Issues

The Supreme Court case that most recently addressed the relevance of thrifts in competitive analysis was the Connecticut National Bank case in 1974.¹⁷ A lower court had found that savings banks were "ferocious competitors" of banks in certain markets. The Supreme Court, however, reaffirmed the line of commerce definition adopted in the Philadelphia case, maintaining that commercial banks offer a unique cluster of services that distinguish them from other institutions. The Court in particular emphasized that there was a lack of significant competition between banks and mutual savings banks for *commercial* accounts.

There was, however, an indication that the Court realized that the Philadelphia definition's usefulness was declining. For example, in the Connecticut case the Court stated:

At some stage in the development of savings banks it will be unrealistic to distinguish them from commercial banks for purposes of the Clayton Act. In

Connecticut, that point may well be reached when and if savings banks become significant participants in the marketing of bank services to commercial enterprises. But, in adherence to the tests set forth in our earlier bank merger cases, . . . such a point has not yet been reached.¹⁸

The Court's emphasis on competition for *commercial* business has led some analysts to speculate that, even with the passage of the MCA, thrifts will still be excluded from the Federal Reserve's competitive analysis of mergers and acquisitions. Indeed, the quantitative impact of the new law is greater with respect to the array of services offered to *retail* customers. All depository institutions in the nation may offer NOW accounts, but not to commercial and business enterprises.¹⁹ Mutual savings banks are now permitted to

¹⁸Ibid.

¹⁹NOW accounts are to be made available only to an individual or to an organization that is "primarily for religious, philanthropic, charitable, educational, or other similar purposes and which is not for profit." These depositors have been defined by the Federal Reserve Board to include individuals, sole proprietors, husbands and wives operating unincorporated businesses, local housing authorities, residential tenant security deposits, independent school districts and redevelopment authorities.

¹⁷*United States v. Connecticut National Bank*, 418 U.S. 656 (1974).

extend business loans (up to 5 percent of total assets) to firms within 75 miles of their main office, but since most mutual savings banks are located in the East, their competitive impact will be limited to eastern markets. Likewise, the commercial lending authority granted to mutual savings banks applies only to savings banks with federal charters. In addition, expanded services to corporations would remain generally unavailable from S&Ls. The MCA, however, permits Federal S&Ls to invest in commercial paper and corporate debt securities (up to 20 percent of assets).

Whether these specific changes will be sufficient to alter the line of commerce definition in court cases is an unsettled issue. Although the competitive impact of the MCA on competition for commercial customers may not be viewed as substantial in quantitative terms, any *marginal* increases must be considered significant since these new powers allow *additional* entrants into markets for these services.

SOME ALTERNATIVES

Many analysts believe that a different approach to the analysis of competition among depository institutions is called for.²⁰ To a limited degree, banking authorities have already begun to introduce the influence of thrifts into their analysis.²¹ The question still remains, however, how the impact of increasing thrift competition should be weighted in the analysis. In other words, how would the line of commerce be "unbundled?" Should commercial banks, mutual savings banks and S&Ls together encompass a line of commerce, or should individual product markets of these institutions be analyzed? Several options are available.

²⁰See, for example, Henry C. Wallich and Walter A. Varvel, "Evolution in Banking Competition," *The Bankers Magazine* (November/December 1980), pp. 26-34, and *Commercial Banking as a Line of Commerce: An Examination of Its Economic and Market Validity in Commercial Bank Antitrust Law*, prepared by Golembe Associates Inc. for the Association of Bank Holding Companies (December 1980).

²¹For recent Federal Reserve actions see (1) approval for the merger of The Bank of New York with Empire National Bank, *Federal Reserve Bulletin* (September 1980), pp. 807-09; (2) denial for Republic of Texas Corporation to acquire Citizens National Bank of Waco, *Federal Reserve Bulletin* (September 1980), pp. 787-89; (3) approval for Key Banks, Inc., to acquire the National Bank of Northern New York, *Federal Reserve Bulletin* (September 1980), pp. 781-82; (4) denial for Texas Commerce Bancshares, Inc. to acquire The First National Bank of Port Neches, *Federal Reserve Bulletin* (July 1980), pp. 584-85; (5) denial for Republic of Texas Corporation to merge with Fort Sam Houston Bankshares, Inc., *Federal Reserve Bulletin* (July 1980), pp. 580-82; (6) approval for Fidelity Union Bancorporation to acquire Garden State National Bank, *Federal Reserve Bulletin* (July 1980), pp. 576-79; (7) denial for United Bank Corporation of New York to acquire The Schenectady Trust Company, *Federal Reserve Bulletin* (January 1980), pp. 61-64.

Add Thrifts to Line of Commerce Framework

One alternative is simply to include thrift institutions as direct competitors of banks; in other words, treat thrifts as commercial banks for purposes of a line of commerce definition. Concentration ratios would continue to be the most likely candidates as the key proxies for measuring competition under such an approach. Including thrifts into the analysis would liberalize merger and acquisition policy to some degree. Since concentration ratios would be diluted by deposits or assets of thrifts, the number of possible bank mergers meeting the Justice Department's current merger and acquisition "standards" would be increased.²²

Unfortunately, this approach suffers from the same flaws that exist with the general use of "commercial banking" as a line of commerce definition. Because significant differences exist in the asset and liability powers between banks and thrifts, competition varies across relevant product lines. Likewise, the varying forms of financial structure observed among geographic areas of the country (location of mutual savings banks in the East and different thrift and bank branching laws across states, for instance) make such concentration ratios difficult to apply consistently.

Maintaining the line of commerce framework by including thrifts but continuing to rely on aggregated market share statistics also suffers from major economic flaws. As argued above, the relevant cross-elasticities among products of banks and thrifts have been altered by changes in technology and a great number of financial innovations in recent years. Likewise, as regulations on interest rate ceilings are removed over the next six years, financial institutions will undoubtedly "unbundle" their own services. Competition among institutions will result in independently priced services and these prices will more closely approximate the marginal costs of their provision.

Maintain Current Approach With "Subjective" Addition of Thrifts

Another alternative is to maintain the current approach of including only banks in concentration analysis, *except* in cases where thrifts are seen as "significant competitors." In such cases, thrifts would be used

²²For an evaluation of the impact of including thrift deposits in market concentration ratio calculations for banking markets in New York and New Jersey, see Roger E. Alcaly and Richard W. Nelson, "Will Including Thrifts in the Banking Market Affect Mergers," *The Banking Law Journal* (April 1980), pp. 346-51.

in calculating market share data. In essence, this is the approach that the banking regulatory authorities are now using and, given the uncertainties of the MCA's impact, is the likely route they will follow during a transition period. This methodology provides enough flexibility to accommodate regional differences in market structure, but is not likely to be legally satisfying given its subjective framework. In addition, it suffers from the same problems as the current line of commerce definition of lumping together the many outputs of banks and thrifts into one *aggregate* measure.

Unbundle Financial Institution Products

A third alternative, more consistent with economic theory, is to disaggregate the traditional line of commerce (defined as commercial banking) into specific subcategories. Though this strategy would more accurately reflect the actual competitive situation, it would increase the difficulty of assessing the impact on "overall" competition. Regulators would first be faced with the problem of assigning weights to the competitive effects of a merger or acquisition *across* product lines. Since institutions are multi-product producers, it is possible that competition among firms may be lessened for some outputs but not for others. For example, two local banks proposing to merge might produce a monopoly on *local* trust services but still generate vigorous competition with many other financial institutions for checking and savings deposits. Depending on the relative weights assigned to the competitive effects across product lines (which would continue to be measured by concentration ratios), the disaggregated product approach might result in a more restrictive stance against mergers and acquisitions.

A second limitation to the disaggregation approach is the lack of detailed statistics measuring some prod-

uct lines. Each product line might correspond to a different geographic market. Correspondent banking services, for example, would have to be analyzed in terms of larger geographic regions (e.g., a state), whereas small business loans would be analyzed within a more localized market. One would have to identify both customers of such product lines and the financial institutions offering close substitutes for this approach. Practical data problems would therefore limit the degree of disaggregation possible.

CONCLUSION

Although Supreme Court cases to date have consistently upheld "commercial banking" as a distinct line of commerce definition in bank merger cases, the foundation of the Court's reasoning has eroded since 1963. Significant market changes since the last Supreme Court case (1974) cast doubt on the practice of evaluating mergers and acquisitions as narrowly as the traditional analysis requires.

With the passage of the Monetary Control Act, there is greater reason to depart from the established tradition of treating commercial banking as an exclusive line of commerce in antitrust analysis. A more broadly defined line of commerce would increase the number of mergers and acquisition proposals meeting antitrust standards. On the other hand, a disaggregated approach to analyzing the product lines of banks and thrifts would more accurately scrutinize proposals for actual anticompetitive effects. Such changes in product and geographic market definitions will have important implications for the future structure and competitive performance of the financial industry. Although the proper analytic approach is still evolving, increased thrift competition will certainly play a more significant role in the evaluation of future bank mergers and BHC acquisition proposals.



Appendix

Defining Banking Markets

The most crucial element of competitive analysis in many bank merger and acquisition cases is the definition of the relevant local banking market. In many proposals analyzed by the Federal Reserve, the only dispute (over which approval or denial of an application depends) is over the appropriate market definition. Given the tendency of the courts in recent years to rely on simple market share tests, it is important to understand the logic and reasoning behind the delineation of banking markets.

There are both conceptual and empirical problems in defining banking markets. The conceptual problems deal with describing the relationship between "sellers" and "buyers," so that an area can be defined as a market. The most basic and widely accepted concept for analyzing markets is "cross-elasticity of demand." The cross-price-elasticity is a measure which summarizes the relationship between the change in price of any one firm's output and the amount of business done by others (see footnote 14 in text). If an increase (decrease) in the price of one firm's service results in a *significant* increase (decrease) in the sales of another, the two may be considered to be subject to the same market forces — and are in the same market. Economic theory does not tell us, however, what magnitude of the cross-elasticity should be used for such determinations. It does tell us that if competition exists, output prices of these firms tend to equalize to prices equivalent to the marginal cost of providing these services.

Implementing this conceptual framework in actual case-work is not easily achieved. Since price data to measure cross-elasticities are difficult to obtain, a number of other proxies are used in defining a market. Most of these indirect measures of cross-elasticity center around judgments about the "reasonable interchangeability" of the products of firms. The "products," of course, have been defined as the general category of banking services (total deposits being used as a proxy for such output) to conform to the line of commerce definition adopted by the courts.

Although there is no uniformly accepted method of defining banking markets, the following items are important factors in the process of defining markets.

- A. **Structural information** — the size and location of competing institutions and branches, other statutes which restrict actual or potential entry (restrictive chartering practices and branching laws, for example).
- B. **Distance factors and commuting patterns** — the distance between relevant competing institutions, traffic flows, the quality of roads and other natural boundaries which affect access to competing institutions.
- C. **Political boundaries** — county and state boundaries (banking laws which restrict branching within

such boundaries adds some weight to using these definitions).

- D. **Geographic distribution of advertising** — radio, television and newspapers.

A useful proxy for interaction of suppliers of banking services and customers is primary service area (PSA) data. The PSA is normally defined as that geographic area contiguous to an office from which 80 percent of the dollar amount of that office's deposits is derived. Applicants are frequently requested to submit comparable data for other services (e.g., demand deposits, savings deposits, loans, etc.).

Confusion reigns among bankers about the difference between PSAs and markets as economists define them. The lack of overlapping service areas between banks does not necessarily mean that banks are located in distinct market areas. *The two are not equivalent concepts.* All of the factors mentioned above may make the market substantially larger than a bank's PSA. In other words, two banks, competing in the same market, need not have common customers or overlapping PSAs.

For those wishing to review the literature on the analytics of defining banking markets, the following sources are suggested:

- David D. Whitehead, "Relevant Geographic Banking Markets: How Should They Be Defined?" Federal Reserve Bank of Atlanta *Economic Review* (January/February 1980), pp. 20-28.
- Paul R. Schweitzer, "Definition of Banking Markets," *Banking Law Journal* (September 1973), pp. 745-62.
- Ira Horowitz, "On Defining the Geographic Markets in Section 7 Cases," Federal Reserve Bank of Chicago *Proceedings of a Conference on Bank Structure and Competition* (1977), pp. 169-82.
- Charles D. Salley, "Uniform Price and Banking Market Delineation," Federal Reserve Bank of Atlanta *Monthly Review* (June 1975), pp. 86-93.
- Douglas V. Austin, "The Line of Commerce and the Relevant Geographic Market in Banking: What Fifteen Years of Trials and Tribulations Has Taught Us and Not Taught Us About The Measure of Banking Structure," Federal Reserve Bank of Chicago *Proceedings of a Conference on Bank Structure and Competition* (1977), pp. 185-209.
- Steven A. Mathis, Duane G. Harris and Michael Boehlje, "An Approach to the Delineation of Rural Banking Markets," *American Journal of Agricultural Economics* (November 1978), pp. 601-08.

Selecting a Monetary Indicator: A Test of the New Monetary Aggregates

R. W. HAFER

THE Federal Reserve System changed its approach to implementing monetary policy on October 6, 1979. Prior to that date, it attempted to reduce fluctuations in short-run interest rates as a means of achieving, along with interest rate stability, a degree of control over movements in the monetary aggregates. On October 6, however, the Federal Reserve shifted its focus from movements in short-run interest rates to movements in reserves held by the banking system. Shortly thereafter, in early 1980, the Federal Reserve announced major redefinitions of the monetary aggregates.

The shift in operating procedures and the change in the monetary definitions points up the need to investigate which of the new monetary aggregates is the best indicator of monetary actions. Selecting the appropriate aggregate as an indicator requires that several issues be addressed. The first issue concerns the controllability of a given monetary aggregate. In other words, given a change in monetary actions, which aggregate will respond to that change in a predictable manner? A second issue concerns the predictability of the movements in the indicator and economic activity, i.e., how well the monetary aggregate explains movements in a measure of economic activity such as nominal GNP. Finally, there is the important question of the proposed indicator's exogeneity with respect to the economic variable that policymakers are attempting to influence. This article will examine the last issue, that of exogeneity, using the new monetary aggregates.

EXOGENEITY TESTS

A *monetary indicator* is a variable that signals the current direction of monetary policy. Thus, movements in the indicator must *not* be influenced unduly by, or result from changes in, some *non-policy* action; that is, the indicator must be *exogenous* to (not

caused by) non-policy actions.¹ If monetary policy-makers attempt to control nominal GNP, for example, changes in GNP should be a direct result of changes in monetary actions as evidenced by changes in the monetary indicator; the monetary indicator must not be directly influenced by changes in GNP. In this sense, a monetary aggregate can be used as an indicator only if movements in GNP do not result in movements in the monetary aggregate.

Previous investigations into the selection of an appropriate monetary indicator have focused primarily on the predictability of the relationship between the hypothesized indicator and nominal income. Friedman and Meiselman, for example, regressed nominal GNP on various measures of money, concluding that M2 (currency, demand and time deposits) was the preferable definition.² Along these same lines, Schadrack examined the relationship between GNP and six different monetary measures, also concluding that M2 was statistically superior.³ Levin provided another

¹An unresolved debate exists concerning the appropriateness of the term indicator. In some instances, the characteristics used here to denote an indicator have also been used to characterize targets of policy actions. In this article the term indicator describes a variable that points to the current direction of monetary policy. To appreciate the complexity of the issues surrounding discussions of "targets" and "indicators" of monetary policy, see Karl Brunner and Allan Meltzer, "The Meaning of Monetary Indicators," *Monetary Economics: Readings on Current Issues*, ed. William E. Gibson and George C. Kaufman (New York: McGraw-Hill, 1971), pp. 403-15; Karl Brunner, ed., *Targets and Indicators of Monetary Policy* (San Francisco: Chandler Publishing Co., 1969); Benjamin A. Friedman, "Targets, Instruments, and Indicators of Monetary Policy," *Journal of Monetary Economics* (October 1975), pp. 443-73.

²Milton Friedman and David Meiselman, "The Relative Stability of Monetary Velocity and the Investment Multiplier in the United States, 1897-1958," in Commission on Money and Credit, *Stabilization Policies* (Englewood Cliffs: Prentice-Hall, 1963), pp. 165-268.

³Frederick C. Schadrack, "An Empirical Approach to the Definition of Money," *Monetary Aggregates and Monetary Policy* (Federal Reserve Bank of New York, 1974), pp. 28-34.

test procedure in which changes in GNP are regressed on current and lagged changes of various money and credit aggregates using the Almon lag technique.⁴ In addition to regressing GNP on the different monetary measures, he estimated the relationships using fiscal variables and strike dummies as additional explanatory variables. Based on in- and out-of-sample results, Levin concluded that bank credit should be used as a monetary indicator.

In contrast, Hamburger explicitly tested for the exogeneity of several monetary variables.⁵ He did this by regressing the different monetary variables on current and lagged values of GNP and the Treasury bill rate. Based on these tests, Hamburger concluded that nonborrowed reserves is a better indicator of policy actions than the other monetary variables studied. Recently, Carlson and Hein also have addressed the issue of selecting a monetary indicator.⁶ Their tests, using the new M1A, M1B and M2 definitions of money, provide a useful examination of the predictive relationship between these money measures and GNP. Their study also provides evidence about the statistical exogeneity of these measures with respect to GNP using tests designed to detect simultaneous equation bias in the estimated regressions.

The focus of this article is to test directly for the exogeneity of the new monetary aggregates with respect to GNP. Nominal GNP is the measure of economic activity traditionally used in studies of this kind. Moreover, there is evidence to suggest that the influence of monetary actions is channeled directly to the economy via nominal GNP. The tests utilized in this article are based on the works of Granger and Sims.⁷

⁴Fred J. Levin, "The Selection of a Monetary Indicator: Some Further Empirical Evidence," *Monetary Aggregates and Monetary Policy* (Federal Reserve Bank of New York, 1974), pp. 35-39.

⁵Michael J. Hamburger, "Indicators of Monetary Policy: The Arguments and the Evidence," *American Economic Review, Papers and Proceedings* (May 1970), pp. 32-39. The monetary measures used by Hamburger include effective nonborrowed reserves, total reserves, old M1, old M2 and bank credit.

⁶Keith M. Carlson and Scott E. Hein, "Monetary Aggregates as Monetary Indicators," this *Review* (November 1980), pp. 12-21.

⁷See C.W.J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica* (July 1969), pp. 424-38; C.W.J. Granger and Paul Newbold, "The Time Series Approach to Econometric Model Building," *New Methods in Business Cycle Research: Proceedings from a Conference* (Federal Reserve Bank of Minneapolis, 1977), pp. 7-21; Christopher A. Sims, "Money, Income, and Causality," *American Economic Review* (September 1972), pp. 540-52 and "Exogeneity and Causal Ordering in Macroeconomic Models," in *New Methods*, pp. 23-43.

Granger Test

Granger's test procedure is based on the following premise: if forecasts of some variable Y (say, GNP) obtained using both past values of Y and past values of another variable X (say, money) are better than forecasts obtained using past values of Y alone, then X is said to "cause" Y .⁸ This causal ordering between two variables is analogous to the ordering between economic activity and certain leading indicators.⁹

Although Granger's test is founded on the notion of causation, it is nevertheless well adapted to determine exogeneity. Suppose, for example, it is shown that changes in GNP "cause" changes in money in Granger's sense. The consequence of this obviates the use of money as an indicator of monetary actions since the policymaker can not differentiate between movements in money due to current changes in policy from those due to changes in GNP. Based on the criteria for selecting a monetary indicator set forth above, the discovery that GNP "causes" money indicates that money is *not exogenous* to GNP. Consequently, it is not a viable indicator of monetary actions.

To test for Granger causality, it is assumed that the information relevant to the prediction of the respective variables is contained solely in the data series Y and X (e.g., GNP and money).¹⁰ Granger's test

⁸More formally, Granger causality may be defined in the following manner. Let $P(t)(Y|U)$ be the optimal, unbiased prediction of the variable Y given that all relevant information U accumulated since period $t-1$ is known. Using this prediction, the relevant error series $\epsilon(t)$ is defined as $\epsilon(t)(Y|U) = Y(t) - P(t)(Y|U)$. The variance of the error series is represented by $\sigma^2(Y|U)$. To say that some variable X "causes" Y in Granger's sense requires that the variance of the error terms—the forecast error variance based on *all* relevant information—is less than the forecast error variance with an information set that does not include X . In other words, if $(U-X)$ is the information set *excluding* the data embodied in X , then Granger causality may be defined in the following manner:

$$\text{If } \sigma^2(Y|U) < \sigma^2(Y|U-X), \\ \text{then } X \text{ is said to cause } Y.$$

It should be noted, however, that satisfying the above criterion is a necessary but not sufficient condition to conclude that unidirectional causation running from X to Y exists. "Bidirectional causation" or feedback from one variable to another may also exist. Feedback occurs if the conditions $\sigma^2(Y|U) < \sigma^2(Y|U-X)$ and $\sigma^2(X|U) < \sigma^2(X|U-Y)$ occur simultaneously. When this result emerges, causation is said to run both from X to Y and from Y to X .

⁹Paul A. Pautler and Richard J. Rivard, "Choosing a Monetary Aggregate: Causal Relationship as a Criterion," *Review of Business and Economic Research* (Fall 1979), pp. 1-18.

¹⁰It is further assumed that the time series X and Y are stationary, i.e., the stochastic processes generating the observed X s and Y s have respective means and variances that are invariant with respect to time.

then consists of estimating the equations

$$(1) X(t) = \sum_{j=1}^n \alpha_j X(t-j) + \sum_{j=1}^m \beta_j Y(t-j) + \varepsilon_t$$

and

$$(2) Y(t) = \sum_{j=1}^m \gamma_j X(t-j) + \sum_{j=1}^n \delta_j Y(t-j) + \eta_t.$$

It is assumed that in estimating these two equations the error series $\varepsilon(t)$ and $\eta(t)$ are uncorrelated.¹¹ On the basis of estimating equations 1 and 2, unidirectional causation from variable X to Y is implied if the estimated coefficients on the lagged X variable in equation 2 are statistically different from zero as a group and the set of estimated coefficients on the lagged Y variable in equation 1 is not statistically different from zero. Conversely, unidirectional causation from Y to X exists if the coefficients on lagged Y in equation 1 are statistically non-zero as a group and the set of the lagged X's coefficients is zero in equation 2. Feedback (bidirectional causation) from Y to X exists when the set of the coefficients on lagged Y in equation 1 and on lagged X in equation 2 are statistically different from zero.

Sims Test

The causality/exogeneity test procedures proposed by Sims also are used to examine the relationship between GNP and the new monetary aggregates. Basically, the notions of Granger causality and statistical exogeneity are equivalent if all of the estimated "future" coefficients $\hat{\alpha}_i$ ($i = -m, \dots, -1$) are jointly zero in the equation

$$(3) Y(t) = \sum_{i=-m}^n \alpha_i X(t-i) + \mu(t),$$

where $\mu(t)$ is a white noise residual.¹² If $\hat{\alpha}_i = 0$ for all i ($i = -m, \dots, -1$), then "Y does not cause X" and "X is exogenous to Y" are equivalent.

The test procedure proposed by Sims involves regressing current values of the variable Y on past, current and future values of X and testing the significance of the coefficients on the future Xs. If the coefficients on the *future* values of X are not statistically significant as a group, then X is exogenous to Y. Thus,

¹¹More specifically, it is assumed that $E[\varepsilon(t), \varepsilon(s)] = 0$, $E[\eta(t), \eta(s)] = 0$ and $E[\varepsilon(t), \eta(s)] = 0$, for all $t \neq s$.

¹²Equation 3 is based on the assumption that the Y and X time series are jointly covariance-stationary. In other words, the covariance of Y and X are invariant with respect to time. See C.W.J. Granger and Paul Newbold, *Forecasting Economic Time Series* (New York: Academic Press, 1977).

regressing current values of the various monetary aggregates on past, current and future values of GNP provides additional evidence about the exogeneity between GNP and each of the new monetary aggregates. Moreover, regressing current values of GNP on current, past and future values of the different monetary measures allows us to test for the possibility of bidirectional causation.¹³

Empirical Results

Quarterly observations of the logarithms of nominal GNP and the monetary aggregates M1A, M1B, M2, M3 and L are used to test for exogeneity.¹⁴ Because the monetary measures are available only since 1959 and because lagged variables must be used in conducting the tests, the empirical results reported are based on the sample period III/1961-II/1980. Even though seasonally adjusted data are used, seasonal dummy variables are included in all regressions as a precaution against residual seasonality.

The Granger-test regressions are reported in table 1. Each regression includes four lagged observations of the dependent variable and eight lags on the independent variable. The Granger test requires the data to exhibit stationary characteristics, a requirement satisfied by entering a linear trend variable in the regressions.¹⁵

¹³The implementation and interpretation of the Granger and Sims tests are subject to several caveats. For example, in establishing causality, the use of a specific set of variables necessitates that causality statements be made only with reference to the *relative* information set. In other words, if the information set consists solely of the variables X and Y, causality is defined only relative to this information. This problem has been explored more fully by Jacobs, et al., who argue that tests of the type proposed by Sims are really tests of "informativeness," not econometric exogeneity.

Another problem that may influence the outcome of these tests is the observation period over which the data are reported. For example, while test results using annual data may imply unidirectional causation from X to Y, feedback between the two variables may result when data for shorter time periods are used.

Finally, it should be stressed that the information provided by these tests is necessary for exogeneity between two variables. If the test results indicate that future coefficients of the independent variable in equation 3 are significantly different from zero, or that the coefficients on the "independent" variables in equations 1 and 2 fulfill the required conditions, then exogeneity is *possible*. See Rodney L. Jacobs, Edward E. Leamer, and Michael P. Ward, "Difficulties with Testing for Causation," *Economic Inquiry* (July 1979), pp. 401-13.

¹⁴For a description of the new monetary aggregates and how they compare to the old measures, see R. W. Hafer, "The New Monetary Aggregates," this *Review* (February 1980), pp. 25-32.

¹⁵This approach also is employed by Thomas Sargent, "A Classical Macroeconomic Model for the United States," *Journal of Political Economy* (April 1976), pp. 207-37.

Table 1
Regression Results for the Granger Test

$$\text{Regression Tested: } Y(t) = \sum_{j=1}^4 \alpha(j) Y(t-j) + \sum_{j=1}^8 \beta(j) X(t-j) + \epsilon_t$$

Sample Period: III/1961-II/1980

Y	X	$\alpha(1)$	$\alpha(2)$	$\alpha(3)$	$\alpha(4)$	$\beta(1)$	$\beta(2)$	$\beta(3)$	$\beta(4)$	$\beta(5)$	$\beta(6)$	$\beta(7)$	$\beta(8)$	SE X 10 ⁻³	D.W.	F-statistic on all $\beta(j)$ F _(8,50)
GNP	M1A	0.916 (6.33)	-0.089 (0.46)	0.078 (0.41)	0.056 (0.40)	0.609 (2.75)	-0.357 (0.96)	0.202 (0.51)	-0.802 (2.06)	0.781 (2.01)	-0.437 (1.05)	-0.181 (0.45)	0.280 (1.33)	8.18	1.96	2.49
GNP	M1B	0.933 (6.45)	-0.092 (0.48)	0.061 (0.32)	0.026 (0.19)	0.551 (2.39)	-0.277 (0.70)	0.141 (0.32)	-0.853 (2.03)	0.778 (1.85)	-0.368 (0.84)	-0.155 (0.38)	0.268 (1.25)	8.20	1.96	2.43
GNP	M2	0.847 (6.16)	-0.111 (0.61)	0.044 (0.25)	-0.052 (0.42)	0.521 (2.66)	-0.493 (1.15)	0.482 (0.96)	-0.891 (1.74)	0.903 (1.74)	-0.399 (0.76)	0.136 (0.30)	0.021 (0.10)	7.67	1.94	3.84
GNP	M3	1.023 (7.46)	-0.194 (1.02)	0.070 (0.38)	-0.018 (0.14)	0.364 (1.86)	-0.212 (0.50)	-0.062 (0.13)	-0.415 (0.87)	1.161 (2.42)	-1.333 (2.67)	0.762 (1.70)	-0.153 (0.74)	7.99	1.89	2.96
GNP	L	0.907 (6.67)	-0.168 (0.92)	0.016 (0.09)	-0.001 (0.00)	0.508 (2.02)	-0.040 (0.08)	-0.261 (0.47)	-0.884 (1.58)	1.736 (3.09)	-1.291 (2.12)	0.216 (0.38)	0.204 (0.74)	7.47	2.01	4.44
M1A	GNP	1.458 (9.53)	-0.661 (2.61)	0.048 (0.19)	0.119 (0.76)	-0.025 (0.26)	0.050 (0.40)	-0.097 (0.78)	0.226 (1.81)	-0.321 (2.53)	0.032 (0.25)	0.192 (1.53)	-0.096 (1.14)	5.47	1.81	1.54
M1B	GNP	1.484 (9.85)	-0.634 (2.50)	-0.037 (0.14)	0.125 (0.82)	-0.018 (0.20)	0.062 (0.52)	-0.055 (0.46)	-0.176 (1.48)	-0.295 (2.46)	0.226 (0.21)	0.226 (1.88)	-0.114 (1.41)	5.23	1.82	1.36
M2	GNP	1.784 (13.68)	-0.993 (3.71)	0.320 (1.19)	-0.105 (0.74)	-0.186 (2.08)	0.076 (0.66)	0.030 (0.26)	0.034 (0.30)	-0.127 (1.11)	0.078 (0.69)	0.024 (0.21)	0.056 (0.70)	5.06	1.99	0.12
M3	GNP	1.917 (14.81)	-1.139 (4.04)	0.169 (0.59)	0.042 (0.29)	-0.088 (1.00)	0.060 (0.50)	-0.010 (0.08)	0.003 (0.02)	-0.007 (0.06)	-0.023 (0.20)	-0.020 (0.17)	0.082 (1.04)	5.28	1.96	0.35
L	GNP	1.796 (13.62)	-0.842 (3.16)	0.014 (0.05)	0.030 (0.20)	-0.033 (0.50)	0.037 (0.43)	-0.073 (0.84)	0.104 (1.22)	-0.128 (1.47)	0.026 (0.30)	0.071 (0.84)	-0.009 (0.16)	3.81	1.98	0.67

Notes: All equations included a constant term, linear trend variable and three seasonal dummy variables. Absolute value of t-statistics appear in parentheses. Because the R² exceeds 0.99 in every instance, only the standard error of the estimating equation is reported. D.W. is the Durbin-Watson statistic. Critical values for the F-statistic are F_(8,50): 2.82 (1 percent) and 2.10 (5 percent).

The upper section of table 1 reports the results of testing the hypothesis that money is exogenous to (causes) GNP. The Durbin-Watson (D.W.) statistic shows no first-order serial correlation.¹⁶ The F-statistics in the last column of table 1 test the joint significance of all the lag terms (β_j s) for the different monetary variables, given lagged GNP. These F-statistics indicate that for the monetary aggregates M1A and M1B, the hypothesis that money is exogenous to GNP cannot be rejected at the 5 percent significance level. At the 1 percent level of significance, the hypothesis cannot be rejected for the M2, M3 and L aggregates. These results thus indicate that money, when defined as M1A, M1B, M2, M3 or L, is statistically exogenous to GNP at high levels of significance.

Showing that the lagged money variables are significant as a group, however, does not preclude the possibility of bidirectional causality (GNP also is exogenous to money). To test for this, a second set of regressions is estimated. This group of regressions employs the different monetary measures as the dependent variables and lagged values of GNP as independent variables. These regressions, reported in the lower section of table 1, are used to test the null hypothesis that GNP is exogenous to (causes) money.

The F-statistics reported in the lower-half of table 1 indicate that lagged GNP *does not* significantly explain movements in the various money measures, once lagged money is accounted for. Not only are they all well below acceptable critical values, but few of the individual coefficients on lagged GNP achieve statistical significance. Thus, the results reported in table 1 support the contention that there is unidirectional causation from money to GNP for the M1A, M1B, M2, M3 and L monetary measures.

To further investigate the econometric relationship between GNP and money, the Sims test procedures are implemented. Regression estimates for the Sims test are presented in table 2.¹⁷ Because future observations are required for the Sims test, the sample

period ends in II/1979. In each regression, four future and eight past values of the independent variable are used. The upper half of table 2 reports the results for the test that money is exogenous to GNP while the lower section reports those for the test that GNP is exogenous to money. A comparison of these two sets of regressions reveals an appreciable difference. The difference is the general insignificance of the estimated coefficients on future money in contrast to the relatively large number of statistically significant coefficients on future GNP. Indeed, this is precisely the outcome to be expected if money is exogenous to (causes) GNP.

Another interesting feature of the regression results is the pattern of the estimated coefficients on the future observations. The general pattern for the $\alpha(-4)$ to $\alpha(0)$ terms in the upper part of table 2 suggests an increasing influence of money on GNP over the first two quarters, followed by a decline in its influence over the next two quarters. This pattern is consistent with that found in studies examining the lag structure between GNP and money via reduced-form equations.¹⁸ In contrast, the future coefficients reported in the lower half of table 2 (the regressions used to test the hypothesis that GNP is exogenous to money) show no regular pattern.

The F-statistics pertinent to Sims' exogeneity test

employed in the Granger tests revealed that the residuals were highly serially correlated. Because the F-tests used in the exogeneity tests are inappropriate in the presence of serial correlation, the following iterative procedure was used to remove serial correlation. Assuming that the serial correlation is not of order greater than two, the second-order filter $(1-kL)^2$ (where $0 < k < 1$ and $X_t L^1 \equiv X_{t-1}$) was used to prefilter the data. The relevant regression is estimated with future and past values of the independent variable present and some initial value of k. The residuals from this regression are calculated and examined for autoregressive characteristics. This is accomplished by estimating the equations

$$(A) \text{ Resid}(t) = a_0 + \sum_{i=1}^2 b_i \text{ Resid}(t-i) + v_1(t)$$

and

$$(B) \text{ Resid}(t) = a'_0 + \sum_{i=1}^4 b'_i \text{ Resid}(t-i) + v_2(t),$$

where Resid is the estimated residual and $v_1(t)$ and $v_2(t)$ are error structures assumed to possess classical properties. The test for serial correlation, then, involves using the standard F-statistic to test for the significance of the b_i and b'_i coefficients. If the calculated F-value exceeds the 5 percent critical value, another value of k is chosen and the entire process is repeated. The final value of k used to transform the data is that value which yields statistically insignificant F-statistics from both equations A and B. This procedure is described in Y. P. Mehra, "Is Money Exogenous in Money-Demand Equations," *Journal of Political Economy* (April 1978), pp. 211-28.

¹⁸See, for example, Carlson and Hein, "Monetary Aggregates as Monetary Indicators."

¹⁶The D.W. statistic is not appropriate when the regression includes a lagged dependent variable. In each regression reported in table 1, however, the Durbin h-statistic could not be calculated. As a check, the residuals were calculated from each regression and used in estimating a second and fourth order autoregressive process (see footnote 17). The results from these tests support the contention in the text that no significant serial correlation exists.

¹⁷The reported k-value in table 2 is the k used to "whiten" the data. Some comments on the technique used to whiten the data in order that the Sims test can be used are in order. Preliminary estimates using the simple filter process

Table 2
Regression Results for the Sims Test

$$\text{Regression Tested: } Y(t) = \sum_{i=-4}^8 \alpha(i) X(t-i) + \mu(t)$$

Sample Period: III/1961-II/1979

Y	X	$\alpha(-4)$	$\alpha(-3)$	$\alpha(-2)$	$\alpha(-1)$	$\alpha(0)$	$\alpha(1)$	$\alpha(2)$	$\alpha(3)$	$\alpha(4)$	$\alpha(5)$	$\alpha(6)$	$\alpha(7)$	$\alpha(8)$	SE X 10 ⁻³	D.W./k
M1A	GNP	-0.143 (2.09)	0.080 (1.09)	0.148 (2.14)	0.214 (3.09)	0.171 (2.42)	0.055 (0.78)	-0.007 (0.11)	-0.082 (1.18)	0.034 (0.47)	-0.128 (1.72)	-0.098 (1.37)	0.130 (1.78)	-0.098 (1.32)	4.41	1.52 0.6
M1B	GNP	-0.163 (2.57)	0.082 (1.22)	0.165 (2.57)	0.215 (3.35)	0.172 (2.63)	0.076 (1.17)	0.031 (0.49)	-0.015 (0.24)	0.050 (0.75)	-0.127 (1.85)	-0.081 (1.23)	0.159 (2.35)	-0.068 (0.99)	4.33	1.64 0.6
M2	GNP	-0.067 (0.93)	0.161 (1.98)	0.232 (2.96)	0.313 (4.11)	0.203 (2.65)	0.054 (0.74)	-0.025 (0.35)	0.003 (0.04)	-0.015 (0.20)	-0.126 (1.59)	-0.061 (0.77)	0.018 (0.23)	-0.079 (1.07)	4.64	1.70 0.8
M3	GNP	-0.006 (0.08)	0.127 (1.41)	0.231 (2.66)	0.297 (3.53)	0.226 (2.67)	0.073 (0.90)	0.006 (0.08)	-0.010 (0.13)	-0.042 (0.51)	-0.070 (0.79)	-0.040 (0.46)	-0.073 (0.82)	0.023 (0.28)	5.14	1.55 0.8
L	GNP	-0.050 (0.97)	0.070 (1.21)	0.172 (3.10)	0.231 (4.27)	0.223 (4.11)	0.160 (3.08)	0.138 (2.75)	0.075 (1.42)	0.102 (1.89)	-0.005 (0.09)	0.013 (0.23)	0.039 (0.69)	0.043 (0.82)	3.29	1.89 0.8
GNP	M1A	0.383 (1.80)	-0.486 (2.01)	0.175 (0.74)	0.061 (0.26)	0.632 (2.59)	-0.005 (0.02)	0.363 (1.36)	0.467 (1.81)	-0.094 (0.37)	-0.153 (0.60)	0.020 (0.07)	0.037 (0.15)	0.131 (0.58)	8.24	1.92 0.6
GNP	M1B	0.547 (2.57)	-0.406 (1.70)	0.186 (0.80)	0.037 (0.16)	0.724 (2.89)	-0.026 (0.10)	0.256 (1.00)	0.400 (1.62)	-0.108 (0.44)	-0.156 (0.64)	-0.051 (0.21)	0.028 (0.12)	0.138 (0.64)	7.76	2.20 0.6
GNP	M2	0.049 (0.24)	-0.099 (0.32)	-0.015 (0.05)	-0.014 (0.04)	0.205 (0.62)	0.363 (1.09)	-0.081 (0.24)	0.412 (1.19)	-0.378 (1.13)	0.146 (0.45)	0.042 (0.13)	0.178 (0.55)	0.164 (0.76)	7.83	1.74 0.4
GNP	M3	-0.105 (0.49)	0.213 (0.72)	-0.063 (0.21)	-0.110 (0.37)	0.225 (0.76)	0.208 (0.72)	0.178 (0.61)	0.092 (0.31)	-0.394 (1.34)	0.685 (2.30)	-0.436 (1.46)	0.234 (0.79)	0.087 (0.42)	8.44	1.58 0.5
GNP	L	0.024 (0.09)	-0.226 (0.58)	0.194 (0.50)	0.006 (0.02)	0.404 (1.02)	0.165 (0.42)	0.249 (0.62)	0.130 (0.33)	-0.711 (1.74)	0.622 (1.50)	-0.265 (0.63)	-0.041 (0.10)	0.197 (0.74)	7.83	1.61 0.4

Notes: All equations included a constant term, linear trend variable and three seasonal dummy variables. SE is the standard error of the estimated equation, D.W. is the Durbin-Watson statistic, and k is the value used to construct the second-order linear filter $(1-kL)^2$ where $0 < k < 1$. The reported k-value yielded residuals that do not exhibit serial correlation up to order four. Absolute values of the t-statistic are in parentheses.

Table 3
Sims Test Results

Dependent variable	Independent variable	F-statistic
M1A	GNP	4.33
M1B	GNP	5.58
M2	GNP	5.72
M3	GNP	3.70
L	GNP	5.69

GNP	M1A	1.65
GNP	M1B	2.28
GNP	M2	0.09
GNP	M3	0.15
GNP	L	0.14

Notes: The calculated F-statistic is pertinent to testing the joint significance of the future values in the regressions reported in table 2. Critical F-values (4,54) are: 2.54 (5 percent) and 3.68 (1 percent).

are reported in table 3. To reiterate, these tests investigate the joint significance of the future coefficients. If the set of future coefficients is significantly different from zero, then the Y variable (the dependent variable) is exogenous to the X variable (the independent variable). Based on standard levels of statistical significance, the results in table 3 suggest that every monetary aggregate is exogenous to nominal GNP; the hypothesis that money is exogenous to GNP cannot be rejected at the 5 percent significance level. In contrast, the notion that GNP is exogenous to money is not supported by the results of the Sims test; the calculated F-statistics are below the 5 percent level of significance. Thus, the Sims and Granger test results agree: the new monetary aggregates are exogenous with respect to nominal GNP.¹⁹

¹⁹The tests used in this article are useful in detecting statistical exogeneity, not empirical correlations between GNP and the different monetary aggregates, *per se*. Because of the relatively nondefinitive nature of the results in selecting a

CONCLUSION

Increased emphasis has been placed on the growth of the monetary aggregates in the formulation and implementation of monetary policy. In February 1980, the Board of Governors of the Federal Reserve System announced major redefinitions of existing monetary aggregates. Crucial to selecting an appropriate monetary measure to be used in policymaking is its exogeneity with respect to the goal variable. This article has empirically investigated the relationship between the new monetary aggregates and nominal GNP by using the exogeneity tests proposed by Granger and Sims. Based on quarterly observations for the period III/1961-II/1980, the results reported here indicate that each of the new monetary aggregates is statistically exogenous to GNP. This supports the belief that control of the money stock is important in influencing movements in GNP.

Although the evidence in this article does not permit the selection of one of the new monetary aggregates as the "best" indicator of monetary actions, it does form a foundation upon which a selection can be made. In this regard, further study into the issues of controllability and predictability of monetary aggregates is warranted.

"best" indicator, it was felt that a useful exercise would be to briefly examine the issue of predictability. This was done by regressing the compounded annual rate of growth of GNP (\dot{Y}) on the compounded annual growth rates of money (\dot{M}) in its different definitions and high-employment government expenditures (\dot{E}). The form of the regression equation is

$$\dot{Y}_t = c + \sum_{i=0}^f m_i \dot{M}_{t-i} + \sum_{i=0}^g e_i \dot{E}_{t-i} + \varepsilon_t,$$

where the lag lengths f and g are each equal to four and ε_t is a random error term. Following Carlson and Hein, this relationship is estimated using ordinary least squares. The sample period was III/1961-II/1980.

Comparing the adjusted R^2 s obtained by using the M1A, M1B, M2, M3 and L monetary aggregates indicates that M1B explains movements in the growth rates of GNP better than the other aggregates. For comparison's sake, the monetary aggregates and their corresponding R^2 s are: M1A (0.36); M1B (0.39); M2 (0.23); M3 (0.21); and L (0.33). Given the results from the exogeneity tests, this evidence further supports the choice of M1B as the most likely monetary indicator from the aggregates examined.

