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THE INTEREST ELASTICITY OF MONEY DEMAND
IN THE NEW FINANCIAL ENVIRONMENT

by

AHMET BAYTAS

A dissertation submitted to the Graduate Faculty
in Economics in partial fulfillment of the
requirements for the degree of Doctor of
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Abstract

THE INTEREST ELASTICITY OF MONEY DEMAND IN THE NEW FINANCIAL ENVIRONMENT

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The recent financial changes stemming from spontaneous or induced market developments, regulatory reforms, and changes in the Fed's operating procedures have led to an array of new financial instruments with both transaction and investment characteristics, changing opportunity cost of holding money, blurred distinction between money and other financial assets as well as blurred distinction between commercial banks and other financial intermediaries. Recent years have also witnessed the rapid spread of cash-management techniques, automation of financial industry and increasing reliance on market-determined interest rates. Naturally, these developments have disturbed or altered the relationship between money stock and the economy. An enormous body of literature has thus emerged examining the role of monetary policy in the new financial environment and searching for a stable money demand function. The status of interest elasticity of money demand in the light of these

developments, however, has only received incomplete and indirect attention, although its relevance for the slope of the LM curve and the conduct of monetary policy has been well established. The main purpose of this study is to analyze the impact of various developments on the interest elasticity of money demand. Has it increased over time as Gurley and Shaw predicted? What have been the effects of new instruments, such as negotiable order of withdrawal accounts, repurchase agreements and money market mutual funds? How would the interest sensitivities of monetary aggregates compare? Answers to these questions are searched both at theoretical and empirical levels. Although a reduced interest elasticity has been widely predicted, particularly after the Depository Institutions Deregulation and Monetary Control Act of 1980, our findings suggest an increased elasticity of various monetary aggregates with respect to open market rates. However, once the deregulation process is completed and flows of funds among various balances are settled, a lower interest elasticity may still be realized.

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CHAPTER I

INTRODUCTION

The recent changes in the financial environment have raised serious questions concerning the competitive structure of the financial sector, the role of various financial intermediaries in financial markets, the supervision and (de)regulation of financial institutions, the degree of substitutability among various financial assets, and, above all, the stability of the money demand function and the conduct and effectiveness of monetary policy. These are, of course, interrelated questions, and, to be sure, they have received some attention earlier: the 1950s and 1960s witnessed the classic works of Gurley and Shaw on the role of financial intermediaries, and of Baumol, Tobin, Friedman, Chow, and Laidler, to name a few, on the demand for money. It was, however, after the apparent shift in the money demand function in 1974, and, in particular, after the recent regulatory, institutional, and technological changes that the stability of the money demand function and its implications for monetary policy have come to the forefront of macroeconomic discussions. Indeed, an enormous body of literature has emerged in recent years, examining the role of monetary policy in the new financial

environment and searching for a stable money demand function.¹

In the post-1973 literature, which followed the pioneering work of Goldfeld,² almost all attention has been devoted to the alleged shifts in the money demand function in 1974, 1978-79, 1980-81, and the velocity decline in 1982-83. Of these, the downward shift in 1974 and the velocity decline in 1982-83 are widely recognized. Most work, in the quest of providing an explanation for these shifts and restoring the stability of the money demand function, has respecified the Goldfeld's "conventional" function, by redefining the monetary aggregate, by reinterpreting or discarding the partial adjustment mechanism, by including interest rate or income ratchet variables, time trends or dummy variables, by replacing GNP by a debit variable as the transactions variable, and so on. A second strand of research has questioned the validity of the conventional function and its derivatives, especially their econometric properties.³

1. For a survey of the literature, see, John P. Judd and John L. Scadding, "The Search for a Stable Money Demand Function: A Survey of the Post-1973 Literature," (hereinafter referred to as "Survey") Journal of Economic Literature, XX, No.3 (Sept., 1982), pp. 993-1023, and Vince V. Roley, "Money Demand Predictability" (hereinafter referred to as "Predictability") (paper prepared for Conference on "Monetary Policy in a Changing Financial Environment," Washington, D.C., Feb.8, 1985).

2. Stephen M. Goldfeld, "The Demand for Money Revisited," (hereinafter referred to as "Revisited") Brookings Papers on Economic Activity, 3:1973, pp. 577-638.

Theoretical investigation and empirical findings in this study, too, will reveal the status of the conventional money demand function to some extent, although this will not be the primary consideration. The purpose of this study, instead, is to analyze the impact of recent developments on the interest elasticity of money demand: Has the latter increased over time as Gurley and Shaw predicted? What have been the effects of new financial instruments on the interest elasticity and how would the interest sensitivities of various monetary aggregates compare?

Generally speaking, these questions, central to the present study, have only received partial and indirect attention in the existing literature, with the exception of the works of Cagan and Schwartz, and Hafer and Hein.⁴ Yet Cagan and Schwartz's work, which found no significant change in the interest elasticity of money demand over time, dates back to 1975 and therefore does not capture the impact of more recent developments. On the other hand, Hafer and Hein's work covers the period only up to 1979. Moreover,

3. Both lines of research are summarized in Jared Enzler, Lewis Johnson and John Paulus, "Some Problems of Money Demand," (hereinafter referred to as "Some Problems") Brookings Papers of Economic Activity, 1:1976, pp. 261-80, and in Judd and Scadding, "Survey," pp. 997 ff.

4. Phillip Cagan and Anna J. Schwartz, "Has the Growth of Money Substitutes Hindered Monetary Policy?" (hereinafter referred to as "Money Substitutes") Journal of Money, Credit and Banking, VII, No.2 (May, 1975), pp. 137-59, and R. W. Hafer and Scott E. Hein, "Financial Innovations and the Interest Elasticity of Money Demand: Some Historical Evidence," (hereinafter referred to as "Elasticity") Journal of Money, Credit and Banking, XVI, No.2 (May, 1984), pp. 246-52.

their work does not pay attention to possibly different effects of recent developments on the interest elasticity of money demand, which this study attempts to do. In addition to testing the Gurley and Shaw hypothesis, our study also tries to rank various monetary aggregates according to their interest elasticities.

The importance of the interest elasticity of money demand arises from its relation to the LM curve and thus the conduct of monetary policy. As Cagan and Schwartz argued, this link between the efficacy of monetary policy and interest elasticity has been widely debated.⁵ In the standard IS-LM model, monetary policy will affect spending in the economy, except for the case known as liquidity trap (perfectly elastic LM curve). With changing interest elasticity of money demand and thus the slope of the LM curve, what changes is "the size of the operation required to produce the desired effect on spending in the short-run."⁶ The natural question then is why be concerned about large operations, especially when it has been established that "the resource cost of open market operations [does] not rise with increases in size,"⁷ as the marginal cost of creating money is near zero. One possible problem with large operations would be the possibility of their being positively related to large

5. Cagan and Schwartz, "Money Substitutes," p. 137.

6. Ibid., p. 138.

7. Ibid., p. 138.

prediction errors, but Cagan and Schwartz admit that no such evidence exists.⁸

It is rather such claims as Tobin's that really justify the study of interest elasticity. Tobin has recently argued as follows:

Monetarist policy has made the LM curve more vertical in recent years. Structural changes are working in the same direction. Deregulation is allowing deposits to bear market-determined interest rates, which will move up or down with the rates depository institutions can earn on their assets. Thus the demand for deposits . . . will be much less sensitive to the general level of rates. In short, this reform itself is making the economy's natural LM curve much steeper.

The corollary of this statement is this: if initially the relevant parameters are chosen so as to minimize the loss function in the economy in the sense Poole has suggested,¹⁰ decreasing interest elasticity of money demand would have to be offset by increased interest sensitivity of money supply as the slope of the LM curve depends on the latter as well. This, of course, might have a significant bearing on how monetary policy is conducted.

8. Ibid., p. 138. In other words, high elasticity "would mean that operations large enough to do the job exposed the economy to large errors of policy."

9. James Tobin, "Monetary Policy: Rules, Targets, and Shocks" (Journal of Money, Credit and Banking Lecture, Western Economic Association, Seattle, July 23, 1983), p. 15.

10. See, William Poole, "Optimal Choice of Monetary Instruments in a Simple Stochastic Macro Model," Quarterly Journal of Economics, LXXXIV, No.2 (May, 1970), pp. 197-216.

Our findings, however, often indicate increased elasticities in recent years of various monetary aggregates, including M1.

Since our concern is to measure the interest elasticity of money demand under recent developments, we will first see the characteristics of the new financial environment, the causes of recent changes and their effects on monetary aggregates and their components. We will then study the money demand function and analyze the empirical findings.

CHAPTER II

THE NEW FINANCIAL ENVIRONMENT

1. Introduction

The recent financial changes stemming from spontaneous or induced market developments and regulatory reforms have provided an array of new and/or modified financial instruments and services. Most of these instruments have both transaction and investment characteristics.¹ M1 now includes interest earning checkable accounts and hence is probably contaminated by portfolio balances; on the other hand, some financial assets, such as money market mutual funds, which are excluded from M1, are occasionally used for transaction purposes. Consequently, "the nature of M1 as a measure of transaction balances has come under question."² Besides changing opportunity costs of holding money as well as

1. For details see, "Financial Innovation and Monetary Policy," (hereinafter referred to as "Financial Innovation") Federal Reserve Bulletin, LXVIII (July, 1982), p. 395.

2. R. W. Hafer, "The Money-GNP Link: Assessing Alternative Transactions Measures," (hereinafter referred to as "Money-GNP Link") Review, Federal Reserve Bank of St. Louis, LXVI, No.3 (March, 1984), p. 20.

changing composition and continuous redefinition of monetary aggregates, and blurred distinction between money and other financial assets, recent years have witnessed the rapid spread of various cash-management techniques, automation of financial industry, and a blurred distinction between commercial banks and non-bank financial intermediaries (NBFIs). The emerging environment, moreover, is characterized by the increasing reliance on market-determined interest rates and the increasing importance of "managed" liabilities.³ Given these developments, it is natural to expect that relationships between money stock measures and the economy is being "disturbed or altered."⁴

Perhaps the following lengthy passage best describes some of the features of the new financial environment:

To cite just one example, the retail firm of Sears Roebuck has become a financial conglomerate with a nationwide electronic funds transfer systems, company with more than 20 million customers, the capability to clear and settle third-party payments, a full-line subsidiary, a nationwide network of more than 1,000 offices, and ready access to the commercial paper

3. That is, financial institutions "design and actively market liabilities," implying that "the supply of deposits . . . must be on equal footing with the demand for such deposits; see, Michael Hadjimichalakis, Monetary Policy and Modern Money Markets (hereinafter referred to as Money Markets) (Lexington, Mass: D. C. Heath and Company, 1982), p. xv. Since the current process of change is not yet complete, the term "emerging" has sometimes been used to describe the "new" environment, see, Ibid., p. xv.

4. Thomas D. Simpson, "Changes in the Financial System: Implications for Monetary Policy," (hereinafter referred to as "Implications") Brookings Papers on Economic Activity, 1:1984, p. 250.

market. Sears has announced its intention to expand its provision of a wide variety of financial services to the public, including payments services.⁵

Following Hadjimichalakis,⁶ we will distinguish among three major sources of recent developments: financial innovations, regulatory changes, and changes in the Fed's operating procedures. We will examine each of these in detail below.

2. Financial Innovations

Financial innovations⁷ can be grouped under two categories: (A) innovations in cash-management techniques and cost-reducing technological innovations, and (B) innovations in liabilities offered. Note that these two developments have been contradictory in their impact on money demand: innovations in cash-management techniques, accompanied by technological progress in financial industry, particularly in data processing and communications, have reduced the need for cash and contributed to the "weakness"

5. "Financial Innovation," p. 395.

6. Hadjimichalakis, Money Markets, p. xv.

7. The term "innovation" is loosely employed throughout and should not necessarily imply that the change it is referring to has resulted in a gain from the social viewpoint. As Marty has shown, some financial innovations which reduce the amount of cash held (shift the demand curve for money to the left) do not constitute a "real saving from society's point of view," and are not "innovations" in the strict sense of the word; see, Alvin L. Marty, "Note," Journal of Political Economy, LXXV, Supplement, No.4, Part II (August, 1967), p. 507.

in M1 during the mid and late 1970s.⁸ Innovations in liabilities offered have, however, necessitated redefinition of M1 which now includes a broader range of assets, therefore strengthening it, especially during the 1980s.

A. Innovations in Cash-Management Techniques

Technological change is perhaps the most important feature of the new financial environment. In the business sector, information about cash-flows has been greatly improved by a variety of cash-management techniques such as lock-boxes, control disbursement techniques, payable through drafts, cash-concentration accounts, forecasting models, zero-balance accounts, and information retrieval systems.⁹ Control disbursement technique provides the firm with information about expected clearings against its account early in the day. As a result, the firm can reduce its cash holdings in excess of any unexpected outflows from its account, economizing in its use of money. Lock-boxes serve a similar function on the receipts side, i.e., increasing certainty about balances to be collected. Furthermore, wire

8. See, "Financial Innovation," pp. 394-95, and Phillip Cagan, "Financial Developments and the Erosion of Monetary Controls" (hereinafter referred to as "Erosion") (unpublished manuscript, 1979), p. 8.

9. For details, see, Richard D. Porter, Thomas D. Simpson and Eileen Mauskopf, "Financial Innovation and the Monetary Aggregates," (hereinafter referred to as "Monetary Aggregates") Brookings Papers on Economic Activity, 1:1981, pp. 218-19.

transfers now permit the firm to exploit the economies of scale which arises from operating one instead of many scattered accounts; "it can be shown that the optimal amount of cash in the concentration account is always less than the optimal cash balance held when separate accounts are maintained."¹⁰ Clearly, once the cash-concentration account is opened, the firm can balance contemporaneous cash outflows and cash inflows against each other. Zero balance accounts, on the other hand, allow the maintenance of a zero balance until the total volume of checks written against a particular account is known. At that time funds are transferred into the account to cover the payments. Of course, business firms will lower their cash-balances if by doing so they reduce the overall costs--which involve, besides the opportunity cost of holding cash, the cash-management or transactions costs.¹¹ Indications are that large corporations began to modify their cash-management procedures about 1973, while smaller ones found it more economical to utilize the new methods more recently.¹²

Cash-management improvements also include debit card, credit card, point of sale terminals, automated

10. Ibid. pp. 218-19. Also see, Judd and Scadding, "Survey," pp. 999.

11. See, M. H. Miller and Daniel Orr, "A Model of the Demand for Money by Firms," Quarterly Journal of Economics, LXXX, No.3 (Aug., 1966), pp. 413-35.

12. Porter, Simpson and Mauskopf, "Monetary Aggregates," p. 217.

clearing houses, revolving credit lines and automated teller machines which have affected the economy as a whole. Credit cards, for example, permit one to hold less cash balances by aiding the synchronization of one's receipts and expenditures; an economy in which "the use of credit cards is widespread would need less money to finance a given volume of transactions than one in which all payments must be made in cash."¹³ In addition, Simpson notes that many banks and financial organizations "offer consumers lines of credit that are secured by equity in real estate or holdings of securities, many of which are accessible by check."¹⁴ Meanwhile, payments practices are changing significantly as the use of automated clearing houses and the number of point of sale terminals expand rapidly. These changes permit the depositor to transfer funds among accounts as well as to make payment. Moreover, a large number of business firms now have on-line connections to their banks, enabling them to reduce labor costs. Consumers, too, can monitor their balances more readily with on-line systems.¹⁵

B. Innovations in Liabilities Offered

The developments outlined above, coupled with

13. David Laidler, The Demand for Money: Theories and Evidence (hereinafter referred to as Evidence) (2d ed.; New York: Harper and Row, 1977), p. 57.

14. Simpson, "Implications," p. 250.

15. Ibid., pp. 260-61.

regulatory reforms, have helped expand the number of liabilities offered by financial institutions. For our purposes, important innovations here include negotiable order of withdrawals (NOW) accounts, automatic transfer of savings (ATS) accounts, repurchase agreements (RPs), money market mutual funds (MMMFs), Super NOWs, money market deposit accounts (MMDA), and, finally, credit union share drafts (CUSD).¹⁶

The growth in the volume of short-term liquid assets such as RPs and MMMFs and of OCDs has been remarkable. Aside from providing transaction services or close substitutes for them, a common feature of these instruments is that they all earn a rate of return. As the fundamental changes in the payments system--for instance, settling transactions by an immediate transfer of funds that earn a rate of return from remote terminals into a national grid of clearing house computers--spread across the economy, one can anticipate an economy in which all financial assets except currency earning a rate of return.¹⁷ The evidence so far tends to imply that demand deposits in the traditional sense, i.e., earning a fixed zero return, will continue to decline in importance, for there will be alternative

16. Besides commercial banks and thrifts, many brokerage firms have begun offering accounts which permit transfer of funds between interest earning investment accounts and transaction balances. NOW, ATS, and CUSD will collectively be referred to as other checkable deposits (OCDs), following the terminology used by the Federal Reserve Board.

17. Cagan, "Erosion," p. 8.

accounts available with as much liquidity and accessibility as demand deposits while earning a rate of return. With interest on demand deposits fixed at zero, banks have been competing for funds by offering "implicit" interest, that is, by providing customers with better and broader range of services, thereby passing all excess profits to depositors in indirect ways.¹⁸

The concept of a NOW account first emerged in 1970 in Massachusetts when a mutual savings bank asked authorities to permit it to offer it. This demand was initially rejected; yet, in May 1972, the state supreme court overturned the denial. Soon after, in September 1972, mutual savings banks in New Hampshire were authorized to offer NOW accounts. In 1974, all depository institutions except credit unions in Massachusetts and New Hampshire could offer NOW accounts. The permission was extended to other Northeastern states and to New York by 1978, and to New Jersey in 1979. NOW accounts became legal nationwide in January 1981 with the passage of the Depository Institutions Deregulation and Monetary Control Act of 1980. They are available to individuals and to qualifying organizations (which basically include non-profit, religious, educational and charitable organizations). NOW accounts began to be

18. Some studies have incorporated a measure of implicit interest explicitly in the money demand function; see, for example, Benjamin Klein, "Competitive Interest Payments on Bank Deposits and the Long-Run Demand for Money," American Economic Review, LXIV, No.6 (Dec., 1974), pp. 931-49.

offered by savings banks to attract depositors. These accounts have permitted a depositor to write checks against his or her savings account. Therefore, NOW accounts were regarded in effect to be interest-earning demand deposits, although not so legally. Nowadays they are offered by most depository institutions and earn a regulated rate of interest.

ATS accounts were legalized nationwide in November 1978. They were first offered by commercial banks. By allowing the latter to cover overdrafts on checking accounts by automatic transfers from savings accounts, the authorities in effect permitted interest payments on checking balances. For funds can remain in savings accounts until they are transferred to demand deposits in the process of clearing checks. To be sure, such transfers were authorized by telephone prior to 1978, but that was "inconvenient for regular use and only worthwhile for covering large payments,"¹⁹ whereas they became more economical after the legalization of ATS accounts.

Drafts on credit union shares are very much like checks. The credit union authorizes a debit to its account when informed by its bank that a draft has reached. In August 1975 no more than "sixteen credit unions were providing this service; by the beginning of 1976, the number had reached fifty-five."²⁰ Now they are offered by almost

19. Cagan, "Erosion," p. 5.

all credit unions.

During the 1960s security dealers, and later commercial banks, began to borrow from corporations by buying demand deposits in exchange for a security and agreeing to repurchase the security at a later date at a predetermined price. Therefore, this form of borrowing funds has been termed repurchase agreements (RPs). Funds could be borrowed overnight (overnight RPs) or for a longer period of time (term RPs). The security itself does not physically change hands; it merely functions as a collateral on the loan, which usually takes the form of overnight transfer of bank reserves at a market-related rate of interest. In other words, demand deposit balance of a corporation is reduced at the end of the business day and restored at the beginning of the following day; hence, a market-related rate of interest (slightly lower than the federal funds rate) is earned. "In actuality, although not in law, interest was being paid to demand deposits,"²¹ thus constituting, in this sense, the counterpart of NOW and ATS accounts in the business world. The characteristics of RPs which make them relatively attractive are that they involve low default risk, low transaction costs, and earn a market-related rate of return. Furthermore, "other money

20. Enzler, Johnson and Paulus, "Some Problems," p. 273.

21. Donald Hester, "Innovations and Monetary Control," (hereinafter referred to as "Innovations") Brookings Papers on Economic Activity, 1:1981, p. 156.

market instruments such as Treasury bills and large negotiable certificates of deposits are not available at such short maturities (and thus involve a larger risk of capital loss)."²² The advantage to the bank is that it does not have to hold reserves against RPs, in accordance with a Fed stipulation in 1969, provided the collateral is a U.S. Treasury or Agency obligation. RPs were initially developed by security dealers as an economical way of financing their inventories. Hester claims that their use by banks were induced by the regulation Q ceilings for certificates of deposits, which led some larger banks to emulate the security dealers.²³

Individuals were not able to earn a market related interest on transaction balances through RPs because denominations of these transactions were often too large for them to participate. During 1972 MMMFs emerged--mutual funds designed to collect consumer savings in small amounts, to pool them and then to invest them in short-term money market instruments such as negotiable certificates of deposits, Treasury bills, and commercial paper, effectively increasing the divisibility of these instruments. Thus, MMMFs offer small savers the opportunity to invest in large denomination instruments and to earn a market-related rate of return on a highly liquid asset. Withdrawals of funds by check or wire is allowed in most cases; these

22. Judd and Scadding, "Survey," p. 999.

23. Hester, "Innovations," p. 156.

characteristics make MMMFs very attractive relative to demand deposits and savings deposits. As is observed, "In effect, they are a combination of an investment asset and a checking account that earns interest."²⁴

Super NOWs and MMDA both became available in 1982. Both of these accounts earn a market-related rate of interest linked directly to weekly changes in other market yields. Funds in MMDA can be transferred to a checking account by telephone or automatic teller machine and are insured to \$100,000. Super NOWs offer unlimited check writing privileges, but "up to six transfers per month may be made . . . no more than 3 by draft; however, an unlimited number of withdrawals can be made in person, including those from automatic teller machines."²⁵ MMDA and Super NOW both had minimum denomination requirements which were eliminated on Jan.1,1986.²⁶

3. Regulatory Changes

Among the recent regulatory changes the Depository Institutions Deregulation and Monetary Control Act (DID and MCA) of 1980 is no doubt the most important one. The DID

24. Hadjimichalakis, Money Markets, p. 21.

25. Simpson, "Implications," p. 260.

26. Initially, the minimum amount required to open MMDA and Super NOWs was \$2,500, which was lowered to \$1,000 starting January 1, 1985.

and MCA of 1980, approved on March 31, 1980, as Public Law 96-221, by President Carter, has been "described by Senator William A. Proxmire, Chairman of the Senate Committee on Banking, Housing, and Urban Affairs, as the most significant banking legislation since the passage of the Federal Reserve Act of 1913."²⁷ It is stated that "the Congress based its enactment of the DID and MCA of 1980 on finding that limitations on interest rates payable on deposits and accounts discourage persons from saving money,. . . and that all depositors, particularly those with modest savings, are entitled to receive a market rate of return on their savings."²⁸

Title I of the Act provides for uniform imposition of required reserves to all transaction balances, i.e., M1 deposits, at all depository institutions.²⁹ Provisions for required reserves were put into effect on September 1, 1980, although they were transitory, providing for an 8-year phase-in for non-member banks and a 4-year phase-in for member banks. Accordingly, all institutions were required to maintain a reserve of 3 percent against M1 deposits of

27. "The Depository Institutions Deregulation and Monetary Control Act of 1980," (hereinafter referred to as "Act of 1980") Federal Reserve Bulletin, LXIV (June, 1980), p. 444.

28. Ibid., p. 444.

29. Depository institutions include commercial banks, mutual savings banks, savings and loan associations, and credit unions. The provision applies to all institutions which are either federally insured or are eligible for federal insurance.

\$25 million or less and a reserve between 8 percent and 14 percent with an initial ratio of 12 percent for that portion of M1 deposits in excess of \$25 million. Also, effective March 31, 1980, "any depository institution holding reservable transactions accounts . . . is entitled to the same discount and borrowing privileges as member banks."³⁰ All depository institutions would now have equal access to services furnished by the Fed, including clearing of checks and using the Fed's wire services to transfer funds, which were formerly available to member banks without charge. As can be seen, the Title I blurred the traditional distinction between member and non-member banks, and between commercial banks and other financial institutions.

Titles II and III pertain to the liabilities of depository institutions. Title II phases out Regulation Q ceilings on interest rates that may be paid on savings accounts and time deposits.³¹ It also "authorizes the continuation of authority for banks to provide ATS from saving to checking accounts; for the establishment of remote service units by savings and loan associations for the purpose of crediting and debiting savings accounts . . . and for the offering of share draft accounts by federally

30. "Act of 1980," pp. 444-45.

31. First legislated in 1933 and now subject to orderly phase-out and ultimate elimination, Regulation Q was revised many times; for details, see Table 1 below.

TABLE 1. STEPS IN THE PHASE-OUT OF REGULATION Q

Date	Nature of Change
June 1878	Money Market certificates (MMC) established with minimum denomination of \$10,000.
Nov. 1978	ATS created.
Jan.1, 1981	NOW permitted nationwide; ceiling rates on NOW and ATS accounts set at 5.25%.
Dec.1, 1981	New category of IRA/Keogh accounts created with minimum maturity of 18 months; no interest ceiling, no minimum denomination.
May 1, 1982	New time deposit created with no interest ceiling, a required denomination of \$500 and an initial minimum maturity of 3.5 years.
Dec.14, 1982	MMDA created with minimum balance of not less than \$2,500; no interest ceiling, no minimum maturity, up to six transfers per month, unlimited withdrawals by mail or in person.
Jan.5, 1983	Super NOW created with the same features as MMDA except that unlimited transfers are permitted; interest rate ceiling eliminated and minimum denomination reduced to \$2,500 on 7-to-31-day account.
Oct.1, 1983	Minimum denomination reduced to \$2,500 on MMC. All interest rate ceilings eliminated except those on passbook and regular NOW accounts.
Jan.1, 1984	Rate differential between commercial banks and thrifts on passbook savings accounts eliminated. All depository institutions now pay a maximum of 5.5%.
Jan.1, 1985	Minimum denominations on MMDA and Super NOW reduced to \$1,000.
Jan.1, 1986	Minimum denominations on MMDA and Super NOW will be eliminated.

Source: R. Altan Gilbert and A. Steven Holland, "Has the Deregulation of Deposit Rates Raised Mortgage Rates?" Review, Federal Reserve Bank of St.Louis, LXVI, No.5 (May, 1984), p. 6.

insured credit unions."³² Title III, or the Consumer Checking Account Equity Act, authorized the nationwide introduction of NOW accounts as of December 31, 1980. The interest ceiling on these accounts will be completely lifted in 1986. Clearly, the Title II and Title III indicate the ultimate goal of market-determined interest rates. Prior to the DID and MCA of 1980 regulatory agencies allowed NBFIs to pay slightly higher interest rates on savings and time deposits, giving them a competitive edge against commercial banks which could offer a broader range of services. Phasing-out of Regulation Q ceilings has been controversial, since the interest rate differential has been vital for the existence of NBFIs. This differential was 0.5 percent until 1973 and 0.25 percent after 1973. On the other hand, NOW accounts and CUSD may be considered as means by which NBFIs can compete for potential deposits of commercial banks.

Titles IV and V concern the asset side of depository institutions. Title IV permits NBFIs to diversify their portfolio, a provision that "further blurs the distinction among financial institutions."³³ For example, Title IV allows savings and loan associations to invest up to 20 percent of their assets in consumer loans, commercial paper, and corporate debt securities. Moreover, the geographical restrictions to make real estate loans were removed. Finally, savings and loan associations were given authority

32. "Act of 1980," p. 449.

33. Hadjimichalakis, Money Markets, p. 30.

to issue credit cards and the ability of federal mutual savings banks to make loans was widened.

Note that the DID and MCA of 1980 shares a contradiction, or, we might say, a paradox, with most deregulations. For the DID and MCA of 1980 aims at reducing the amount of regulation to which all depository institutions are subject, eliminating inequities and imperfections to bring about competitive conditions, with the ultimate goal of increasing the effectiveness of monetary control. Since NBFIs, for example, had developed a number of deposits which in effect were M1 money, most provisions of the Act may have been warranted; yet now the Fed, in conducting monetary policy has to watch over a larger range of institutions and larger variety of liabilities offered by them. In fact, The New York Times recently reported what some experts call "reregulation," the increasing tendency towards stricter regulation and supervision of depository institutions by federal banking agencies. The government, it is said in the report, has acted out of "necessity after a record number of liquidations and distress mergers in 1985." Among the examples of this new "activism" are the following: The announcement by the Fed and the FDIC to increase the reserve requirements against risky loans from 6 to 9 percent; the Fed's decision to restrict the use of speculative high-yield certificates in hostile takeovers; and the severe restriction of the rate of deposit growth at thrifts and the

limitation of the kinds of investments these institutions can make, both of which are measures taken by the FHLBB in 1985.³⁴

In a sense, the DID and MCA of 1980 is a recognition of actual market developments that have been taking place. That is, it may be, to large extent, legalization of what has already been taking place. After all, OCDs were in use before the passage of the Act, though no doubt that the latter accelerated the process of change in financial markets.

There have been a number of other regulatory changes in the last decade. Beginning in 1975, savings and loan associations were allowed to make preauthorized payments by depositors to third parties to cover expenditures, which was previously restricted to household-related expenditures.³⁵ Commercial banks were also permitted to make such payments from savings accounts in 1975. Meanwhile, savings accounts became available to state and local governmental units in 1974 and to businesses in 1975.³⁶ Furthermore, member banks of the Federal Reserve System were authorized in 1975 to allow depositors to order transfer of funds from savings to checking accounts by telephone; such transfer of funds

34. New York Times, Feb. 18, 1986, p. D1.

35. Cagan, "Erosion," p. 5.

36. Savings accounts previously were restricted to non-profit organizations and individuals. Some limitations still remained in effect, though. For example, there was a limit of \$150,000 per business per bank.

became automatic beginning November 1, 1978, leading to the creation of ATS accounts. Finally, Garn-St.Germain Depository Institutions Act of 1982 allowed savings and loan associations to broaden their operating powers.

4. Changes in the Fed's Operating Procedures

The recent change in the Fed's operating procedures is another feature of the new financial environment. In October 1979 the Fed started targeting unborrowed reserves as opposed to the federal funds rate which it had been targeting previously. This switch in procedures "was based on the recognition that a more direct control over the growth of money would better achieve the objective of real economic growth at low rates of inflation."³⁷ However, Hafer here cites some evidence indicating that the Fed continued its practice of fine-tuning after October 1979.³⁸ Strictly speaking, this switch means that the rate of interest would now be determined by market forces. Such a change is consistent with the other developments noted above and with the DID and MCA of 1980, all of which encourage market determined interest rates. The implications of this change in the Fed's operating

37. R. W. Hafer, "Choosing Between M1 and Debt as an Intermediate Target for Monetary Policy," (hereinafter referred to "Target") Carnegie-Rochester Conference Series on Public Policy, XXII (Spring, 1985), pp. 89-90.

38. Ibid., p. 89.

procedures for monetary policy and macroeconomy have been discussed in many recent studies and are not within the scope of the present work.

However, note that the proliferation of financial instruments and shifting of funds among various components of M1 and M2, and the velocity decline in 1982-83, have led some to argue that M1 is no longer the preferred intermediate target. In this view, "the link between a narrow money measure and GNP has been broken."³⁹ In fact, the Federal Open Market Committee (FOMC) de-emphasized M1 in its conduct of monetary policy at its October 1982 meeting, placing greater emphasis on the behavior of broader monetary aggregates. This was evident in 1982 when M1 was allowed to grow at a 8.5 percent rate compared to the target rate range of 2.5 to 5.5 percent.⁴⁰

5. Causes of Recent Developments

A thorough investigation of the causes of the recent changes in the financial environment itself would require a large amount of work in the field of the Theory of Financial Innovation. Such an attempt will not be undertaken here.

39. Ibid., p. 89. Also see, R. W. Hafer, "Money-GNP Link," p. 19.

40. John P. Judd and Rose McElhattan, "The Behavior of Money and the Economy in 1982-83," Economic Review, Federal Reserve Bank of San Francisco, No.3 (Summer, 1984), p. 46.

We will, however, briefly survey the most popular views.

Among the causes mentioned in the literature are government regulations, movements in interest rates, technological developments, inflation, and tax effects. In a popular view, most innovations are considered as induced by government regulations. As Silber points out, "financial innovation is often viewed as a by-product of regulation."

⁴¹ In fact, Hadjimichalakis holds that most innovations developed from the "initiative of the financial intermediaries in their efforts to (1) circumvent the prohibition of paying explicit interest on demand deposits; (2) circumvent Regulation Q ceilings on interest rates on other deposits; and (3) circumvent (high) required reserve ratios."⁴² Silber, on the other hand, claims that this perspective is too narrow and puts forward the hypothesis that "new financial instruments or practices are innovated to lessen the financial constraint imposed on firms. . . both externally [i.e., government regulations], and internally [i.e., achieving market power--the firm's self-imposed constraints]." ⁴³

41. William L. Silber, "Recent Structural Changes in Capital Markets," (hereinafter referred to as "Changes") American Economic Review, LXXIII, No.2 (May, 1983), p. 89.

42. See, Hadjimichalakis, Money Markets, p. 5. Hadjimichalakis makes a similar argument for the increased use of RPs: "Because . . . RPs pay market levels of interest rates, they are a means by which financial institutions can circumvent Regulation Q ceilings on savings and other time deposits." Ibid., p. 24.

43. Silber, "Changes," p. 89.

It is widely accepted that an important cause of the regulatory reforms, especially the DID and MCA of 1980, was the declining membership with the Federal Reserve System. This decline had stemmed from the fact that member banks were required to keep non-interest bearing reserves in Federal Reserve Banks, whose costs were increasing due to increasing interest rates. The ratio of commercial banks that were members had declined to 37 percent in 1977 from around 45 percent in the mid 1960s.⁴⁴ Note that legalization of ATS and NOW accounts was in part a method of reducing total required reserves, for reserve requirements are much higher for demand deposits than they are for other checkable deposits.

It should be clear by now that another important cause of the changes in the financial environment is the technological progress, particularly in data processing and communications. The recent trends in interest rates is also often cited as an important factor that has contributed to the developments in the last decade.⁴⁵ In this view, increasing interest rates and the new financial technology together have accelerated the competitive pressures to provide substitutes for demand deposits. Since the early 1970s interest rates on all financial assets except demand deposits have tended to increase. This has increased the

44. "Statements to Congress," Federal Reserve Bulletin, LXIV (Aug., 1978), p. 636.

45. Ibid. p. 89.

opportunity cost of holding demand deposits as the interest payments on demand deposits were prohibited by the Banking Act of 1933 for member banks and by the Banking Act of 1935 for nonmember banks. Competition, however, had undermined this prohibition and this regulation too was circumvented through the payment of implicit interest payments (favorable terms on loans, financial and payroll services, reduction or elimination of service charges, and so on). Finally, Cagan mentions the increased financial sophistication of public which has become more sensitive to the higher and increasing opportunity costs of holding non-interest bearing instruments."⁴⁶

46. Cagan, "Erosion," p. 6.

CHAPTER III

THE EFFECTS OF RECENT DEVELOPMENTS ON MONETARY AGGREGATES

1. The New Monetary Aggregates

Recent developments, in particular, innovations in liabilities offered, have changed the traditional meanings of monetary aggregates and revived the controversies surrounding the definition of money and the problems of monetary aggregation. The Fed has responded by redefining M1 and other monetary aggregates.

Starting January 1979 the Fed included other checkable deposits at all depository institutions in transaction balances, M1. These balances were further qualified in 1981 when M1-A was defined as the narrowest aggregate, consisting of currency held by the public, demand deposits at commercial banks and traveler's checks; M1-B was defined to include the other checkables at all depository institutions as well. This distinction between M1-A and M1-B was dropped in January 1982 and M1-B became M1. M2, on the other hand, is now defined as M1 plus savings and small denomination time deposits at all depository institutions, overnight RPs at commercial banks, overnight Eurodollars

held by U.S. residents including banks at Caribbean branches of member banks, and broker/general purpose MMMFs. M3 includes M2 plus large denomination time deposits at all depository institutions, term RPs at commercial banks and savings and loan associations, and balances of institutions-only MMMFs.

2. Moneyness of Some New Instruments

Although overnight RPs (and sometimes overnight Eurodollars) and MMMFs have been included in transaction balances in quite a few empirical works, and such procedures have often improved the fit and the forecasting ability of the money demand function,¹ do they really belong in M1? The strongest theoretical argument for the moneyness (liquidity) of overnight RPs is made by Garcia and Pak who stated that they can be considered as part of M1, for they are "immediately available as a claim against other assets during the business day which is the only time such a claim can be exercised."² Yet another possible interpretation is that "the increased use of RPs has lowered the

1. Two-thirds of the increase in M1 error in the late 1970s is attributed to MMMMFs; see, Porter, Simpson and Mauskopf, "Innovation," p. 219, while overnight RPs is found to contribute substantially to the weakness in M1 in another work; see, Gillian Garcia and Simon Pak, "Some Clues in the Case of Missing Money," (hereinafter referred to as "Some Clues"), American Economic Review, LXIX, No.2 (May, 1979), pp. 330-34.

2. Garcia and Pak, "Some Clues," p. 332.

transactions costs, but not so much that they cannot be distinguished from demand deposits." ³ It is also often observed that "MMMFs . . . can serve as transactions balances or as a very close substitute for them."⁴ MMMFs, as was noted above, have low brokerage fees, high yields and are checkable.

Porter, Simpson and Mauskopf, however, are more sceptical about the moneyness of these instruments. For to conclude that, as did Garcia and Pak, by including RPs and/or MMMFs in M1 no weakness in this aggregate would emerge, is to argue that "RPs dominate demand deposits by some agents." They attempt to explain part of the growth in these instruments by the increase in their own yields and pose the question, "how can we be sure that growth in MMMFs and RPs has not come at the expense of time and savings deposits as well as demand deposits?"⁵ They argue that the volume of RPs negotiated late in the day is small and that even if MMMFs have replaced demand deposits, they are not being used as checking accounts. Only one draft is written on these accounts, they find, compared to twenty-two per month on demand deposits. The annual turnover rate of MMMFs is found to be only 2.5 to 3, compared to that of demand deposits of 100 at banks outside New York City (which

3. Judd and Scadding, "Survey," p. 999.

4. "Financial Innovation," p. 394.

5. Porter, Simpson and Mauskopf, "Monetary Aggregates," p. 222.

is heavily influenced by financial transactions).⁶ Another study found that only 4 percent of MMMFs were actively being used for transactions purposes.⁷

3. Recent Trends in Monetary Aggregates and Their Components

It must be understood at the outset that the analysis of the monetary data can at best provide a limited insight into recent shifts of funds among various financial assets and thus movements of funds among components of monetary aggregates. For both M1 and M2 have been changing in composition: Funds possibly have been flowing between M1 and M2 in both direction as well as within M1 and M2 from one component to the other. Yet the sources of the movements in M1 and M2 and in their components for the stability of the money demand function are obvious. For instance, if the funds to other checkable deposits have come from demand deposits, then a measure of narrow money which includes former balances should remain unaffected. If some

6. The relevance of turnover rates, or transactions velocity, to the moneyness of financial assets is not that clear. For example, the turnover rate of ATS/NOW accounts was only 7.8 in December 1979, and 14.0 in May 1982--not particularly high, although they are included in M1; for turnover rates, see various issues of Federal Reserve Bulletin.

7. David Lindsey, "Recent Monetary Developments and Controversies," (hereinafter referred to as "Recent Controversies") Brookings Papers on Economic Activity, 1:1982, p. 250.

portion of these funds has come from savings deposits, then M1 would be strengthened, although the net effect of all the movements may weaken M1, as RPs and/or MMMFs may have attracted funds away from demand deposits, not to mention the financial innovations in cash-management techniques which reduce the need for M1 balances. Again, if RPs have cut into demand deposits that would otherwise have been invested in other short-term liquid assets, then RPs are consistent with the historical relationship between M1, national income, and interest rates.

Everyone agrees that the weakness in M1 in the late 1970s was due to the weakness in demand deposits. This

Table 2. Demand Deposits at Commercial Banks
(billions of dollars)

1984:2	246.3		:1	235.6	1979:4	261.0		
	:1	244.1	1981:4	235.4		:3	260.2	
1983:4	243:4		:3	236.4		:2	255.6	
	:3	243.7		:2	240.1		:1	251.6
	:2	241.3		:1	247.1	1978:4	253.6	
	:1	238.8	1980:4	269.3		:3	251.7	
1982:4	237.8		:3	264.9		:2	247.2	
	:3	231.8		:2	257.0		:1	242.3
	:2	232.2		:1	263.9			

trend seems to have continued into the 1980s. The amount of demand deposits was higher in 1978:4 than it was in 1984:2, \$253.6 billion compared to \$246.3 billion.⁸ The most dramatic fall in demand deposits occurred in 1981, from \$269 billion, its highest level ever, in 1980:4, to \$235.4 billion in 1981:4. This represented an annual decline of nearly 12.6 percent and coincides with the DID and MCA Act of 1980, which legalized ATS and NOW accounts. In his study, Hadjimichalakis declared that "other checkables cut deeply into the amount of demand deposits. In January 1982, for every dollar in demand deposits, 35 cents were in other checkables . . . in June 1980 only 8 cents were."⁹ But he adds, "Of course, not all this shift came at the expense of demand deposits; other instruments also have suffered." According to Garcia and Pak, RPs were more important than other checkables in attracting funds away from demand deposits. Tatom, however, states that no other financial innovation has "so affected the measurement and assessment of narrow monetary aggregates as the introduction of ATS and NOW."¹⁰ He argues that funds to ATS have come basically from demand deposits. Even during the recent quarters when

8. The source of the following figures is Citibase Data Bank, unless otherwise stated.

9. Hadjimichalakis, Money Markets, p. 21.

10. John A. Tatom, "Recent Financial Innovations: Have They Distorted the Meaning of M1?" Review, Federal Reserve Bank of St. Louis, LXIV, No.4 (April, 1982), p. 23. The weakness in demand deposits relative to income is revealed by the income velocity of demand deposits, which has risen from 9.6 in 1979:4 to 14.8 in 1984:2.

demand deposits increased, their share in M1 fell in every quarter after 1980:1. Overall, the share of demand deposits in M1 fell from 71.3 percent in 1978:1 to an astoundingly low 45.5 percent in 1982:2.

Unlike demand deposits, currency has been quite stable and predictable during the last decade. Its share in M1 has changed only about 2 percentage points in seven years, from 1978 to 1984, and its ratio to nominal GNP has been remarkably constant. The income velocity of currency was 23.6 in 1979:4 and 1980:4; 24.6 in 1981:4; 23.4 in 1982:4; and 23.3 in 1983:4. It is no doubt the component which has been affected the least by recent developments. The amount of currency increased steadily from \$90.0 billion in 1978:1 to \$153.0 billion in 1984:2.

The growth of other checkables has been considerable. They amounted to just \$4.4 billion in 1978:1, and reached \$137.6 billion in 1984:2, representing a 3,027 percent growth in 26 quarters, or an average quarterly growth of 116.4 percent. Their growth accelerated just after the DID and MCA of 1980. In the first quarter of 1981, they nearly doubled, reflecting an increase of about \$25 billion, compared to \$22 billion decline in demand deposits during the same quarter. Note that in the first quarter of 1981 savings deposits declined significantly as well, from \$410 billion to \$379.8 billion. Thus other checkables possibly attracted funds away from savings deposits too--as Lindsey noted, an estimated amount of \$12

billion shifted from non-M1 sources to other checkables in 1981 alone and that, overall, "The expansion of ATS and NOW accounts . . . has been boasted by shifts from savings deposits and other non-M1 sources."¹¹

Table 3. Other Checkable Deposits at All Depository Institutions

(billions of dollars)

1984:2	137.6	:1	82:6	1979:4	16.7
:1	132.5	1981:4	75.4	:3	16.1
1983:4	129.0	:3	70.1	:2	14.0
:3	123.8	:2	66.0	:1	11.1
:2	119.8	:1	51.3	1978:4	6.8
:1	110.1	1980:4	26.6	:3	5.1
1982:4	101.0	:3	23.2	:2	4.8
:3	90.3	:2	19.6	:1	4.4
:2	87.4	:1	18.0	1977:4	4.0

The percentage share in M1 of other checkables has, meanwhile, increased from 1.3 in 1978:1 to 25.4 in 1984:2.¹²

A question arises at this point as to which sector's demand deposits holdings were more unstable in recent years,

 11. Lindsey, "Recent Controversies," p. 248.

consumer or business. When we look at the data pertaining to the ownership of demand deposits, we see that demand deposits holdings of businesses were relatively more volatile. At the end of 1979, consumers owned a balance of \$99 billion, compared to business holdings of \$158 billion.¹³ These figures were \$78 billion and \$155 billion in 1984:2, respectively. The absolute decline in the holdings of businesses was less, only \$3 billion, compared to \$21 billion drop in consumer holdings. But the trend in consumer holdings has been much steadier and more predictable, whereas business holdings showed much more erratic behavior.

Table 4. M1 Balances (billions of dollars)

1984:2	540.9	:2	451.2	:2	390.0	
	:1	532.7	:1	448.8	:1	394.3
1983:4	523.3	1981:4	437.3	1979:4	387.4	
	:3	517.1	:3	432.6	:3	383.7
	:2	505.1	:2	429.2	:2	374.0
	:1	490.0	:1	420.9	:1	365.5
1982:4	475.7	1980:4	416.1	1978:4	360.5	
	:3	458.1	:3	405.5	:3	354.3

12. The data, though, indicate that the growth in other checkables, both in absolute and percentage terms, slowed down in 1983 and 1984 (during when demand deposits showed signs of recovery), suggesting that the flows of funds have started to settle down.

13. Various issues of Federal Reserve Bulletin.

When we look at the M1 data in Table 4, we observe that M1 increased in every quarter in the sample, in absolute terms, except in 1980:2, right before the passage of the DID and MCA of 1980. The slowest M1 growth took place in 1981 at an annual rate of 5.1 percent. Later, however, M1 recovered and grew at an annual rate of 8.9 percent in 1982, and 10.0 percent in 1983, as Table 5 indicates. Its growth is notable in 1982:4 and in 1983:1 and 1983:2, leading to the velocity decline, and coinciding with the recession. Although the recession and declining rates of interest may have been important factors in the 1982-83 velocity decline (a sharp decline in interest rate, coupled with a higher interest elasticity, could lead to a decline in velocity), it is not surprising that some have tried to explain it in terms of the strength in other checkable deposits.¹⁴ Note that between 1982:3 and 1983:3, M1 increased by \$59 billion, for which other checkable deposits accounted \$33.5 billion and demand deposits only \$11.9 billion.

Table 6 shows the amount of RPs, which totaled a mere \$2.9 billion in 1972:4. It grew at an annual rate of 30 percent in 1981 and 1982 and then 26 percent in 1983. Overall, the growth in RPs has been steady and without big swings; there has not been a quarter with a significant

14. To cite an example, a work by the Federal Reserve Board staff pointed out that NOW and ATS accounts were responsible for the strength in M1 over 1982-83; see, Simpson, "Implications," pp. 253-54.

Table 5. The Rate of M1 Growth (annual percentage rates)

1984:2	6.2	:2	2.2	:2	-4.4
:1	7.2	:1	10.5	:1	7.1
1983:4	4.8	1981:4	4.4	1979:4	3.9
:3	9.5	:3	3.0	:3	10.1
:2	11.6	:2	8.0	:2	9.3
:1	12.8	:1	4.6	:1	5.5
1982:4	15.4	1980:4	10.5	1978:4	7.0
:3	6.1	:3	15.9	:3	7.9

shift, unlike all other instruments--the largest quarterly change is the increase of \$5.5 billion in 1980:3.

The growth of MMMFs has been even more notable, from \$2.3 billion in 1977:3 to \$147 billion in 1984:2. But they have been more unpredictable than RPs in recent years, responding to economic conditions (interest rate, for one) more strongly. MMMFs reached their peak level in 1982:3 (when interest rates started to decline,) amounting to \$179 billion, and then after suffering a record decline in 1982:4, falling to \$125 billion, they recovered and leveled off. Their increase, in absolute terms, was especially strong between 1980:4 and 1982:3, an increase of \$117.6 billion. A study cited by Lindsey suggests that expansion of MMMFs in 1981 depressed the demand for M1 and increased its velocity.¹⁵ They probably attracted more funds from

M1 components and savings deposits than RPs did during the first couple years in the 1980s.

Table 6. Overnight RPs (billions of dollars)

1984:2	45.8	1981:4	27.3	:2	21.5
:1	47.4	:3	27.8	:1	18.8
1983:4	45.0	:2	26.2	1978:4	16.8
:3	42.8	:1	24.3	:3	14.6
:2	45.1	1980:4	23.3	1977:4	13.3
:1	40.7	:3	22.8	1976:4	9.8
1982:4	38.0	:2	17.3	1975:4	6.3
:3	33.8	:1	17.5	1974:4	6.2
:2	32.9	1979:4	19.6	1973:4	5.7
:1	31.4	:3	22.1	1972:4	2.9

Since the appeal of MMMFs is their higher yield compared to the ceilings rates imposed by Regulation Q, the elimination of such ceiling rates and any appreciable decline in interest rates may dilute their appeal.

Savings deposits is the component which suffered the largest absolute declines in recent years due to the emergence of new financial instruments. They declined from about \$500 billion at the end of 1978 to \$305 billion in

15. Lindsey, "Recent Controversies," p. 251.

1982:4; a decline of nearly \$200 billion, or 40 percent in just four years. The only year they recorded an increase was 1982, when the growth in M1 was the most rapid. The decline in savings deposits balances was the largest in 1981, right after the DID and MCA of 1980, during when new instruments gained in size and importance.

Table 7. General Purpose/Broker-Dealer MMMFs
(billions of dollars)

1984:2	147.1	:2	165.1	:2	51.5
:1	141.6	:1	156.2	:1	43.8
1983:4	138.2	1981:4	143.1	1979:4	30.7
:3	138.6	:3	120.0	:3	22.1
:2	143.3	:2	97.9	:2	14.9
:1	161.2	:1	73.2	:1	9.5
1982:4	125.9	1980:4	61.7	1978:4	5.8
:3	179.3	:3	60.7	:3	4.7

CHAPTER IV

THE INTEREST ELASTICITY OF MONEY DEMAND
AND THE DEMAND FOR MONEY FUNCTION: THEORETICAL BACKGROUND1. The Interest Elasticity of Money Demand

The interest elasticity of money demand is strictly linked to the slope of the LM curve and therefore to the workings of the macroeconomy, in terms of both stabilization policy and random shocks. Given the developments outlined above, the changing relationship between money balances and interest rates should be expected. Yet, although a lowered interest elasticity and steeper LM curve had been expected, our findings often indicate that the interest elasticity of money balances has in fact risen.

In theory, then, the answers to the questions addressed in this study are as follows: First, has the increased substitutability between money and other financial assets increased the interest elasticity? This is the Gurley and Shaw hypothesis--originally they noted the growing importance of NBFIs and their providing liquid assets, like checking accounts; this argument was extended by others to claim that the interest elasticity would rise as the money substitutes grew. If, then, recent

developments (technological progress, innovations in cash-management techniques and innovations which reduce the transactions costs, i.e. reducing costs of converting non-money assets into money) make transactions balances and, say, savings deposits closer substitutes, the interest elasticity of money balances with respect to the savings deposits rate must increase, other things held constant. That is, if they are closer substitutes, a given change in the savings deposits rate would now cause a greater variation in transaction balances. If other market instruments are closer substitutes now than they were before, or if the new market instruments paying market-related rates are now available as closer money substitutes, we would expect increased sensitivity of money balances to the market interest rate over time. The evidence on this question favors the view that the interest elasticity has not changed significantly over time.¹

Secondly, how would the interest elasticity be affected when we include RPs and/or MMMFs in money balances? We should expect decreased interest elasticity, for two reasons: first, RPs and MMMFs pay variable interest rates and therefore they are less interest sensitive than the other components of money balances; and second, the scale effect (broader money balances) would make money balances

1. Cagan and Schwartz, Hafer and Hein, a work by the staff at the Federal Reserve Bank of San Francisco, and Roley all found no increase whereas a work by the Federal Reserve Board found increased elasticity.

less interest elastic.

But what if we include in money balances components which pay fixed and explicit rates of interest in money, such as other checkables? In particular how would the interest sensitivities of current M1 (which includes other checkables) and the former M1 (which excludes other checkables) compare? Theoretically, the answer here is much less clear. One would think that the inclusion of other checkables should shift the money demand curve to the right, say in a parallel fashion, as individuals would hold more money at a given rate of interest. Let us illustrate this: assume that when money pays no interest individuals choose to hold \$100 dollars and that when it pays a fixed 5 percent interest (in reality, interest rate on NOW accounts was fixed at 5.25 percent) the money holdings is \$150 dollar. Also assume that the market rate of interest is 10 percent. Let us now suppose that the market rate of interest falls to 8 percent. In the case where money pays zero return, this represents a fall of 2 percentage points in the opportunity cost of holding money, from 10 percent to 8 percent. In the case where money pays a fixed rate of 5 percent, the same change would represent a fall of 2 percentage points in the opportunity cost of holding money as well, from 5 percent to 3 percent. Then, if individuals behave by reacting to such percentage point changes, this fall in the market rate would increase their money holdings by the same amount in each case, say from \$100 to \$120 and from \$150 to \$170, since the

initial shift in the function was parallel. But the latter represents a smaller percentage change and thus this scale effect should make the broader balances less interest elastic. This reasoning, of course, assumes that components of money will behave similarly when a change in the market rate occurs, whether these components are earning zero, five or ten percent, as long as these rates are fixed, although the higher the interest earned on money balances, the higher would be the level of money held.

The above analysis can be expressed in algebraic terms. We have the following money demand function:

$$(1) (M/P) = A y^\alpha r^\beta$$

where (M/P) is the real balances, A is a constant, y is the real income and r is the nominal rate of interest. The interest elasticity of the function, which is constant, is given by β . A shift in this function as described above would be described

$$(2) (M/P) = A y^\alpha r^\beta + c$$

where c is the amount of additional real balances individuals hold with the availability of other checkable accounts at any given rate of interest. The interest elasticity of the function given by (2) can be shown to be lower than that of the function described by (1). For, with $m = (M/P)$,

$$(3) (rdm/mdr) = (\beta r A y^\alpha r^{\beta-1} / m) = (\beta A y^\alpha r^\beta / A y^\alpha r^\beta + c) \\ = (\beta b / b + c)$$

where $b = A y^\alpha r^\beta$. Clearly, $(\beta b / b + c)$ is smaller than β ;

therefore, a parallel shift in the function reduces the interest elasticity. A similar argument could be made for the alternative form of the function which we later use, namely

$$(4) (M/P) = A Y^{\alpha} e^{\beta r}$$

where β is the semi-elasticity (or the interest slope), which is the percentage change in real balances for a given percentage point change in the rate of interest.

But the inclusion of other checkables in real balances may, at the same time, tend to raise the interest elasticity; in other words, there is a possibility that other checkables have a different interest sensitivity than the components of money which earn zero rate of interest. (In terms of the function given by (1) this would mean increase in the value of β .) This possibility arises if individuals consider percentage changes in opportunity cost of holding money, as opposed to percentage point changes, making other checkables more interest elastic. This would increase the interest elasticity of money balances which include such balances. Simpson in fact quotes such a study in his paper.² Let us now go back to our example to illustrate this point. A fall in the market rate from 10 percent to 8 percent would reduce the opportunity cost of holding other checkables from 5 percent to 3 percent, by about 40 percent, whereas it would reduce the opportunity cost of holding other components paying zero interest from

2. Simpson, "Implications," p. 256.

10 percent to 8 percent, or by about 20 percent. It follows that changes in market rates have a greater relative impact on the opportunity cost of other checkables and would therefore have a larger impact on the demand for such balances. The conclusion the above-mentioned study derives is that "the elasticity of demand for M1 with respect to the open market rate has changed as NOW accounts have grown in importance; the market interest elasticity has tended to rise . . . as the proportion of NOW accounts subject to fixed ceilings has grown," adding that, "in the future the market rate elasticity will fall as the proportion of M1 that is subject to an unregulated own rate grows."³ A study by Judd and Motley, too, cites the growing share of other checkables in M1 as a factor which tends to increase the interest sensitivity of these balances. Their reasoning is similar, namely that "since NOW accounts pay explicit interest but demand deposits do not, a given change in market interest rates causes a larger proportional change in the opportunity cost (the market rate minus the rate on money) of holding NOWs than of demand deposits." As a result, a larger changes in NOW accounts than in demand deposits are induced by variations in market rates, thereby increasing the elasticity of M1 as a whole.⁴

3. Ibid., p. 256.

4. John P. Judd and Brian Motley, "The 'Great Velocity Decline' of 1982-83: A Comparative Analysis of M1 and M2," Economic Review, Federal Reserve Bank of San Francisco, No.3 (Summer, 1984), p. 59.

2. The Money Demand Function

The question of whether there exists a meaningful, well-defined, and stable money demand function has long been a central issue in economic thinking; "No proposition in macroeconomics has received more attention than that there exists, at the level of aggregate economy, a stable money demand function."⁵ In 1959 the Radcliffe Report argued that the money demand function is "essentially nonexistent as a stable relationship."⁶ Later, some Keynesians, such as Robinson and Kaldor expressed similar views.⁷ Yet there is enough evidence that, despite its unpredictable behavior after 1973, the money demand function has been a useful tool for the study of the macroeconomy, and that perhaps what is needed is a reformulation of the function, instead of abandoning it altogether.

We will basically use what is known as the "conventional" money demand function, and its somewhat modified forms. One reason for this choice is that since the conventional specification is still widely used, or

5. David Laidler, Monetarist Perspectives (hereinafter referred to as Perspectives) (Cambridge, Mass.: Harvard University Press, 1982), p. 39. Stability here means that money demand is related to small number of parameters and that the values of these parameters do not change "too much" over time.

6. Ibid., p. 6.

7. See, for example, Joan Robinson, "Quantity Theories Old and New," Journal of Money, Credit and Banking, II, No.2 (Nov., 1970), pp. 504-12.

since most approaches are consistent with it, it provides a yardstick against which the findings of the present study may be judged.

Overwhelmingly large volume of studies has supported the notion that money demand is related to both income and interest rate, yielding,

$$(1) M = f (Y,r)$$

where M is the nominal balances, r is the nominal rate of interest and Y is the nominal income.⁸ Then the demand for real balances is given by

$$(2) (M/P) = f (y,r)$$

where y is the real income. It is assumed, of course, that the price level elasticity of nominal balances is unity. Here the Keynesian idea that the demand for money consists of a transactions component, related to income, and a speculative component, related to the rate of interest has been discarded; in other words, the real balances in (2) may be regarded as transaction balances. In any case, it is impossible to know every individual's motives for holding money; thus, the Keynesian distinction is not very useful empirically. For us, "What is important . . . is that agents do desire to hold real balances, and not why."⁹ In fact, Tobin and Baumol developed the notion that transaction balances may be interest elastic, since holding such

8. A proxy for wealth (usually permanent income) has sometimes been used in place of income, though most short-run studies have preferred income over wealth.

9. Laidler, Perspectives, p. 43.

balances involves opportunity costs.¹⁰ In the words Tobin,

"Even if there were unanimity and certainty that prevailing interest rates would continue unchanged indefinitely, so that no motive for holding cash other than transactions requirements existed, the demand for cash would depend inversely on the rate of interest. The reason is simply the cost of transactions between cash and interest-bearing assets."¹¹

In fact, the conventional money demand function and its derivatives utilize the Baumol-Tobin transactions view, replacing the Baumol-Tobin transactions variable by real GNP, employing the rates on time deposits, savings deposits, T-bills and/or commercial paper as measures of the opportunity cost of holding money and assuming that the real transactions costs are constant, obtaining,

$$(3) (M/P) = A y^b r^c$$

Taking natural logs, we get,

$$(4) \ln (M/P) = a + b \ln y + c \ln r$$

Combining (4) with a partial adjustment mechanism, explained below, we obtain,

$$(5) \ln (M/P)_t = a + b \ln y_t + c \ln r_t + d \ln (M/P)_{t-1}$$

It is essentially (5) and some its modified forms that we

10. William J. Baumol, "The Transactions Demand for Cash: An Inventory Theoretic Approach," Quarterly Journal of Economics, LXVI, No.4 (Nov., 1952), pp. 545-56, and James Tobin, "The Interest Elasticity of Transactions Demand for Cash," (hereinafter referred to as "Transactions Demand") Review of Economics and Statistics, XXXVIII, No.3 (Aug., 1956), pp. 241-47.

11. Tobin, "Transactions Demand," p. 241.

estimate over four sample periods, each with five to seven different dependent variables. Real balances and real income in (5) are often expressed in per capita terms which will also be done in this study.¹²

3. The Partial Adjustment Mechanism

Money demand models usually assume that in the short-run actual real balances diverge from their desired or long-run level.¹³ A partial adjustment mechanism, therefore, is added to the model given by equations (3) or (4), resulting in the presence of a lagged dependent variable as an additional explanatory variable. The

12. Admittedly, this study, like the majority of studies on money demand, does not pay explicit attention to the identification problem and the money supply process. Money demand clearly is not a variable which can be directly observable. It is rather measured by assuming that money market is in equilibrium. The possibility then arises that what we are estimating is in fact the money supply function or the combined effects of both money demand and money supply functions. As Laidler mentioned, in order to avoid this possibility, one "must be sure that the supply function of money shifts independently of the demand-for-money function, that the supply-of-money contains at least one variable that does not appear in the demand function. It is not hard to establish that this is the case, for the level of reserves made available by the Central Bank . . . figures prominently in any theory of the supply of money." See, Laidler, Evidence, p. 115. Laidler adds that "There is quite bit of evidence that the results for the demand for money are not usually greatly or importantly altered by taking explicit account of the supply side of the market." Ibid., p. 117.

13. See, Gregory Chow, "On the Long-Run and Short-Run Demand for Money," Journal of Political Economy, LXXIV, No.2 (April, 1966), pp. 111-31. This article was an application to money of techniques which Chow himself had used when working on the demand for automobiles.

rationale for the incorporation of the partial adjustment mechanism in the model may be either one of the following:¹⁴

(1) Transactions costs involved in adjusting money holdings, including brokerage fees, psychological and "shoe-leather" costs. In the words of Goldfeld, "portfolio adjustment costs, both pecuniary and nonpecuniary, are assumed to prevent full, immediate, adjustment of actual money holdings to desired levels."¹⁵

(2) Sluggish adjustment of interest rates, income or prices. Laidler views the sluggish adjustment of prices as the best explanation for the use of the partial adjustment mechanism. With a sticky price level, he argues, interest rate and income will tend to change as the money market attempts to clear itself when money supply is exogeneously disturbed. If the model we use consists of a series of markets in continuous Walrasian equilibrium (as in the

14. Problems involving the use of a lagged dependent variable has been discussed by Laidler, Perspectives, pp. 42-57; Brian Motley, "Dynamic Adjustment in Money Demand," (hereinafter referred to as "Dynamic") Economic Review, Federal Reserve Bank of San Francisco, No.1 (Winter, 1984), pp. 22-26; Marvin Goodfriend, "Reinterpreting Money Demand Regressions," (hereinafter referred to as "Reinterpreting"), Carnegie-Rochester Conference Series on Public Policy, XXII (Spring, 1985), pp. 207-42; David Laidler, "Expectations and Adjustment in the Monetary Sector Revisited: A Comment," (hereinafter referred to as "Expectations"), Carnegie-Rochester Conference Series on Public Policy, XXII (Spring, 1985), pp. 243-54; and David Laidler, "The Demand for Money in the U.S.--Yet Again," (hereinafter referred to as "U.S."), Carnegie-Rochester Conference Series on Public Policy, XII (Spring, 1980), p. 219-71.

15. Goldfeld, "Revisited," p. 582.

flexible-price models constructed by Sargent, Lucas and Wallace) and we recognize that the dominant impulse driving the business cycle is exogenous shocks to the nominal supply of money (this is widely accepted in Walrasian models), then we are forced to the conclusion that the economy will always be on its long-run demand for money. Therefore, Laidler, concludes, the presence of lags in the money demand function cannot be attributed to adjustment costs. The alternative explanation for the presence of lags he presents is the existence of price rigidities. If there is an unanticipated increase in the money supply, prices of all goods will tend to rise; but, due to wage-price rigidities induced by long-term contracts which characterize our economy, disequilibrium will result in the money market--there will be excess supply of money.¹⁶

(3) Money serves as a buffer between receipts and expenditures; when money holdings change agents do not at once adjust their holdings to the desired level because they anticipate variations in actual holdings, increasing when outlays are unexpectedly low or receipts are unexpectedly high. A strong objection to both adjustment costs and buffer stock interpretations came from Goodfriend, who assumes that money demand adjusts completely in each period to current interest rate and transactions variables.¹⁷

According to Goodfriend, the partial adjustment mechanism is

16. Laidler presents this argument in the case where the nominal balances, as opposed to real balances, adjust slowly to their desired levels; see, Laidler, "Expectations," p. 248, and Laidler, Perspectives, p. 94 ff.

rationalized by way of "reallocating transitory income from temporary, safe, liquid stores of value to a more desirable portfolio of securities and consumer durables." He gives the following scenario: an increase in income in the previous period is first added to M1. Then in the current period M1 is adjusted towards the desired level--for example, some portion of the additions to M1 is invested in securities. Thus, money balances serve as a shock absorber or buffer-stock. But this argument does not, in his view, explain partial adjustment of currency and demand deposits, since particularly in the new financial environment, equally safe and liquid stores of value, such as MMMFs, RPs, Super NOWs, and even savings deposits, are available and could serve as shock absorbers. That is, the buffer-stock interpretation could be justified for balances excluded from M1; M1 balances adjust on a period by period basis. In terms of our empirical work, this should mean that the buffer-stock rationale is more appropriate when the dependent variable is broader.

Despite the fact that interpretation of regressions utilizing the partial adjustment mechanism is difficult, in our view its drastic contribution to their explanatory power makes its use indispensable. In other words, as Laidler

17. He also uses a lagged dependent variable, though, but for different reasons. Lagged money enters because "with regressor measurement error and serially correlated appropriate interest rate and transactions variables, lagged money helps predict money." See, Goodfriend, "Reinterpreting," p. 207.

himself admitted, the lagged money variable is included in the regression for its empirical usefulness.¹⁸ There are two versions of the partial adjustment mechanism-- partial adjustment of real balances and partial adjustment of nominal balances.

A. Partial Adjustment of Nominal Balances

For an individual agent we can rewrite equation (4) as

$$(6) \ln (M/P)_t^d = a + b \ln y_t + c \ln r_t$$

where the desired real balances, the left-hand side variable, are the only endogenous variable. The partial adjustment of nominal balances is given by

$$(7) \ln M_t - \ln M_{t-1} = h (\ln M_t^d - \ln M_{t-1})$$

(7) suggests that the individual agent starts period t with M_{t-1} ; at period t the desired nominal balances, M_t^d , is determined by P_t , r_t and y_t in (6). The actual nominal balances in period t will move toward the desired level at a speed given by h . If h is unity, the adjustment is instant and $M_t^d = M_t$. It is expected that h is less than unity. Noting that in (2),

$$(8) \ln M_t^d = \ln [(M_t^d/P_t) P_t]$$

and substituting (6) for $\ln (M/P)_t^d$ in (7), we obtain,

$$(9) \ln (M/P)_t = k + l \ln y_t + m \ln r_t + n \ln (M_{t-1}/P_t)$$

where n is equal to $1-h$. The interpretation of (9) is

18. Ibid., p. 28.

straightforward for an individual agent. Price level, interest rate and real income are beyond his control; the lagged nominal balances are also exogenously given at the beginning of period t . Only the left-hand side variable, $(M/P)_t$, is endogenous. For any change in nominal income, interest rate or price level, the equation (9) will generate the time path of his money holdings. Note that, since the price level is given, the individual must move his real balances to the desired level by adjusting nominal balances. Because of, say, adjustment costs, he will take his time doing so.

Although the individual experiment presents no problems, the model does not make much sense at the aggregate level, particularly when prices are flexible and money supply is exogenous. It is for this reason that the question of whether the money supply is exogenous or endogenous has often been asked in the money demand literature and that the recent changes in the Fed's operating procedures may have significant implications for the interpretation of the conventional money demand specification. Now, at the aggregate market level, assume that the money supply is exogenous. Then real balances are still endogenous, since the price level is endogenous for the economy as a whole. But, if prices are perfectly flexible, the economy as a whole cannot take time about getting back to equilibrium; for the aggregate economy, all the money which is available to be held must be held. Or,

as Motley puts it, if the money supply is exogenous it becomes a "hot-potato" so that "the desired stock of money must adjust to match the actual stock rather than conversely."¹⁹ Laidler's above-mentioned criticism of Walrasian models is based on this reasoning, namely, that "The transactions costs which face the individual are irrelevant in the neo-Austrian market experiment, for there real balances are adjusted by changing the price-level and not by any act of trading."²⁰ Is, then, the money supply exogenous? The major argument in favor of the conventional specification--against exogeneity--is that "the Federal Reserve's use of an interest rate instrument to control the money supply up to October 1979 effectively led it to peg interest rates in the short-run. In order to do that, it had to provide whatever quantity of money was demanded by the public at those interest rates."²¹ As a result, the money supply was endogenous. Even after October 1979, there have been periods when the growth of M1 differed substantially from the targeted growth. Judd and Scudding, citing some studies, note that "the evidence on balance does not suggest a strong case for exogeneity of money."²²

 19. Motley, "Dynamic," p. 22.

20. Laidler, Perspectives, p. 95. Laidler's solution was, as the reader will recall, the existence of price-stickiness: "If the quantity of nominal money is an exogenous variable, then the only way in which the quantity of real money can adjust slowly to equilibrium is by way of a slow adjustment of the general price-level." Laidler, Evidence, p. 144.

21. Judd and Scudding, "Survey," p. 1013.

This issue, however, is far from settled. In the literature, there are two competing hypotheses: the money market hypothesis, which claims that instrument of monetary policy has consistently been interest rates (thus endogenous money supply), and the credit market hypothesis, advanced by Brunner and Meltzer, which incorporates the market for real capital into the analysis and argues against endogeneity.²³

B. Partial Adjustment of Real Balances

Consider again equation (6), which describes the real balances desired by an individual agent,

$$(6) \ln (M/P)_t^d = a + b \ln y_t + c \ln r_t$$

where, as usual, the desired balances are the only endogenous variable. The partial adjustment equation now has the form,

$$(10) \ln (M/P)_t - \ln (M/P)_{t-1} = h [\ln (M/P)_t^d - \ln (M/P)_{t-1}]$$

where actual real balances adjust to the gap between desired real balances in period t and the actual real balances at the beginning of period t . Combining (6) and (10) yields,

$$(11) \ln (M/P)_t = k + l \ln y_t + m \ln r_t + n \ln (M/P)_{t-1}$$

22. Ibid. p. 1013.

23. For further details on this issue the reader should see Judd and Scadding, "Survey," p. 1013, and Laidler, "U.S.," pp. 233-39.

where n equals $1-h$. The main difference between (9) and (11) is that in (9) the variable lagged nominal balances is divided by the current price-level, whereas in (11) it is divided by the lagged price-level. To put it differently, "a reduction of the lagged value of the nominal money stock due to rising prices is subject to partial or lagged adjustment" in (9), while (11) implies that "such a reduction is subject to immediate adjustment."²⁴

This version of the conventional money demand function makes more sense at the market level, for it is now real balances, rather than exogenous nominal balances, which adjust slowly to any disturbance; the former are endogenous at the market level even when the latter are not. Note, however, that if one of the expressions (9) or (11) fits a given data set well, so will the other, for the price-level series is not extremely erratic. But the real adjustment model performs better in our regressions (and this is true for almost all studies on money demand), in the sense that it provides an estimate of $(1-h)$ that is less than unity.

24. Stephen M. Goldfeld, "The Case of the Missing Money," Brookings Papers on Economic Activity, 3:1976, p. 691.

CHAPTER V

THE INTEREST ELASTICITY ESTIMATES:
EMPIRICAL RESULTS1. The Notation and The Data

The following notation is utilized in analyzing the estimation results below:

DD: nominal demand deposits at commercial banks

M1A: nominal currency held by public plus DD plus traveler's checks

M1: M1A plus nominal other checkables at all depository institutions

M1AR: M1A plus nominal overnight RPs

M1R: M1 plus nominal overnight RPs

M1AF: M1A plus nominal general purpose, broker/dealer MMMFs

M1RF: M1R plus nominal general purpose, broker/dealer MMMFs

y: real GNP in 1972 prices

P: implicit GNP deflator, 1972 = 1.00

RSD: commercial bank savings deposit rate

RTB: 3-month treasury bill rate

T: time trend

N: U.S. population

All regressions are estimated using OLS with Cochrane-Orcutt. All data are obtained from the Citibase Data Bank, with the exception of commercial bank passbook rate which was made available by the Federal Reserve Bank of New York. Quarterly data are used in all regressions. The detailed results of all regressions are given in the Appendix.¹

2. Estimation Results

Basically, we estimated the specifications given by equations (9), (11) and their several modified forms over four sample periods, each with five to seven different monetary aggregates (dependent variables). The sample periods chosen are 1963:4-84:2, which is our entire sample; 1963:4-73:4, the first main subsample which covers the period during which money demand function is assumed to be stable; 1974:1-84:2, the second main sample which covers the period characterized by shifts and financial innovations; and, finally, 1978:4-84:2, which covers the most recent period.²

The first specification estimated is

1. The results obtained from the estimation of the function not including a lagged dependent variable are not reported, for they yield very low R^2 's (for the sample period, 1963:4-1984:2. R^2 was 0.14). Also not reported are the coefficients estimated by the least-squares method, for they were not significantly different from those obtained by using OLS with Cochrane-Orcutt.

$$(A) \ln (M/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M/P)_{t-1}$$

which is similar to the one used by Hafer and Hein. M_t here denotes a certain monetary aggregate. Specification A is first estimated with DD as the dependent variable. All four sample periods yield significant RTB and the lagged money coefficients at the 5 percent level with theoretically expected signs. The coefficients of income, however, is significant only for the period 1963:4-73:4. Moreover, the latter has a negative sign for the period 1978:4-84:2--in fact, a negative but statistically insignificant income coefficient is common in most specifications with most monetary aggregates. This breakdown of the relationship between real income and real money balances may be due to the 1982-83 recession and the erratic behavior of most monetary components (especially demand deposits) in recent years. We should also note that the estimated coefficients of the lagged money do not indicate an increase in the speed of adjustment of DD balances. In fact, the highest value for the latter is obtained for the period 1963:4-7:4, which is 0.249 (or, about 25 percent of the gap between actual and desired balances are closed in a quarter). The other samples yield a speed of adjustment of less than 0.10. Similar results are obtained from virtually all specifications of the function.³

 2. It is noted that, "Given the different characteristics of the post-1974 economy . . . pooling pre- and post-1974 data may bias the estimation results." See, Roley, "Reinterpreting," p. 8.

The elasticity of real DD with respect to the 3-month treasury bill rate, which will be denoted as ERTB of DD, is estimated to be (in absolute values) 0.039 for the entire sample period, 0.018 for 1963:4-73:4 and 0.049 for 1974:1-84:2. Noting that this estimate assumes the value of 0.076 for the period 1978:4-84:2, these findings support the Gurley and Shaw hypothesis that the interest elasticity of DD has been rising. In other words, they suggest that more recently a given increase in the open market rate reduces real DD holdings by more than before, a conclusion which we would expect given the developments outlined above.

The same specification is also estimated using per capita real DD balances as the dependent variable and per capita real GNP as the transactions variable. The inclusion of population in the regression leaves the estimates of ERTB of DD virtually unchanged--the only period affected is 1963:4-73:4, where an ERTB of 0.023 is now obtained compared to the earlier estimate of 0.018. Also note that during this period R^2 is increased from 0.89 to 0.98. With per capita balances and income, however, estimates of income elasticities and speed of adjustment both are somewhat altered.

With the dependent variable real M1A, the

3. These results are consistent with the findings of most studies on money demand. Goodfriend notes that "The estimated coefficients on lagged money is typically too high to be interpreted as representing a speed of adjustment." See, Goodfriend, "Reinterpreting," p. 211.

coefficients estimated on RTB and the lagged money are again all significant at the 5 percent level with correct signs. The income elasticity is again only significant during the period 1963:4-73:4. The ERTB estimates are 0.014 for 1963:4-73:4 and 0.040 for 1974:1-84:2, while the estimate for the entire sample is 0.032. Again, the largest estimate, 0.061, is obtained from the sample 1978:4-84:2. We can conclude that ERTB of M1A has risen over time.

Comparing ERTB of DD with ERTB of M1A, we see that the latter are smaller for all four samples: the addition of currency and traveler's checks to DD lowers the interest elasticity. This could be due to the scale effect, or to the fact that currency is less interest elastic than DD (open market instruments are closer substitutes for DD than they are for currency), or to both. When specification A is expressed in real per capita terms with M1A as our monetary variable, once again above results are not altered, except ERTB of M1A for the period 1963:4-73:4 rises from 0.014 to 0.021.

When overnight RPs are added to M1A, giving us M1AR, we get significant coefficient estimates for all three variables for all periods, except for the income coefficient for the most recent period, 1978:4-84:2. Surprisingly, the addition of RPs to M1A leaves the ERTB estimates unaffected in all samples; that is, ERTB of M1A and ERTB of M1AR are not statistically different, although one would expect a lower ERTB of M1AR, broader money balances which include a

component paying a variable rate of return. The impact of expressing the regression in per capita terms is the same as it was when the dependent variable excluded RPs. Thus, whether the function is expressed in per capita terms or not, ERTB of M1AR also rises over time.

Specification A is estimated with aggregate real M1 as the monetary aggregate--which could be thought of adding other checkables to M1A. The overall results are substantially altered: For one thing, all income coefficients are significant at the 5 percent level with correct signs--the period 1978:4-84:2, which so far had not yielded a positive and significant income elasticity, now gives the largest estimate, 0.246. The addition of other checkables to M1A, therefore, restores the relationship between income and money balances. All other coefficients are also significant at the 5 percent level. For another thing, the ERTB estimates are lower than those obtained previously (except for the period 1963:4-73:4 when other checkables had not yet gained in size): the addition of other checkables to M1A lowers the interest elasticity. On the other hand, ERTB of M1 too seems to have increased over time, although this increase is not as strong as it was with other monetary aggregates. In fact, when per capita real balances are used as the dependent variable, we observe an unchanged ERTB over time: 0.021 during 1963:4-73:4, 0.020 during 1974:1-84:2 and 0.021 during 1978:4-84:2.

The next dependent variable used is aggregate real M1R, real M1 plus real overnight RPs. Again all coefficients, including those of income, are significant at the 5 percent level with expected signs. Observe that the income elasticity is as large as 0.500 for the period 1978:4-84:2 and that income elasticity in general becomes larger and statistically more significant with broader balances (although this is not true for per capita form of the regression). The ERTB estimate for the entire period is 0.018, with an estimate of 0.015 for 1963:4-73:4 and 0.026 for 1974:1-84:2. ERTB of M1R, too, has risen over time, reaching 0.073 during 1978:4-84:2. Comparing to ERTB of M1, ERTB of M1R is larger during 1978:4-84:2 and the same in other samples. This result suggests that the addition of RPs to M1 tends to raise the interest elasticity, whereas we would expect the opposite. The regression, however, expressed in terms of per capita real M1R and per capita real income, does not suggest increasing ERTB of M1R over time just as it did not imply increasing ERTB of M1. Under per capita specification, the estimates obtained from the two main subsamples, 1963:4-73:4 and 1974:1-84:2, are identical, having the value of 0.020. When ERTB of M1 and ERTB of M1R are compared under this specification, no difference can be seen: the addition of RPs to M1 does not, in this case, affect the interest elasticity.

Finally, specification A is estimated with monetary aggregates which include MMMFs. First, the dependent variable used is real M1AF, real MMMFs plus real M1A. The data for MMMFs were available starting 1974:1, thus only the most recent two sample periods are estimated. Both samples yield insignificant (and positive) interest elasticity estimates. The positive sign must not be very surprising, since as RTB was rising, so was the rate on MMMFs, which is closely tied to the market rate--in other words, RTB behaves like the own rate of MMMFs. The estimates obtained from per capita specification are also positive but insignificant. When MMMFs are added to M1R, 1978:4-84:2 period yields positive and also statistically significant ERTB under both forms of the function, without and with the population factor. This suggests that monetary aggregate which includes M1A, other checkables, RPs and MMMFs (our broadest aggregate) varied directly with RTB, again not surprising as this aggregate has two sizable components which earn a market rate of return.

The results obtained from the estimation of specification A is summarized in Table 8, where monetary aggregates are ranked according to their interest elasticities, from the largest to the smallest during the sample period 1974:1-84:2. Table 8 also shows whether the interest elasticities of the monetary aggregates are rising over time.

Table 8. ERTB ESTIMATES UNDER SPECIFICATION A

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.018	-0.049	-0.076	Rising
M1AR/P	-0.015	-0.040	-0.065	Rising
M1A/P	-0.014	-0.040	-0.061	Rising
M1R/P	-0.015	-0.026	-0.073	Rising
M1/P	-0.014	-0.026	-0.053	Rising
M1AF/P	--	n.s.	n.s.	--
M1RF/P	--	n.s.	0.032	--
<hr/>				
Dependent Variable				
DD/PN	-0.023	-0.049	-0.076	Rising
M1AR/PN	-0.020	-0.040	-0.065	Rising
M1A/PN	-0.021	-0.040	-0.060	Rising
M1R/PN	-0.020	-0.020	-0.023	Unchanged
M1/PN	-0.021	-0.020	-0.021	Unchanged
M1AF/PN	--	n.s.	n.s.	--
M1RF/PN	--	n.s.	0.032	--

Note: n.s. denotes coefficients not significant at the 5 or 10 percent level. "Rising" indicates that the change in ERTB from 1963:4-73:4 to 1974:1-84:2 is statistically significant at the 5 percent level. "Unchanged" indicates that the change in ERTB is not statistically significant.

The second specification estimated is

$$(B) \ln (M/P)_t = a + b \ln Y_t + c \ln RTB_t + d \ln (M/P)_{t-1} + e T$$

where a linear trend is added to specification A. The time trend variable is sometimes interpreted as a proxy for cost-reducing innovations, innovations in cash-management techniques, and technological progress in the financial industry.⁴

With real DD as the dependent variable, the impact of the addition of the trend in the regression is substantial on the income and lagged money coefficients: the income elasticity is now significant in three samples either at the 5 percent or 10 percent level. The coefficients of the lagged money are now lower in all sample periods--implying increased speed of adjustment of real DD balances in the presence of a time trend variable. The ERTB estimates are essentially unaffected, however. Thus, our earlier result, that ERTB of DD has risen, remains. The trend coefficient is negative in all periods, but it is significant at the 10 percent level only during the entire period 1963:4-84:2 (remember the declining importance and size of DD). The ERTB estimates obtained from the regression with per capita balances are not statistically

4. For example, see, Charles Lieberman, "Structural and Technological Change in Money Demand," American Economic Review, LXIX, No.2 (May, 1979), p. 26, where he states that "The inclusion of a time trend . . . assumes that the implementation of new technologies or practices reduces money demand smoothly over time."

different.

Next, specification B is estimated with the monetary aggregate real M1A. Again the trend coefficient is negative and significant at the 10 percent level for 1963:4-84:2. Once more, the ERTB estimates obtained are the same as those obtained from specification A, so that previous results still hold. For instance, ERTB of M1A is lower than that of DD. When per capita real M1A balances and per capita real income are used in specification B, no significant change in the estimates of ERTB is observed.

The next dependent variable used is real M1AR. A comparison of Table 8 and Table 9 shows that the inclusion of the linear trend variable has no notable effect on the ERTB estimates. The trend variable is again significant at the 10 percent level only during the entire period, 1963:4-84:2. Using per capita real balances in place of aggregate real balances in the regression does not change the ERTB estimates.

With aggregate real M1 as the dependent variable in the present model, again no significant change is observed in the ERTB estimates--none of the differences in ERTB estimates, obtained from specification A and specification B, is significantly different from zero. But when the dependent variable is replaced by real per capita M1 balances, the estimates of ERTB are altered: whereas we had observed no change over time under specification A expressed

Table 9. ERTB ESTIMATES UNDER SPECIFICATION B

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.020	-0.050	-0.080	Rising
M1AR/P	-0.016	-0.041	-0.067	Rising
M1A/P	-0.016	-0.041	-0.064	Rising
M1R/P	-0.016	-0.025	-0.055	Rising
M1/P	-0.016	-0.024	-0.046	Rising
M1AF/P	--	0.018	0.052	--
M1RF/P	--	0.015	0.030	--
Dependent Variable				
DD/PN	-0.021	-0.049	-0.079	Rising
M1AR/PN	-0.017	-0.040	-0.067	Rising
M1A/PN	-0.017	-0.040	-0.063	Rising
M1R/PN	-0.017	-0.025	-0.054	Rising
M1/PN	-0.017	-0.024	-0.046	Rising
M1AF/PN	--	0.019	0.053	--
M1RF/PN	--	0.015	0.030	--

in per capita terms, specification B suggests an increase in ERTB of M1. Also note that the regression in per capita terms yield, in all four samples, positive and significant trend coefficients.

The trend variable is positive and significant at the 5 percent or 10 percent level in all samples whether the regressions are expressed in aggregate or per capita terms when the dependent variable is real M1R, except during the period 1963:4-73:4 when RPs were not yet important. ERTB of M1R is reduced for the period 1978:4-84:2 under specification B which gives an estimate of 0.055, compared to the earlier estimate obtained from specification A of 0.073. Yet the main result remains that it has risen over time even when the regression is in terms of real per capita balances and real per capita income.

Table 9 shows that the ranking of the monetary aggregates according to their interest elasticities is the same as it was in Table 8. It also indicates that money balances including MMMFs have significant positive elasticities. To sum, specification B estimates suggest that the interest elasticities of various balances with respect to the open market rate, represented by 3-month treasury-bill rate, have risen over time and that the addition of RPs to M1A or to M1 does not reduce the interest elasticity, whereas the addition of other checkables to M1A does lower it.

Next, the following regression model was specified:

$$(C) \ln(M/P)_t = a + b \ln y_t + c \text{RTB}_t + d \ln (M/P)_{t-1}$$

where RTB enters the function in non-logarithmic form. Thus the coefficient c is the interest slope of demand (not elasticity)--it is the percentage change in demand with respect to arithmetic (percentage point) changes in the interest rate, RTB. As Cagan and Schwartz stated, this form of the function enables us to avoid "the resulting blow-up of small changes which occurs at low levels of the interest rate."⁵ Table 10 summarizes the results obtained from the estimation of specification C, where interest elasticities are calculated by multiplying the estimate of the interest slope by the average RTB during the sample period. As can be seen, the calculated elasticities given by Table 10 are virtually the same as those directly estimated under specification A. Our previous conclusions, therefore, still hold. Table 10 also lists the slope estimates. Although the ranking of the aggregates remains the same, note that from 1963:4-73:4 to 1974:1-84:2 the slope estimate of M1 does not rise whereas its elasticity does. In other words, the percentage change in M1 for a given percentage point change in the market rate, RTB, has not increased in our second main subsample, 1974:1-84:2 (although an increase is indicated in the most recent sample); but the percentage change in M1 for a given percentage change in the rate of interest has risen.

5. Cagan and Schwartz, "Money Substitutes," p. 141.

Table 10. ERTB ESTIMATES UNDER SPECIFICATION C

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.019	-0.052	-0.075	Rising
M1AR/P	-0.014	-0.042	-0.064	Rising
M1A/P	-0.015	-0.042	-0.061	Rising
M1R/P	-0.014	-0.027	-0.069	Rising
M1/P	-0.015	-0.027	-0.050	Rising

THE SLOPE ESTIMATES UNDER SPECIFICATION C

DD/P	-0.0038	-0.0060	-0.0070	Rising
M1AR/P	-0.0028	-0.0048	-0.0059	Rising
M1A/P	-0.0030	-0.0048	-0.0057	Rising
M1R/P	-0.0028	-0.0031	-0.0064	Rising
M1/P	-0.0030	-0.0031	-0.0046	Unchanged

One of the interesting questions is whether taking into account the explicit own rate of return on M1 would affect the ERTB estimates. Specifically, as the interest rate variable (which represents the opportunity cost of holding money), we use RTB less the proportion of other checkables in M1 multiplied by 5.25 percent (the fixed rate on other checkable deposits). This procedure, of course, lowers the level of the opportunity cost of holding M1. Would this change the interest sensitivity of real M1 balances? To find an answer, the following regression is estimated:

$$(D) \ln (M1/P)_t = a + b \ln y_t + c \ln R_t + d \ln (M1/P)_{t-1}$$

where R is our interest rate variable just defined. Specification D is estimated using the aggregate real M1 and per capita real M1 as dependent variables over four sample periods. The entire sample period now starts with 1967, since the amount of other checkables before this year was zero. The estimation results are given in Table 11. Comparing these estimates with those obtained under specification A, we see that for the period 1974:1-84:2 the ERTB estimates are the same (0.027 and 0.026, respectively), whereas for the period 1978:4-84:2 specification D gives a lower ERTB than did specification A, 0.044 compared to 0.053 (the difference is statistically significant at the 5 percent level). In other words, ERTB of M1 is reduced when holding M1 is associated with a lower opportunity cost.

Table 11. ERTB ESTIMATES OF M1 UNDER SPECIFICATION D

Dependent variable (M1/P)		Dependent variable (M1/PN)	
SAMPLE	ERTB	SAMPLE	ERTB
67:4-84:2	-0.021	67:4-84:2	-0.020
70:4-84:2	-0.025	70:4-84:2	-0.025
74:1-84:2	-0.027	74:1-84:2	-0.027
78:4-84:2	-0.044	78:4-84:2	-0.042

The next specification estimated is the Goldfeld's conventional money demand function with two interest rate variables, one being unregulated RTB and the other one regulated (by Regulation Q) commercial bank savings deposit rate, RSD. RSD was included separately in the Goldfeld's function, but this variable, which has already become less and less significant in explaining the variations in variously defined money balances, as we will see, may be dropped from the function once the process of the phasing-out of Regulation Q is completed. For the rationale for its separate inclusion is that it is regulated and therefore does not behave like RTB. Our model is,

$$(E) \ln (M/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t \\ + e \ln (M/P)_{t-1}$$

which utilizes the partial adjustment of real balances, as

did all the previous specifications. Specification E, too, is estimated with each of the seven monetary aggregates as the dependent variable.

First, aggregate real DD is used as the dependent variable. RTB and the lagged dependent variables are both significant at the 5 percent level with expected signs in all four samples, while income elasticity estimate is not significant in samples 1974:1-84:2 and 1978:4-84:2. The coefficient of RSD, which we will denote in general as ERS_D (in this case, the elasticity of real DD with respect to the savings deposit rate), is significant only at the 10 percent level during the period 1963:4-84:2 and at the 5 percent level during 1963:4-73:4, with a value of 0.096 (in absolute value). That is, real DD has become insensitive to the variations in RSD in recent years, which should not be surprising given the developments outlined above; in particular, given the fact that savings deposits have become less attractive (indicated by the amount of savings deposits held) as more liquid alternatives with higher yields have emerged. On the other hand, the ERT_B estimates are 0.040 for the period 63:4-84:2, 0.017 for 1963:4-73:4 and 0.049 and 0.083 for the two most recent periods. Clearly, these estimates once again indicate a rising ERT_B of real DD over time. Compared to the estimates obtained from specification A, which uses only one interest variable, RTB, we see that the addition of the RSD variable to the regression does not change the ERT_B estimates (none of the differences is

significant). Moreover, the same is true when the regression is expressed in per capita terms, although in the latter case all ERSD estimates are statistically insignificant.

Next, specification E is estimated using real M1A as money balances. Again, RTB and the lagged money variables are significant in all samples at the 5 percent level with correct signs. The ERTB estimates are again similar to those obtained from earlier specifications, so that the previous conclusions that ERTB of M1A has risen over time and that ERTB of M1A is lower than ERTB of DD still remain. RSD variable is significant at the 5 percent level only during 1963:4-73:4, with a value of 0.075, lower than ERSD of real DD during the same period at the 5 percent level. With real per capita M1A as the dependent variable, however, all ERSD estimates are insignificant.

With real M1AR as the monetary aggregate, all ERTB estimates have the same magnitude as those obtained from specification A; thus, again, all earlier results hold. The only significant ERSD estimate is obtained during the period 63:4-84:2. All ERSD estimates are insignificant when population factor is included (when real per capita balances are used).

The addition of RSD to the regression does not alter ERTB of M1 either. But for the entire period 1963;4-84:2 as well as for 1963:4-73:4 we now obtain significant ERSD

estimates with negative signs. The period 1974:1-84:2, on the other hand, yields a positive and significant (at the 10 percent level) ERSD estimate. While the per capita form of the function gives a slightly higher ERTB for the period 1963:4-73:4, it also yields an insignificant estimate of ERSD for the period 1963:4-73:4 and significantly positive and large estimates for the periods 1974:1-84:2 and 1978:4-84:2. The ERSD estimates for these samples are 0.270 and 0.374, respectively. If anything, these findings suggest that in recent years real M1 varied directly with the rate on savings deposits. But they must be interpreted carefully. Keeping in mind that in recent samples the variable RSD was in general insignificant in regressions using real DD, real M1A, and real M1AR as monetary aggregates, we have reasons to believe that specification A should be preferred over specification E. Although the ERSD estimates are occasionally positive and significant when M1 or broader balances are the dependent variables, a close look at the data will reveal that since RSD is regulated, it has not varied much, especially during most recent years. It was 5.24 percent from 1982:2 to 1984:2, 5.23 percent in 1982:1, 5.20 percent in 1981:4 and 1981:3, and 5.18 percent during 1980. Furthermore, despite the fact that it increased from 4.92 percent in 1978:1 to 5.24 percent in 1984:2 (although not a large increase), savings deposits, as we saw above, suffered a significant decline during this period. That is, the amount of savings deposits held varied indirectly with its own rate: RSD probably was not an

Table 12. ERTB ESTIMATES UNDER SPECIFICICATION E

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.017	-0.049	-0.083	Rising
M1A/P	-0.014	-0.040	-0.066	Rising
M1AR/P	-0.016	-0.039	-0.066	Rising
M1/P	-0.014	-0.029	-0.052	Rising
M1R/P	-0.016	-0.023	-0.072	Rising
M1AF/P	--	n.s.	n.s.	--
M1RF/P	--	n.s.	0.036	--
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Dependent Variable				
DD/PN	-0.024	-0.050	-0.082	Rising
M1A/PN	-0.021	-0.041	-0.065	Rising
M1AR/PN	-0.020	-0.041	-0.066	Rising
M1R/PN	-0.020	-0.030	-0.032	Rising
M1/PN	-0.021	-0.029	-0.058	Rising
M1AF/PN	--	n.s.	n.s.	--
M1RF/PN	--	n.s.	n.s.	--

important factor in the movements in both savings deposits and M1 and possibly picks up the effects of other developments and rates of return when broader balances are used in the regressions.

Table 12 shows the ERTB estimates obtained under specification E. All our previous results are reaffirmed: ERTB rises over time and the ranking of monetary aggregates according to their interest sensitivities during the period 1974:1-84:2 is essentially the same as before. The only notable change is that unlike specification A, the present specification yields lower ERTB estimates of M1R than those of M1 during 1974:1-84:2 when aggregate real balances are used, and during 1978:4-84:2 when per capita real balances are employed--these results, suggesting that the addition of RPs to M1 lowers the interest elasticity, are theoretically more acceptable, as was discussed previously in this study.

Meanwhile, let us note that the explanatory power of the regressions are much lower when MMMFs are added to M1A under most specifications. Under specification A, R^2 is 0.86 for the sample 1974:1-84:2 and 0.69 for 1978:4-84:2; these figures are 0.86 and 0.48, respectively, under specification B, and 0.87 and 0.68 under specification E, all when aggregate real balances are used. Including the population variable in the function raises R^2 considerably. The latter is often, though not always, true. Virtually all other regressions have R^2 values between 0.90 and 0.99.

Table 13. ERSD ESTIMATES UNDER SPECIFICATION E

Dependent Variable	SAMPLE			ERSD OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.096	n.s.	n.s.	Falling
M1A/P	-0.025	n.s.	n.s.	Falling
M1AR/P	n.s.	n.s.	n.s.	--
M1R/P	n.s.	n.s.	n.s.	--
M1/P	-0.070	0.180	0.078	Falling
M1AF/P	--	n.s.	0.732	--
M1RF/P	--	0.250	n.s.	--
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Dependent Variable				
DD/PN	n.s.	n.s.	n.s.	--
M1A/PN	n.s.	n.s.	n.s.	--
M1AR/PN	n.s.	n.s.	n.s.	--
M1R/PN	n.s.	0.278	n.s.	--
M1/PN	n.s.	0.270	0.374	--
M1AF/PN	--	0.396	0.702	--
M1RF/PN	--	0.314	n.s.	--

The ERSD estimates, most of which are statistically zero, are summarized in Table 13. What can be said about ERSD of various balances over time? Not much when the aggregate form of the function is estimated and virtually nothing when per capita form is used. Nor does it make sense to rank the monetary aggregates according to their interest elasticities with respect to the RSD.

The version of the conventional money demand function with two interest rate variables which utilizes the partial adjustment of nominal balances is also estimated. The model now is given by

$$(F) \ln (M/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t \\ + e \ln (M_{t-1}/P_t)$$

The results obtained from specification F are summed up in Table 14 and Table 15. Generally speaking, these results are the same as those obtained from the version of the model which uses the partial adjustment of real balances. The major difference between the two models (described by specifications E and F) is that, in most cases, specification F yields lower ERTB, ERSD and lower income elasticity estimates, but larger lagged money coefficients (often greater than one). In fact, under the present specification, only one sample yields significant ERSD estimate when aggregate real balances are used as dependent variables.

Table 14. ERTB ESTIMATES UNDER SPECIFICATION F

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.014	-0.035	-0.071	Rising
M1A/P	-0.011	-0.026	-0.052	Rising
M1AR/P	-0.010	-0.025	-0.051	Rising
M1R/P	-0.010	-0.013	-0.052	Rising
M1/P	-0.011	-0.012	-0.032	Rising
M1AF/P	--	0.023	n.s.	--
M1RF/P	--	0.021	0.044	--
<hr/>				
Dependent Variable				
DD/PN	-0.017	-0.035	-0.069	Rising
M1A/PN	-0.014	-0.025	-0.050	Rising
M1AR/PN	-0.012	-0.025	-0.048	Rising
M1R/PN	-0.012	-0.014	-0.030	Rising
M1/PN	-0.010	-0.013	-0.038	Rising
M1AF/PN	--	0.019	n.s.	--
M1RF/PN	--	0.020	0.045	--

Table 15. ERSD ESTIMATES UNDER SPECIFICATION F

Dependent Variable	SAMPLE			ERSD OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.071	n.s.	n.s.	Falling
M1A/P	n.s.	n.s.	n.s.	--
M1AR/P	n.s.	n.s.	n.s.	--
M1R/P	n.s.	n.s.	n.s.	--
M1/P	n.s.	n.s.	n.s.	--
M1AF/P	--	n.s.	n.s.	--
M1RF/P	--	n.s.	n.s.	--
Dependent Variable				
DD/PN	n.s.	n.s.	n.s.	--
M1A/PN	n.s.	n.s.	n.s.	--
M1AR/PN	n.s.	n.s.	n.s.	--
M1R/PN	n.s.	n.s.	n.s.	--
M1R/PN	n.s.	n.s.	n.s.	--
M1AF/PN	--	0.305	n.s.	--
M1RF/PN	--	0.244	n.s.	--

Linear time trend is added to the real adjustment version of the conventional money demand function, i.e., to the specification E, giving,

$$(G) \ln (M/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t \\ + e \ln (M/P)_{t-1} + f T$$

The negative trend coefficient is significant during 1978:4-84:2 when real DD and real M1A are the money balances in the regression (indicating the weakness in DD in recent years), and positive and significant during 1963:4-84:2 and 1974:1-84:2 when real M1 and real M1R are used. It is also significant with real balances including MMMFs during 1978:4-84:2. Two effects of the addition of the trend variable to specification E can be seen: First, it raises the ERTB estimates during 1978:4-84:2 when the dependent variables are real DD, real M1A, and real M1AR, but lowers the ERTB estimate of M1R from 0.072 to 0.046 during the same period. Second, ERSD of DD and of M1A are now both very large and positive during the latter period. As Table 16 and Table 17 indicate, however, in general our earlier findings and conclusions still remain.

Table 16. ERTB ESTIMATES UNDER SPECIFICATION G

Dependent Variable	SAMPLE			ERTB OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.016	-0.055	-0.120	Rising
M1A/P	-0.013	-0.044	-0.094	Rising
M1AR/P	-0.013	-0.041	-0.086	Rising
M1/P	-0.013	-0.023	-0.049	Rising
M1R/P	-0.013	-0.021	-0.046	Rising
M1AF/P	--	n.s.	n.s.	--
M1RF/P	--	n.s.	n.s.	--

Table 17. ERSD ESTIMATES UNDER SPECIFICATION G

Dependent Variable	SAMPLE			ERSD OVER TIME
	63:4-73:4	74:1-84:2	78:4-84:2	
DD/P	-0.105	n.s.	0.934	Falling
M1A/P	-0.093	n.s.	0.631	Falling
M1/P	-0.091	n.s.	n.s.	Falling
M1AR/P	n.s.	n.s.	n.s.	--
M1R/P	n.s.	n.s.	n.s.	--
M1AF/P	--	n.s.	n.s.	--
M1RF/P	--	n.s.	n.s.	--

CHAPTER VI

CONCLUSIONS

Recent regulatory, institutional, and technological developments have brought about substantial changes in the financial environment. They have also altered or disturbed the historical relationships among real income, nominal interest rates, and real money stock. Numerous studies thus have been undertaken in recent years to establish the features of the new financial environment and to capture the impact of the new developments on the workings of the macroeconomy. A remarkable number of such new studies concerns the stability of the money demand function and the issues surrounding the latter. The present study aimed at exploring one such issue: the interest elasticity of money demand. Specifically, it has tried to answer questions like "Have recent developments increased interest elasticities of variously defined monetary aggregates?" and "How do interest elasticities of these aggregates compare?" Some important findings as well as answers to these questions are briefly discussed below.

(1) Generally speaking, interest elasticities of various monetary aggregates seem to have increased during the last

decade. More specifically, our estimates indicate that under all demand-for-money function specifications used interest sensitivities of demand deposits, demand deposits plus currency and traveler's checks (the former M1), the latter measure plus overnight RPs have all risen over time. They also suggest increased interest elasticities with respect to the open market rate of the current M1 and of money balances defined as the current M1 plus overnight RPs under all specifications but one. When specification A is expressed in per capita form, both elasticities turn out to be constant over time. Nevertheless, it is safe to conclude that, notwithstanding certain empirical shortcomings involved in this study, recent technological developments, innovations in cash-management techniques and innovations in liabilities offered by depository institutions, all of which together have contributed to the reduced transactions costs and increased substitutability among most financial assets, have increased the interest sensitivity of money balances. This conclusion may provide some explanation for the 1982-83 velocity decline; increased interest elasticity coupled with a sharp decline in interest rates could indeed be responsible, at least in part, for a significant decline in the income velocity of M1.

(2) The interest elasticity of M1 balances with respect to open market rates has increased both whether the non-zero return on other checkable deposits component is explicitly accounted for or not. In other words, an increased elasticity is found when changes in the level of the

opportunity cost of holding M1 is considered. However, with a lower opportunity cost of holding M1, the interest sensitivity is slightly lower in the 1978-84 period--when the fixed differential between the market rate and the rate on M1 is reduced, so is the elasticity.

(3) When money market mutual funds are included in money balances, overall fit of the regressions estimated is usually poorer, both in terms of low R^2 's and in terms of the magnitude and signs of the coefficient estimates. Still, it can be concluded that such balances have either positive or statistically insignificant elasticities with respect to open market rates and the savings deposit rate, possibly due to their large size and their variable market yields.

(4) When overnight repurchase agreements are added to the current M1 or the former M1 (M1A), interest sensitivity of these broader balances do not fall. In general, the addition of RPs to money balances leaves interest elasticities unchanged. Yet, clearly, due to the scale effect and to the fact that RPs earn a market rate of return--therefore their own elasticities would be expected to be low--one would expect decreased elasticities of these monetary measures.

(5) There are certainly problems involved with the use and interpretation of both nominal and real versions of the partial adjustment mechanism, as was discussed in length in this study. A particularly unexpected finding is that our results do not indicate an increasing speed of adjustment of

money balances with the accelerated rate of technological changes and innovations in cash-management techniques. The speed of adjustment itself is also quite low, usually below 0.10.

(6) The rate on savings deposit rate is too often insignificant in explaining money holdings, especially in samples starting 1974 and later. In fact, as was suggested above, we believe that there are quite many empirical and theoretical reasons to drop this regulated rate from the function--one just has to remember the declining significance of savings deposits, and the Depository Institutions Deregulation and Monetary Control Act of 1980 which phased-in the gradual elimination of Regulation Q ceilings. With most of the estimates insignificant, it is not very meaningful to rank the monetary measures according to their sensitivities to the savings deposit rate; nor is it easy to decide whether their elasticities have changed over time. Some specifications, however, suggest, if anything, that interest sensitivities of narrow measures (demand deposits, for one) might have declined over time.

(7) All these results essentially remain unchanged when the regressions include the population factor. That is, the differences in estimates obtained from regressions using aggregate real balances and those using per capita real balances are quite insignificant with only a few exceptions.

(8) All these results must be interpreted with caution. For our empirical study covers a transitory period (1978 to 1984) which is characterized by rapid changes, substantial

flows of funds within and among monetary aggregates, and incomplete regulatory reforms. Once the new financial environment settles down (if it at all does), once the deregulation is completed and financial innovations spread all over the economy, there are reasons to believe that the interest elasticity of money balances, particularly of M1, would indeed be lower as expected. For with money balances paying a variable market rate of interest, a given, say, increase in open market rates will not increase the opportunity cost of holding money as much, as the rate on the latter will increase as well; in other words, the money demand curve will become flatter, implying lower interest elasticity.

APPENDIX

R^2 figures given are adjusted R^2 . DW denotes Durbin-Watson statistic. Numbers in parentheses are t-statistics. The estimates of the constant term are not reported. In specifications in which interest rates enter the function in non-log form, reported coefficients are elasticities calculated by multiplying average interest rate within the sample period by the coefficients obtained.

$$\ln (DD/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (DD/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.019 (1.24)	-0.039 (5.84)	0.982 (73.42)	0.99	1.98
63:4-73:4	0.076 (2.04)	-0.018 (2.39)	0.761 (5.71)	0.89	1.67
74:1-84:2	0.061 (1.18)	-0.049 (5.17)	0.975 (45.03)	0.99	2.02
78:4-84:2	-0.059 (0.38)	-0.076 (4.10)	0.970 (33.69)	0.99	2.17

$$\ln (DD/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (DD/PN)_{t-1}$$

63:4-84:2	0.040 (1.81)	-0.040 (5.96)	0.977 (69.20)	0.99	1.98
63:4-73:4	0.187 (1.86)	-0.023 (3.61)	0.780 (6.54)	0.98	1.70
74:1-84:2	0.091 (1.43)	-0.049 (5.17)	0.964 (46.33)	0.99	2.03
78:4-84:2	-0.046 (0.26)	-0.076 (4.06)	0.974 (36.19)	0.98	2.17

$$\ln (M1A/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1A/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.029 (1.82)	-0.032 (6.09)	0.968 (63.76)	0.99	1.98
63:4-73:4	0.109 (2.22)	-0.014 (2.29)	0.698 (4.75)	0.95	1.68
74:1-84:2	0.058 (1.62)	-0.040 (5.68)	0.960 (40.81)	0.99	2.01
78:4-84:2	-0.018 (0.17)	-0.061 (4.63)	0.956 (32.31)	0.98	2.18

$$\ln (M1A/PN)_t = a + b \ln (Y/N)_t + c \ln RTB_t + d \ln (M1A/PN)_{t-1}$$

63:4-84:2	0.054 (2.88)	-0.033 (6.26)	0.957 (55.54)	0.98	1.99
63:4-73:4	0.161 (1.67)	-0.021 (3.78)	0.848 (8.26)	0.99	1.77
74:1-84:2	0.094 (2.09)	-0.040 (5.54)	0.940 (36.74)	0.98	2.02
78:4-84:2	-0.010 (0.78)	-0.060 (4.48)	0.952 (29.82)	0.98	2.19

$$\ln (M1AR/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1AR/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.033 (3.01)	-0.031 (6.16)	0.951 (48.84)	0.97	2.00
63:4-73:4	0.126 (2.40)	-0.015 (2.64)	0.708 (5.14)	0.97	1.76
74:1-84:2	0.077 (2.43)	-0.040 (5.85)	0.941 (32.37)	0.98	2.07
78:4-84:2	-0.047 (0.55)	-0.065 (5.72)	0.929 (29.30)	0.98	2.47

$$\ln (M1AR/PN)_t = a + b \ln (Y/N)_t + c \ln RTB_t + d \ln (M1AR/PN)_{t-1}$$

63:4-84:2	0.092 (4.04)	-0.033 (6.45)	0.926 (39.33)	0.98	2.01
63:4-73:4	0.119 (1.45)	-0.020 (3.84)	0.906 (11.17)	0.99	1.83
74:1-84:2	0.141 (3.27)	-0.040 (5.69)	0.901 (25.41)	0.95	2.06
78:4-84:2	-0.034 (0.29)	-0.065 (5.72)	0.924 (23.97)	0.97	2.46

$$\ln (M1/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.036 (3.01)	-0.019 (3.77)	0.900 (23.18)	0.89	2.04
63:4-73:4	0.120 (2.40)	-0.018 (2.23)	0.670 (4.53)	0.95	1.69
74:1-84:2	0.110 (4.51)	-0.026 (4.30)	0.880 (16.39)	0.89	1.94
78:4-84:2	0.246 (2.96)	-0.053 (4.88)	0.710 (8.20)	0.93	2.15

$$\ln (M1/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1/PN)_{t-1}$$

63:4-84:2	0.110 (2.65)	-0.018 (3.25)	0.890 (16.63)	0.97	2.03
63:4-73:4	0.161 (1.73)	-0.021 (3.79)	0.848 (8.33)	0.99	1.76
74:1-84:2	0.163 (2.48)	-0.020 (2.59)	0.937 (11.71)	0.90	2.02
78:4-84:2	-0.285 (1.35)	-0.021 (1.29)	1.151 (8.50)	0.94	2.00

$$\ln (M1R/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1R/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.052 (3.00)	-0.018 (3.20)	0.912 (17.73)	0.93	2.03
63:4-73:4	0.126 (2.41)	-0.015 (2.65)	0.709 (5.18)	0.97	1.76
74:1-84:2	0.147 (4.21)	-0.026 (3.63)	0.903 (14.58)	0.91	1.97
78:4-84:2	0.500 (2.59)	-0.073 (4.15)	0.561 (3.42)	0.93	2.03

$$\ln (M1R/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1R/PN)_{t-1}$$

63:4-84:2	0.053 (1.10)	-0.016 (2.82)	0.986 (19.48)	0.99	2.02
63:4-73:4	0.118 (1.46)	-0.020 (3.83)	0.907 (11.26)	0.99	1.83
74:1-84:2	0.121 (1.67)	-0.020 (2.53)	1.023 (17.09)	0.96	1.98
78:4-84:2	-0.349 (2.30)	-0.023 (1.72)	1.132 (16.32)	0.97	2.13

$$\ln (M1AF/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1AF/P)_{t-1}$$

Sample	b	c	d	R ²	DW
74:1-84:2	0.060 (1.67)	0.013 (1.36)	0.776 (10.15)	0.86	2.00
78:4-84:2	0.067 (0.49)	0.025 (1.29)	0.814 (6.94)	0.69	2.07

$$\ln (M1AF/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1AF/PN)_{t-1}$$

74:1-84:2	0.119 (1.69)	0.009 (1.36)	0.890 (10.15)	0.95	2.02
78:4-84:2	0.054 (0.27)	0.024 (1.25)	0.909 (10.94)	0.85	2.12

$$\ln (M1RF/P)_t = a + b \ln (Y/N)_t + c \ln RTB_t + d \ln (M1RF/P)_{t-1}$$

Sample	b	c	d	R ²	DW
74:1-84:2	0.108 (2.76)	0.010 (1.30)	0.959 (38.88)	0.99	1.99
78:4-84:2	0.025 (0.20)	0.032 (2.22)	0.989 (28.48)	0.98	2.34

$$\ln (M1RF/PN)_t = a + b \ln (Y/N)_t + c \ln RTB_t + d \ln (M1RF/PN)_{t-1}$$

74:1-84:2	0.124 (2.28)	0.010 (1.30)	0.984 (51.85)	0.99	1.98
78:4-84:2	0.006 (0.40)	0.032 (2.26)	0.993 (43.42)	0.99	2.35

$$\ln (DD/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (DD/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.169 (2.11)	-0.042 (6.44)	0.949 (43.65)	-0.001 (1.89)	0.99	1.98
63:4-73:4	0.165 (1.62)	-0.020 (2.82)	0.743 (5.36)	-0.001 (1.01)	0.90	1.67
74:1-84:2	0.194 (1.73)	-0.050 (5.03)	0.916 (12.38)	-0.002 (0.82)	0.99	2.03
78:4-84:2	0.080 (0.32)	-0.080 (4.04)	0.894 (7.90)	-0.002 (0.70)	0.99	2.14

$$\ln (DD/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (DD/PN)_{t-1} + e T$$

63:4-84:2	0.161 (1.98)	-0.042 (6.30)	0.952 (44.34)	-0.001 (1.54)	0.99	1.99
63:4-73:4	0.167 (1.54)	-0.021 (2.95)	0.729 (5.08)	0.001 (0.87)	0.98	1.67
74:1-84:2	0.186 (1.10)	-0.049 (4.95)	0.920 (12.45)	-0.001 (0.62)	0.99	2.03
78:4-84:2	0.076 (0.31)	-0.079 (4.02)	0.894 (7.91)	-0.002 (0.74)	0.98	2.13

$$\ln (M1A/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1A/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.140 (2.13)	-0.034 (6.62)	0.931 (37.22)	-0.001 (1.83)	0.99	1.98
63:4-73:4	0.168 (1.80)	-0.016 (2.72)	0.700 (4.70)	-0.001 (0.87)	0.95	1.68
74:1-84:2	0.142 (1.05)	-0.041 (5.53)	0.911 (11.66)	-0.001 (0.65)	0.99	2.01
78:4-84:2	0.062 (0.31)	-0.064 (4.31)	0.907 (8.50)	-0.001 (0.47)	0.98	2.16

$$\ln (M1A/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1A/PN)_{t-1} + e T$$

63:4-84:2	0.132 (1.98)	-0.034 (6.47)	0.935 (37.99)	-0.001 (1.22)	0.98	1.99
63:4-73:4	0.188 (1.87)	-0.017 (2.89)	0.656 (4.26)	0.001 (1.59)	0.99	1.70
74:1-84:2	0.139 (1.03)	-0.040 (5.41)	0.912 (11.54)	-0.001 (0.36)	0.98	2.02
78:4-84:2	0.057 (0.29)	-0.063 (4.22)	0.903 (8.29)	-0.001 (0.47)	0.97	2.17

$$\ln (M1AR/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1AR/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.159 (2.32)	-0.034 (6.61)	0.902 (27.66)	-0.001 (1.86)	0.97	2.01
63:4-73:4	0.144 (1.78)	-0.016 (2.73)	0.772 (5.27)	-0.0002 (0.37)	0.97	1.77
74:1-84:2	0.126 (0.95)	-0.041 (5.67)	0.910 (10.68)	-0.001 (0.38)	0.98	2.06
78:4-84:2	0.014 (0.07)	-0.067 (4.93)	0.894 (8.65)	-0.001 (0.35)	0.98	2.45

$$\ln (M1AR/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1AR/PN)_t + e T$$

63:4-84:2	0.151 (2.20)	-0.033 (6.52)	0.907 (28.55)	-0.0002 (0.90)	0.98	2.01
63:4-73:4	0.157 (1.78)	-0.017 (2.91)	0.687 (4.79)	0.001 (1.79)	0.99	1.77
74:1-84:2	0.122 (0.93)	-0.040 (5.65)	0.914 (10.66)	0.0001 (0.31)	0.95	2.06
78:4-84:2	0.011 (0.06)	-0.067 (5.01)	0.894 (8.70)	-0.0003 (0.31)	0.97	2.44

$$\ln (M1/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1/P)_{t-1} + e T^t$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.004 (0.08)	-0.019 (3.69)	0.920 (18.32)	0.0002 (0.55)	0.89	2.02
63:4-73:4	0.180 (1.94)	-0.016 (2.68)	0.676 (4.57)	-0.001 (0.90)	0.96	1.69
74:1-84:2	-0.012 (0.24)	-0.024 (4.87)	0.957 (19.38)	0.001 (2.63)	0.93	2.01
78:4-84:2	0.133 (0.57)	-0.046 (2.74)	0.786 (4.67)	0.0004 (0.51)	0.93	2.19

$$\ln (M1/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1/PN)_{t-1} + e T$$

63:4-84:2	0.001 (0.02)	-0.019 (3.66)	0.921 (19.12)	0.0004 (2.15)	0.98	2.01
63:4-73:4	0.189 (1.89)	-0.017 (2.90)	0.655 (4.27)	0.001 (4.27)	0.99	1.70
74:1-84:2	-0.077 (0.16)	-0.024 (4.93)	0.954 (19.30)	0.001 (4.76)	0.96	2.01
78:4-84:2	0.130 (0.57)	-0.046 (2.85)	0.782 (4.63)	0.001 (2.99)	0.96	2.19

$$\ln (M1R/P)_t = a + b \ln y_t + c \ln RTB_t + d \ln (M1R/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	-0.031 (0.59)	-0.018 (3.35)	0.954 (18.81)	0.001 (1.60)	0.94	2.01
63:4-73:4	0.143 (1.78)	-0.016 (2.74)	0.722 (5.30)	-0.0002 (0.36)	0.97	1.76
74:1-84:2	0.001 (0.01)	-0.025 (4.38)	0.939 (18.79)	0.001 (2.80)	0.94	1.98
78:4-84:2	0.154 (0.59)	-0.055 (2.86)	0.742 (4.17)	0.001 (1.73)	0.95	2.18

$$\ln (M1R/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + d \ln (M1R/PN)_{t-1} + e T$$

63:4-84:2	-0.032 (0.60)	-0.018 (3.33)	0.951 (19.12)	0.001 (2.60)	0.99	2.01
63:4-73:4	0.156 (1.78)	-0.017 (2.92)	0.688 (4.82)	-0.001 (1.79)	0.99	1.77
74:1-84:2	0.004 (0.07)	-0.025 (4.40)	0.936 (18.76)	0.001 (4.16)	0.98	1.98
78:4-84:2	0.147 (0.58)	-0.054 (2.96)	0.740 (4.15)	0.002 (2.33)	0.97	2.17

$$\ln (M1AF/P)_t = a + b \ln y_t + c \ln RTB_t + \\ d \ln (M1AF/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	-0.067 (0.69)	0.018 (1.79)	0.673 (6.46)	0.001 (1.40)	0.86	1.95
78:4-84:2	-0.963 (2.99)	0.052 (1.82)	-0.300 (1.32)	0.008 (4.09)	0.48	1.90

$$\ln (M1AF/PN)_t = a + b \ln (y/N)_t + c \ln RTB_t + \\ d \ln (M1AF/PN)_{t-1} + e T$$

74:1-84:2	-0.068 (0.70)	0.019 (1.87)	0.672 (6.49)	0.002 (2.39)	0.95	1.95
78:4-84:2	-0.971 (3.06)	0.053 (1.85)	-0.304 (1.33)	0.009 (4.83)	0.69	1.90

$$\ln (M1RF/P)_t = a + b \ln y_t + c \ln RTB_t + \\ d \ln (M1RF/P)_{t-1} + e T$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	-0.058 (0.68)	0.015 (1.96)	0.877 (19.64)	0.002 (2.16)	0.99	2.01
78:4-84:2	-0.181 (0.94)	0.030 (1.98)	0.701 (3.65)	0.005 (1.52)	0.98	2.07

$$\ln (M1RF/PN)_t = a + b \ln (Y/N)_t + c \ln RTB_t + \\ d \ln (M1RF/PN)_{t-1} + e T$$

74:1-84:2	-0.058 (0.69)	0.015 (2.04)	0.875 (19.81)	0.002 (2.70)	0.99	2.01
78:4-84:2	-0.181 (0.94)	0.030 (1.98)	0.701 (3.65)	0.005 (1.52)	0.98	2.07

$$\ln (DD/P)_t = a + b \ln y_t + c RTB_t + d \ln (DD/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.013 (1.11)	-0.038 (7.67)	0.974 (84.60)	0.99	2.02
63:4-73:4	0.073 (2.06)	-0.019 (2.78)	0.780 (6.14)	0.90	1.70
74:1-84:2	0.064 (1.46)	-0.052 (6.48)	0.977 (52.74)	0.99	2.14
78:4-84:2	-0.064 (0.43)	-0.075 (4.44)	0.969 (35.55)	0.99	2.24

$$\ln (M1A/P)_t = a + b \ln y_t + c RTB_t + d \ln (M1A/P)_{t-1}$$

63:4-84:2	0.017 (1.97)	-0.031 (8.03)	0.958 (73.68)	0.99	2.01
63:4-73:4	0.101 (2.16)	-0.015 (2.76)	0.728 (5.19)	0.95	1.70
74:1-84:2	0.058 (1.97)	-0.042 (7.22)	0.961 (48.62)	0.99	2.14
78:4-84:2	-0.022 (0.22)	-0.061 (5.03)	0.954 (34.27)	0.99	2.26

$$\ln (M1/P)_t = a + b \ln y_t + c RTB_t + d \ln (M1/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.034 (2.91)	-0.017 (3.76)	0.877 (21.57)	0.88	2.04
63:4-73:4	0.115 (2.36)	-0.015 (2.63)	0.694 (4.88)	0.95	1.72
74:1-84:2	0.108 (4.94)	-0.027 (4.84)	0.859 (16.71)	0.90	1.94
78:4-84:2	0.250 (2.88)	-0.050 (4.61)	0.706 (7.77)	0.93	2.13

$$\ln (M1AR/P)_t = a + b \ln y_t + c RTB_t + d \ln (M1AR/P)_{t-1}$$

63:4-84:2	0.032 (3.65)	-0.030 (8.00)	0.936 (55.01)	0.98	2.04
63:4-73:4	0.121 (2.32)	-0.014 (2.73)	0.723 (5.29)	0.97	1.77
74:1-84:2	0.076 (2.91)	-0.042 (7.40)	0.939 (38.18)	0.98	2.22
78:4-84:2	-0.050 (0.60)	-0.064 (6.05)	0.926 (19.61)	0.98	2.57

$$\ln (M1R/P)_t = a + b \ln y_t + c RTB_t + d \ln (M1R/P)_{t-1}$$

Sample	b	c	d	R ²	DW
63:4-84:2	0.053 (2.96)	-0.015 (3.06)	0.885 (16.41)	0.92	2.05
63:4-73:4	0.121 (2.32)	-0.014 (2.74)	0.724 (5.32)	0.97	1.76
74:1-84:2	0.153 (4.48)	-0.027 (3.94)	0.875 (14.25)	0.92	1.97
78:4-84:2	0.499 (2.43)	-0.069 (3.79)	0.563 (3.22)	0.93	2.05

$$\ln (M1/P)_t = a + b \ln y_t + c \ln R_t + d \ln (M1/P)_{t-1}$$

Sample	b	c	d	R ²	DW
67:4-84:2	0.032 (2.41)	-0.021 (4.03)	0.905 (18.99)	0.87	2.03
70:4-84:2	0.060 (3.25)	-0.025 (4.59)	0.935 (20.58)	0.91	1.98
74:1-84:2	0.100 (5.04)	-0.027 (5.19)	0.888 (18.55)	0.91	1.96
78:4-84:2	0.153 (2.01)	-0.044 (5.23)	0.776 (10.17)	0.94	2.20

$$\ln (M1/PN)_t = a + b \ln y_t + c \ln R_t + d \ln (M1/PN)_{t-1}$$

67:4-84:2	0.007 (0.27)	-0.020 (4.01)	0.923 (27.52)	0.97	2.02
70:4-84:2	0.047 (1.41)	-0.025 (4.44)	0.923 (28.41)	0.97	1.99
74:1-84:2	0.077 (2.35)	-0.027 (5.14)	0.873 (25.41)	0.96	1.94
78:4-84:2	0.109 (0.99)	-0.042 (5.31)	0.810 (12.15)	0.94	2.21

$$\ln (DD/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (DD/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.071 (2.21)	-0.077 (1.79)	-0.040 (6.27)	0.981 (77.11)	0.99	2.00
63:4-73:4	0.167 (2.95)	-0.096 (2.13)	-0.017 (2.46)	0.626 (4.34)	0.91	1.64
74:1-84:2	0.063 (1.06)	-0.016 (0.07)	-0.049 (4.39)	0.973 (29.01)	0.99	2.03
78:4-84:2	-0.061 (0.40)	0.216 (0.66)	-0.083 (3.96)	0.992 (22.82)	0.99	2.22

$$\ln (DD/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (DD/PN)_{t-1}$$

63:4-84:2	0.098 (2.31)	-0.058 (1.58)	-0.041 (6.24)	0.973 (70.31)	0.99	2.00
63:4-73:4	0.193 (1.89)	-0.016 (0.47)	-0.024 (3.64)	0.810 (6.52)	0.98	1.71
74:1-84:2	0.090 (1.22)	0.001 (0.03)	-0.050 (4.41)	0.965 (26.14)	0.99	2.03
78:4-84:2	-0.039 (0.22)	0.194 (0.60)	-0.082 (3.90)	0.997 (22.17)	0.98	2.21

$$\ln (M1A/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1A/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.064 (2.61)	-0.063 (1.93)	-0.033 (6.65)	0.967 (68.05)	0.99	1.99
63:4-73:4	0.191 (3.03)	-0.075 (2.05)	-0.014 (2.46)	0.583 (3.79)	0.96	1.66
74:1-84:2	0.059 (1.33)	-0.003 (0.02)	-0.040 (4.93)	0.959 (25.97)	0.99	2.01
78:4-84:2	-0.029 (0.10)	0.165 (0.73)	-0.066 (4.55)	0.979 (22.43)	0.98	2.24

$$\ln (M1A/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1A/PN)_{t-1}$$

63:4-84:2	0.094 (2.73)	-0.039 (1.36)	-0.033 (6.48)	0.954 (56.39)	0.98	2.00
63:4-73:4	0.160 (1.62)	-0.001 (0.04)	-0.021 (3.73)	0.849 (7.48)	0.99	1.77
74:1-84:2	0.087 (1.46)	0.032 (0.20)	-0.041 (4.95)	0.947 (21.44)	0.98	2.03
78:4-84:2	-0.017 (0.13)	0.153 (0.70)	-0.065 (4.45)	0.980 (19.53)	0.98	2.24

$$\ln (M1AR/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AR/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.080 (3.38)	-0.069 (2.18)	-0.032 (6.79)	0.949 (52.24)	0.98	2.03
63:4-73:4	0.154 (2.71)	-0.043 (1.39)	-0.016 (2.97)	0.704 (5.26)	0.97	1.77
74:1-84:2	0.085 (1.89)	-0.044 (0.25)	-0.039 (5.00)	0.932 (20.03)	0.98	2.06
78:4-84:2	-0.058 (0.63)	0.074 (0.38)	-0.066 (5.36)	0.942 (20.02)	0.98	2.50

$$\ln (M1AR/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AR/PN)_{t-1}$$

63:4-84:2	0.130 (3.61)	-0.037 (1.33)	-0.033 (6.64)	0.924 (40.08)	0.98	2.02
63:4-73:4	0.117 (1.33)	-0.001 (0.05)	-0.020 (3.79)	0.909 (9.05)	0.99	1.83
74:1-84:2	0.135 (1.99)	0.019 (0.12)	-0.041 (5.12)	0.908 (15.40)	0.95	2.05
78:4-84:2	-0.043 (0.35)	0.060 (0.35)	-0.066 (5.49)	0.938 (16.39)	0.97	2.49

$$\ln (M1/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.099 (3.81)	-0.090 (2.69)	-0.021 (4.48)	0.876 (23.69)	0.91	0.91
63:4-73:4	0.198 (3.13)	-0.070 (2.01)	-0.014 (2.45)	0.570 (3.74)	0.96	1.68
74:1-84:2	0.058 (1.61)	0.180 (1.76)	-0.029 (5.07)	0.950 (16.51)	0.91	1.96
78:4-84:2	0.197 (1.60)	0.078 (0.54)	-0.052 (4.74)	0.752 (6.56)	0.93	2.19

$$\ln (M1/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1/PN)_{t-1}$$

63:4-84:2	0.130 (2.42)	-0.021 (0.62)	-0.018 (3.25)	0.889 (16.65)	0.97	2.03
63:4-73:4	0.160 (1.63)	-0.001 (0.03)	-0.021 (3.74)	0.849 (7.51)	0.99	1.76
74:1-84:2	0.052 (1.06)	0.270 (3.85)	-0.029 (4.94)	0.984 (18.14)	0.95	1.98
78:4-84:2	0.180 (0.64)	0.374 (2.27)	-0.058 (2.64)	0.820 (4.33)	0.95	2.11

$$\ln (M1R/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1R/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.121 (3.51)	-0.091 (2.32)	-0.019 (3.62)	0.880 (17.24)	0.94	2.00
63:4-73:4	0.152 (2.71)	-0.042 (1.37)	-0.016 (2.98)	0.710 (5.32)	0.97	1.77
74:1-84:2	0.083 (1.79)	0.185 (1.73)	-0.023 (4.35)	0.944 (16.40)	0.93	1.96
78:4-84:2	0.390 (1.80)	0.147 (1.03)	-0.072 (4.12)	0.626 (3.68)	0.94	2.11

$$\ln (M1R/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1R/PN)_{t-1}$$

63:4-84:2	0.067 (1.20)	-0.019 (0.55)	-0.016 (2.83)	0.992 (19.57)	0.99	2.01
63:4-73:4	0.117 (1.33)	-0.002 (0.05)	-0.020 (3.79)	0.909 (9.09)	0.99	1.83
74:1-84:2	0.069 (1.16)	0.278 (3.02)	-0.030 (4.18)	0.985 (19.10)	0.97	1.98
78:4-84:2	-0.243 (0.85)	0.108 (0.42)	-0.032 (1.26)	1.070 (6.74)	0.96	2.10

$$\ln (M1AF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AF/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	-0.005 (0.91)	0.253 (1.62)	0.010 (1.09)	0.705 (8.15)	0.87	1.97
78:4-84:2	-0.097 (0.58)	0.732 (1.85)	0.003 (0.15)	0.483 (2.36)	0.68	1.96

$$\ln (M1AF/PN)_t = a + b \ln (Y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AF/PN)_{t-1}$$

74:1-84:2	0.054 (0.89)	0.396 (2.43)	0.005 (0.59)	0.754 (10.03)	0.96	1.99
78:4-84:2	-0.029 (0.14)	0.702 (1.67)	0.003 (0.12)	0.648 (3.74)	0.85	1.99

$$\ln (M1RF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1RF/P)_{t-1}$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	0.068 (1.55)	0.250 (1.67)	0.006 (0.72)	0.928 (30.35)	0.99	2.03
78:4-84:2	0.017 (0.13)	-0.098 (0.33)	0.036 (1.91)	1.010 (15.94)	0.98	2.39

$$\ln (M1RF/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1RF/PN)_{t-1}$$

74:1-84:2	0.089 (1.77)	0.314 (2.09)	0.004 (0.54)	0.939 (33.38)	0.99	2.03
78:4-84:2	-0.010 (0.07)	-0.119 (0.39)	0.037 (1.97)	1.010 (20.64)	0.99	2.40

$$\ln (DD/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (DD_{t-1}/P_t)$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.068 (2.24)	-0.043 (1.06)	-0.029 (4.81)	1.013 (82.37)	0.99	1.98
63:4-73:4	0.141 (2.80)	-0.071 (1.65)	-0.014 (2.18)	0.738 (5.50)	0.91	1.62
74:1-84:2	0.058 (0.98)	-0.029 (0.12)	-0.035 (3.15)	1.000 (29.12)	0.99	2.03
78:4-84:2	-0.076 (0.52)	0.237 (0.75)	-0.071 (3.54)	1.026 (23.69)	0.99	2.25

$$\ln (DD/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (DD_{t-1}/P_t N_{t-1})$$

63:4-84:2	0.082 (2.04)	-0.031 (0.87)	-0.029 (4.71)	1.009 (74.28)	0.99	1.99
63:4-73:4	0.171 (1.87)	-0.012 (0.35)	-0.017 (2.76)	0.864 (7.66)	0.98	1.70
74:1-84:2	0.074 (1.00)	-0.011 (0.05)	-0.035 (3.16)	0.999 (26.16)	0.99	2.03
78:4-84:2	-0.069 (0.40)	0.202 (0.65)	-0.069 (3.43)	1.035 (22.88)	0.98	2.24

$$\ln (M1A/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1A_{t-1} / P_t)$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.052 (2.34)	-0.028 (0.92)	-0.021 (4.71)	1.010 (74.88)	0.99	1.99
63:4-73:4	0.137 (2.61)	-0.050 (1.49)	-0.011 (2.08)	0.756 (5.68)	0.95	1.60
74:1-84:2	0.045 (1.06)	-0.007 (0.04)	-0.026 (3.29)	1.000 (29.96)	0.99	2.02
78:4-84:2	-0.061 (0.62)	0.180 (0.85)	-0.052 (3.93)	1.030 (24.07)	0.99	2.28

$$\ln (M1A/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1A_{t-1} / P_t N_{t-1})$$

63:4-84:2	0.059 (1.88)	-0.016 (0.61)	-0.021 (4.50)	1.010 (62.44)	0.98	2.00
63:4-73:4	0.139 (1.66)	-0.002 (0.06)	-0.014 (2.52)	0.900 (9.12)	0.99	1.75
74:1-84:2	0.052 (0.88)	-0.017 (0.11)	-0.025 (3.25)	1.003 (22.10)	0.98	2.03
78:4-84:2	-0.074 (0.59)	0.143 (0.68)	-0.050 (3.66)	1.038 (20.55)	0.98	2.28

$$\ln (M1AR/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AR_{t-1} / P_t)$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.059 (2.75)	-0.032 (1.13)	-0.021 (4.78)	1.010 (58.27)	0.98	2.04
63:4-73:4	0.140 (2.78)	-0.037 (1.22)	-0.010 (2.00)	0.775 (6.30)	0.97	1.73
74:1-84:2	0.060 (1.37)	-0.050 (0.29)	-0.025 (3.34)	0.988 (20.88)	0.98	2.10
78:4-84:2	-0.111 (1.24)	0.066 (0.35)	-0.051 (4.31)	0.992 (20.66)	0.98	2.49

$$\ln (M1AR/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AR_{t-1} / P_t N_{t-1})$$

63:4-84:2	0.074 (2.26)	-0.019 (0.77)	-0.021 (4.61)	1.002 (45.22)	0.99	2.04
63:4-73:4	0.117 (1.48)	-0.002 (0.07)	-0.012 (2.32)	0.935 (10.15)	0.99	1.79
74:1-84:2	0.079 (1.19)	-0.008 (0.06)	-0.025 (3.42)	0.982 (16.24)	0.96	2.07
78:4-84:2	-0.133 (1.08)	0.006 (0.04)	-0.048 (4.11)	1.007 (16.66)	0.97	2.46

$$\ln (M1/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1_{t-1} / P_t)$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.065 (3.44)	-0.042 (1.71)	-0.012 (3.36)	0.950 (34.50)	0.95	1.98
63:4-73:4	0.150 (2.82)	-0.052 (1.54)	-0.011 (2.05)	0.726 (5.47)	0.96	1.66
74:1-84:2	0.054 (1.70)	0.011 (0.13)	-0.012 (2.38)	0.940 (19.36)	0.93	2.01
78:4-84:2	0.066 (0.52)	0.020 (0.16)	-0.032 (2.69)	0.850 (7.25)	0.94	2.11

$$\ln (M1/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1_{t-1} / P_t N_{t-1})$$

63:4-84:2	0.081 (2.40)	-0.009 (0.42)	-0.014 (2.83)	0.962 (28.91)	0.99	1.98
63:4-73:4	0.142 (1.79)	-0.002 (0.05)	-0.010 (2.54)	0.897 (9.16)	0.99	1.75
74:1-84:2	0.063 (1.49)	0.094 (1.49)	-0.013 (2.33)	0.960 (20.89)	0.96	2.10
78:4-84:2	0.116 (0.51)	0.188 (1.20)	-0.038 (1.91)	0.844 (5.70)	0.96	2.12

$$\ln (M1R/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1R_{t-1}/P_t)$$

Sample	b	c	d	e	R ²	DW
63:4-84:2	0.087 (3.62)	-0.052 (1.89)	-0.011 (3.03)	0.937 (26.77)	0.97	1.99
63:4-73:4	0.140 (2.80)	-0.037 (1.22)	-0.010 (2.01)	0.775 (6.35)	0.97	1.72
74:1-84:2	0.083 (2.06)	0.017 (0.18)	-0.013 (2.19)	0.930 (19.16)	0.95	1.97
78:4-84:2	0.253 (1.22)	0.058 (0.47)	-0.052 (2.88)	0.707 (4.50)	0.95	2.08

$$\ln (M1R/PN)_t = a + b \ln (Y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1R_{t-1}/P_t N_{t-1})$$

63:4-84:2	0.077 (2.11)	-0.008 (0.37)	-0.009 (2.37)	0.982 (30.17)	0.99	1.99
63:4-73:4	0.120 (1.51)	-0.002 (0.07)	-0.012 (2.33)	0.933 (10.18)	0.99	1.78
74:1-84:2	0.085 (1.62)	0.118 (1.38)	-0.014 (2.08)	0.958 (21.54)	0.98	1.99
78:4-84:2	-0.075 (0.32)	0.087 (0.38)	-0.030 (1.32)	0.949 (7.66)	0.97	2.05

$$\ln (M1AF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AF_{t-1} / P_t)$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	-0.012 (0.24)	0.155 (0.99)	0.023 (2.67)	0.681 (8.61)	0.88	2.00
78:4-84:2	-0.122 (0.79)	0.632 (1.68)	0.013 (0.57)	0.495 (2.80)	0.71	2.00

$$\ln (M1AF/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AF_{t-1} / P_t N_{t-1})$$

74:1-84:2	0.053 (0.90)	0.305 (1.89)	0.019 (2.18)	0.727 (10.60)	0.96	2.04
78:4-84:2	-0.060 (0.31)	0.635 (1.60)	0.013 (0.57)	0.620 (4.15)	0.86	2.05

$$\ln (M1RF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1RF_{t-1} / P_t)$$

Sample	b	c	d	e	R ²	DW
74:1-84:2	0.067 (1.67)	0.169 (1.24)	0.021 (3.02)	0.902 (33.68)	0.99	2.09
78:4-84:2	0.026 (0.19)	-0.034 (0.12)	0.044 (2.32)	0.950 (16.14)	0.98	2.36

$$\ln (M1RF/PN)_t = a + b \ln (y/N)_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1RF_{t-1} / P_t N_{t-1})$$

74:1-84:2	0.092 (1.88)	0.244 (1.76)	0.020 (2.74)	0.915 (36.68)	0.99	2.08
78:4-84:2	-0.003 (0.02)	-0.053 (0.17)	0.045 (2.39)	0.962 (20.80)	0.99	2.37

$$\ln (DD/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (DD/P)_{t-1} + f T^t$$

Sample	b	c	d	e	f	R ²	DW
63:4-84:2	0.142 (1.41)	-0.033 (0.44)	-0.042 (6.14)	0.960 (29.96)	-0.001 (0.74)	0.99	1.99
63:4-73:4	0.146 (1.43)	-0.105 (1.87)	-0.016 (2.24)	0.625 (4.25)	0.0002 (0.26)	0.90	1.63
74:1-84:2	0.262 (1.28)	0.204 (0.62)	-0.055 (4.25)	0.899 (11.25)	-0.003 (1.02)	0.99	2.03
78:4-84:2	0.466 (1.62)	0.934 (2.15)	-0.120 (4.83)	0.773 (6.80)	-0.008 (2.07)	0.99	2.48

$$\ln (M1A/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1A/P)_{t-1} + f T^t$$

63:4-84:2	0.105 (1.30)	-0.040 (0.72)	-0.034 (6.37)	0.950 (27.03)	-0.001 (0.53)	0.99	1.97
63:4-73:4	0.158 (1.70)	-0.093 (1.92)	-0.013 (2.05)	0.569 (3.63)	0.001 (0.55)	0.95	1.65
74:1-84:2	0.179 (1.14)	0.116 (0.49)	-0.044 (4.54)	0.899 (10.88)	-0.002 (0.80)	0.99	2.00
78:4-84:2	0.353 (1.51)	0.631 (1.96)	-0.094 (4.73)	0.796 (7.20)	-0.005 (1.79)	0.99	2.47

$$\ln (M1AR/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AR/P)_{t-1} + f T^t$$

Sample	b	c	d	e	f	R ²	DW
63:4-84:2	0.105 (1.27)	-0.057 (1.08)	-0.033 (6.37)	0.936 (21.25)	-0.001 (0.31)	0.97	2.03
63:4-73:4	0.113 (1.33)	-0.069 (1.55)	-0.013 (2.28)	0.669 (4.81)	0.001 (0.82)	0.97	1.76
74:1-84:2	0.124 (0.85)	-0.008 (0.04)	-0.041 (4.37)	0.911 (10.41)	-0.003 (0.28)	0.98	2.58
78:4-84:2	0.212 (0.80)	0.363 (1.11)	-0.086 (3.97)	0.816 (6.56)	-0.003 (1.09)	0.98	2.58

$$\ln (M1/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1/P)_{t-1} + f T^t$$

63:4-84:2	-0.015 (0.34)	-0.127 (4.09)	-0.020 (4.92)	0.953 (24.95)	0.010 (2.92)	0.94	1.99
63:4-73:4	0.168 (1.79)	-0.091 (1.87)	-0.013 (2.01)	0.549 (3.53)	0.001 (0.52)	0.95	1.67
74:1-84:2	-0.017 (0.31)	-0.044 (0.27)	-0.023 (3.75)	0.952 (17.88)	0.001 (1.72)	0.92	2.01
78:4-84:2	0.163 (0.60)	0.054 (0.34)	-0.049 (2.27)	0.772 (4.24)	0.0002 (0.14)	0.93	2.19

$$\ln (MIR/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (MIR/P)_{t-1} + f T$$

Sample	b	c	d	e	f	R ²	DW
63:4-84:2	-0.019 (0.46)	-0.147 (4.36)	-0.019 (4.66)	0.947 (23.52)	0.001 (4.10)	0.96	2.01
63:4-73:4	0.122 (1.33)	-0.067 (1.53)	-0.013 (2.31)	0.674 (4.88)	0.001 (0.81)	0.97	1.76
74:1-84:2	-0.024 (0.37)	-0.181 (0.94)	-0.021 (2.94)	0.922 (17.33)	0.002 (2.21)	0.95	1.99
78:4-84:2	0.063 (0.21)	-0.140 (0.56)	-0.046 (1.89)	0.786 (4.17)	0.002 (1.40)	0.95	2.19

$$\ln (M1AF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1AF/P)_{t-1} + f T$$

Sample	b	c	d	e	f	R ²	DW
74:1-84:2	-0.013 (0.12)	0.234 (0.84)	0.011 (0.85)	0.700 (6.65)	0.0001 (0.08)	0.86	1.96
78:4-84:2	-0.872 (2.60)	0.478 (0.86)	0.037 (1.13)	-0.308 (1.32)	0.007 (2.63)	0.48	1.89

$$\ln (M1RF/P)_t = a + b \ln y_t + c \ln RSD_t + d \ln RTB_t + e \ln (M1RF/P)_{t-1} + f T$$

74:1-84:2	-0.062 (0.57)	-0.017 (0.07)	0.015 (1.43)	0.876 (17.54)	0.002 (1.31)	0.99	2.09
78:4-84:2	-0.306 (1.41)	-0.414 (1.20)	0.045 (2.32)	0.649 (3.37)	0.007 (1.91)	0.98	2.16

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