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# Automated Clearinghouses—

## Current Status and Prospects

By Carl M. Gambs

Electronic funds transfer systems have been widely discussed since the mid-1960's. While early forecasts of their growth and development have proved to be exaggerated, substantial growth in several types of EFT systems has occurred in recent years. Some of these systems are highly visible to the public—for example, the automated teller machines now used by many banks and other financial institutions, and the point of sale terminals used by a number of department store chains. Other systems are invisible except to the financial community—for example, the Federal Reserve System's wire transfer system and the Clearinghouse Interbank Payment System (CHIPS) operated by the New York City Clearinghouse Association.

One electronic funds transfer system already affecting a large number of individuals. is the system of automated clearinghouses (ACH's) that now covers most of the United States.[1] This article will discuss the origin and development of ACH's, and then examine their current status and the plans to create a nationwide ACH network. The article will then analyze the costs and benefits of ACH's to the various users and to the institutions that provide payments services. Finally, there will be a discussion of the role of the Federal Reserve System in the provision of ACH services and a brief look at the outlook for ACH development.

### ORIGIN AND GROWTH OF ACH'S

ACH's are institutions analogous to the clearinghouses existing in many cities for the interchange of paper checks. In an ACH payment, however, instructions are carried on magnetic tapes, while in a check clearinghouse, payment instructions are carried on paper checks. Two types of payments move through ACH's—credit payments and debit payments. Credit payments are payments such as Social Security or wage payments which result in a deposit of funds to an individual's account. Debit payments are payments which transfer funds from an individual's account to the account of a firm—for example, an insurance or mortgage payment.[2]

When a credit payment is made by check, the check is delivered to the recipient of the

1 The only states not currently served by ACH's are Alaska, Hawaii, Nevada, and part of West Virginia.

2 Every payment, of course, involves a credit to one account and a debit to another account. In ACH terminology, a credit payment is a transfer from the originating firm or Government unit to an individual's account and a debit is a transfer to the firm originating the payment.

payment, then deposited with a commercial bank, next placed in the check clearing system, and finally arrives at the bank on which it is drawn. ACH credit payments are made using a magnetic tape created by either the originator of the credits or its bank. The tape contains the amounts of the various payments, along with the names, bank numbers, and bank account numbers of the individuals to be paid, and the name of the firm or Government unit originating the payments. The ACH uses the tapes provided to it to prepare tapes for individual financial institutions[3] which list the payments being made to each institution's account holders. The tapes are then delivered to individual financial'institutions, which credit the accounts of the appropriate individuals. Debit transfers occur in much the same way, except that the tape is prepared by the firm or bank which will be receiving the payment, with information on the amounts to be paid by various customers included on the tape. Most debit transfers are recurring payments such as insurance premiums and mortgage payments.

The first ACH's began operation in San Francisco and Los Angeles in October **1972.** These ACH's were the outgrowth of the work of the Subcommittee on Paperless Entries (SCOPE) set up by the bank clearinghouse associations in the two cities in April **1968.** The actual implementation of the ACH's was made possible when the Federal Reserve Bank of San Francisco agreed to perform the operations of the ACH's. The pattern established in California, with local ACH associations handling ACH organizational and marketing matters and Federal Reserve Banks performing the operations, became the norm as ACH's were developed in other parts of the country. The only exceptions are Chicago and New York where local clearinghouses handle the operations.[4]

**Table 1**
**NUMBER OF ACH'S IN OPERATION AT YEAREND**

| Year | Number |
|---|---|
| 1972 | 1 |
| 1973 | 2 |
| 1974 | 4 |
| 1975 | 17 |
| 1976 | 25 |
| 1977 | 32 |

**SOURCE: National Automated Clearinghouse Association (NACHA).**

The California ACH operations were followed by the introduction of ACH's in Atlanta in **1973** and in Boston and Minneapolis in **1974.** Beginning in **1975,** there was **a** rapid spread of ACH's to the rest of the country, with **32** ACH's in operation by the end of **1977.**[5] (See Table **1.)**

The growth of ACH operations was given a substantial boost by the U.S. Government's interest in eliminating the mailing of checks. In September **1973,** the U.S. Air Force conducted a test utilizing the Denver Branch of the Federal Reserve Bank of Kansas City and the California and Atlanta ACH's to directly deposit approximately **20,000** payroll entries. The test was considered highly successful and, beginning in **1974,** the Air Force began depositing its regular payroll electronically. The Social Security Administration began depositing Social Security payments electronically

**3 ACH transfers may be made to and from accounts at thrift institutions as well as at commercial banks.**

**4 The Chicago ACH recently announced that it may turn its processing over to the Federal Reserve Bank of Chicago.**

**5 The California ACH performs operations at both Los Angeles and San Francisco and the Mid-America ACH performs operations at Kansas City and Omaha.**

early in 1976 and other Government payments have been gradually added. By the end of 1977, payments from eight different Government programs were being sent through the ACH system. These Government payments now constitute about 85 per cent of all ACH transactions.[6] Plans are underway for making additional types of Government payments through ACH's.

## CURREIUTACHUSAGE

In December 1977, approximately 9.3 million payments, most either to or from individuals, were made through ACH's. While this is small relative to the number of checks written (perhaps 3 billion in December 1977), it is growing extremely rapidly. (See Chart 1.) The two ACH's in the Tenth Federal Reserve District, the Rocky Mountain Automated Clearinghouse—which serves Colorado, Wyoming, and northern New Mexico—and the Mid-America Automated Clearinghouse serving the rest of the District—handled about 800,000 of this total.

The ACH's are used for three types of transactions: private debit transfers, private credit transfers, and Government credit transfers. Government payments dominate ACH volume in all parts of the country, but private payments, particularly debit transfers, are growing rapidly in both the nation and the Tenth Federal Reserve District. (See Charts 1 and 2.)

### Government Payments

In December 1977,' Government payments made up 85 per cent of the items moving through ACH's nationally and 72 per cent of the items in the Tenth District. Nationally, 80 per cent of these items are various types of Social Security benefits. The remainder are Air Force payroll items; Civil Service, CIA, and Railroad Retirement benefits; Veterans Administration benefits; and Revenue Sharing payments. Additional Government payments will be added later, with U.S. Navy Retirement benefits scheduled for May 1978.

### Private Credit Transfers

Virtually all private ACH credit transfers are payroll items. Although direct deposit of payroll checks is not new, having been practiced by certain firms and the Federal Government long before ACH's came into existence, it remains confined to a relatively small percentage of the work force. In December 1977, there were 619,000 private credit items, about 6.6 per cent of total ACH volume. While private credit volume in December 1977 was 118 per cent above the December 1976 figure, it was far below the hopes of the early developers of ACH's. For example, SCOPE had predicted that more than 8 million paychecks per month would go

6 The Government payments and private ACH programs are technically different, but, with the exception of New York and Chicago, use the same facilities and operating techniques. Both are treated as ACH operations here. All data in this article include both the private ACH's and the Government payments made through the Federal Reserve Banks.

7 ACH statistics are slightly exaggerated by the practice of sending a test item through the ACH prior to the first time an actual payment is made. Test items are exactly like regular ACH items, except that they have a zero amount. The receiving financial institution reports any error (for example, an erroneous bank account number or non-existent account) to the originator. These "prenotifications" normally lead to a minor overstatement of ACH volume. However, the December commercial debits figure was overstated by more than 60,000 items because of first-time ACH use by a large insurance company in the Tenth District.

**Chart 1**
**U.S. ACH ACTIVITY**

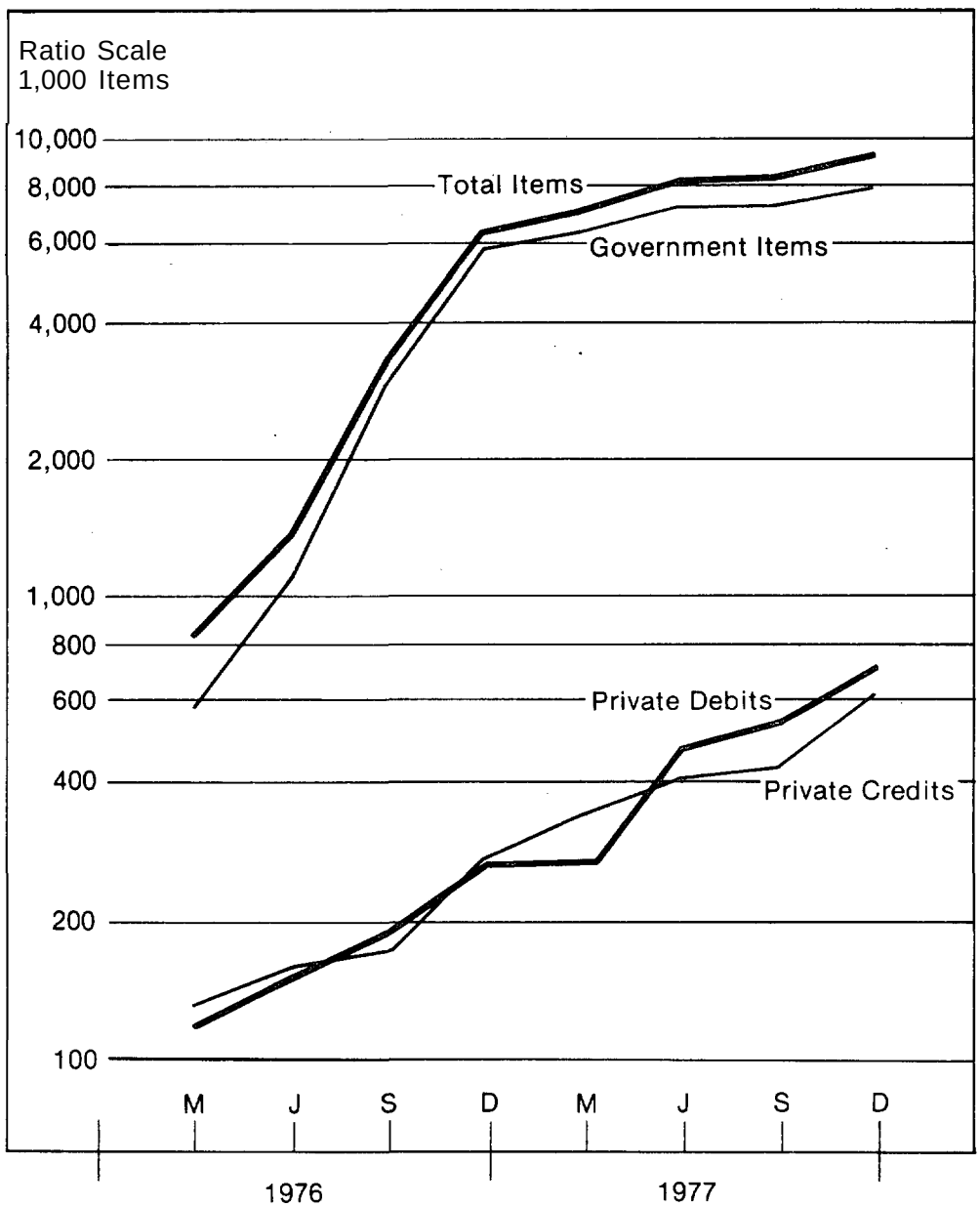
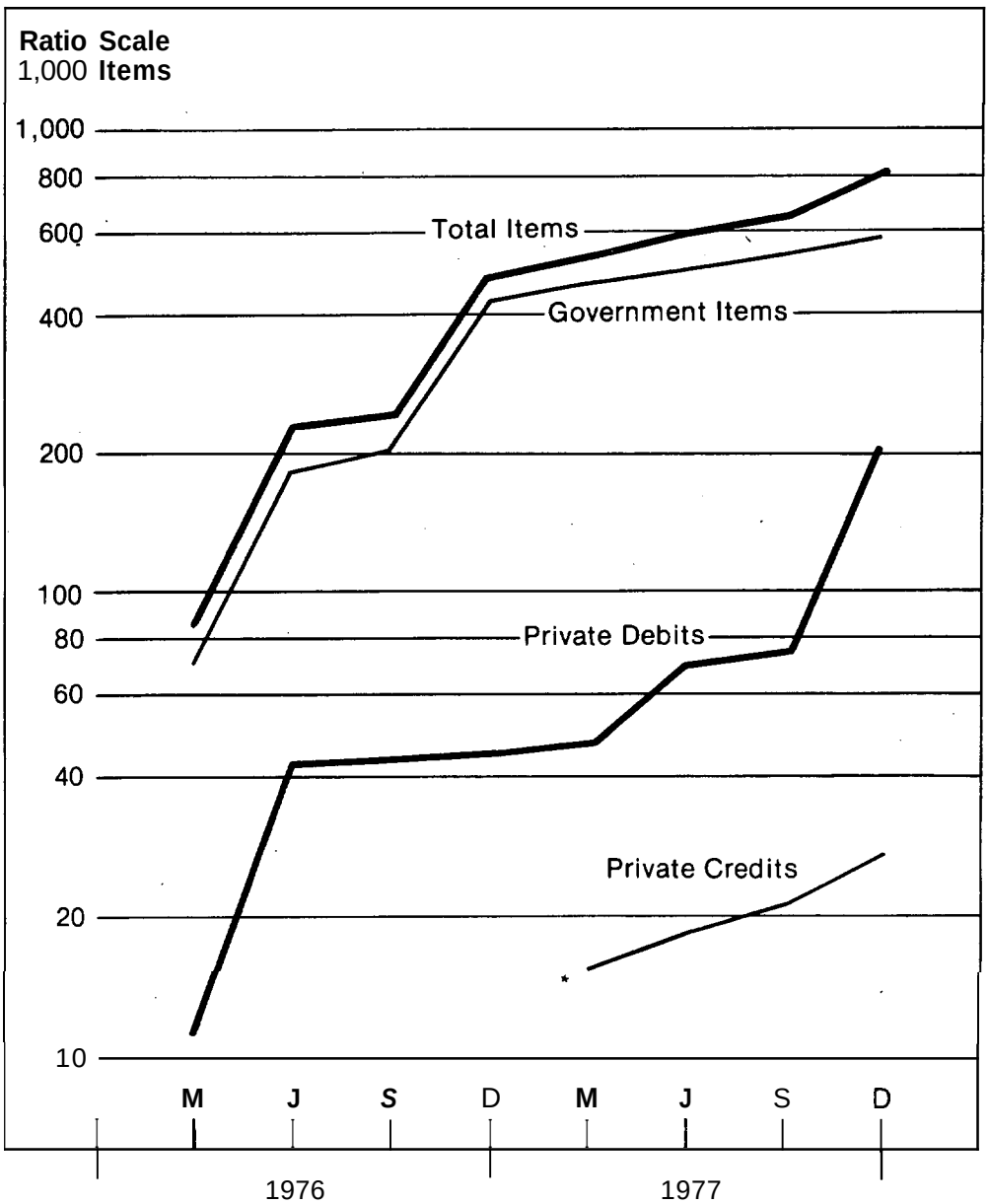


**Chart 2**
**TENTH FEDERAL RESERVE DISTRICT**
**ACH ACTIVITY**




'The volume of private credits in 1976 was too small to plot.

through the California ACH alone by 1977. As discussed later, the less than expected growth probably reflects the fact that many firms and their employees believe that there are few benefits in direct deposit.

### Private Debit Transfers

Private debit transfers constitute the fastest growing type of ACH payment. In December 1977, 739,000 debit transfers—7.9 per cent of total volume—were made through the ACH's. Total debit transfers were 161 per cent above the year-earlier total. Most of these debit transfers involve the payment of a fixed recurring sum by individuals to businesses. The largest volume of debit transfers involves payments to insurance companies, with mortgage payments probably occupying second place. Premium payments to two Tenth District insurance companies accounted for more than 100,000 transfers during December 1977. However, there are a wide variety of other users. Examples include utilities with customers operating under a "level payment plan," organizations collecting members' dues payments, and even a cemetery which sells lots on the instalment plan.

While the primary use of ACH debit payments has been for recurring payments, plans now in use in Atlanta, Philadelphia, and the Fourth (Cleveland) Federal Reserve District demonstrate other possibilities. In Atlanta, a system called "Bill Check" was instituted at the time the ACH was formed. Under Bill Check, a customer may pay bills by returning a signed authorization to his creditor in place of a check. The creditor then prepares a tape which provides the information necessary for an ACH debit transfer.

In Philadelphia, a bank is operating a system which, like systems in other areas, allows the withdrawal of funds at supermarkets equipped with terminals. The unusual feature of this particular system is that users need not have an account with the bank operating it. Withdrawals by users with checking accounts at other banks are made by means of an ACH debit item.

The U.S. Postal Service is currently using the ACH's in the Fourth Federal Reserve District as a cash management system. ACH debit items are used to transfer funds from many commercial banks to a single account in a Pittsburgh bank.

The ACH's could also be used in a giro payments system—that is, a system where customers send payment orders to their financial institution which in turn transfers funds to individual creditors. A number of financial institutions already offer such services (generally called bill paying services). It would appear to be feasible to move these payments through ACH's without .making major changes in ACH procedures.

## A NATIONAL ACH SYSTEM

The usefulness of ACH's has thus far been limited because payments through existing ACH's can be made only to recipients in a limited geographic region—either a single Federal Reserve District or a portion of it. Many potential ACH users are not interested in a system that is not nationwide in scope. For example, a number of life insurance companies which collect premium payments by issuing drafts drawn on their customers' accounts nationwide have generally not used the ACH's.

In view of the perceived importance of a national ACH system, the National Association of Automated Clearing Houses (NACHA) requested that the Federal Reserve System attempt a test of an inter-ACH interchange. The interregional test was begun March 1977 using the Federal Reserve communicatio'ns system to transmit payments among Federal

Reserve-operated ACH's in the Boston, Cleveland, Atlanta, Dallas, and San Francisco Districts, and the privately operated ACH in New York. By the end of November 1977, 29 firms were making payments through the interregional ACH system at the rate of 45,000 items per month. The bulk of the firms were using the system for direct deposit of payroll items, but most of the payments were debit items generated by life insurance companies.

The test was deemed a success on several counts. The interregional movement of funds was confirmed technically and operationally feasible. There also appears to be a substantial demand by firms for an interregional system. Finally, the system did not appear to create problems for consumers. NACHA therefore requested that the Federal Reserve System adopt a permanent interregional system involving all 32 operating ACH's. The Federal Reserve Board of Governors approved a plan for a national system on April 14, 1978. Current plans call for adding ACH's gradually to the interregional system, so that all will be a part of it by the end of 1978. This system will not involve a central ACH, but rather will have each ACH transmit data to all other ACH's for which it has payments. In this regard, it will be much like the present check processing system where checks are sent by each Federal Reserve office to all other Federal Reserve offices.

## ACH COSTS AND BENEFITS

Much of the discussion of electronic funds transfer in the 1960's seems to have been motivated by the belief that it was an absolute necessity because check volume would eventually exceed the level that the Federal Reserve and commercial banks could handle. Today this view seems at best naive. Check volume continues to grow about 7 per cent per year, but it seems clear that this volume growth can be handled virtually indefinitely, although it will be necessary to expand bank and Federal Reserve check processing departments. Contrary to the expectations of many, check processing technology has continued to change, and productivity growth in check processing has been at least as good as that in other areas of the economy.[8] Since it now seems that the payments system can continue to function indefinitely without EFT, it is necessary to evaluate any EFT system with the same cost-benefit approach that would be used with other proposed innovations. Per item costs for ACH's depend very heavily on the volume of items going through the system. Thus, it is not possible to calculate precisely the cost of operating ACH's in some future year without some idea of what ACH volume will be. However, such an estimate is extremely difficult to make. Although past estimates of future ACH usage have sometimes proven too high, ACH use is growing at a rate more rapid than can be sustained indefinitely. It is possible, however, to reach some general conclusions about the costs and benefits of ACH's.

Ultimately, ACH volume will depend on whether using the ACH will provide benefits to users of financial services. Even if ACH's provide substantial benefits to financial institutions and the Federal Reserve System, ACH's will not be used unless the users of the payments system—households, businesses, and Governmental units—find that using the ACH is preferable to using alternative means of payment. Thus, any analysis of ACH costs and benefits should start with these potential users.

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**8 Functional cost data suggests that over the period 1971-76, bank check handling productivity improved by an average of 2.8 per cent per year, as compared with 1.5 per cent per year in the entire nonfarm business sector.**

## Costs and Benefits to Households

**Direct Deposit of** Paychecks. From the earliest discussions of ACH's, it has been widely believed that the system would be used extensively for direct deposit of payroll checks. Direct deposit means that a worker need no longer visit his financial institution or mail his check to it, and that his funds reach the bank account faster and more conveniently. These advantages might seem to provide an irresistible combination.

In practice, however, the support given direct deposit by working Americans has not been particularly strong. While most workers do not yet have the opportunity to have their pay directly deposited, only a minority of those who are .eligible for direct deposit have used it. Apparently, the trip to the bank to deposit a check is not regarded as a significant cost, or at least is not costly enough to offset reservations about direct deposit, perhaps because many individuals need to obtain currency from the bank in any case. Potential users also cite fears of computer error and the desire to maintain control of their finances. In addition, approximately 20 per cent of households do not yet have a checking account. A major unanswered question affecting future ACH usage is the extent to which time and experience will overcome reservations about direct deposit.

**Direct Deposit of Government Benefits.** In contrast to experience with direct deposit of payroll, it seems fair to describe the direct deposit of Government benefits such as Social Security as at least a limited success. Early in December 1977, it was estimated that 16 per cent of eligible Government payments were being directly deposited through ACH's. This is a respectable record, given that the program has been in effect for a short time and that the age group receiving most of the payments tends to be relatively conservative.

This record reflects the fact that the potential gains to recipients are fairly high. Unlike most paychecks, Government benefit checks are distributed through the mail. While Social Security recipients may not completely trust the reliability of the banking system, there is also considerable distrust of the postal system. There have been substantial problems in many parts of the country with stolen Social Security checks and replacement is both difficult and time consuming. Since direct deposit eliminates lost and stolen checks, the program has an obvious attraction and its success is not surprising.[9]

Growth in direct deposit of paychecks will eventually encourage greater use of direct deposit of Social Security checks, as retirees who have become accustomed to direct deposit of payroll checks are likely to have Social Security checks directly deposited. The highest percentage of eligible recipients of Government payments currently using direct deposit is among the Civil Service retirees, many of whom have had their paychecks directly deposited.

**Debit Transfers.** Debit transfer payments exceeded private credit transfers for the first time in 1977, and are continuing to grow at a more rapid rate than are credit transfers. While the rapid growth almost certainly reflects the fact that debit transfers are more attractive to originators than are credit transfers, it also reflects features that make these transfers attractive to households. Debit transfers eliminate the time required for householders to write checks. These transfers also eliminate the cost of postage—a factor which has become increasingly important. First class postage rates have increased by 160 per cent since 1967, approximately twice the 81.6 per cent rise in

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**9 The considerable effort that the Treasury has put into advertising direct deposit is probably also an important factor in its success.**

the consumer price index between 1%7 and 1977. Furthermore, U.S. Postal Service projections imply an even more rapid rate of increase in postage rates during the next several years than over the last decade.

It seems unlikely, however, that households will be willing to preauthorize the transfer of funds from their accounts to pay bills which are not fixed in amount. Consumer surveys have consistently shown that households do not wish to relinquish control of their checking accounts. There are, however, substantial numbers of recurring payments for items such as mortgage and instalment credit payments. The combination of convenience and rapidly increasing postage rates may well incline many customers toward authorizing ACH transfers for these purposes.

The success of an ACH giro system which would allow customers to direct their banks to transfer funds directly to creditors is essentially speculative. Giro transfer systems have been extremely successful in other countries, but in these countries personal checking accounts had never been the dominant means of payment. It may well be that high postage rates will also give an impetus to giro payments, since a number of payments could be authorized with one communication to a financial institution, and the communication could just as well be over the phone as by mail.

## Costs and Benefits to Businesses

ACH growth will require business cooperation, since most payments which can potentially move through ACH's are between businesses and consumers. Businesses are, of course, quite concerned with the costs of making payments, but they also are concerned with the potential effect of ACH's and other EFT developments on their cash flow. In recent years, businesses have devoted substantial efforts to speeding up receipts and delaying expenditures, since funds gained in this manner can be invested in short-term interest-bearing assets or used to reduce short-term borrowing. One important factor in making ACH decisions will be the impact of the use of ACH's on cash flow.

**Credit Transfers.** Most firms do not mail paychecks, but rather distribute them directly to employees, so using the ACH for payrolls will not save significantly on postage expenses. Furthermore, it is necessary to provide employees with a statement of wages and deductions, so using the ACH will provide little, if any, saving in processing costs. Paying through the ACH will, however, lead to a loss of float for businesses, since ACH payments will all be deducted from a firm's account on payday, while paychecks frequently take several days to clear. The net result is that, with the exception of firms that mail paychecks, the benefit of paying through an ACH is its value as an employee benefit, while the loss of float leads to a definite cost. As long as workers show little interest in this benefit, there would seem to be little reason why firms would move rapidly toward paying employees through ACH's, unless the pricing of the payments system is changed drastically so that checks become substantially more expensive than ACH payments.

**Debit Transfers.** Debit transfers, unlike credit transfers, can potentially reduce processing and postage costs and speed cash flow. Under the check system, firms generally bill customers, even when the payment is a recurring one (although mortgage and instalment lenders sometimes provide a coupon book in lieu of regular billing). The firm must always bear the expense of opening envelopes, preparing deposits, and manually entering payments data into the firm's accounting system. The use of ACH's can eliminate or automate these tasks, at a potentially substantial cost saving for a large firm.

Furthermore, in most cases, the firm will have speedier access to the funds. Thus, it seems likely that firms will have much greater interest in debit transfers than in credit transfers in the near future.

## Costs and Benefits to the U.S. Government

The U.S. Government is the largest user of the payments system and is the user that has been most interested in ACH's, since the Treasury has seen two substantial types of saving from using ACH's: savings in postal costs and savings in investigating and replacing lost and stolen checks.

To the extent ACH use reduces postal volume, and that the reduced volume has a smaller impact on costs than on revenue, ACH's may eventually require a larger subsidy for the U.S. Postal Service than would otherwise be the case. However, this subsidy will probably be small, since the actual effect of ACH's on postal volume is likely to be quite small. Furthermore, the Postal Service can be expected to reduce its costs in response to a lower volume to a greater extent in the long run than in the short run, so much of any necessary subsidy is likely to be transitory. Rather optimistic projections of ACH volume suggest that ACH's are unlikely to eliminate more than 200 million first class mail items by 1980.[10] This would be less than one-half of 1 per cent of current first class mail volume.

## Costs and Benefits to Financial Institutions

It is hoped that ACH's will eventually reduce bank costs, as large volumes of items on magnetic tape would be substantially cheaper to process than paper checks. While there are no data available on the current effect of ACH's on the costs of financial institutions, it does appear that at current volume levels ACH's have not reduced, and may have slightly increased, costs for most participating institutions.[11] Perhaps the only institutions making a profit are a few banks that obtain fee income or deposit balances by originating items for commercial customers, and a small number of savings and loans using the system for mortgage payments.

ACH's affect the flow of funds to financial institutions, as well as to firms and individuals. Banks will generally receive funds quicker when credit transfers move through an ACH rather than the conventional check processing system, while banks originating debit transfers will lose the funds more quickly. Thus, in the absence of some compensating price system, banks have a greater incentive to promote debit transfers than credit transfers. Recognizing this, some ACH's are discussing pricing systems which involve transfer payments from institutions benefiting from the flow of funds in an ACH system to those who lose funds.

## Costs and Benefits to the Federal Reserve System

The Federal Reserve's exact cost of operating ACH's is extremely difficult to determine as many of the facilities used in operating the ACH's would be necessary for check processing in the absence of ACH's. Federal Reserve costs for ACH processing in the fourth quarter of 1977 are estimated at about 4 cents per item, as

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10 **"Analysis of Anticipated Impact of EFTS on the Postal Service." NACHA Quarterly *Update*. Supplement Number 6, July 1977, pp. 4-5.**

11 **Testimony of Virgil Dissmeyer, President, NACHA, in U.S. Senate. 95th Congress. First Session, "Oversight on the Payments Mechanism, the Federal Reserve's Role in Providing Payments Services, and the Pricing of Those Services." Hearings, October 10 and 11, 1977.**

compared with approximately 1 cent per item for conventional check processing. However, because such a large part of ACH costs are fixed, unit costs can be expected to decline rapidly as volume increases. Ultimately, it seems likely that ACH costs will be below those of conventional check processing.

The proposed interregional ACH interchange will increase costs somewhat. The Federal Reserve Board of Governors staff estimates that Federal Reserve costs will increase by $500,000 during 1978 as a result of the interchange and might be as much as $1.2 million per month higher within 5 years.

## THE ROLE OF THE FEDERAL RESERVE IN ACH'S

As has been previously noted, the Federal Reserve System currently performs the operating functions for 30 of 32 ACH's and provides courier service and settlement facilities for all of them. The Federal Reserve has provided these services because ACH's were natural extensions of the traditional Federal Reserve roles in check processing and the provision of services to the U.S. Treasury, and because they had been requested by Federal Reserve member banks and the Treasury. If the Federal Reserve System were not assuming these ACH functions, it is extremely unlikely that there would now be any substantial degree of ACH activity. Before the Federal Reserve began performing courier service for the Midwest ACH in Chicago in 1976, courier services were costing the ACH $1,000 per week[2]—nearly 35 cents per item on even the December 1977 payments going through that ACH. It is unlikely that any private enterprise would have been willing to subsidize the startup costs for a nationwide ACH to the extent that the Federal Reserve has.

It does not necessarily follow that the Federal Reserve should indefinitely operate ACH's. Indeed, it has even been argued that the Federal Reserve System should get out of conventional check clearing.[13] Two issues concerning continued Federal Reserve participation in ACH operations are of considerable current concern: the degree to which a public institution like the Federal Reserve should be operating ACH's, and if the Federal Reserve continues to operate ACH's, whether prices should be charged for ACH services.

### Public Versus Private Operations of ACH's[14]

Opposition to Federal Reserve operation of ACH's has centered on two issues. The first is the general opposition in our economy to Government operation of any activity which could be performed by the private sector. This opposition is to some extent based on philosophical grounds, but also on the belief that private enterprise is more likely to operate efficiently. In general, there is reason to believe that an institution subject to the profit motive will be more inclined to minimize costs. There is also the belief that to the extent that private firms would like to engage in ACH activities, Federal Reserve operations in this area constitute unfair competition.

Proponents of Federal Reserve operation of ACH's argue that this is simply an extension of the Federal Reserve's traditional role in check

12 "Courier Services to Independent ACH's," NACHA *Quarterly Update*. October 1976, p. 6.

13 Preston J. Miller, "The Right Way to Price Federal Reserve Services," Federal Reserve Bank of Minneapolis *Quarterly Revrew.* Summer 1977, pp. 15-22.

14 George C. White, Jr., "Private Sector Alternative," *Issues in Bank Regulation.* 1 (Autumn 1977). pp. 6, 13-15; and Benjamin Wolkowitz, "The Fed's Role in EFTS," *Issues m Bank Regulation.* 1 (Autumn 1977), pp. 7-12.

processing and that no private institution would be willing to take over the operation of ACH's at a reasonable cost at this time. It is also argued that an ACH is a natural monopoly—that is, that only one ACH will be required to provide services efficiently in a given market and that if the Federal Reserve operates the system, access can be guaranteed to all potential users on a fair and equitable basis. It has also been suggested that it might be useful to have the Federal Reserve active in EFT operations even if there are also private EFT organizations in operation, in order to serve as "a clearer of last resort" and to ensure that all users have access to the system.[15]

The Privacy Protection Study Commission has suggested that the Federal Reserve should not be involved in ACH operations because these operations are inherently threatening to personal privacy.[16] The fear has been expressed that since the Federal Reserve is a Government entity, the Government might eventually use the ACH's to gain information about individuals' financial transactions which it would not otherwise be entitled to. While the Commission recognized that the ACH's do not currently have the capability to provide this information, there was the fear that such a capability might be developed in the future.

What this argument seems to overlook is that there is no reason to develop such a capability, except for the purpose of invading personal privacy. While commercial banks need to store information on the transactions of individual customers in such a way that it can be retrieved for the customers' statements, ACH's have nothing to gain by doing this. Building the capability to store information so that the transactions of a specific customer could be retrieved would be extremely expensive, as would the cost of maintaining this information. It seems unlikely that a Government willing to go to this extreme would hesitate to extricate information from an ACH simply because it was part of the private sector. Commercial banks, while part of the private sector, are today required to retain copies of all checks written for more than $100. Thus, the privacy issue does not seem to be an important one as far as determining whether or not the Federal Reserve should operate ACH's.

Under current conditions, the question does not appear to be whether the Federal Reserve or the private sector should operate ACH's, but rather whether the Federal Reserve should operate ACH's or there should be no ACH's at all. As previously noted, there are now two exceptions to Federal Reserve operation, but these two are in the two most important financial centers in the country. The New York case is unique in that the New York clearinghouse, unlike other clearinghouses, was already operating computer facilities. The Chicago ACH has been one of the least successful, if success is measured by the number of private transactions relative to the size of the population in the area served by the ACH.[17]

The realization that eliminating Federal Reserve participation at this time would eliminate most ACH activity was an important factor in the unanimous recommendation of the National Commission on Electronic Funds Transfers that the Federal Reserve System continue its ACH operations.[18]

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15 Wolkowitz, p. 11

16 **Personal Privacy in an Information Society. The Report of the Privacy Protection Study Commission, Washington, 1977, pp. 122-24.**

17 **The Chicago metropolitan area has about 3.5 per cent of the U.S. population, but its ACH had only 0.9 per cent of the private volume in December 1977.**

18 **National Commission on Electronic Fund Transfers, EFT in the United States. Policy Recommendations and the Public Interest. Washington, 1977, pp. 213-14.**

## Should the Federal Reserve Charge for ACH Services?

The Federal Reserve System has generally provided its services free of explicit charge to member banks. Under Federal Reserve rules, member banks could, in most cases, have the Federal Reserve perform work for nonmember banks free of charge. When Regional Check Processing Centers (RCPC's) were introduced in the early 1970's, nonmember banks were allowed to deposit checks directly with the RCPC. ACH operations have always performed transfers for nonmember banks, and now perform them for thrift institutions as well, without a charge.

When the Federal Reserve System performs services without charge, private firms obviously find it difficult to compete, although private institutions do compete with the Federal Reserve to some extent in check processing and wire transfers. Offering a service below cost also leads to resources being used inefficiently.[19] For example, the Federal Reserve may perform functions that could be performed more cheaply by private firms. Or services may be performed to a greater extent than is desirable, because banks will tend to use Federal Reserve services up to the point where the value of an additional unit of service is zero, even if the services are costly to perform.

Because of these considerations, there has been considerable discussion of charging for Federal Reserve services. However, the requirement that Federal Reserve member banks hold funds in noninterest-bearing deposits at Federal Reserve Banks or vault cash puts member banks at an earnings disadvantage relative to nonmember banks.[20] For this reason, the Federal Reserve System has always felt that it was desirable to partly offset this membership burden by providing free services. In light of the substantial attrition of Federal Reserve member banks in recent years, the Federal Reserve felt that it is undesirable to price Federal Reserve services without a solution to the membership problem.[21]

The pricing of ACH services also presents a serious problem because of the substantial economies of scale in this activity. Increases in volume will substantially reduce per item ACH costs. Should ACH services be priced at the level of current costs or of lower expected future costs, or at the marginal (or incremental) cost level? Pricing at current costs would deter a desirable increase in ACH activity, while pricing at expected future costs would make it more difficult for the private sector to compete with the Federal Reserve. Marginal cost pricing would, as long as costs are diminishing with volume, lead to the Federal Reserve operating ACH's at a loss and would deter private competition. 'In spite of these difficulties, the Board of Governors, at the time the interregional ACH interchange was approved, decided that a pricing schedule for ACH services would be developed in the future, possibly along with prices for other services.

## CONCLUSION—THE FUTURE OF ACH'S

At the end of 1977, ACH's were handling payments at the rate of more than 100 million

19 Miller.

20 Robert E. Knight, "Comparative Burdens of Federal Reserve Member and Nonmember Banks," Federal Reserve Bank of Kansas City *Monthly Review,* March 1977, pp. 13-28.

21 Philip E. Coldwell, statement to the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, October 11, 1977, in *Federal Reserve Bulletin,* 63 (October 1977), p. 906.

items per year with volume growing at a rate of 40 to 50 per cent per year. At this rate of growth, it will be at least 3 or 4 years before ACH's will have a discernible effect on check volume. If this rate of growth continues for a decade, ACH's could actually induce a decline in check volume.

For ACH growth to continue, however, it will be necessary for privates transactions to move in ever increasing numbers through the ACH's. It is clear that there now are a substantial number of recurring debit payments that could be automated with benefits to the parties on both sides of the transactions. There is not, however, any strong incentive for paychecks and other 'credit transfers to move through ACH's.

Conceivably, if ACH costs eventually fall far below the cost of check handling, banks might provide their customers with price incentives to use ACH's and ACH volume might rise substantially. However, as long as banks are not permitted to pay interest on checking accounts; they have an incentive to compete for deposits by offering checking accounts with low or zero service charges,[22] and have little room for offering ACH services at costs lower than check services. Interest-bearing checking accounts might eventually lead to higher priced check services and provide a stimulus for ACH growth.

The institution of a giro system using ACH facilities could also assist in facilitating ACH growth, and continued increases in postal rates may give such a system a boost. In the absence of such a system, it seems unlikely that ACH use will lead to a substantial decline in check volume.

The goal of the Federal Reserve System in supporting ACH's was not simply to reduce check volume, but to reduce the cost and improve the quality of the payments system. The ACH's; by speeding payments and making their arrival time more certain, have improved the quality of the system. However, ACH volume has as yet been insufficient to reduce payment system costs—in fact, costs have probably increased slightly as a consequence of the ACH's. Nonetheless, there is reason to believe that sustained increases in volume will eventually lead to ACH costs below those of the check system.

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22 *Bryon Higgins*, **"Interest Payments on Demand Deposits: Historical Evolution and the Current Controversy," Federal Reserve Bank of Kansas City *Monthly* Review. July-August 1977, p. 8.**

# The Choice of a Monetary Policy Instrument

By J. A. Cacy

Alternative methods of conducting monetary policy have been extensively debated in recent years. Much of the debate has centered around the question of whether the Federal Reserve should use interest rates or the money supply as the instrument variable in conducting monetary policy. This article analyzes some aspects of this question. The first section of the article defines an instrument variable and outlines the relationship between instrument and goal variables. A model of the economy is presented in the second section. The third and fourth sections use the model to analyze the choice of an instrument variable. The last section summarizes the article findings.

## INSTRUMENT AND GOAL VARIABLES

An instrument variable is one the Federal Reserve controls on a continuous basis. By controlling instrument variables, the Federal Reserve influences the behavior of goal variables, which measure conditions or processes related to the System's overall economic goals. The Federal Reserve's goals include, in general terms, reasonable price stability, high employment, satisfactory economic growth, and international balance. For example, a price index may be a goal variable because it measures the extent of inflation, a process related to the general goal of price stability. Thus, one objective of the Federal Reserve in controlling instrument variables may be to influence the behavior of a price index.

Instrument variables have two characteristics. First, they are controllable—that is, they are closely related to Federal Reserve actions; and they can be observed continuously so that any imprecision in the relationship can be immediately compensated for by Federal Reserve actions. The other characteristic is that instrument variables are closely related to goal variables or to other variables related to goal variables; and inforination is available about these relationships.

Because a number of variables are potential instrument variables, the Federal Reserve must choose one or more to control. As mentioned earlier, this article deals with the choice between the interest rate and the money supply. The article also discusses the alternative of using both variables as instruments.[1] When only the interest rate is used, a "pure" interest rate policy is followed, defined as a policy of maintaining the interest rate at a specified level

[1] The article assumes that there is only one interest rate and one measure of the money supply. Also, the article assumes that both the interest rate and the money supply can be continuously controlled. While these assumptions are unrealistic, they allow the analysis to focus on the important issue of the choice between interest rates and the money supply.

for a specified period. The period is referred to as the decision period. When only the money supply is used as an instrument variable, a pure money supply policy is followed, defined as a policy of maintaining the money supply at a specified level during the decision period. When both variables are used, a "combination" policy is followed, defined as moving the interest rate and the money supply during the decision period in response to certain developments.

National income is treated as the Federal Reserve System's goal variable in this article. It is assumed that policymakers want to achieve a specified level of income because income below that level is accompanied by unutilized resources, while income above that level is accompanied by inflationary pressures.

## THE IS-LM MODEL

In considering the instrument choice problem, the relationship between instruments and goal variables must be analyzed. To do so, a model of the economy is needed. One frequently used is the IS-LM model, a highly simplified theoretical macroeconomic model. Due to the simplified and theoretical nature of the model, conclusions about monetary policy based on the model are not definitive; Policy analysts, however, have found the model very useful in identifying general considerations relevant to the choice of instrument variables.

The IS-LM model has three variables—national income, the interest rate, and the money supply. The major focus of the model is real national income, which (in the absence of supply constraints) is determined by the aggregate demand for goods and services. Aggregate demand, in turn, is generally determined by two broad sets of factors—"real" factors and "monetary" factors. Real factors refer to factors—such as the return on investment—that directly affect the public's aggregate spending (consuming, investing) and saving behavior. Monetary factors affect the public's money holding behavior and have an indirect effect on aggregate demand. In line with the real/monetary dichotomy, the IS-LM model divides the economy into real and monetary sectors. Each sector is summarized by one equation or function. In the real sector, the equation is the IS function which summarizes the relationship between income and the interest rate in the real sector. In the monetary sector, the LM function summarizes the relationship between income and the interest rate, given the supply of money.

### The LM Function

The LM function is a relationship between the levels of real national income and the interest rate that are consistent with equilibrium in the financial or monetary sector of the economy. Monetary sector equilibrium means that, in the aggregate, economic units are holding the quantity of money balances they plan or demand to hold, and that the quantity of money demanded is equal to the quantity of money supplied, with the quantity of money supplied being given. Also, monetary sector equilibrium means that, if equilibrium exists, there is no tendency for income to change due to the underlying factors affecting equilibrium in the monetary sector—that is, due to adjustments by economic units with regard to their holding of money balances.

The LM relationship is based on one underlying relationship, along with the condition that the demand for money equals the supply of money. The underlying relationship is the demand for money function, or the relationship between the quantity of money demanded and the rate of interest and income.

To illustrate how a given combination of income and rate of interest may be consistent

with equilibrium in the monetary sector, assume that when the interest rate and income are at certain levels, say $i_1$ and $y_1$, economic units will demand to hold a certain quantity of money balances. Now assume the quantity of money supplied is equal to this quantity demanded, so that if $i_1$ and $y_1$ are realized, economic units will be holding the quantity of money they plan to hold—that is, the demand for money will equal the supply. Thus, given the supply of money, $i_1$ and $y_1$ are consistent with monetary sector equilibrium. When $i_1$ and $y_1$ are realized, there is no tendency for income to change due to factors affecting income in the monetary sector.

The LM function is a positive one—that is, a high rate of interest is associated with a high level of income and a low rate of interest is associated with a low level of income. The function is positive because the quantity of money demanded is negatively related to the rate of interest and positively related to the level of income. Money demanded is negatively related to the rate of interest because a relatively high interest rate encourages economic units to economize on money balances, while a low interest rate discourages units from economizing on balances. The quantity of money demanded is positively related to income because a relatively high level of income creates a need for a relatively high level of balances and a low level of income creates a need for a low level of balances.

To illustrate the positive slope of the LM function, assume that certain levels of the interest rate and income are consistent with monetary sector equilibrium. Now assume a higher level of income. At the higher level, economic units will demand more money balances, so that the quantity of money demanded will be greater than the quantity supplied. Now assume, in addition to the higher income, successively high levels of the interest rate. At the higher levels, units will demand fewer money balances. At some higher interest rate, the lesser demand due to the higher interest rate will offset the greater demand due to the higher income, leaving the quantity of money demanded unchanged and equal to the unchanged supply of money. Thus, the higher income requires a higher interest rate to maintain equilibrium.

As shown in Figure 1, the LM function "slopes upward and to the right." In the figure, monetary equilibrium exists if the rate of interest is i, and income is $y_1$, or if the rate of interest is $i_2$ (higher than $i_1$) and income is $y_2$ (higher than $y_1$). All other combinations of the interest rate and income that lie on the LM curve are consistent with monetary sector equilibrium, also.

## The IS Function

The IS function is a relationship between the levels of real national income and the interest rate that are consistent with equilibrium in the real sector of the economy. Real sector equilibrium means that, given the interest rate and income, consumers are consuming the amount they intend or plan to consume, savers are saving the amount they plan to save, investors in capital goods are investing the amount they plan to invest, and that planned saving equals planned investment.[2] Also, real sector equilibrium means that, if equilibrium exists, there is no tendency for income to change due to underlying factors affecting income in the real sector—that is, due to adjustments by economic units with regard to the amounts they consume, save, and invest relative to their incomes and the interest rate.

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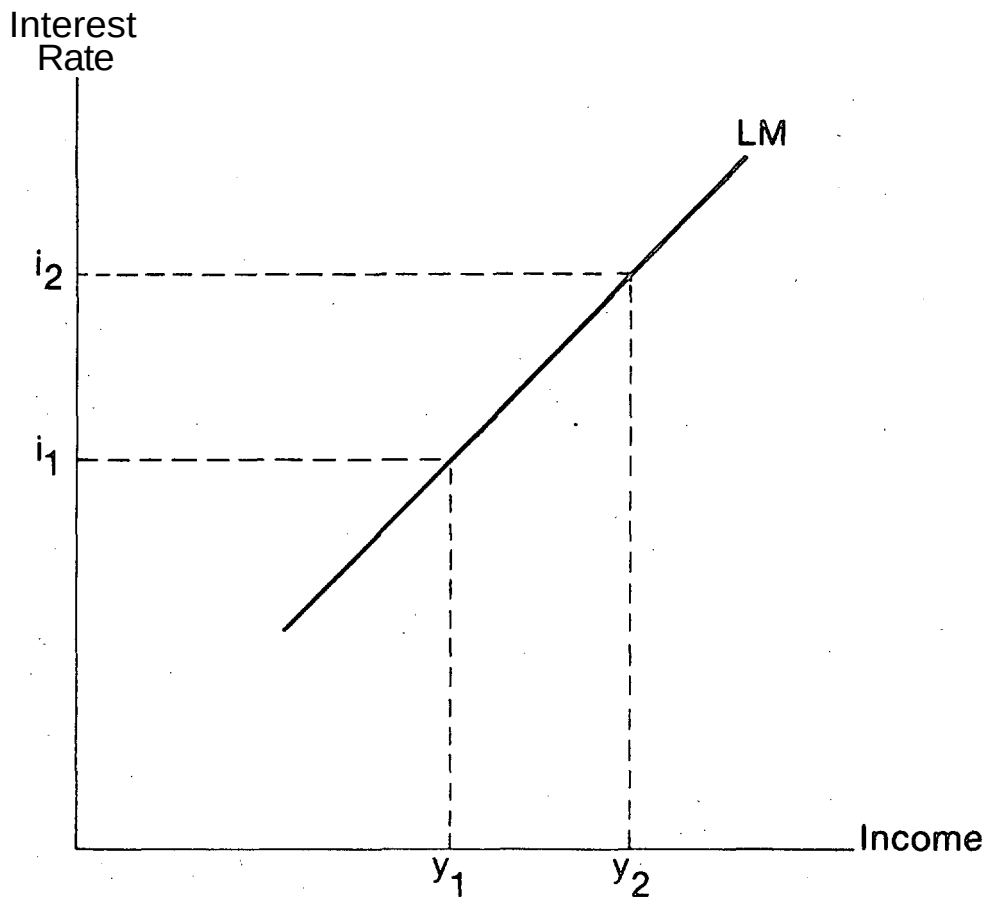
**2 In a more complete model, containing a government and a foreign sector, the equilibrium condition would be that saving equals domestic and net foreign investment plus the government's budget deficit.**

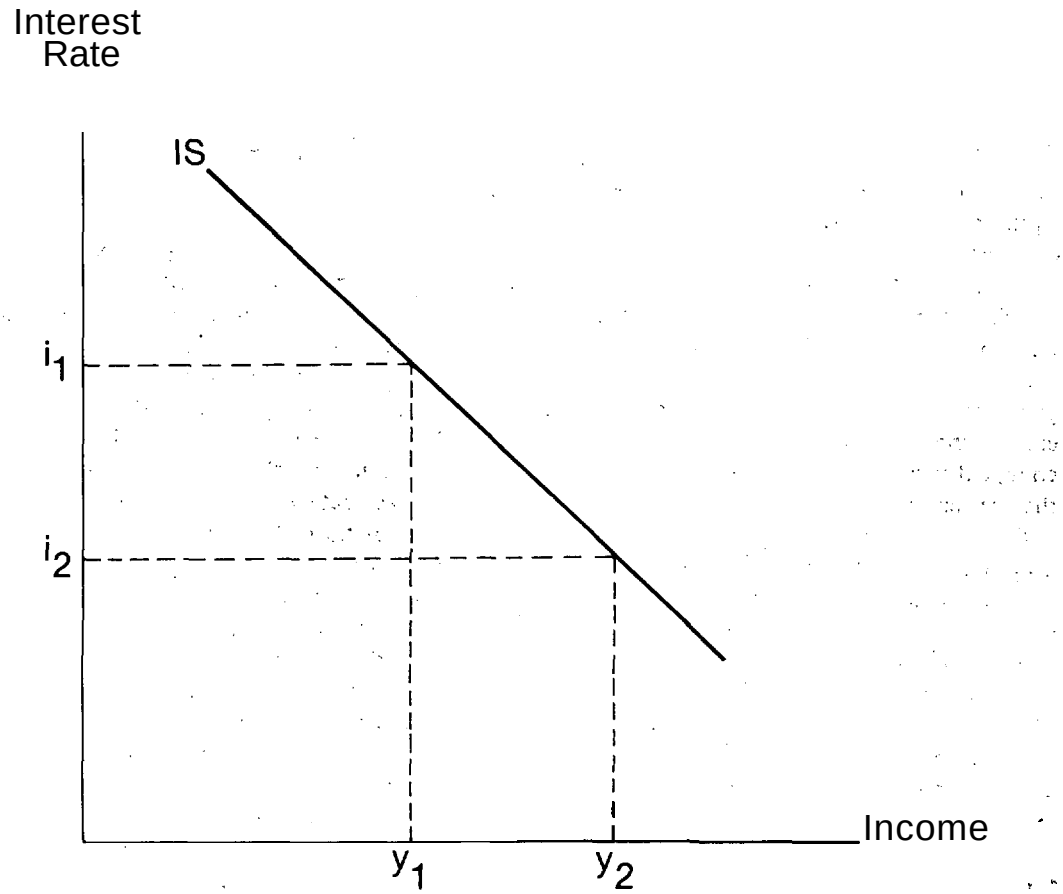
**Figure 1**
**THE LM FUNCTION**




The IS function is based on two underlying functions or relationships, along with the condition that planned saving equals planned investment. One underlying relationship is the investment demand function, a relationship between planned investment and the rate of interest. The other relationship is the consumption function, or alternatively the saving function, the latter being a relationship between income and planned saving.

To illustrate how a combination of income and the interest rate may be consistent with real sector equilibrium, assume that when the interest rate is at a given level, say $i_1$, investors plan a given amount of investment. If realized, the investment generates income in the sector of the economy that produces capital goods. Economic units receiving the income save part and consume part of the income: The part consumed also generates income, with part being saved and part consumed, and so on. Thus, the given level of investment generates or supports a given level of income, say $y_1$, with the level of income being that level at which the

**Figure 2**
**THE IS FUNCTION**




amount savers plan to save equals the amount investors plan to invest. Given the interest rate, $i_1$, the real sector equilibrium level of income is $y_1$. When $i_1$ and $y_1$ are realized, planned consumption, saving, and investment are realized; planned saving equals planned investment; and there is no tendency for income to change due to factors affecting income in the real sector.

The **IS** function is an inverse one—that is, a high rate of interest is associated with a low level of income. and a low rate of interest is associated with a high level of income. The **IS** function is inverse because the underlying investment demand function is inverse. **A** high rate of interest tends to discourage investment and therefore results in a low level of income, while a low rate of interest tends to encourage investment and results in a high income. The inverse **IS** relationship is said to "slope downward and to the right," as illustrated in Figure 2. In the figure, real sector equilibrium exists if the rate of interest is $i_1$ and income is $y_1$, or if the rate of interest is $i_2$ (lower than $i_1$)

and income is $y_2$ (higher than y,). All other combinations of the interest rate and income that lie on the IS curve are consistent with real sector equilibrium, also.

## Full Equilibrium in the IS-LM Model

Full equilibrium in the IS-LM model exists if both the real and monetary sectors are in equilibrium. The full equilibrium combination of the rate of interest and income is a combination that is consistent with the conditions that planned saving equals planned investment, and the demand for money equals the supply of money, with the supply of money given outside the model. If full equilibrium exists, there is no tendency for income to change due to factors affecting income in either the real or monetary sectors.

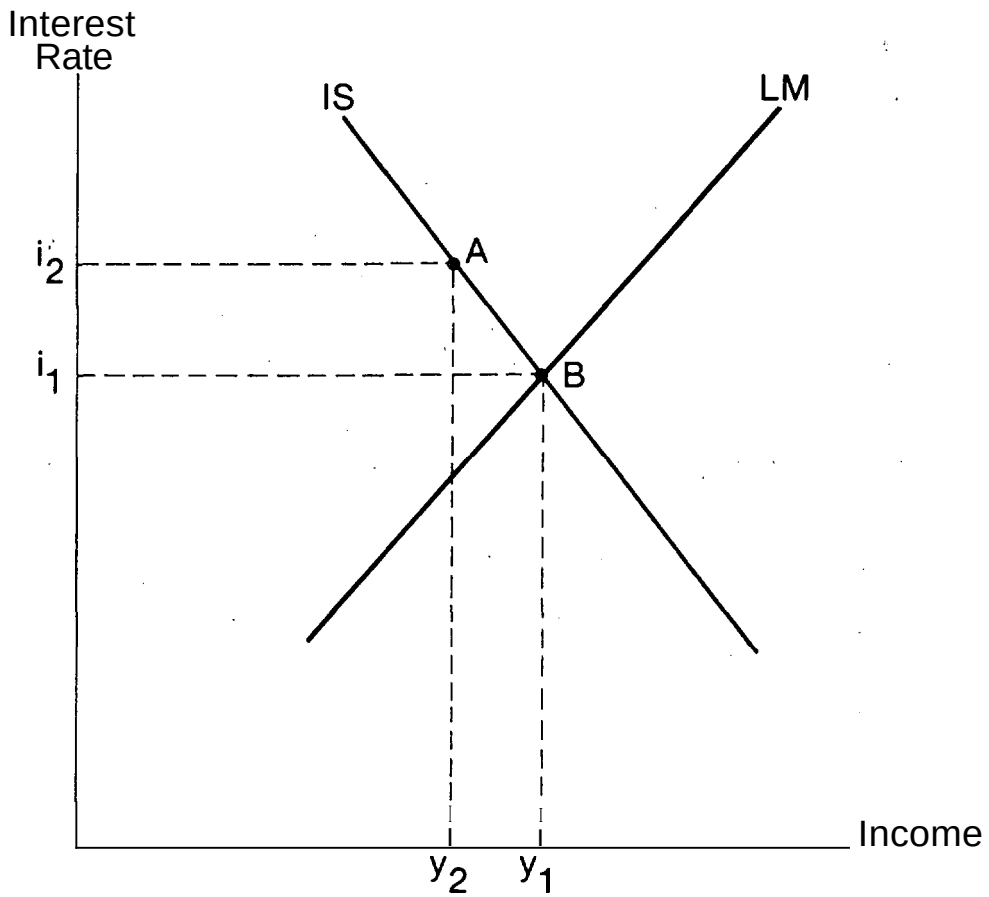
Full equilibrium may be illustrated graphically by drawing both the IS and LM functions on the same graph. The full equilibrium interest rate and income levels are given by the intersection of the two functions. In Figure 3, the full equilibrium combination of interest rate and income is i, and y,. If any other combination of the interest rate and income exists, income tends to change. For example, at point A in Figure 3, real sector equilibrium exists and economic units are saving, consuming, and investing according to plan. However, monetary equilibrium does not exist, and the economic units are not holding the quantity of money balances they demand to hold. In particular, the supply of money exceeds the demand for money. Under these circumstances, units attempt to reduce their money balances by buying securities, which increases the price of securities and lowers the rate of interest. As the interest rate declines, investors tend to increase their capital investment, and the higher investment generates a higher income. These adjustments by economic units tend to propel the interest rate down and income up, so that the interest rate and income are propelled toward point B in Figure 3 and the equilibrium combination, i, and y,.

## Impact of a Change in the Supply of Money

The IS-LM model may be used to analyze the impact on the rate of interest and income of a change in the quantity of money supplied. Since the LM function assumes a given quantity of money supplied, a change in the supply of money causes the LM curve to shift. An increase in the supply of money shifts the function "to the right," because any given interest rate requires a higher income level to be consistent with the monetary sector equilibrium. The higher income level is required to increase the quantity of money demanded to the higher quantity supplied, so that the demand for and supply of money are equal. Similarly, a decline in the supply of money shifts the function "to the left." Thus, the position of the LM function is affected by the supply of money.

An increase in the supply of money that shifts the LM function to the right lowers the rate of interest and increases income, as illustrated in Figure 4. In the figure, the money supply is assumed initially to be a certain amount, M,, which results in a certain LM function, labeled LM,. Given M, (and the IS function), the interest rate is $i_1$ and income is y,. Now assume an increase in the supply of money to $M_2$, which shifts the LM function to LM, and results in a decline in the interest rate to i, and an increase in income to y,. The analysis of the forces that cause the interest rate and income to move from $i_1$ and y, to $i_2$ and $y_2$ is identical to the analysis of the movement from point A to point B in Figure 3.

**Figure 3**
**FULL EQUILIBRIUM**

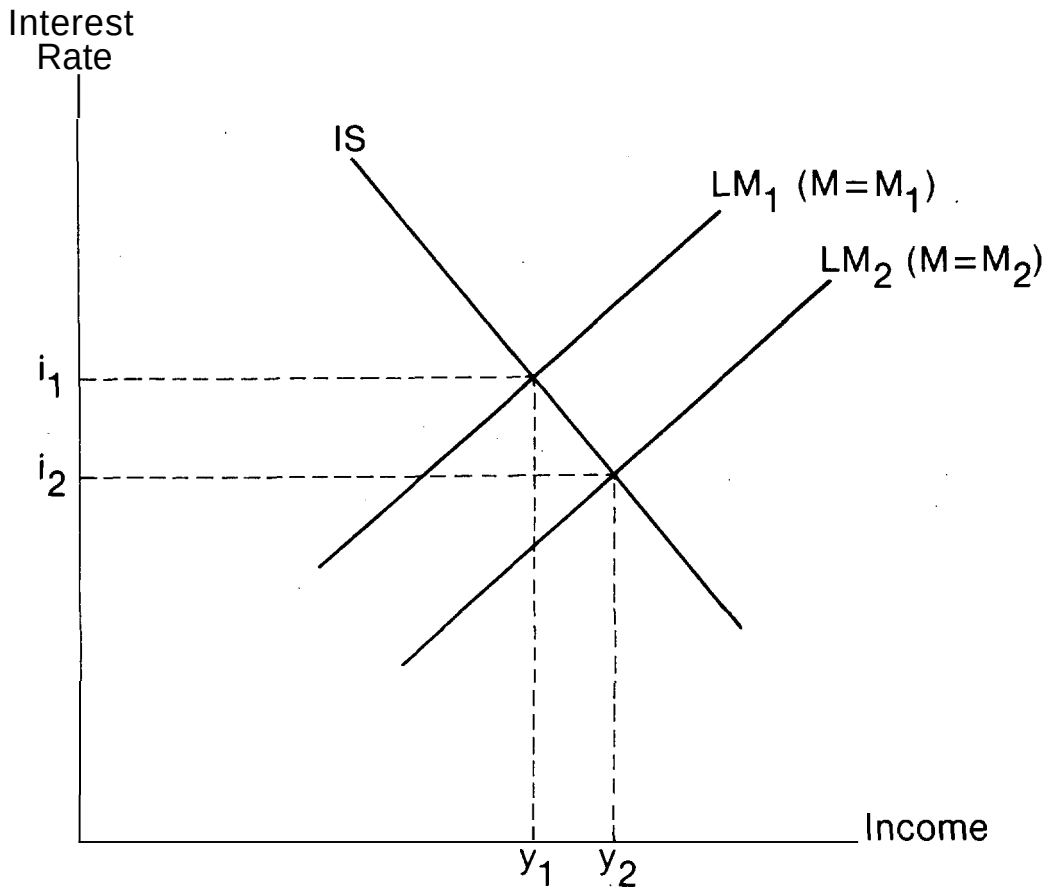



## CHOOSING THE INSTRUMENT

The IS-LM model may be'used to analyze the choice of the best instrument to use in conducting monetary policy.[3] This section treats the choice between the interest rate and the money supply, while the following section

[3] The IS-LM model was first used to rigorously analyze the problem of instrument choice in William Poole, "Optimal Choice of Monetary Policy in a Simple Stochastic Macro Model," *Quarterly Journal of Economics.* Vol. 84 (May 1970). pp. 197-216. Also, see Stephen F. LeRoy and David E. Lindsey, "Determining the Monetary Instrument: A Diagrammatic Exposition," *Special Studies Paper No. 103,* Board of Governors of the Federal Reserve System (1977); LeRoy and Roger N. Waud, "Applications of the Kalman Filter in Short-Run Monetary Control," *International Economic Review,* Vol. 18, No. 1 (February 1977), pp. 195-207; and Benjamin M. Friedman, "The Inefficiency of Short-Run Monetary Targets for Monetary Policy, Comments and Discussion," *Brookings Papers on Economic Activity.* (1977:2), the Brookings Institution, Washington. D.C., pp. 293-346.

**Figure 4**
**IMPACT OF A CHANGE IN THE MONEY SUPPLY**




discusses the possibility of using both variables. In general, the relative efficacy of the two variables as instruments depends on the relative closeness of their relationship to the goal variable, national income. Relative closeness depends on the characteristics of the IS and LM functions, linking the interest rate, money supply, and income. In particular, relative closeness depends especially on whether and to what extent the two functions are stable.

In view of the importance of stability, this section's analysis of instrument choice is divided into four parts distinguished by the extent of stability. In the first part, both the real and the monetary sectors are assumed to be stable. In the second part, the real sector is stable, but the monetary sector is unstable. In the third part, the real sector is unstable, but the monetary sector is stable; and in the fourth part, both sectors are assumed to be unstable.

The analysis of the better instrument is preceded by a brief discussion of the meaning of stability and instability.

## Meaning of Stability and Instability

Stability in both the real and monetary sectors means that the IS and LM functions remain in the positions they are expected to occupy and do not fluctuate away from or around their expected positions. For the IS function to be stable, policymakers must know the precise levels of investment that investors plan at various interest rate levels, as well as the precise amounts of consumption and saving that consumers and savers plan to undertake at various income levels. For the LM function to be stable, policymakers must know the precise quantities of money demanded at various interest rate and income levels.

Instability in the monetary sector means that the LM function fluctuates around its expected position. That is, for various rates of interest, equilibrium income levels fluctuate above and below expected levels of income. Instability in the LM function arises when policymakers do not know the precise quantities of money balances that are demanded at various interest rate and income levels. Thus, they do not know, for various rates of interest, the precise levels of income that are consistent with equilibrium in the monetary sector of the economy. However, while policymakers are uncertain about the precise position of the LM function, they can estimate its expected position. That is, for various interest rate levels, they can estimate the levels of income that are expected to be consistent with monetary sector equilibrium.

Instability in the real sector means that the IS function fluctuates around its expected position. Instability in the IS function arises when policymakers do not know the precise amounts of investment that are planned at various interest rate levels or the precise amounts of consumption and saving that are planned at various income levels. Thus, policymakers do not know, for various interest rate levels, the precise levels of income that are consistent with equilibrium in the real sector of the economy. However, while policymakers are uncertain about the precise position of the IS function, they can estimate its expected position.

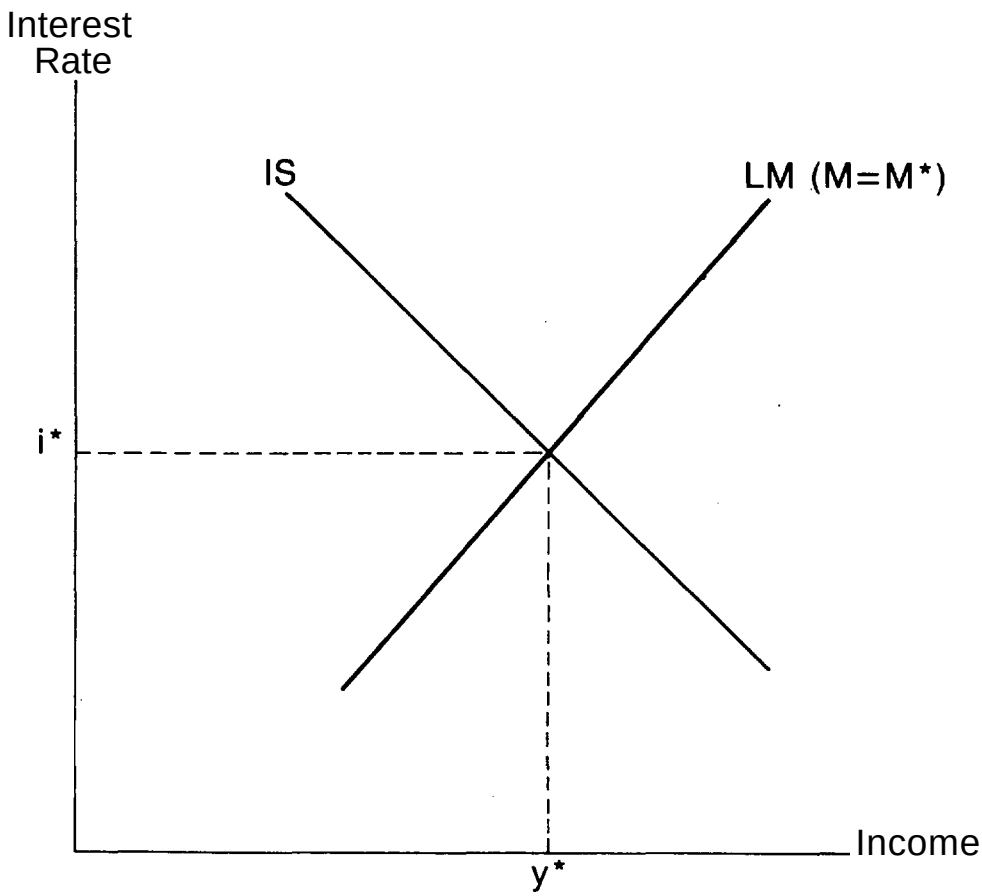
## Instrument Choice Under Stable Conditions

If both the monetary and real sectors are stable, neither an interest rate policy nor a money supply policy is preferred. Both policies are equally good because the target level of income is achieved by using either the interest rate or the money supply as an instrument variable.

Under stable conditions, an interest rate policy maintains the interest rate at that level associated with the target level of income, as indicated by the IS function. This is the interest rate that leads to a level of investment sufficient to generate the target level of income. The "maintained" interest rate level may be designated as $i^*$ and the target level of income may be designated as $y^*$. (See Figure 5.) By maintaining the interest rate at $i^*$, the target level of income, $y^*$, is achieved. (Throughout this article, $i^*$ designates the interest rate that is maintained under an interest rate policy, and $y^*$ designates the target level of income.)

A money supply policy maintains the money supply at the level that causes the LM function to intersect the IS function at the target level of income. This is the money supply that equals the quantity of money demanded when income is at the target level. The maintained level of the money supply may be designated at $M^*$. As shown in Figure 5, by maintaining the money supply at $M^*$, the target level of income, $y^*$, is

**Figure 5**
**STABILITY IN REAL AND MONETARY SECTORS**



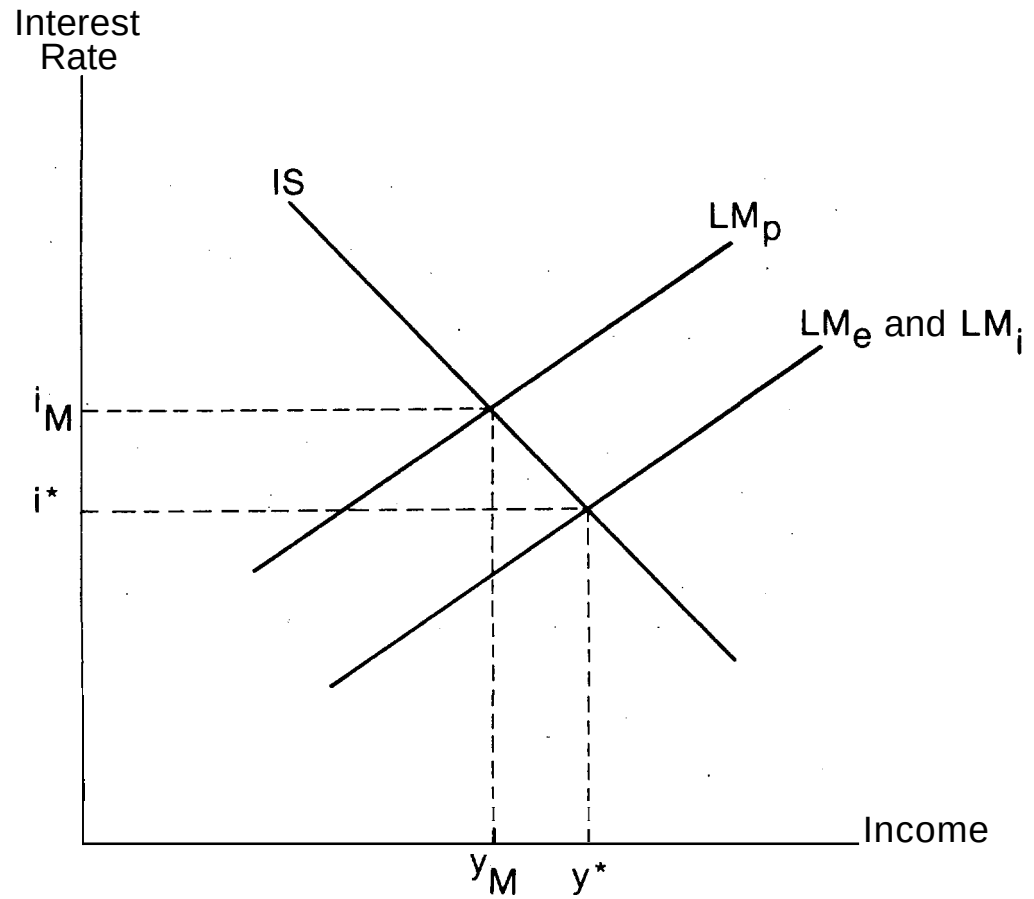

achieved. (Throughout this article, M* designates the money supply that is maintained under a money supply policy.)

To summarize, if both the monetary and real sectors are stable, there is no difference between using the money supply and the interest rate as the instrument variable. Use of either variable achieves the target income level. Moreover, maintaining the interest rate at i* under an interest rate policy results in a money supply of M*—the maintained level under a money supply policy. Similarly, maintaining M* results in i*. In other words, i* implies M* and M* implies i*.

### Instrument Choice Under Instability in the Monetary Sector

If the real sector is stable but the monetary sector of the economy is unstable, an interest rate policy is better than a money supply policy. The interest rate policy is better because the target level of income is achieved when using

**Figure 6**
**INSTABILITY IN THE MONETARY SECTOR**




NOTE: $LM_e$ represents the LM function that is expected when M* is maintained; $LM_p$ represents the function that may possibly result when M* is maintained; and $LM_i$ represents the function that results when i* is maintained.

the interest rate, but the target income may not be achieved when using the money supply.

Under these conditions of stability in the real and instability in the monetary sectors, an interest rate policy maintains the interest rate at the level associated with the target level of income, according to the IS function. As above, maintaining the interest rate at i* achieves y*.

A money supply policy maintains the money supply at that level that causes the expected LM function to intersect the IS function at the target level of income. However, in this case, maintaining the money supply at M* does not ensure the achievement of the target level' of income because the LM function fluctuates and is unstable, as illustrated in Figure 6. In the figure, the expected LM function is labeled $LM_e$. The function may fluctuate, though,

possibly shifting "leftward" to $LM_p$. (Throughout the remainder of the article, $LM_e$ indicates the expected LM function when the money supply is maintained at M*, while $LM_p$ indicates the function that may possibly result when the money supply is maintained at M*.) The leftward shift may be due to economic units temporarily demanding a greater than expected quantity of money balances. If the LM function shifts leftward to $LM_p$, the level of income achieved by maintaining the money supply at M* is $y_p$, which is less than y*. Alternatively, the LM function may shift "rightward" due to units demanding a smaller than expected quantity of money balances. In this case (not shown in Figure 6), the achieved level of income is greater than the target level.

In summary, if conditions are stable in the real sector but unstable in the monetary sector, the interest rate is better than the money supply as an instrument variable. Moreover, unlike the previous case, there is a difference between using the two variables. In this case, i* does not necessarily imply M*. Maintaining the interest rate at i* may result in a money supply either above or below M*, as the LM function fluctuates around its most likely position. In the case illustrated in Figure 6 of a leftward shift in the LM function to $LM_p$—due to a greater than expected demand for money—the money supply that results from maintaining i* is higher than M*. The higher level of money balances (which, under an interest rate policy, holds the LM function at the expected position) is needed to provide for the greater than expected demand for money. Similarly, maintaining the money supply at M* may result in an interest rate above or below i*. In the case of a leftward shift in the LM function, the level of the interest rate that results from maintaining M* is higher than i*. The higher interest rate (designated by $i_M$) is needed to reduce the greater than expected demand for money balances.

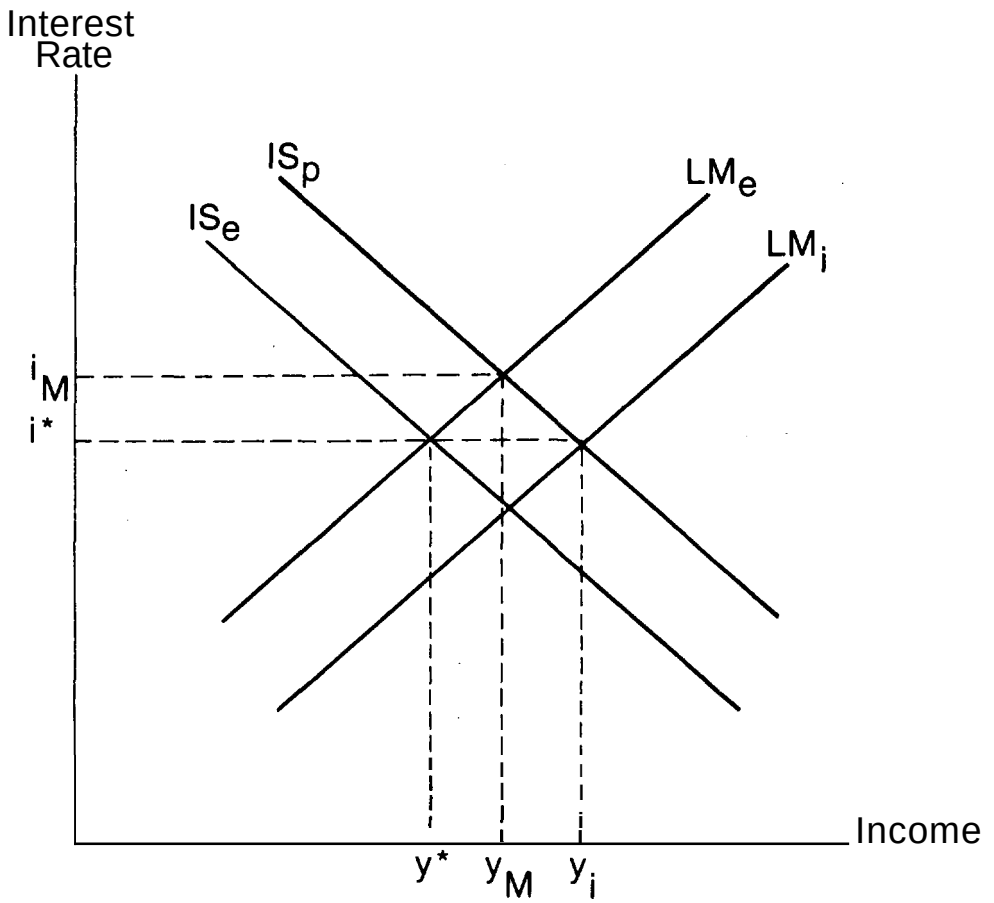
## Instrument Choice Under Instability in the Real Sector

If the monetary sector is stable but the real sector of the economy is unstable, a money supply policy is better than an interest rate policy. The money supply policy is better because, while the precise target level of income is not achieved by using either instrument, the divergence between the income level achieved and the target level will be less when using the money supply than when using the interest rate as an instrument variable.

Under conditions of monetary stability and real sector instability, an interest rate policy maintains the interest rate at that level associated with the target level of income as indicated by the IS function, assuming the function occupies its expected position. However, maintaining the interest rate at i* does not ensure achievement of the target level of income. This is because the IS function fluctuates and is unstable, as illustrated in Figure 7. In the figure, the expected IS function is labeled $IS_e$. The function may fluctuate, though, possibly shifting rightward to $IS_p$. (Through the remainder of the article, $IS_e$ indicates the expected IS function, while $IS_p$ indicates a possible function.) The rightward shift may be due to economic units temporarily investing more than expected. If the IS function shifts rightward to $IS_p$, the level of income achieved by setting the interest rate at i* is $y_i$, which is more than y*. Alternatively, the IS function may shift leftward due to units temporarily investing a smaller than expected amount. In this case (not shown in Figure 7), the achieved level of income is less than the target level.

A money supply policy maintains the money supply at that level that causes the LM function to intersect the expected IS function at the target level of income, assuming the IS function occupies its expected position. However, M* does not ensure achievement of the target level

**Figure 7**
**INSTABILITY IN THE REAL SECTOR**

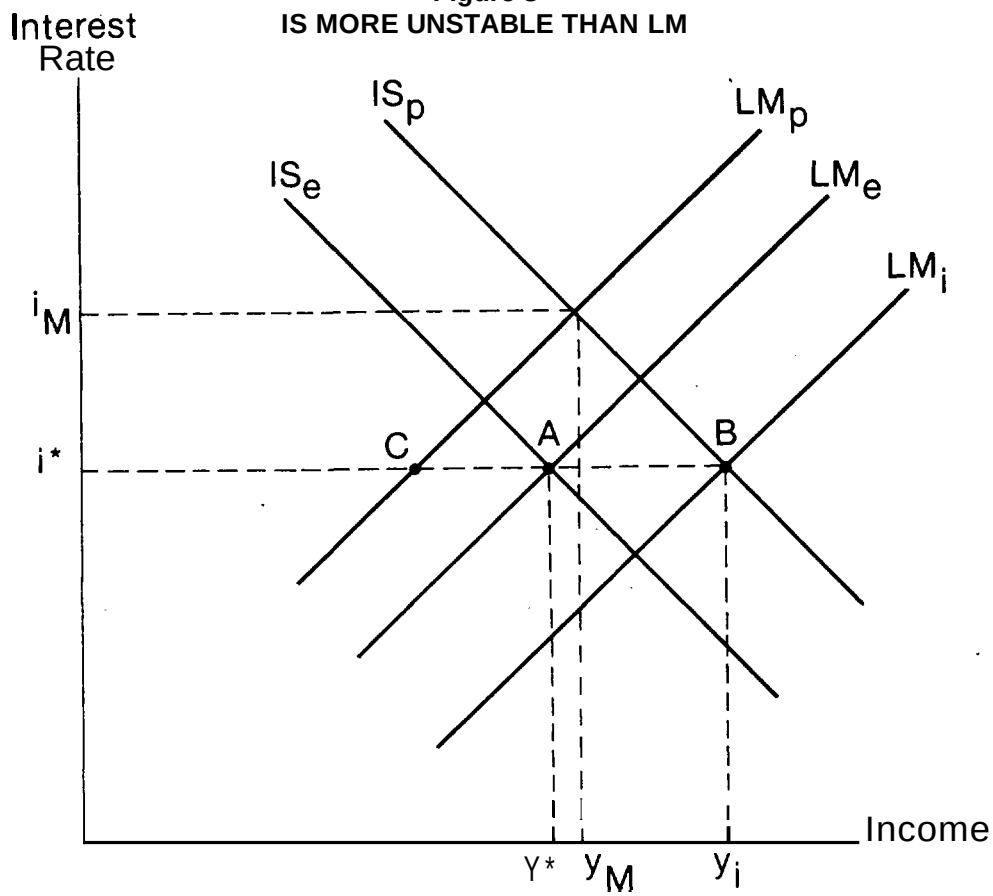



**NOTE: $LM_e$ represents the LM function that is expected when $M^*$ is maintained; $LM_p$ represents the function that may possibly result when $M^*$ is maintained; and $LM_i$ represents the function that results when $i^*$ is maintained.**

of income because the IS function is unstable. In the case illustrated in Figure 7 of the rightward shift in the IS function to $IS_p$, the level of income achieved by maintaining the money supply at M* is $y_M$, which is greater than y*. In the case of a leftward shift in the IS function (not shown in Figure 7), the level of income achieved by maintaining the money supply at M* is less than the target level.

In summary, if conditions are stable in the monetary sector but unstable in the real sector, the money supply is better than the interest rate as an instrument variable because the divergence between the achieved level of income and the target level is less when using the money supply than when using the interest rate. The smaller divergence is illustrated in Figure 7, which shows' that the difference

**Figure 8**
**IS MORE UNSTABLE THAN LM**




NOTE: $LM_e$ represents the LM function that is expected when M* is maintained; $LM_p$ represents the function that may possibly result when $M^*$ is maintained; and $LM_i$ represents the function that results when $i^*$ is maintained.

between y* and $y_M$—the level of income achieved when using the money supply—is less than the difference between y* and $y_i$—the level of income achieved using the interest rate. Moreover, there is a difference between the two policies, as i* does not imply M* and M* does not imply i*. Maintaining the interest rate at $i^*$ may result in a money supply either above or below M*, as the IS curve fluctuates around its most likely position. Similarly, maintaining the money supply at M* may result in an interest rate either above or below i*.

## Instrument Choice Under Instability in the Real and Monetary Sectors

If conditions are unstable in both the real and monetary sectors, either the interest rate or the money supply may be the best instrument variable, depending on certain factors. One factor is the relative instability of the IS and LM functions. As illustrated in Figure 8, a money supply policy is preferred if the IS function is less stable than the LM function. The figure assumes a rightward IS shift and a

leftward LM shift, with the IS shift being more pronounced. The greater IS shift may be verified by noting that the distance between points A and B exceeds that between points A and C. Figure 8 shows that a money supply policy is preferred because the divergence between y* and $y_M$ is less than the divergence between y* and $y_i$.

Since a money supply policy is preferred if the IS function is less stable than the LM function, the analyst might expect that an interest rate policy is preferred if the LM function is less stable. However, in the case of a less stable LM function, an interest rate policy is not necessarily preferred. The policy choice depends on the extent the LM function is less stable as well as on the slopes of the two functions. Ignoring the slopes, the money supply tends to be the better instrument if the instability of the LM function exceeds the IS function's instability by a small amount. If the excess instability of the LM function is large, however, the interest rate tends to be the better variable.

Figure 9 illustrates the impact on instrument choice of the degree of excess LM instability. The figure assumes a rightward IS shift and two alternative leftward LM shifts. Both LM shifts exceed the IS shift, with the shift labeled $LM_p'$, exceeding the IS shift by a larger amount than does the shift labeled $LM_p$. (Note that both line segments AC and AD exceed AB.) In the case of the relatively small shift to $LM_p$, a money supply policy is preferred even though the LM shift exceeds the IS shift. In the case of the relatively large LM shift to $LM_p$, however, an interest rate policy is preferred.

In addition to stability, the choice of an instrument depends on the slope of the IS and LM functions. The slope of a function refers to the relative changes in the interest rate and income that occur between equilibrium combinations of the two variables. The slope is "steep" if, for any given change in the interest rate, the change in income is small. The slope is "flat" if, for any given change in the interest rate, the change in income is large.

Ignoring the degree of excess instability of the LM function, if the LM function is relatively steep (flat), the interest rate (money supply) tends to be the better variable. The LM function is relatively steep (flat) if the demand for money is relatively insensitive (sensitive) to interest rate changes. Thus, an interest rate (money supply) policy tends to be preferred if the demand for money is relatively insensitive (sensitive) to changes in the rate of interest.

If the IS function is relatively steep (flat), the money supply (interest rate) tends to be the better instrument variable. The IS function is relatively steep (flat) if the demand for investment is relatively insensitive (sensitive) to interest rate changes. Thus, a money supply (interest rate) policy tends to be preferred if the demand for investment is relatively insensitive (sensitive) to changes in the rate of interest.[4]

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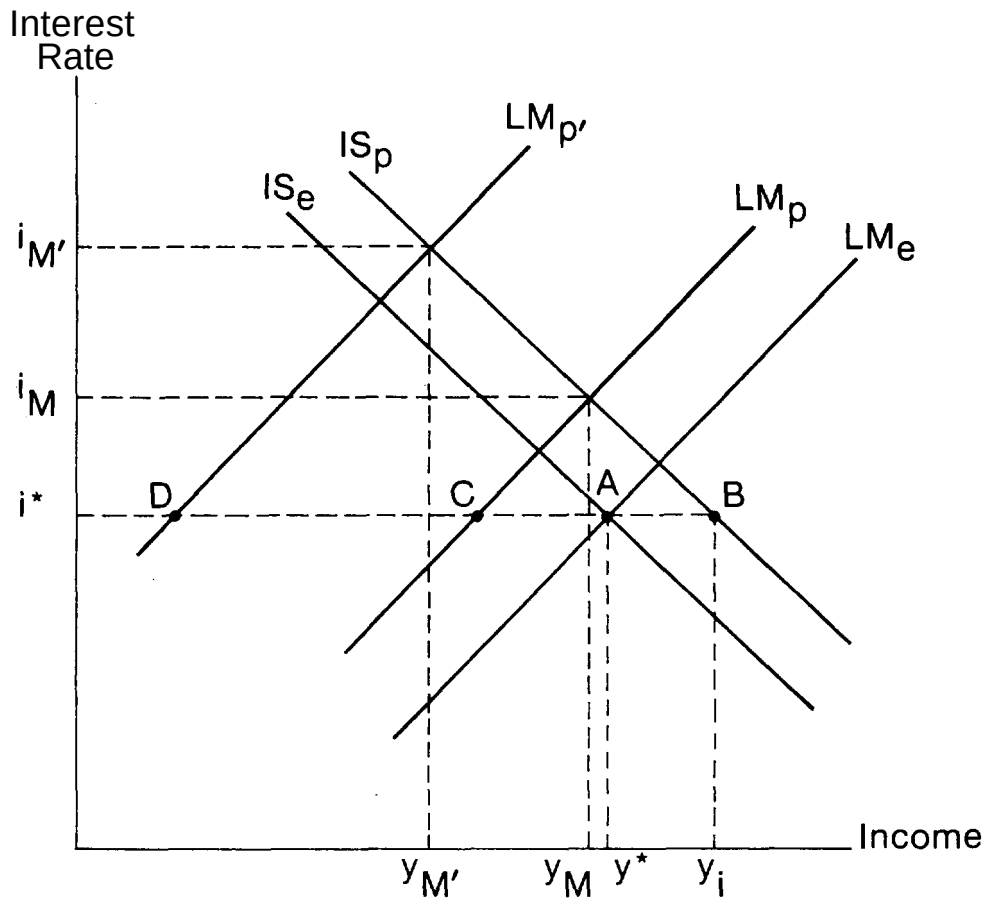
4 The impact on instrument choice of the slope of the LM function can be illustrated by envisaging the impact on $y_M$ of a progressive steepening of the LM function labeled $LM_p$ in Figure 9. The steepening would be shown by a counterclockwise rotation of $LM_p$ around an axis located at point C. As $LM_p$ rotates and becomes steeper, $y_M$ becomes progressively further from y*. This increases the divergence between $y_M$ and y* and increases the likelihood that a money supply policy is inferior to an interest rate policy. (Note that the rotation in $LM_p$ does not affect $y_i$.)

The impact on instrument choice of the slope of the IS function can be illustrated by envisaging the impact on $y_M$ of a progressive steepening of the IS function labeled $IS_p$. The steepening would be shown by a clockwise rotation of $IS_p$ around an axis at point B. As $IS_p$ rotates and becomes steeper, $y_M$ becomes progressively closer to y*, increasing the likelihood that a money supply policy is preferred to an interest rate policy. (Note again that the rotation in $IS_p$ does not affect $y_i$. Also note that at some point, the clockwise rotation of $IS_p$ moves $y_M$ above y* and a further rotation beyond this point Increases the divergence between $y_M$ and y*. However, the divergence cannot exceed the divergence between y* and $y_i$ Thus, it cannot result in conditions whereby an interest rate policy is preferred.)

**Figure 9**
**LM MORE UNSTABLE THAN IS**




NOTE: $LM_p$ and $LM_{p'}$ represent functions that may possibly result when $M^*$ is maintained. The function labeled $LM_i$ was not drawn; it would intersect $IS_p$ at point B.

## COMBINATION POLICY

This section discusses the possibility that using both the interest rate and the money supply as instrument variables may be preferred to using either one or the other. The use of both instruments is referred to as a combination policy. Under a combination policy — instead of maintaining either the interest rate or the money supply at some specified level — policymakers move both variables in response to shifts in the IS and LM functions.

If precise information is available about shifts that occur in the functions, a combination policy is the preferred policy. For example, in the case illustrated in Figure 9, a combination policy would move the interest

rate above i*, and move the money supply above M*. The policy would achieve the target income level, y*, and would therefore be preferred to an interest rate or a money supply policy. While a combination policy is preferred, its implementation may not be feasible because information about shifts in the IS and LM functions may not be available. An assumption that policymakers have precise information about the shifts is unrealistic and is equivalent to assuming that the functions are stable.

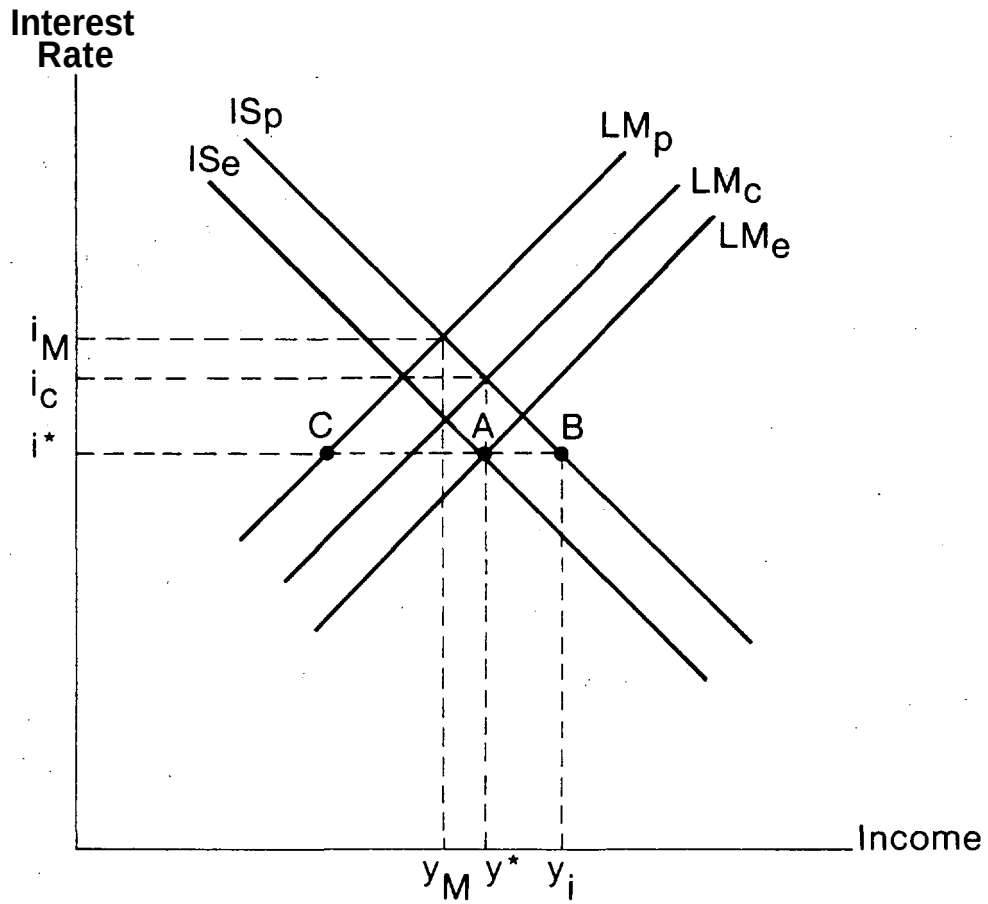
Some information, however, may be available that may possibly allow implementation of a combination policy. In general, three types of information may be available. First, some information is provided by observing the money supply and the interest rate. Thus, observed deviations of the interest rate away from i*, when the money supply is maintained at M*, indicate that the IS and LM functions have shifted. An observed tendency for the interest rate to move above i* indicates a probable leftward shift in the LM function and a rightward shift in the IS function because leftward LM shifts and rightward IS shifts tend to place upward pressure on the interest rate. Similarly, a tendency for the interest rate to move below i* indicates a leftward IS shift and a rightward LM shift.[5]

Information provided by observing the interest rate and the money supply, however, is not sufficient to support implementation of a combination policy. This is because the information indicates only the probable direction of IS and LM shifts and does not indicate their probable extent. For example, upward interest rate pressure may reflect either large IS and small LM shifts or small IS and large LM shifts. A large IS shift would call for a combination policy that moves the interest rate above i* by a large amount, while a small IS shift would call for a policy that moves the interest rate above i* by a small amount. Moreover, no basis would exist for determining the desirable course of action. Thus, information provided by observing the interest rate and the money supply is insufficient to allow the implementation of a combination policy.

A second type of available information may be about the relative stability of the IS and LM functions. For example, past experience may show that one of the functions tends to be more unstable than the other. Under these circumstances, it may be reasonable to assume that the more unstable function shifts more than the other one. This information about the relative stability of the IS and LM functions, along with information provided by observing the interest rate and money supply, may be sufficient to allow the implementation of a combination policy. The implementation may be based on two reasonable assumptions: (1) pressure on the interest rate to move away from i*, when M* is maintained, reflects counterdirectional shifts in the IS and LM functions; and (2) the extent of the shifts in the functions reflect their relative stability, as indicated by past experience. Implementing a combination policy is illustrated in Figure 10. In the figure, when M* is maintained, the interest rate tends to move above i* to $i_M$. It is assumed that the pressure on the interest rate

**5 The assumption that upward (downward) pressure on the interest rate is due to rightward (leftward) shifts in the IS function and to leftward (rightward) shifts in the LM function is based on the reasonable assumptions that some relationship exists between the magnitude of shifts and that small shifts are more likely to occur than large ones. In other words, any given degree of pressure on the interest rate most likely reflects the smallest possible shifts in each of the functions that would be consistent with the relationship and would produce the given degree of pressure. This implies, for example, that any given deviation of the interest rate above i*, when M* is maintained, is more likely to be caused by a small rightward IS shift and a small leftward LM shift than by, say, a large leftward IS shift and a large leftward LM shift.**

**Figure 10**
**THE COMBINATION POLICY**




**NOTE: $LM_c$ represents the LM function that results when the money supply is moved to $M_c$. $LM_i$ is omitted.**

reflects rightward IS and leftward LM shifts, and the LM shift is twice the IS shift. The greater LM shift may be verified by noting that the distance between points A and C on the chart is twice the distance between points A and B. If the functions shift as assumed, the combination policy achieves y* by moving the interest rate to $i_c$ and the money supply to $M_c$.[6] Thus, the policy would be preferred to either

[6] **The combination policy assumes that the IS and LM functions shift in accordance with the ratio of the variances of the shifts. For a complete treatment of the combination policy, see LeRoy and Lindsey, "Determining the Monetary Instrument," cited earlier.**

an interest rate policy or a money supply policy.

Of course, the combination policy would not always achieve y*. The IS and LM functions would not always shift in accordance with past experience; that is, the two assumptions stated in the preceding paragraph would not always be realized. Nevertheless, the combination policy would be preferred because it would result, on average, in smaller divergencies between the achieved and target income levels than an interest rate or a money supply policy.

A third type of information may be about the behavior of income. While it is unrealistic to assume that the precise level of income is observed during the decision period, some information may be available about the extent that income is deviating from the target level. Suppose, for example, that information is available to indicate that income is falling below the target level. Also, assume that the LM curve is known to be more unstable than the IS curve, and that the interest rate tends to move above i* when M* is maintained. Under these circumstances, as above, it is reasonable to assume that the IS curve has shifted rightward and the LM curve has shifted leftward, with the LM shift being more pronounced than the IS shift. In this case, though, the assumption of the leftward LM and the rightward IS shifts is solidified by the observation of a shortfall in income below the target level because these shifts tend to reduce income while opposite shifts tend to increase income. Thus, a combination policy may be implemented with increased confidence.

## CONCLUSIONS

This analysis of the choice of a monetary instrument leads to several conclusions. One is that the choice depends importantly on the relative stability of the relationships among economic variables. The money supply tends to be better than the interest rate as a monetary instrument to the extent that the demand for money function is stable and the demand for investment and the saving functions are unstable. The interest rate is better to the extent that the demand for money function is unstable and the demand for investment and the saving functions are stable.

Another conclusion is that instrument choice also depends on the sensitivity of the demand for money and investment to changes in the rate of interest. The money supply is the better instrument variable to the extent that the demand for money is sensitive and the demand for investment is insensitive to changes in the rate of interest. The interest rate is better to the extent that the demand for money is insensitive and the demand for investment is sensitive to changes in the rate of interest.

A third conclusion is that a combination policy—using both variables as instruments—may be more effective than using either the money supply or the interest rate. The combination policy is better to the extent that information is available on the extent of stability in the relationships among economic variables and on the current behavior of economic variables.