



WP/03/62

# IMF Working Paper

---

## Factors Underlying the Definitions of Broad Money: An Examination of Recent U.S. Monetary Statistics and Practices of Other Countries

*Ewe-Ghee Lim and Subramanian S.  
Sriram*

**IMF Working Paper**

Statistics Department

**Factors Underlying the Definitions of Broad Money: An Examination of Recent U.S. Monetary Statistics and Practices of Other Countries**

Prepared by Ewe-Ghee Lim and Subramanian S. Sriram <sup>1</sup>

Authorized for distribution by Armida San Jose

March 2003

**Abstract**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

The paper examines the experiences of countries in defining monetary aggregates, particularly those countries that have undertaken substantial redefinitions. It finds that both the functional and empirical approaches are important; and that monetary definitions tend to be dynamic in nature, becoming prone to revisions whenever the current definition no longer satisfies both criteria. While countries may adhere to both approaches, monetary definitions may still vary across countries, reflecting specific institutional settings and the requirements of the empirical approach. This finding supports the approach in the IMF's *Monetary and Financial Statistics Manual* of not prescribing specific definitions of broad money.

JEL Classification Numbers: E0; E4, E5

Keywords: Definitions Money; Monetary Aggregates; United States; United Kingdom; Euro Area

Authors' E-Mail Addresses: [elim@imf.org](mailto:elim@imf.org) and [ssriram@imf.org](mailto:ssriram@imf.org)

---

<sup>1</sup> We would like to thank Armida San Jose, Edgar Ayales, Claudia Dziobek, Robert Heath, and Paul Duran for helpful comments, and Sangeeta Srivastava for valuable research assistance. Any errors are our own.

Contents	Page
I. Introduction .....	3
II. Background .....	3
III. Definitions of Money .....	4
A. Functions of Money Approach .....	4
B. Empirical Approach .....	5
C. Factors Underlying the Definition of Money .....	7
IV. Country Practices.....	8
A. United States .....	8
Model of Pressure for Redefinitions .....	11
Developments in the 1970s.....	11
Redefinitions in the 1980s .....	13
Developments in the 1990s.....	16
Summary of the Factors Underlying Monetary Definitions in the United States .....	18
B. United Kingdom and the Euro Area.....	19
United Kingdom.....	19
Euro Area Monetary Aggregates .....	22
Differences Among the U.S., U.K., and ECB Definitions of Money .....	25
C. Definitions of Money in Other Countries .....	27
V. Conclusion .....	27
Bibliography .....	33
Text Tables	
1. United States: Monetary Aggregates Prior to 1980 .....	10
2. United States: Monetary Aggregates in 1990 and at Present.....	15
3. United Kingdom: Monetary Aggregates.....	20
4. Asset Composition of Broad Money Aggregates Prior to Countries' Membership in Euro Area, 1996.....	23
5. Components of Monetary Aggregates: Selected Industrial and Developing Countries .....	28
Box	
1. The Decline in Demand for M1 and M2 in the 1970s .....	13

## I. INTRODUCTION

The IMF's new *Manual on Monetary and Financial Statistics (MFSM)* considers broad money a very important concept in its methodology. It also considers the depository corporation survey (DCS), which presents data on broad money, to be "the major focus of monetary statistics" and "to constitute a core set of data for macroeconomic analysis" (paragraph 365).<sup>2</sup> However, the *MFSM* does not provide prescriptions for defining broad money. It chooses to give only overall guidance, discussing the various financial assets that are possible candidates for inclusion in broad money, based on their liquidity and store-of-value characteristics (IMF, 2000, paragraphs 285–324). Generally, the *MFSM* leaves the choice of the assets to be included in broad money to the discretion of the national authorities.

If different countries choose different definitions of broad money, what rationales underlie the specific choices? This paper surveys the recent experience of the United States and other country practices, particularly in those countries that have undertaken substantial redefinitions of their monetary aggregates. The objective of the paper is to attempt to distill from the experiences certain broad principles that may be useful to practitioners contemplating their own countries' broad money definitions. In addition, it is hoped that the paper may throw some light on why the *MFSM* has chosen not to provide specific prescriptions for defining broad money.

The sections ahead will provide you with background, definitions of money, country practices, and conclusions.

## II. BACKGROUND

Since broad money is a monetary aggregate, the question of its definition is in essence the same as the question traditionally posed on money in general: "What is money? How should it be defined?" This question has been the subject of controversy for many years, with economists proposing many different groupings of financial assets into something called money—but no single definition has been universally acceptable.<sup>3</sup> However, understanding the issues surrounding this traditional debate should help clarify the issues that practitioners ought to consider in defining broad money.

Conceptually, the notion of money has usually been linked to the formulation of monetary policy and to the need to provide the appropriate amount of "liquidity" to the economy—to facilitate its maximum expansion without inflation. But what is this liquidity and how is it

---

<sup>2</sup>A comparable survey is the *Monetary Survey*, which is narrower in the coverage of financial institutions (including only what used to be called deposit money banks) and is discussed in the IMF, 1984, "A Guide to Money and Banking Statistics in International Financial Statistics."

<sup>3</sup>An excellent survey is provided by Friedman and Schwartz (1970), pp. 89–198.

measured? In the abstract, this liquidity is money; and its measurable, empirical counterpart is the monetary aggregate. What guides the construction of these monetary aggregates? In general, economists have used two approaches—the function-of-money approach and the empirical approach (Broaddus, 1975; Walter, 1989).

### III. DEFINITIONS OF MONEY

#### A. Functions of Money Approach

The first approach—*functional*—is based on principle, and asks what money is used for and why it is demanded. Money is used to facilitate purchases, is a means of payment, and should therefore include those assets used directly in making purchases, and exclude other assets. This criterion, focusing on money's role as a medium of exchange, is particularly attractive in that it links the amount of money in an economy to domestic aggregate spending—so that money can be a useful indicator of economic conditions.

Initially, economists taking this view defined money as the sum of currency in the hands of the public and demand (checking) deposits at commercial banks. However, they soon realized that spending decisions need not be limited to those assets that could be used *directly* as media of exchange. Spending decisions could just as easily be affected by and reflected in the quantities of other liquid assets that are “stores of value” or “temporary abodes of purchasing power,” that is, assets earning a return before being converted into media of exchange for future transactions. Being *close substitutes* for the means of payment, these assets should also be included in money, to get a full measure of the potential purchasing power inherent in a given quantity of money, so defined. The universe of financial assets that are potential money candidates thus expanded significantly, although there remained no consensus as to what all these assets should be (Broaddus, 1975).

This *functional approach* to defining money is the approach used by the *MFSM* to provide overall guidance to practitioners on constructing monetary aggregates. The *MFSM* emphasizes that “in constructing broad money aggregates, it is necessary to evaluate the degree of moneyness of a wide array of financial assets, focusing on the extent to which each type of financial asset provides liquidity and a store of value.” *Liquidity* is defined as “the extent to which financial assets can be sold at, or close to, full market value on short notice” (paragraph 287). Based on these criteria, the *MFSM* discusses a broad range of candidates that can be included in broad money. These candidates include currency; transferable deposits; term deposits; savings deposits; foreign-currency-denominated deposits; shares or other deposits issued by savings and loans associations, building societies, and credit unions; repurchase agreements; money market mutual fund shares; negotiable certificates of deposits (CDs); and short-term and even some medium-term (e.g., those with maturities of two years or less) securities, that are convertible into cash or transferable deposits with reasonably short delays and at close to full value if traded before maturity.

The *MFSM* has thus in essence updated and formalized the functional approach by using the notion of liquidity to help define the *boundary of potential money candidates*. Conversely, it suggests that assets that have limited liquidity may be excluded. That is, we may exclude

those assets for which there are significant time delays and transactions costs associated with their conversion into media of exchange, or those for which there is significant potential variability in their market price, such as in response to changes in interest rates. These assets that may be excluded from money include long-term securities, loans, shares and other equity, financial derivatives, and shares in equity mutual funds and bond mutual funds that may experience substantial price variability (IMF, 2000, paragraphs 312–313). Those suggestions notwithstanding, the *MFSM* (in line with the functional approach) does not prescribe a definitive list of assets for inclusion in money.

## B. Empirical Approach

The second approach is *empirical* in nature; it seeks to define money by finding the grouping of financial assets whose movements are most closely correlated with the movements of various macroeconomic variables of interest—such as national income and prices. Two prominent proponents of this view are Milton Friedman and Anna Schwartz, who argue that the question of the correct definition of money cannot be separated from the question of the *practical uses to which such a definition would be put by policymakers or others*, as follows:

“We conclude that the definition of money is to be sought for not on grounds of principle but on grounds of usefulness in organizing our knowledge of economic relationships. ‘Money’ is that to which we choose to assign a number by specified operations; it is not something in existence to be discovered like the American continent; it is a **tentative financial construct to be invented**, like ‘length’ or ‘temperature’ or ‘force’ in physics.” (Friedman and Schwartz, 1970).

In the view of Friedman and Schwartz, money is *any grouping of financial assets* (regardless of the functions they may satisfy) whose movements are found empirically to have a *stable and predictable relationship* with basic macroeconomic variables, such as national income and prices, because money, however defined, must be usable as an *instrument of policy*.

How does one go about constructing money so defined? We can use the framework usually associated with the empirical approach—the famous equation of exchange:

$$\text{Money} * \text{Money's Velocity} = \text{the Price level} * \text{Real GDP}$$

or

$$M * V = P * Y \dots\dots\dots (1)$$

The equation (1) states that the money stock, *M*, facilitates the transaction of *Y* goods, each costing on average *P* dollars, by changing hands *V* times a year. It suggests that money that has a stable and predictable velocity will have a stable and predictable relationship vis-à-vis nominal income (*P \* Y*). We thus see one of the conditions for Friedman and Schwartz’s

definition of money—a stable and predictable velocity.<sup>4</sup> Under the empirical approach, any grouping of financial assets with a stable and predictable velocity is money.

We can then see how money, as defined above, can also be an *instrument of policy*—the second condition of the empirical approach. We transform the equation of exchange into growth rates, as follows:

$$\text{Nominal GDP Growth} - \text{Money Supply Growth} = \text{Velocity Growth} \dots\dots\dots(2)$$

$$\text{Inflation} + \text{Real Output growth} = \text{Money Supply Growth} - \text{Velocity Growth} \dots\dots (3)$$

$$\text{Inflation} = \text{Money Supply Growth} - (\text{Real Output Growth} - \text{Velocity Growth}) \dots\dots(4)$$

From Equation (2), we see that if velocity growth can be *reliably estimated* (given interest rates), policymakers can influence nominal GDP growth by managing money supply growth. In addition, Equation (4) shows that if the long-run real GDP growth can be reliably estimated (say, typically 2½-3½ percent in the United States) policymakers can maintain an average inflation of zero (or any other desired rate) by limiting money supply growth to the long-run real GDP growth minus the growth in velocity. The equation of exchange thus provides the framework that facilitates the derivation of monetary aggregates using the empirical approach.<sup>5</sup>

---

<sup>4</sup>More precisely, since velocity (*V*) can change positively with respect to interest rates (or the opportunity cost of holding money, i.e., the spread between a riskless short-term market interest rate and the average yield on monetary assets), money’s velocity needs to have a stable and predictable relationship vis-à-vis interest rates (Duca, 1995). It follows then that any grouping of financial assets whose velocity has a stable and predictable relationship vis-à-vis interest rates should be defined as money. This condition is usually stated as the need for a *stable money demand function*—this is because the inverse of velocity indicates the proportion of nominal income that is demanded as money, as follows:

$$M = [1/V(i)] * [P * Y] \text{ where } V(i) \text{ is velocity written as a function of interest rates}$$

A stable and predictable velocity vis-à-vis interest rates gives us a stable and predictable demand for money as a function of income.

<sup>5</sup>We have used the equation of exchange in a closed economy context to illustrate the need for monetary aggregates with a stable and predictable velocity (stable demand function), as is usually done in the empirical approach. However, the need for a stable money demand function does not change if we move to a small open economy framework with fixed exchange rates, where inflation is largely determined by world inflation, and the central bank’s target is the management of foreign reserves (and maintenance of the fixed rate regime) through the control of its domestic assets. This framework links monetary statistics to other macroeconomic statistics like the balance of payments and government finance statistics, and is illustrated in the *MFSM* (IMF, 2000, paragraphs 372–78) as follows:

$$\text{Net Foreign Assets} + \text{Domestic Credit} - \text{Other Items (Net)} = M \tag{5}$$

It may also be worthwhile to point out—as will be seen in the sections below on country experiences—that this framework will also be useful in the reverse, that is, where velocity *cannot be reliably estimated*. In that event, the framework will throw into question the usefulness of the defined monetary aggregate (being used), because these defined aggregates will then also begin to under-predict or over-predict nominal GDP—depending on whether velocity is higher or lower than expected.

### C. Factors Underlying the Definition of Money

A synthesis of the two different approaches above suggests several factors that practitioners should consider in defining money’s empirical counterparts—the monetary aggregates.

- First, the monetary aggregates should exhibit a certain degree of “moneyness” based on their liquidity and store of value characteristics, as advocated by the *MFSM* and the functional approach. Potential money candidates are bound by a certain minimum amount of liquidity, reflecting the fundamental transactional nature of monetary assets and their connection to aggregate spending potential.
- Second, monetary aggregates should ideally have an empirically stable and predictable relationship vis-à-vis national income and prices. This property allows the aggregates to be a useful instrument of policy: (1) as an *indicator* of inflation pressures and nominal GDP over the medium and long run; and (2) as an intermediate target of policy, if the operational strategy happens to be monetary targeting. Under monetary targeting, the monetary aggregates play a prominent and direct role in the monetary policy framework because targets or monitoring ranges are set up for the aggregates. Where monetary targeting is not used or has been abandoned, the indicator property of monetary aggregates remains important in supplementing other economic statistics to indicate the current and likely future course of economic developments. The indicator property is particularly important in practical terms, because data on monetary aggregates and interest rates are usually available much sooner than GDP data.

---

Equation (5) shows that changes in foreign reserves would reflect changes in money demand, given the level of domestic credit (and other items, net). As such, an unstable money demand (and velocity) would result in unstable levels of foreign reserves, given domestic credit and other items, net, and *vice versa*. We can see this as follows:

$$M = [1/V(i)] * [P*Y] \quad \text{Equation of Exchange} \dots \dots \dots (6)$$

Substituting Equation (6) into Equation (5), we see that:

$$\text{Net Foreign Assets} + \text{Domestic Credit} - \text{Other Items (Net)} = [1/V(i)] * [P*Y] \dots \dots \dots (7)$$

Equation (7) shows that a stable and predictable velocity, given domestic credit and other items, net, would result in a stable and predictable net foreign asset position, and is needed to facilitate the management of foreign reserves. Monetary aggregates with unstable velocity would make management of foreign reserves difficult.



- Third, a corollary condition of stability vis-à-vis national income and prices is stability of the demand function for the monetary aggregate. In particular, the income velocity of the aggregate must be stable relative to the opportunity cost of holding the aggregate, that is, interest rates.

While the conditions above appear conceptually straightforward, achieving them in practice, however, is usually not easy. In practice, the functional approach is frequently the natural *theoretical* starting point for defining money. However, its implementation normally contains a subjective element, since it is difficult to assess with precision the boundary separating monetary and nonmonetary assets based on liquidity. This difficulty arises because so many near-monies exist and are continually created in dynamic financial markets. As such, *both approaches are usually applied in a mutually supportive manner*, that is, subjecting the various candidate definitions suggested by the functional approach to empirical tests and accepting only the candidate that passes the empirical tests. Even then, however, there is no *a priori* reason to presume that any of the aggregates chosen under the functional approach would pass the empirical tests. And it may happen that no single aggregate can fully satisfy the conditions of both of the approaches. For that reason, in practice, *multiple monetary aggregates* are usually defined in the hope that multiple aggregates may collectively convey more information about the state of the economy than any single aggregate can.

#### IV. COUNTRY PRACTICES

This section surveys the practices of the United States, the United Kingdom, the Euro Area, and other countries in defining their monetary aggregates. We chose the United States and United Kingdom because they recently undertook substantial revisions of their monetary aggregates. A discussion of their experiences thus would hopefully explain in more concrete terms the factors underlying the monetary redefinitions. The Eurosystem is chosen because it reflects a recent attempt to define harmonized monetary aggregates out of the many different aggregate definitions in existence in member countries.

In all these cases, we will also point out the policy aspects of the monetary redefinitions where appropriate because they are an inherent aspect of the story. But we will not make an in-depth assessment of the policy issues, because the focus of this paper is the statistical aspects of monetary definitions. As expected, both approaches to defining money aggregates described above are the major underlying influence in the definitions of money in all the three jurisdictions, although we will also discuss specific differences. Finally, the practices of various other countries will be documented.

##### A. United States

The United States probably has the most substantial documentation of the issues covered in this paper owing to the extensive research undertaken by staff of the Federal Reserve System (Fed). Our discussion of the U.S. experience will be the most extensive, in part because of the substantial documentation but also because there is generality in the U.S. experience.

Official estimates of U.S. monetary aggregates are of surprisingly recent origin, with the Fed beginning to publish a series labeled as money only in 1960; and until 1971, the Fed published only one such series, M1—defined as currency plus demand deposits at commercial banks (Larkins, 1983). The coverage of the *money-issuing institutions* was limited to banks, because most transactional deposits were at that time kept with banks. Both the two approaches were reflected in the monetary choice because M1 was a major medium of exchange and had good empirical properties (Simpson and Porter, 1980; Anderson and Kavajecz, 1994; and Duca, 1995). The focus of policy in those early days was M1.

In 1971, the United States constructed broader monetary aggregates to take into account near-monies, which were considered close substitutes for M1. Such near-monies included savings and time deposits at banks and deposits at thrift (nonbank) institutions such as *savings and loan associations, and mutual savings banks*. The money-issuing institutions were thus extended to include these nonbank thrift institutions (and later also *credit unions*).<sup>6</sup> The criterion for distinguishing among the broader aggregates was liquidity of the deposits (the functional approach), with the belief then being that deposits at banks were more liquid than those at the nonbank thrift institutions. It was thought that firms and households would tend to purchase a bundle of services from a *single* institution rather than separate products from different institutions (Anderson and Kavajecz, 1994). As such, banks' *nontransactions* (savings and small-time) deposits were considered to be *closer* substitutes for banks' transactions (demand) deposits than the deposits of the nonbank thrift institutions.

The hierarchy of liquidity thus developed reflected banks' demand deposits as the most liquid deposits, followed by banks' nontransactions deposits (closest substitutes to banks' demand deposits), and lastly the deposits at the nonbank thrifts. Deposits at banks and at thrifts were thus classified in separate monetary aggregates. The more liquid M2 was defined as M1 plus savings and time deposits at *commercial banks*, and the less liquid M3 was defined as M2 plus deposits at the *nonbank institutions* (Table 1).<sup>7</sup> *The construction of the broader aggregates thus reflected largely aggregation of deposits by type of money-issuing institution.*

---

<sup>6</sup>These thrifts were considered as nonbank financial institutions because in general they did not provide demand deposits.

<sup>7</sup>Large nonnegotiable time deposits were in M2 and M3 but large negotiable time deposits were not included in the monetary aggregates.

Table 1. United States: Monetary Aggregates Prior to 1980 1/

Components	M1	M2	M3	M4	M5
Currency	x	x	x	x	x
Demand deposits at commercial banks	x	x	x	x	x
Savings deposits at commercial banks		x	x	x	x
Savings deposits at nonbank thrifts			x		
Time deposits at commercial banks 2/		x	x	x	x
Time deposits at nonbank thrifts			x		x
Negotiable CDs at large commercial banks				x	x
NOW accounts at commercial banks		x	x	x	x
NOW accounts at nonbank thrifts			x		x
Credit union share drafts accounts			x		x
Money market deposit accounts	n.a.	n.a.	n.a.	n.a.	n.a.
Retail money market mutual fund shares	n.a.	n.a.	n.a.	n.a.	n.a.
Institutional money market fund shares	n.a.	n.a.	n.a.	n.a.	n.a.
Overnight Repurchase Agreements (RP)	n.a.	n.a.	n.a.	n.a.	n.a.
Term (beyond overnight) RPs	n.a.	n.a.	n.a.	n.a.	n.a.
Overnight Eurodollars at Caribbean branches of U.S. banks	n.a.	n.a.	n.a.	n.a.	n.a.
Travelers' checks	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: Larkins (1983) and Peterson (1995).

1/ n.a. denotes not applicable, i.e., not included in any monetary aggregate.

2/ Excludes negotiable CDs at large commercial banks.

### **Model of Pressure for Redefinitions**

Since 1971, however, this methodology has been subject to various stresses and pressures for change, largely dictated by the adherence to the two approaches to defining money.<sup>8</sup> The stresses and pressures for change can be articulated in a model of change (particularly significant change) whereby the sequence of events would usually begin with the *existing functional coverage* of monetary assets becoming inadequate. Such a development would often result from the *emergence of new near-money assets* (reflecting innovations in financial markets or regulatory changes), or from the emergence of *new payment methods*, which makes it easier or less costly to switch from nonmonetary assets into monetary assets (reflecting technological advances that lower transactions costs).

Second, the inadequacy of functional coverage would then cause the historical *empirical relationships* between the *traditionally defined monetary assets* and economic activity to break down. This would happen as demand for traditional monetary assets tends to fall (with money holders shifting into the new assets or into nonmonetary assets with new payment methods), causing the velocity of traditional monetary assets to become unstable. The empirical breakdown then spurs calls for redefining the aggregates, so as to restore their usefulness in policy. In recent U.S. monetary history, this model of pressure for substantial monetary redefinition has occurred twice—*first in the 1970s and then again in the 1990s*. In each period, new assets and payment methods would disrupt the functional coverage and empirical properties of traditional monetary aggregates.

### **Developments in the 1970s**

In the 1970s, the *new assets* were negotiable order of withdrawal (NOW) accounts and credit union share draft accounts, money market mutual funds ( MMMF), and overnight repurchase agreements (RP). In addition, the *new payment methods* were preauthorized transfers from savings accounts for bill payments, telephone transfers, and automatic transfers from savings to demand accounts (ATS).

#### ***Impact of the NOW and credit union share draft accounts***

The new NOW and credit union share draft accounts were interest-bearing accounts on which a negotiable draft (like a check drawn on a demand deposit) could be drawn to make payments to third parties—effectively, *transactions balances that paid interest*, unlike the noninterest-paying demand deposits at banks. They were thus direct substitutes for demand deposits. However, because they paid interest, the NOW accounts were classified as part of M2 (Table 1). In addition, not all NOW accounts were classified in M2. NOW accounts at nonbank thrift institutions, which offered basically the same services as NOW accounts at

---

<sup>8</sup>In 1975, a minor change was the introduction of even broader aggregates, M4 and M5. M4 was defined as M2 plus large negotiable time CDs issued by large weekly reporting commercial banks; M5 was defined as M3 plus the same large negotiable time CDs added to M4.

banks, were classified in M3 because of the aggregation by type of institution (Larkins, 1983). Meanwhile, share draft accounts at credit unions (nonbanks), which offered the same deposit checking facilities as bank demand deposits, were also classified in M3 because of the aggregation by type of institution. The impact of the new interest-bearing transactions accounts was thus a decline in demand for M1, as depositors shifted from demand deposits to the new assets classified in M2 and M3.

### *Impact of the new payment methods*

The effect of the *new payment methods* was largely the same. These methods made it easier or less costly for depositors to shift from savings to demand accounts (to make payments as needed, for instance with the ATS accounts). Consequently, they were also, in effect, providing interest-bearing accounts with the characteristics of transactions accounts. Depositors again preferred these interest-bearing savings accounts to the noninterest-bearing demand deposits. However, such savings accounts continued to be classified in M2 or M3, depending on the type of institution involved. As such, the net effect of the new payment methods was again a shift in demand out of M1 into M2 and M3.

### *Impact of the MMMFs and overnight RPs*

The impact of the MMMF and overnight RPs was somewhat different, in that they competed more directly with traditional M2 assets. MMMFs and overnight RPs were very liquid instruments—MMMFs usually offered limited check writing privileges while overnight RPs could be used to finance transactions the next day—but they were not transactions balances.<sup>9</sup> However, because MMMFs and RPs were not subject to *regulatory interest ceilings* on savings and time deposits in existence then,<sup>10</sup> they were able to offer higher market-related interest rates than the M2 assets. MMMFs and overnight RPs thus grew rapidly in the 1970s, as depositors shifted out of M2 into these new instruments. Since MMMFs and overnight RPs were at that time considered to be nonmonetary instruments, these shifts were reflected as a net decline in monetary assets, particularly M2 (into these nonmonetary instruments).

### *Overall impact*

Overall, there was a net decline in demand for M1 and M2 assets but the decline was particularly severe for M1. The demand for M1 fell drastically, particularly in the mid-1970s, resulting in an unusually sharp increase in its velocity  $[(P*Y)/M1]$ . Because the sudden increase in velocity was not anticipated, M1 growth began to severely under-predict GDP growth, decreasing its effectiveness in policy (Duca, 1995).<sup>11</sup> The effect on traditional M2

---

<sup>9</sup>Businesses, in particular, used overnight RPs to minimize their noninterest-bearing balances.

<sup>10</sup>Interest on these deposits was capped by the well-known Regulation Q restrictions.

<sup>11</sup>Recall that  $M*V = P*Y$ . Because growth in  $V$  was higher than *expected*, the growth of  $M1$  will tend to under-predict growth of nominal income (i.e., using historical estimates of velocity,  $M*V$  would under-predict  $P*Y$ ).

was similar, but less severe. M2 benefited from the shift out of demand deposits into NOW accounts and ATS savings deposits (which were classified in M2). However, M2's velocity also increased unexpectedly because of a strong shift to MMMFs (see Box 1 for more details). The loss in efficiency of both aggregates in policymaking led to calls for redefinitions of the aggregates—to take into account the new developments in financial markets and develop new aggregates with more stable empirical properties. As a result, a major redefinition of the monetary aggregates took place in the 1980s, the major part of it occurring in 1980.

**Box 1. The Decline in Demand for M1 and M2 in the 1970s**

The story of the decline in M1 and M2 holdings is actually a little more complicated. Deductively, if households shift out of traditional monetary aggregates into MMMF assets, there need not be a fall in traditional monetary aggregates. From banks' point of view, the holders of monetary aggregates have just switched from households to MMMFs (MMMFs were at that time not considered as depository institutions but nonbank entities)—there is no immediate decline in M1 or M2. The decline occurred because another shift was also happening. Firms in the 1970s were also shifting their source of finance from bank loans to commercial paper. The reason was that banks were rationing credit due to Regulation Q (which places ceilings on interest rates) and passing along the higher costs of reserve requirements due to high interest rates. Meanwhile, MMMFs were picking up these commercial paper assets and Treasury bills. In terms of flows, firms used the proceeds from issuing commercial paper (picked up by MMMFs) to pay off high interest bank loans, while banks used the same funds received to pay off depositors who were shifting out of traditional M1 and M2 assets into the MMMFs (Duca, 1994).

In the framework of the *MFSM*, the level of monetary aggregates fell because of a decline in domestic credit (firms paying off their high interest bank loans) since  $Net\ Foreign\ Assets + Domestic\ Credit = Monetary\ Aggregates + Other\ Items\ Net$  (IMF, 2000, para. 373).

**Redefinitions in the 1980s**

The redefinitions in the 1980s rationalized the hierarchy of the money-issuing institutions (in terms of liquidity of their deposits) on the basis of the nature of the assets offered to holders. The aggregation of deposits into monetary aggregates on the basis of the type of institution offering them was thus abandoned in favor of a criterion by *asset types*. That is, assets with similar properties that are *good substitutes* for each other are combined at each level of aggregation (regardless of the type of institution at which they are held). Under this principle, all transactions balances would be aggregated into M1, and all liquid assets that are near-monies would be aggregated into the broader monetary aggregates, independently of their institutional affiliation. Together with the emphasis on asset types, two familiar questions were also posed:

1. Is the asset a transactions balance, does it serve as a medium of exchange, or is the asset readily convertible into a medium of exchange?
2. Does the defined monetary aggregate have a stable empirical relationship with important economic variables such as GDP?

In accordance with these considerations, by 1990, the Fed had redefined the major aggregates as follows (Table 2):

- M1 was made equal to old M1 (currency and demand deposits at commercial banks) plus interest-bearing checkable deposits *at all bank and nonbank thrift institutions*. It combined NOW deposits at nonbank thrifts, credit union share draft balances, and demand deposits at mutual savings banks, with demand and NOW accounts at commercial banks. ATS (automatic transfer from savings) accounts at banks were also included because they were in effect transactions balances. The new M1 thus included all assets that had characteristics of transactions balances, regardless of whether they paid interest or whether they were held at nonbank thrift institutions or at banks;
- M2 was redefined to equal the new M1 plus overnight RPs, retail MMMF shares, money market deposit accounts (MMDA), savings and small-denomination time deposits <sup>12</sup> *at all bank and nonbank thrift institutions*, and overnight Eurodollar deposits held by U.S. nonbank residents at Caribbean branches of Fed member banks.<sup>13</sup> The new M2 was thus defined to include all assets that had some transactions-related characteristics (that make them close substitutes for M1), but were also liquid investments. For example, retail MMMFs, overnight RPs, and overnight Eurodollars had some of the characteristics of transactions balances and could be easily converted into transactions balances, but were also attractive as liquid investments. These assets were kept out of M1 because the Fed decided that on balance, they were more like investments than transactions balances.<sup>14</sup> Conversely, to emphasize liquidity, large-denomination time deposits (more than \$100,000) were excluded from the new M2 (large nonnegotiable time deposits at banks were previously included in the old M2), and institutional MMMF shares were also excluded. Large time deposits which were expected to be less liquid were moved to the new M3, and institutional MMMFs were also classified in the new M3.

---

<sup>12</sup>Retail MMMF shares are those less than \$50,000 in size; conversely, institutional MMMF shares are those with minimum size of \$50,000 or more. Small-denomination time deposits are those issued in denominations of less than \$100,000.

<sup>13</sup>The inclusion of only Eurodollar deposits at Caribbean branches of U.S. banks reflected mainly data availability.

<sup>14</sup>For instance, it was found that turnover rates in MMMFs were very much like balances in ordinary savings accounts, and thus on average were not being actively used for transaction purposes (Simpson, 1980).

Table 2. United States: Monetary Aggregates in 1990 and at Present

1990	Present
<p>M1 = Currency            + Demand deposits at banks and nonbank thrifts            + Other checkable deposits, including NOW, ATS accounts, credit union share drafts            + Travelers' checks</p> <p>M2 = M1            + Savings deposits at banks and nonbank thrifts            + Small-denomination time deposits at banks and nonbank thrifts 1/            + Money market deposit accounts            + Retail money market mutual funds 2/            + Overnight Repurchase Agreements            + Overnight Eurodollar deposits at Caribbean branches of U.S. banks</p> <p>M3 = M2            + Large-denomination time deposits at banks and nonbank thrifts            + Term repurchase agreements at banks and nonbank thrifts            + Institution-only money market mutual funds            + Term Eurodollar balances at depository institutions</p>	<p>M1 = Currency            + Demand deposits at banks and nonbank thrifts            + Other checkable deposits, including NOW, ATS accounts, credit union share drafts            + Travelers' checks</p> <p>M2 = M1            + Savings deposits at banks and nonbank thrifts            + Small-denomination time deposits at banks and nonbank thrifts            + Money market deposit accounts            + Retail money market mutual funds</p> <p>M3 = M2            + Large-denomination time deposits at banks and nonbank thrifts            + Overnight/term repurchase agreements at banks and nonbank thrifts            + Institution-only money market mutual funds            + Overnight/term Eurodollar balances at depository institutions</p>

Sources: *Federal Reserve Bulletin* (various issues) and Peterson (1995).

1/ Time deposits in amounts of less than \$100,000.

2/ Initial size less than \$50,000.



- An *important* effect of including more liquid assets within M2 (retail MMMFs etc.) was that it imparted a certain *empirical stability* to the aggregate, because shifts in demand among these assets would now only affect the composition but not the size of M2. For instance, without affecting its size, M2 would accommodate shifts of deposits across banks and nonbank institutions; shifts of demand for saving and small-time deposits from all bank and nonbank thrift institutions to MMMFs, which had been growing rapidly; shifts of demand from savings deposits towards MMDA accounts, another rapid grower; and shifts towards NOW accounts.
- M3 was redefined to equal the new M2 plus all large-denomination time deposits at *all bank and nonbank thrift institutions* (including negotiable CDs), term RPs (longer than overnight), and institutions-related MMMFs. Large-denomination time deposits, term RPs, and MMMF shares held by institutions were considered to be substitutes in many portfolios and relatively liquid.

These redefinitions improved the functional coverage of the monetary aggregates by regrouping assets according to their *functions* as transactions balances or as investments with varying degrees of liquidity. The redefined M1 became more reflective of financial assets that were transactions balances. At the same time, the redefined M2 included all the transactions balances in M1 as well as liquid investments that could be easily turned into transactions balances but were not previously included in any of the monetary aggregates (such as MMMFs and RPs).

There was also improvement in the *empirical properties*, although the results were mixed. The new M2's velocity improved and registered a stable relationship with nominal GDP during the 1980s (Simpson, 1980; Small and Porter, 1989). However, M1's empirical properties did not improve, because continuing financial innovations in the 1980s—including new cash management techniques by firms to avoid holding noninterest-bearing deposits—caused M1's velocity to remain unstable (Duca, 1995). In the 1980s, attention thus turned toward the M2 aggregate as the major focus of policymaking.

### **Developments in the 1990s**

As it turned out, the new M2's stable empirical properties lasted only a decade and broke down in the 1990s. In the early 1990s, the demand for M2 fell unexpectedly in spite of a considerable drop in the opportunity cost of holding M2 assets (Collins and Edwards, 1994).<sup>15</sup> A drop in the opportunity cost of M2 should have resulted in an increase in demand for M2 assets, not a fall. But the fall led to an unexpected increase in M2's velocity; and the actual growth of M2 (like M1 in the 1970s) began to under-predict GDP growth.

---

<sup>15</sup>The opportunity cost of holding M2 assets is the spread between the yield on a short-term Treasury security and the weighted average return of M2 assets.

The cycle of developments mirrored those of the 1970s (for M1). The deterioration in the empirical properties of M2 again reflected the emergence of new assets with more attractive yields, yet having the liquidity to serve as close substitutes for M2 assets. This time, the new assets were bond and equity mutual funds. The consensus explanation for the unexpected decline in M2 in the early 1990s was a substantial shift by households out of M2 assets into bond and equity mutual funds, or long-term funds (Anderson, 1994).

The shift appeared to have been motivated by several factors. One was a sharp drop in short-term (M2-type) deposit rates in contrast to strong growth in equity prices in the 1990s, which boosted demand for stocks and stock funds. Also important was the increasing *liquidity* of these stock funds by the 1990s because of continuing improvements in computer and telecommunications technology—which facilitated the speedy and low-cost transfer of funds among various assets (Peterson, 1995). For instance, investors could easily redeem their fund holdings by telephone and have the proceeds wired to the checking or money market fund the same day. In addition, the vast majority of fund complexes (a group of funds managed by the same advisor) routinely offered exchange privileges between long-term and money market funds at nominal or no cost. Thus, a telephone call allowed fund investors to shift in and out of long-term funds and M2-type accounts (like MMMFs). The liquidity of these stock and bond funds made them close substitutes for M2 assets, causing the functional coverage of traditional M2 to become inadequate and leading ultimately to a breakdown in its empirical properties.

The breakdown in M2's empirical properties was severe enough that the Chairman of the Board of Governors of the Federal Reserve System, Mr. Greenspan, officially de-emphasized the importance of monetary aggregates as policy guides in his July 1993 Humphrey-Hawkins Act testimony before Congress (Greenspan, 1993). Mr. Greenspan informed Congress that the monetary aggregate, M2, had been “downgraded as a reliable indicator of financial conditions in the economy,” reflecting the fact that “the historical relationships between money and income, and money and the price level [had] largely broken down (Ragan and Trehan, 1998).”

The M2 breakdown (similar to developments in the 1970s) spurred many attempts to search for a replacement with better empirical properties, including M2+ (M2 plus household holdings of bond and equity mutual funds).<sup>16</sup> Among the successors proposed, M2+ seemed the most logical. If households were shifting out of M2 assets into bond and equity mutual funds, then the inclusion of these funds within an aggregate such as M2+ would internalize those shifts. That is, such shifts would only affect the composition of M2+, not its size. And this would give M2+ the same empirical stability that the inclusion of the new assets, such as retail MMMFs and MMDA etc., had given M2 in the 1980s.

---

<sup>16</sup>These proposals included liquid M2 (M2 less small-time deposits); MZM (M2 less small-time deposits plus assets of institution-only money market mutual funds); M2E (M2 plus assets of institution only MMMFs); household M2 (M2 less demand deposits and overnight RPs and Eurodollars); and M2BF (M2 plus bond mutual funds). However, none of these behaved any better than M2 (Collins and Edwards, 1994).

In addition, staff at the Fed estimated that while turnover rates<sup>17</sup> for the long-term bond and equity funds were smaller than for checkable deposits, savings accounts, and MMMFs, they were similar to those for small-time deposits. To the extent that small-time deposits were included in M2, there was no reason not to include long-term funds within an M2 aggregate.

However, the empirical evidence did not support the use of M2+ as a replacement for M2 in policymaking. While M2+ appeared to have better properties than M2, it did not turn out to be a better indicator of movements in nominal GDP growth than M2 (Anderson, 1994; Orphanides, Reid, and Small, 1994). The major drawback was that the value of M2+ was very sensitive to movements in bond and equity prices. Its value was not capital-certain (an important requirement of liquidity under the *MFSM* and the functional approach) in that it could not be sold at, or close to, full market value on short notice. Instead, its sensitivity to movements in bond and equity prices makes its capital value and resultant velocity uncertain.

Since 1994, efforts have continued at the Fed to define an appropriate monetary aggregate for use in policymaking (Carlson and Keen, 1996; Estrella and Mishkin, 1996; Mehra, 1997; and Lown, Peristiani, and Robinson, 1999). Thus far, no such aggregate has been found but efforts continue. Meanwhile, the major monetary aggregates in the United States remain M1, M2, and M3, with largely the same definitions as before (Table 2). While these aggregates generally satisfy the conditions for money under the functional approach, they no longer satisfy those for the empirical approach. The monetary aggregates remain useful as one of many indicators of economic activity over the long run but no longer play a prominent role in the monetary policy framework.<sup>18</sup>

### **Summary of the Factors Underlying Monetary Definitions in the United States**

Both the functional and empirical approaches to defining money were important in the definition of monetary aggregates in the United States. When financial market developments and regulatory change led to increasing similarities between the deposit liabilities of banks and nonbank thrift institutions, the requirements of the functional approach led to a methodological shift from aggregating deposits by type of institution to a focus on asset type. The focus on asset type led to aggregation of all transactions-type balances into M1; inclusion of many liquid near-money investments (previously excluded from the monetary aggregates such as MMMFs) into M2; reclassification of large denomination time deposits out of M2 into the new M3; and separate classification of retail and institutions-related MMMFs into M2 and M3, respectively. The separate treatments of time deposits and MMMFs on the basis of size reflects the notion that smaller size implies a retail and more

---

<sup>17</sup>Turnover rate is defined as total withdrawals divided by outstanding balances.

<sup>18</sup>While the Fed does not explicitly characterize its new monetary policy framework as inflation targeting, its new framework reacts to expected inflation pressures by manipulating the federal funds rate (short-term interest rate).

liquid character, while a larger size implies a wholesale, less liquid, and more investment-oriented character.

The redefined aggregates in the early 1980s passed the empirical tests in that the empirical properties of the new M2 were found to be stable—even though those of the new M1 remained problematic. However, one stable series was sufficient, and M2 became the major focus of monetary policy, replacing M1. When the empirical properties of M2 began to break down in the 1990s, several proposals for new monetary aggregates were put forward on functional grounds. While support for these aggregates, for instance, for M2+, could reasonably be supported on functional grounds, these aggregates could not pass the empirical tests and had to be abandoned. When the defined aggregates cannot pass the empirical tests, they continue to be defined on functional grounds but at the same time become less prominent and de-emphasized in policy—even as research continues for better aggregates.

## **B. United Kingdom and the Euro Area**

The United Kingdom and the Euro Area apply the same functional and empirical methodology to their monetary definitions as the United States does. Although some differences exist in the specific definitions, owing to specific institutional factors in each country and jurisdiction, the overall similarities in approach and experience testify partly to the *generality of the U.S. experience*. This section will discuss the similarities before discussing the differences.

### **United Kingdom**

The U.K.'s experience particularly mirrors that of the United States in that its economy was also buffeted by innovations and deregulation in financial markets. The dynamics of change follows the model of the United States with only minor differences. Noteworthy (perhaps even more than in the case of the United States) is how many times different U.K. aggregates were defined and then discarded as the economic and financial landscape changed—reflecting adherence to the functional and empirical approaches (Table 3).

Official estimates of the U.K. money stock have been available from 1963 and published since 1966 (Bank of England, 1990). Two narrow measures, noninterest-bearing M1 (NIBM1), defined as currency and noninterest-bearing sight deposits at banks, and M1, defined as NIBM1 and interest-bearing sight deposits at banks, were published in the 1970s (Table 3). These aggregates, however, were discarded in 1991 and 1989, respectively, because it became by then difficult to distinguish them from many other interest-bearing deposits, which also had characteristics of transactions balances (Thorp and Turnbull, 2000).

Table 3. United Kingdom: Monetary Aggregates

Name	Components	First Published	Discontinued
NIBM1 (Noninterest bearing M1)	Notes and coins in circulation + NBPS noninterest-bearing sight bank deposits	1975	1991
M1	NIBM1 + NBPS interest-bearing sight bank deposits	1970	1989
M2	NIBM1 + NBNBSPS checkable deposits at banks and building societies + NBNBSPS deposits at banks and building societies of less than 100,000 with residual maturity of less than one Month	1982	1992
Sterling M3	Notes and coins in circulation + sterling liabilities of banks to NBPS	1977	1987
M4	Notes and coins in circulation + sterling liabilities of banks and building societies NBNBSPS	1987	...
M5	M4 + NBNBSPS holdings of Treasury bills, bank bills, and other short-term Instruments	1987	1991
Retail M4	Notes and coins and retail deposits in M4	1992	...

Sources: Arestis and others (1993) and Bank of England (1990).

Note: NBPS = Nonbank private sector; and NBNBSPS = Nonbank nonbuilding society private sector.

A broad aggregate, called Sterling M3, defined as M1 plus sterling time and certificates of deposits at banks, was published in 1977. But it was discarded in 1989, as deposits at *building societies* (much like the nonbank thrift institutions in the United States) began to offer the same services as deposits at banks. Sterling M3 had also been the monetary target in policymaking since 1977, but its empirical properties deteriorated in part as deposits at building societies became close substitutes to deposits at banks.

Sterling M3 was thus replaced by M4, which combined building-society deposits to Sterling M3. M4 also replaced M3 as the broad monetary target used in policy, but its empirical properties were not much of an improvement. Both the velocities of Sterling M3 and M4 were unstable.<sup>19</sup> As it turned out, the U.K. authorities abandoned monetary targeting at the end of the 1980s. The United Kingdom has moved to a monetary policy framework of inflation targeting and now uses M4 as one of many economic indicators over the long term (Leigh-Pemberton, 1997).

Besides M4, an M2 aggregate is still published, called “retail M4.” It is the proportion of M4 that is retail in nature, that is, the deposits taken by banks and building societies into their advertised retail accounts, mainly but not wholly from the household sector (Thorp and Turnbull, 2000). The focus on the retail holdings of M4 reflects a desire to have an aggregate more closely related to transactions balances, much like the focus on small-denomination time deposits and retail MMMFs in the U.S. M2.

A very broad aggregate, M5—defined as M4 plus various debt instruments like Treasury bills and bank bills—was also published in 1987. However, it was discontinued in 1991 because its behavior was not substantially different from that of M4. M5 has not been replaced by another aggregate, but many of its components are now published separately as “Liquid assets outside M4,” which can each be selectively combined with M4 by users as desired.

Effectively, out of the many aggregates—from NIBM1 to M1 through M5 published in the last few decades—only M4 and retail M4 (M2) continue to be compiled in the United

---

<sup>19</sup>A difference from the U.S. experience here is that while the problem with U.S. M1 and M2 was that their velocities rose unexpectedly, the velocities of the U.K.’s Sterling M3 and M4 fell unexpectedly through the 1980s. The reason was that deregulation in financial markets had somewhat different effects in the United Kingdom owing to the existence of credit rationing (before deregulation) by building societies in their mortgage lending to the personal sector. The elimination of credit rationing with deregulation and greater competition between banks and building societies resulted in increased availability of mortgage and other credit to the personal sector and higher deposit rates. The confluence of greater availability of mortgage and other credit and higher deposit rates led to some readjustments in the balance sheets of households—out of their past accumulated savings previously tied up in housing (due to the credit controls) into more liquid assets like Sterling M3 or M4 through borrowing or trading down (Leigh-Pemberton, 1986). The increase in holdings of liquid assets led to higher growth of Sterling M3 and M4 than expected, resulting in unexpected declines in their velocities. While the U.S. model of change appears quite general in the context of financial innovations, this U.K. experience suggests that velocities may also become unstable on the downside, depending on the initial structure of and regulations in the financial system.

Kingdom.<sup>20</sup> As in the case of the United States, the definitions of these aggregates now reflect largely their functional characteristics. Their empirical properties have not been stable enough for them to be used as short-term tools in policymaking. As such, they constitute one of many economic indicators for evaluating policy over the longer term.

### **Euro Area Monetary Aggregates**

The experience of the Euro Area<sup>21</sup> is instructive in that it reflects a recent attempt to define harmonized monetary aggregates out of the many different definitions previously in use in the member countries (to illustrate, Table 4 shows the many different definitions of broad money in the Euro area countries as of 1996). As such, the Euro Area experience is both interesting and has generality in that it is a successful attempt to define monetary aggregates in a way that would be acceptable to the 12 participating member countries, which had hitherto had their own definitions. The principles underlying the effort would thus be particularly relevant for countries trying to come up with their own definitions of appropriate monetary aggregates. As mentioned, these principles also reflect the considerations spelled out in the functional and empirical approaches to defining money. The European Central Bank (ECB) explicitly stated that it applied conceptual (functional) considerations but also used empirical studies to arrive at useful and appropriate monetary aggregates (ECB, 1999).

On a functional basis, the Euro Area defines money much like the *MFSM* does—on the basis of “degree of moneyness” criteria. It uses criteria such as transferability/ convertibility; maturity; and period of notice. Briefly, transferability/convertibility refers to the convenience with which the asset can be used in making third party payments. Maturity refers to the time between a contract and the redemption date, prior to which it is difficult to convert funds placed on deposit. And the period of notice refers to the time the holder of a deposit gives notice of his/her intention to redeem the instrument and the date on which the holder is allowed to convert the respective instrument into cash without a penalty.

---

<sup>20</sup> An aggregate, the monetary base called M0 (but not considered broad money in this paper), is still compiled and constitutes one of the economic indicators evaluated under inflation targeting.

<sup>21</sup> The Euro Area countries are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

Table 4. Asset Composition of Broad Money Aggregates Prior to Countries' Membership in Euro Area, 1996

Name of Aggregates	Belgium		Germany		Greece		Spain	France		Ireland		Italy		Luxembourg	Netherlands	Austria	Portugal	Finland	
	M3	M4	M3	M3E	M3	M4	M3	M3	M4	M3	M3E	M2E	M3H	M3	M3	M2	M3	M3H	
Notes, coins, sight deposits	√		√		√		√	√		√		√	√	√	√	√	√	√	
Foreign currency deposits	√						√	√					√	√	√	√	√	√	
Savings deposits at three months notice			√																
Various savings type deposits								√											
MMMF (foreign and domestic)				√				√											
Time deposits (funds borrowed for < four years)			√					√											
Notes ( up to one year)							√						√						
Saving bonds	√												√			√			
Certificates of deposits					√		√	√				√		√	√	√	√	√	
Repurchase agreements					√												√		√
Treasury certificates (up to one year)		√				√			√										
Commercial paper (one year)		√							√				√						
Bearer debt securities (maturities of < two years)				√															
Postal savings deposits/certif.												√							
Residents' deposits in foreign Branches of domestic banks				√								√							
Deposits at nonlicensed credit institutions											√								

Source: European Monetary Institute (1997).



In light of the U.S. and U.K. experiences discussed earlier, interestingly, the ECB started by rationalizing the definition of money-issuing institutions on the basis of the asset type offered. The Euro Area defines such institutions as monetary financial institutions (MFIs). They consist, among other things, of (1) resident credit institutions, whose “business is to receive deposits or other repayable funds from the public (including the proceeds arising from the sales of bank bonds to the public) and to grant credit on its own account;” and (2) other resident financial institutions, whose business is to receive deposits and/or *close substitutes* for deposits from entities other than MFIs and, for their own account, to grant credits and/or to invest in securities. The latter includes mostly money market funds.<sup>22</sup>

With these guidelines, the ECB defined three monetary aggregates: (1) M1, consisting of currency and overnight deposits, which can be converted into currency or used for cashless payments; (2) M2, comprising M1 and deposits with maturities of up to two years and deposits redeemable at notice of up to three months (the motivation for M2 was to develop an aggregate consisting of currency and deposits which are relatively liquid); and (3) M3, which comprises M2 and marketable instruments issued by the MFI sector. M3 includes money market instruments, such as money market fund shares/units (MMFs), money market paper, and repurchase agreements, and MFI debt securities issued with an original maturity of two years. These were all included because of their liquidity and relative price certainty, which makes them close substitutes for deposits. The inclusion of these instruments tend to make M3 a more stable aggregate.<sup>23</sup>

On the empirical side, the ECB met its objective of identifying a monetary aggregate that is a stable and reliable indicator of inflation over the medium term. This was because M3, as defined, was found to have a relatively stable velocity. Presumptively, M3 is relatively stable, because the inclusion of the various financial instruments mentioned above imply that substitution among these instruments and deposits would affect only the composition, not the size, of M3. Empirically, the ECB was able to determine that M3’s velocity over the last two decades showed a relatively smooth downward trend, growing on average at about 1 percent per annum faster than nominal GDP.<sup>24</sup> At the same time, the ECB’s econometric studies support the view that the long-run demand for M3 has been stable, and that growth of M3 contains useful information for future price developments. M3 growth leads inflation by

---

<sup>22</sup>The MFI is equivalent to depository institutions in the *MFSM*, which defines the latter in part as institutions whose liabilities constitute broad money, nationally defined.

<sup>23</sup>As a result of their inclusion, M3 is less affected by substitution between various liquid asset categories than narrower definitions of money, and hence, is more stable. See also the following text: second paragraph (last bullet point) of subsection “Redefinitions in the 1980s” and fifth paragraph of subsection “Developments in the 1990s” of Section IV.A., and fifth paragraph of subsection “Euro Area Monetary Aggregates” of Section IV.B.

<sup>24</sup>Euro monetary aggregates compiled from the consolidated balance sheet are available from September 1997. Time series going further back in the past are estimated by the ECB using the conversion rates of the national currencies vis-à-vis the euro fixed on December 31, 1998. The data and methodological notes on the historical euro series can be found in the Annex to the ECB (1999) article.

about six quarters. Unlike the experience of the United States and the United Kingdom, monetary aggregates (in this case, M3) play a prominent role in the ECB's monetary policy framework because of these stable empirical properties. In its monetary policy, the Governing Council of the ECB announces a reference value for M3's annual growth rate.<sup>25</sup>

### **Differences Among the U.S., U.K., and ECB Definitions of Money**

Although the United States, the United Kingdom, and the ECB apply the same underlying approaches to defining money, there are nevertheless differences in the specific definitions. These reflect in part specific institutional factors or financial market structures in each country/jurisdiction. The existence of various specific differences appears to be an aspect of the subject of monetary definitions that is quite prevalent, as will be illustrated in the next section.

On an idiosyncratic level perhaps, the application of numerics to tiered monetary definitions is not always consistent. While higher numbered aggregates generally suggest greater breadth, this principle does not always hold across countries. For instance, while the definition of the U.S. M2 aggregate is somewhat narrower than the U.K.'s M4 aggregate, the U.S. M3 aggregate is somewhat broader (than the U.K. M4) because of its inclusion of term Eurodollar deposits. As such, comparisons of monetary aggregates across countries cannot presume the relative breadth of an aggregate based alone on the number attached to it.

The treatment of the public sector is different between the United States and the ECB on the one hand and the United Kingdom on the other. The United States and the ECB exclude deposit holdings of the central government from the definition of money but includes holdings by state and local governments, social security funds, and public corporations. Deposit holdings of the central government are normally excluded because the central government's expenditures are not thought to be linked to its monetary holdings. This owes to its access to other sources of finance, like the central bank. The United Kingdom, however, excludes the holdings of the whole public sector (including state and local governments and public corporations) from money. The reason is it has determined empirically that movements in the public sector's deposits (generally insignificant) are unlikely to be linked to economic activity (Thorp and Turnbull, 2000). Local U.K. authority bank deposits, which are very small, are not deemed to be related to local authorities' expenditures, in part because these authorities have ready access to the money market. And public corporations' bank deposits, which are also small, are not deemed to be related to their expenditures, because these corporations have access to central government funds (Bank of England, 1984).

---

<sup>25</sup>The reference value for M3 growth is derived from the equation of exchange; it is set at 4½ percent, reflecting long-run real GDP growth of 2-2½ percent, a trend decline in velocity of ½ percent to 1 percent, and an inflation rate of under 2 percent. Money growth substantially in excess of the reference value would tend to signal inflation risks, if the relationship between M3, prices, and real GDP, and the underlying trend decline of velocity remains stable.

Original maturity is a determinant of the assets to be included in monetary aggregates in the Eurosystem. As noted, the ECB's M2 includes deposits with an original maturity of up to two years and redeemable at notice up to three months, and its M3 includes MFI debt securities with original maturity of up to two years. In general, maturity should be a useful criterion for distinguishing between money held for transactions purposes from those held more as a store of wealth and to distinguish money from other financial assets. The United Kingdom and the United States, however, in general do not differentiate money on the basis of maturity. For the United Kingdom, the reason is pragmatic in the sense that the great majority of deposits and similar assets that are candidates for inclusion in money are generally very short-term and those that are nominally long-term are often usable with an insignificant penalty (Bank of England, 1990; Thorp and Turnbull, 2000). Thus the only maturity criterion now used to define U.K. monetary aggregates is MFI short-term paper and securities (including CDs) up to an original maturity of five years, which is included in M4. The United States too generally defines its monetary aggregates without reference to original maturity, in part because it argues that residual maturity rather than original should be the criterion but data on residual maturity are not generally available at the frequency desired.

Another issue is the holdings by residents of foreign-currency deposits. The ECB includes residents' holdings of foreign-currency deposits at MFIs in the Euro Area as part of M3, because it deems these assets to be close substitutes for euro-denominated assets. The United States and the United Kingdom, however, exclude such deposits for different reasons. The United Kingdom excludes such deposits on the grounds that they are probably held to finance expenditures abroad or expenditures on other foreign currency assets, and as such includes them only in "Liquid assets outside M4." The United States, on the other hand, excludes such deposits because they are very small compared to deposits in domestic currency.

A related issue is the holdings by residents of domestic-currency deposits in banks abroad. The United States includes Eurodollar deposits in their M2 and M3 aggregates in the belief that these deposits can be related to residents' domestic spending, while the United Kingdom and the ECB do not include such deposits. In the case of the United Kingdom, such deposits held by residents are only shown in "Liquid assets outside M4."

Finally, the United Kingdom excludes holdings of MMMF shares/units from its definition of money solely because of their small size. The competitiveness of banks and building societies and the diversity of products already offered by them are thought to explain why such funds are small in the United Kingdom. However, MMMFs are included in the ECB's monetary aggregates and also in the U.S. monetary aggregates, where they are quite large.

The major lesson from these differences is that while countries may follow the same fundamental approaches to defining money, differences in definitions across countries are often unavoidable. The definitions reflect differences in institutional settings or financial market structures, and the empirical approach itself implies that different definitions may be empirically stable in different countries. In the discussion above, the different institutional settings/financial market structures have resulted in pragmatic choices such as the exclusion of MMMFs in the United Kingdom (because of their small size). They have also resulted in

choices based more on empirical considerations, such as the scope of the public sector excluded from monetary aggregates, the inclusion or exclusion of resident holdings of foreign currency deposits, and the inclusion or exclusion of resident holdings of domestic currency deposits abroad. *What these results suggest is that monetary definitions can be expected to be different across countries, even if the countries follow the same fundamental approaches to defining money.* This inference is examined in the next section, which documents the monetary definitions in wider set of other countries.

### **C. Definitions of Money in Other Countries**

As noted, the intention in this section is documentation, not an in-depth assessment of monetary definitions along the lines undertaken for the U.S., U.K., and the Euro Area (that is beyond the scope of the paper). The objective is to take a cursory look at the monetary definitions of a wider set of countries/jurisdictions to see if the results are generally consistent with the inference noted above. Table 5 lists the national monetary definitions in 37 countries, including 32 developing countries. It shows that in general the 37 countries adopt many different definitions for their monetary aggregates, a result consistent with this paper's inference.

To give a general flavor of some of the differences, we note that many of the differences mirror those already discussed above although others do not. For differences similar to those above, foreign-currency deposits of residents are not included in Australian monetary aggregates but are included in many others. In addition, maturity is a consideration in many countries such as India, South Africa, and Zimbabwe (where deposits are distinguished by their short- and long term-characteristics) but does not appear to be a consideration in many other countries; and deposits of residents in banks abroad are excluded from the monetary aggregates of most countries but not for Mexico.

For other differences (among these 37 countries), Table 5 shows that some of the countries include nongovernment deposits at the Central Bank in the monetary aggregates (India, Jordan, Mauritius), but others do not. In addition, Turkey and Croatia include central government deposits and Mexico includes the bank deposits of foreign residents in the monetary aggregates, while others do not. Finally, some countries include government securities in some of their higher-numbered aggregates (Brazil, Chile, Hungary, Kenya, Mexico).

### **V. CONCLUSION**

This paper argues that the functional and empirical approaches likely underlie many countries' definition of their monetary aggregates. In practice, the functional approach is frequently the natural theoretical starting point for defining money. Nevertheless, it is difficult to determine with precision the 'true' boundary separating monetary and nonmonetary assets based on liquidity. Consequently, both the functional and empirical

Table 5. Components of Monetary Aggregates: Selected Industrial and Developing Countries

Country 1	CU 2	DD/OCD 3	SD 4	TD 5	FCD 6	OD 7	MMMF 8	RP 9	PSD 10	CD 11	M1 12	M2 13	M3 and/or Other Measures 14
<b>Industrial Countries</b>													
1. Australia	*	*		*		*				*	2+3		M3 = M1 + 5 + 7 + 11 (CD)
2. Canada	*	*	*	*	*		*				2+3	M1 + 4 + nonpersonal notice deposits	M3 = M2 + 6 + nonpersonal TDs
3. Japan	*	*	*	*	*			*	*	*	2+3	M2 = M1 + 4 + 5 + 6 + nonresident Yen deposits with surveyed financial institutions	M3 + CDs = M2 + 10 + 11 (CD) + cooperatives, trusts, etc.
4. Sweden	*	*	*	*	*				*	*			M3 = 2 + 3 + 4 + 5 + 6 + 10 + 11 (CD) M3+ = M3 + national savings accounts + TB
5. Switzerland	*	*	*	*							2+3 + sight deposits at Swiss Post	M1 + 4 (excluding pension funds account)	M3 = M2 + 5
<b>Developing Countries</b>													
1. Brazil	*	*	*	*				*			2+3	M1 + 4 + special remunerated deposits + securities issued by depositary institutions	M3 = M2 + 9 + fixed-yield funds M4 = M3 + highly liquid government securities held by public
2. Cameroon	*	*	*	*							2+3	M1 + 4 + 5	
3. Chile	*	*	*	*	*						2+3 (DD) M1A = M1 + 3 (OCD) + 4	M2A = M1A + 5	M3 = M2A + time saving deposits (including those for housing) M4 = M3 + instruments of the central bank held by nonfinancial private sector M5 = M4 + treasury promissory notes held by nonfinancial private sector M6 = M5 + credit bills held by nonfinancial private sector

Table 5 (continued). Components of Monetary Aggregates: Selected Industrial and Developing Countries

Country 1	CU 2	DD/OCD 3	SD 4	TD 5	FCD 6	OD 7	MMMF 8	RP 9	PSD 10	CD 11	M1 12	M2 13	M3 and/or Other Measures 14
4. China	*	*	*	*		*					2+3	M1 + 4 + 5 + 7 + security margin Requirement	
5. Croatia	*	*	*	*	*	*	*				2+3+7 (with central bank) M1A = 2+3+DD of the central government and funds with DMBs		M4 = M1 + 4 + 5 + 6 + bonds and money market instruments
6. Czech Republic	*	*		*	*						2+3	M1 + 5 + 6	L = M2 + short-term securities held by nonbank entities
7. Egypt	*	*	*	*	*						2+3	M1 + 4 + 5 + 6	
8. Estonia	*	*	*	*	*	*					2+3+6 (DD)	M1 + 4 + 5 + 6 + 7 - 9	
9. Hong Kong SAR	*	*	*	*	*					*	2+3+6 (DD) (Licensed Banks)	M1 + 4 + 5 + 6 + 11 (Licensed Banks)	M3 = M2 + customer deposits with plus NCDs issued by restricted license banks & deposit-taking companies (in nc & fc)
10. Hungary	*	*		*	*						2+3	M1 + 5 + 6	M3 = M2 + securities issued by credit institutions M4 = M3 + government securities held by nonbanks + central bank domestic forint bonds held by nonbanks
11. India	*	*	*	*		*			*	*	2+3+7 (with central bank)	NM2 = M1 + 5 (short-term)	NM3 = NM2 + 5 (long-term) + call/term funding from financial institutions
12. Indonesia	*	*	*	*	*						2+3	M1 + 4 + 5 + 6	
13. Iran, Islamic Republic of	*	*	*	*							2+3	M1 + 4 + 5	
14. Jamaica	*	*	*	*	*						2+3+6 (DD)	M1 + 4 + 5 + 6	
15. Jordan	*	*	*	*	*						2+3+DD of OBIs with central bank (in nc)	M1 + 4 + 5 + 6	
16. Kazakhstan	*	*			*	*					2+transferable deposits	M1 + 6 (transferable deposits) + 7	M3 = M2 + 6 (nontransferable deposits)
17. Kenya	*	*	*	*	*								M3 = 2+3+4+5 M3X = M3 + 6 M3XT = M3X + government securities held by nonbank private sector

Table 5 (continued). Components of Monetary Aggregates: Selected Industrial and Developing Countries

Country 1	CU 2	DD/OCD 3	SD 4	TD 5	FCD 6	OD 7	MMMF 8	RP 9	PSD 10	CD 11	M1 12	M2 13	M3 and/or Other Measures 14
18. Korea	*	*	*	*	*			*		*	2 + 3  New M1 = 2 + transferable deposits at depository corporations	M1 + 4 + 5 + 6  New M2 = New M1 + 4 + 9 + 11 (CD) + cover bills + money in trust + beneficial certificates of investment trust companies and merchant banking corporation + debentures + other financial instruments (<2 years) at depository corporations	M3 = M2 + 9 + 11 (CD) + OFI deposits + debentures issued + commercial bills sold + cover bills  MCT = M2 + 11 (CD) + money in trust (excluding CD & money in trust of development institutions)
19. Kuwait	*	*	*	*	*					*	2 + 3	M1 + 4 + 5 + 6 + 11 (CDs in nc)	M3 = M2 + private-sector deposits with deposit-taking investment companies
20. Latvia	*	*		*	*						2 + 3	Quasi-money = 5 + 6 M2X = M1 + quasi money M2D = M2X - 6	
21. Malaysia	*	*	*	*	*			*			2 + 3	M1 + 4 + 5 + 6 + NIDs	M3 = M2 + deposits placed with OBIs (excludes interplacement of deposits between these institutions)
22. Mauritius	*	*	*	*	*	*					2 + 3 + 7 (DD with central bank)	M1 + 4 (includes margin deposits) + 5 + 6	
23. Mexico	*	*	*	*			*				2 + 3	M1 + bank deposits of domestic residents + government & private securities held by domestic residents, including pension funds and retirement funds	M3 = M2 + bank deposits of foreign residents + government securities held by foreign residents  M4 = M3 + deposits of domestic & foreign residents in branches & agencies of Mexican banks abroad
24. Pakistan	*	*		*	*	*					2 + 3 + 7 (with central bank)	M1 + 5 + 6	
25. Peru	*	*	*	*	*						Money = 2 + 3		Quasi money = 4 + 5 Broad money in local currency = money + quasi money Broad money = broad money in local currency + 6
26. Poland	*	*	*	*	*			*			2 + 3 + 4 + 6 (DD)	M1 + 5 + 6 + 9	
27. Singapore	*	*	*	*	*	*				*	2 + 3	M1 + 4 + 5 + 7 + 11 (NCDs in nc)	M3 = M2 + net deposits with NBFIs

Table 5 (concluded). Components of Monetary Aggregates: Selected Industrial and Developing Countries

Country 1	CU 2	DD/OCD 3	SD 4	TD 5	FCD 6	OD 7	MMMF 8	RP 9	PSD 10	CD 11	M1 12	M2 13	M3 and/or Other Measures 14
28. South Africa	*	*	*	*					*		M1A = 2 + check & transmission deposits of the domestic private sector with monetary institutions  M1 = M1A + DD (other than check & transmission deposits)	M1 + 4 + 5 + 10	M3 = M2 + long-term deposits held by the domestic private sector with monetary institutions (including national savings certificates issued by the Postbank)
29. Tanzania	*	*	*	*	*						2 + 3	M1 + 4 + 5	M3 = M2 + 6
30. Thailand	*	*	*	*	*						2 + 3	M2 = M1 + 4 + 5  M2A = M2 + promissory notes	M3 = M2A + deposits taken by the six specialized financial institutions from the public
31. Turkey	*	*	*	*	*	*					2 + 3	M2 = M1 + 4 + 5  M2Y = M2 + 6	M3Y = M2Y + official DD + official TD + other central bank deposits
32. Zimbabwe	*	*	*	*							2 + 3	M1 + 4 + 5 (<30 days)	M3 = M2 + 5 (>30 days)

Note: The following abbreviations are used: CD = certificate of deposits; CP = commercial paper; CU = currency in circulation outside banks; DD = demand deposits (including current and sight deposits); DMB = deposit money bank; fc = foreign currency; FCD = foreign-currency deposits; MMMF = money market mutual funds; NBFIs = Nonbank financial institutions; nc = national currency; NCD = negotiable CDs; OBIs = other banking institutions; OCD = other checkable deposits; OD = other deposits; PSD = postal savings deposits; RP = repurchase agreements; SD = savings deposits; TB = treasury bills; and TD = time deposits.

The table is constructed based on the information as of July 2002.

Sources: Central Bank bulletins and websites; IMF, Reports on the Observance of Standards and Codes (available at [www.imf.org](http://www.imf.org)); and area departments.



approaches are usually applied in defining money, that is, the best monetary aggregate must fulfill both the functional criteria and pass the empirical test of stability vis-à-vis major macroeconomic variables. However, there is no derivative reason why aggregates chosen under the functional approach should pass the empirical tests—and it may happen that no single aggregate can fully satisfy the conditions of both approaches. As a result, most countries resort to defining multiple monetary aggregates, in the hope that multiple aggregates may collectively convey more information about the state of the economy than any single aggregate can.

Because of the adherence to both the approaches, monetary definitions tend to have a dynamic nature—in that they become prone to revisions whenever the traditional monetary definition no longer satisfies the criteria for both approaches. A common model of change occurs when the existing functional coverage of monetary assets becomes inadequate, owing to innovations or deregulation in financial markets. Shifts in demand for the traditional monetary assets then cause the historical empirical relationships to break down. The inadequate functional coverage and consequent empirical breakdown then spurs calls for redefinitions of the aggregates—to derive new aggregates that have comprehensive functional coverage and stable empirical properties.

Although many countries may apply the same underlying functional and empirical approaches to defining money, there can nevertheless be many differences in national definitions. These differences reflect various factors. An overall general factor is that the empirical approach itself dictates that definitions must be tailored to empirical and policy relevance—a test that may give different results across countries. For instance, the M3 monetary aggregate defined and deemed to be empirically stable in the Euro Area is not necessarily so in the United States. Other more specific factors reflect mainly different institutional settings or financial market structures in different countries—such as the exclusion of MMMFs from the U.K. aggregates because of their small size, or the inclusion or exclusion of residents' foreign currency deposits.

These results suggest that, *a priori*, a monetary definition that is deemed to be appropriate in one country may not be so in another. They also explain why the *MFSM* has chosen not to prescribe a given definition of broad money, leaving it to countries to provide their own national definitions of broad money. However, a note of caution is in order—the *MFSM* approach does not mean that national definitions of broad money can be arbitrary in nature. Overall, national definitions will still have to be defended in the context of the basic functional and empirical approaches to defining money.

## Bibliography

- Anderson, Richard G., 1994, "Editor's Introduction" in "Symposium on Mutual Funds and Monetary Aggregates," *Review*, Federal Reserve Bank of St. Louis, Vol. 76 (November/December), pp. 3–5.
- , and Kenneth A. Kavajecz, 1994, "A Historical Perspective on the Federal Reserve's Monetary Aggregates: Definition, Construction, and Targeting," in "Money Stock Measurement: History, Theory, and Implications," *Review*, Federal Reserve Bank of St. Louis, Vol. 76 (March/April), pp. 1–31.
- Arestis, P., I. Biefang-Frisancho Mariscal, and P.G.A. Howells, 1993, "UK Monetary Aggregates—Definition and Control," in *Money and Banking, Issues for the Twenty-First Century, Essays in Honour of Stephen F. Frowen*, ed. by Philip Arestis (New York: St. Martin's Press), pp. 163–91.
- Bank of England, 1984, "Changes to Monetary Aggregates and the Analysis of Bank Lending," *Quarterly Bulletin*, Vol. 24 (March), pp. 78–83.
- , 1987, "Measures of Broad Money," *Quarterly Bulletin*, Vol. 27 (May), pp. 212–19.
- , 1990, "Monetary Aggregates in a Changing Environment: A Statistical Discussion Paper," Discussion Paper No. 47 (London: Bank of England).
- Board of Governors of the Federal Reserve System, 1977, *Improving the Monetary Aggregates: Report of the Advisory Committee on Monetary Statistics* (Washington).
- , *Federal Reserve Bulletin* (various issues).
- Broaddus, Alfred, 1975, "Aggregating the Monetary Aggregates: Concepts and Issues," *Economic Review*, Federal Reserve Bank of Richmond (November/December), pp. 3–12.
- Carlson, John B., and Benjamin D. Keen, 1995, "M2 Growth in 1995: A Return to Normalcy," Federal Reserve Bank of Cleveland. Available on the web at <http://www.clev.frb.org/research/com/1295.htm>.
- , 1996, "MZM: A Monetary Aggregate for the 1990s?" *Economic Review*, Federal Reserve Bank of Cleveland, Vol. 32 (Second Quarter), pp. 15–23.
- Collins, Sean, and Cheryl L. Edwards, 1994, "An Alternative Monetary Aggregate: M2 Plus Household Holdings of Bond and Equity Mutual Funds," in "Symposium on Mutual Funds and Monetary Aggregates," *Review*, Federal Reserve Bank of St. Louis, Vol. 76 (November/December), pp. 7–29.

- Duca, John V., 1994, "Commentary" in "Symposium on Mutual Funds and Monetary Aggregates," *Review*, Federal Reserve Bank of St. Louis, Vol. 76 (November/December), pp. 67–70.
- , 1995, "The Changing Meaning of Money," *The Southwest Economy*, Federal Reserve Bank of Dallas, Issue 6 (November/December), pp. 6–9.
- Estrella, Arturo, and Frederic Mishkin, 1996, "Is there a Role for Monetary Aggregates in the Conduct of Monetary Policy" NBER Working Paper No. 5845 (Cambridge, Massachusetts: National Bureau of Economic Research).
- European Central Bank, 1999, "Euro Area Monetary Aggregates and Their Role in the Eurosystem's Monetary Policy Strategy," *ECB Monthly Bulletin* (February), pp. 29–46.
- European Monetary Institute, 1997, *European Money and Banking Statistical Methods 1996* (Frankfurt).
- Friedman, Milton, and Anna Schwartz, 1970, "Monetary Statistics of the United States: Estimates, Sources, Methods" (New York: National Bureau of Economic Research).
- Greenspan, Alan, 1993, "Statement to the Congress," *Federal Reserve Bulletin*, Vol. 79 (September), pp. 849–55.
- International Monetary Fund, 1984, "A Guide to Money and Banking Statistics in International Financial Statistics" (Washington).
- , 2000, *Monetary and Financial Statistics Manual* (Washington).
- Kumah, Emmanuel O., "Monetary Concepts and Definitions," IMF Working Paper 89/92 (Washington: International Monetary Fund).
- Larkins, Daniel J., 1983, "The Monetary Aggregates: An Introduction to Definitional Issues," *Survey of Current Business*, Vol. 63 (January), pp. 34–46.
- Leigh-Pemberton, Robin, 1986, "Financial Change and Broad Money," *Bank of England Quarterly Bulletin*, Vol. 26 (December), pp. 499–507.
- , 1997, "Evolution of the Monetary Framework," *Bank of England Quarterly Bulletin*, Vol. 37 (February), pp. 98–103.
- Lown, Cara S., Stavros Peristiani, and Kenneth J. Robinson, 1999, "What was Behind the M2 Breakdown?" (unpublished; Federal Reserve Bank of New York and Federal Reserve Bank of Dallas).

- Mehra, Yash P., 1997, "A Review of the Recent Behavior of M2 Demand," *Economic Quarterly*, Federal Reserve Bank of Richmond, Vol. 83 (Summer), pp. 27–43.
- Orphanides, Athanasios, Brian Reid, and David H. Small, 1994, "The Empirical Properties of a Monetary Aggregate that Adds Bond and Stock Funds to M2," in "Symposium on Mutual Funds and Monetary Aggregates," *Review*, Federal Reserve Bank of St. Louis, Vol. 76 (November/December), pp. 31–51.
- Petersen, David J., 1995, "FYI—Monetary Aggregates, Payments Technology, and Institutional Factors," *Economic Review*, Federal Reserve Bank of Atlanta, Vol. 80 (November/December), pp. 30–37.
- Ragan, Kelly, and Bharat Trehan, 1998, "Is it Time to Look at M2 Again," in *Economic Letter*, Federal Reserve Bank of San Francisco (March), pp. 1-5. Available on the web at <http://www.sf.frb.org/econrsrch/wklyltr/wklyltr98/el98-07.html>
- Salmon, Chris, 1995, "Influences on Broad Money Growth," *Bank of England Quarterly Bulletin*, Vol. 35 (February), pp. 46–53.
- Simpson, Thomas D., 1979, "A Proposal for Redefining Monetary Aggregates," *Federal Reserve Bulletin* (January), pp. 13–33.
- , 1980, "The Redefined Monetary Aggregates," *Federal Reserve Bulletin*, Vol. 66 (February), pp. 97–114.
- , and Richard D. Porter, 1980, "Some Issues Involving the Definition and Interpretation of the Monetary Aggregates," in *Controlling Monetary Aggregates III*, Federal Reserve Bank of Boston Conference Series No. 23 (October), pp. 161–234.
- Small, H. David, and Richard D. Porter, 1989, "Understanding the Behavior of M2 and V2," *Federal Reserve Bulletin*, Vol. 75 (April), pp. 244–54.
- Thorp, John, and Philip Turnbull, 2000, "Banking & Monetary Statistics" (London: Centre for Banking Studies, Bank of England).
- Walter, John R., 1989, "Monetary Aggregates: A User's Guide," *Economic Review*, Federal Reserve Bank of Richmond (January/February), pp. 20–28.
- Whitesell, William, and Sean Collins, "A Minor Redefinition of M2 (unpublished; Washington: Board of Governors of the Federal Reserve System).