Weighting Multiple Monetary Aggregate Targets

By Bryon Higgins

The view that monetary and financial aggregates are important determinants of economic performance is widely accepted by **policymakers,** economists, and other analysts. For this reason, there is general agreement that the Federal Reserve System ought to use monetary policy instruments to influence the behavior of these aggregates. There is no consensus, though, regarding which of the aggregates should be emphasized in the conduct of monetary policy. The Federal Reserve has not selected a single aggregate; instead, policy actions are designed to influence the behavior of several monetary aggregates. This article analyzes conditions in which it is desirable to establish target growth rates for more than one monetary aggregate and discusses the implications of following such a practice.

The first section provides a brief description of the current procedure used by the Federal Reserve to implement monetary policy. The second section discusses one possible reason for establishing multiple monetary targets. It is demonstrated that uncertainty about which monetary aggregate is most useful as a guide to the conduct of monetary policy would justify the use of multiple targets. A weighting procedure for establishing consistent monetary targets that reflects this type of uncertainty is then discussed. In the third section, an alternative reason for the use of multiple targets is analyzed. It is shown that targets for more than one monetary aggregate would be appropriate if different types of assets have different effects on the economy. A weighting procedure for setting consistent targets that reflects the relative magnitude of the economic impact of different types of assets. is also analyzed. The article concludes by contrasting the policy implications of the alternative reasons for establishing multiple targets and compares the policy procedures implied by the use of multiple targets to the current method of implementing monetary policy.

THE CURRENT PROCEDURE FOR IMPLEMENTING MONETARY POLICY

In recent years, the Federal Open Market Committee (FOMC) has progressively emphasized the role of monetary aggregates in the implementation of monetary policy. Since early ·1975, the FOMC has each quarter established annual ·**growth** ranges for **M1,** M2, and M3 that are believed to be consistent with the economic goals of the Federal Reserve System.'

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1 **M1** is composed of currency and demand deposits held by the nonbank public. **M2** includes time deposits at commercial banks (other than large negotiable certificates of deposit at weekly reporting banks) in addition to the **M1** assets. **M3** includes **M2** assets plus time deposits at **thrift** institutions.

At the October 1977 FOMC meeting, for example, growth ranges of 4 to 6% per cent for **M1,** 6% to 9 per cent for M2, and 8 to 10% per cent for M3 were established for the period from the third quarter of 1977 to the third quarter of 1978.

The FOMC attempts to achieve its long-term monetary objectives by providing for financial conditions that keep the monetary aggregates on paths consistent with the long-run growth ranges. The FOMC meets once each month to determine the monetary policy most conducive to the attainment of its long-run monetary objectives. The desired policy is conveyed to the manager of the System open market account in the policy directive issued after each FOMC meeting.

The policy directive as currently formulated includes 2-month growth ranges for **M1** and M2 thought to be reasonably consistent with the long-run growth ranges. A Federal funds rate objective is also stipulated in the directive. The Federal funds rate is the primary operational variable used by the account manager to influence monetary growth. Other things being equal, there tends to be an inverse relation between monetary growth rates and the Federal funds rate. The Federal funds rate objective described in the policy directive is the **FOMC's** estimate of the rate necessary to achieve the desired short-run monetary growth rates.

The Federal funds rate objective contained in the directive sometimes proves to be inconsistent with the short-run **M1** and M2 growth ranges, however. New information on the monetary aggregates becomes available to the account manager every week. If the new data indicate that the initial estimates of monetary growth rates resulting from the Federal funds rate specified in the policy directive were mistaken, the account manager must determine how to adjust the funds rate to

comply with the wishes of the FOMC. The policy directive contains a rule for adjusting the Federal funds rate within a specified range in response to incoming. 'monetary data. The account manager is authorized to increase the funds rate when monetary growth is significantly above the desired growth and to lower the funds rate when monetary growth is significantly below the desired growth.

Deviations from desired **M1** and M2 growth rates are not always of the same magnitude nor in the same direction. The account manager, therefore, must know the relative priorities assigned to attainment of the desired monetary growth rates in order to determine the appropriate policy response. For the past two years, the FOMC has instructed the account manager to give equal weight to **M1** and M2 in determining the Federal funds rate that is consistent with policy objectives.

In summary, the Federal Reserve takes account of the behavior of several monetary aggregates in formulating monetary policy, with **M1** and M2 receiving the greatest attention. The behavior of monetary aggregates is influenced by taking policy actions to keep the growth rates of M1 and M2 within specified **ranges.** Although these growth rate ranges are frequently referred to as monetary targets by policy observers, the current procedure for implementing monetary policy is not strictly equivalent to the use of monetary aggregate targets.' In precise terms, a policy target is an economic variable whose value is kept on some predetermined path regardless of the behavior of other economic variables. The **M1** and M2 growth ranges are not policy targets by this

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2 For a thorough discussion of the current procedure for implementing monetary policy and its resemblance to the use of intermediate targets, see Benjamin M. Friedman, "Targets, Instruments, and Indicators of Monetary Policy," *Journal of Monetary Economics.* Vol. 1, No. 4 (1975).

definition because a number of nonmonetary factors contribute to the Federal Reserve's policy decisions.

Current procedures for implementing monetary policy do resemble the use of monetary targets in many respects, however. Accordingly, the theoretical analysis in the remainder of this article proceeds as if policy were conducted in a manner that conforms precisely to the use of monetary targets, even though the theoretical discussion is not directly applicable to the way the Federal Reserve conducts monetary policy at the present time. Although **M1** and **M2** are frequently thought of as mutually exclusive policy targets, there are a number of reasons for using both in formulating monetary policy. Two alternative reasons for establishing both **M1** and **M2** targets are discussed below. It is then shown how the **M1** and **M2** target growth rates most conducive to attainment of ultimate policy goals might be determined in each case if the Federal Reserve were to adopt procedures that are equivalent to the use of **M1** and **M2** targets as the sole determinants of short-run policy decisions.

ESTABLISHING MULTIPLE TARGETS BECAUSE OF UNCERTAINTY

It might be desirable to establish target growth rates for both **M1** and **M2** if there is uncertainty about which aggregate is the most effective policy guide. For a monetary aggregate to serve as an effective guide for the conduct of monetary policy, it must be closely related to ultimate policy goals. A good summary measure of the numerous goals of monetary policy is the rate of growth of current dollar or nominal gross national product **(GNP).** Achieving a **GNP** growth rate that is consistent with high employment and reasonable price stability may be considered to be the primary goal of monetary policy. For a monetary aggregate to be a useful policy guide, therefore, it must be so closely related to **GNP** that achieving a certain growth rate for the aggregate can be relied upon to result in the desired growth in **GNP.**

A Method for Determining Desirable M1 and M2 Growth Rates

One commonly used method of determining the closeness of the relation between **GNP** and **M1** or **M2** is to estimate empirically the parameters of reduced form equations that include either **M1** or **M2** as an independent variable. A reduced form **GNP** equation directly measures the relation between **GNP** and one or more policy-related variables. A highly simplified reduced form equation with **M1** as an independent variable is:

$$(1) \qquad GNP = a_0 + a_1 \, \dot{M1},$$

where **GNP** is the growth rate of nominal **GNP;** $\dot{M1}$ is the growth rate of **M1,** and a_0 and a_1 are the parameters.

Numerical estimates of the parameters of the reduced form **GNP/M1** equation can be obtained using multiple regression analysis. Having obtained the parameter estimates, the reduced form equation can be used to predict the **GNP** growth rate resulting from any given **M1** growth rate. Comparison of actual **GNP** growth rates with those predicted by the equation indicates the closeness of the relation between **M1** and **GNP.** The lower are the magnitude and variability of differences between predicted and actual **GNP** growth rates, the closer is the relation between **M1** and **GNP.** A similar procedure can be used to determine the closeness of the relation between **M2** and **GNP.**

A primary reason why there is uncertainty about whether M1 or M2 is the better policy guide is that studies using the reduced form approach have been unable to demonstrate conclusively that either M1 or M2 is more closely related to GNP in all circumstances.[3] In some time periods, M1 appears to have been more closely related to GNP, while in other periods, M2 appears to have been more closely related to GNP. Thus, the question of whether M1 or M2 is the more useful policy guide remains unresolved. This uncertainty regarding which monetary aggregate is the more effective policy guide provides one possible reason for establishing target growth rates for both M1 and M2.

The reduced form approach can also be used to derive target growth rates for M1 and M2. To illustrate, assume that the desired growth rate of GNP is 12 per cent and that the following estimates of the relations between GNP and M1 and M2 growth rates are relied on in setting targets:[4]

$$(2) \qquad \dot{GNP} = 6.0 + 1.0 \ \dot{M1}$$

and

$$(3) \qquad \dot{GNP} = 7.0 + 0.5 \ \dot{M2}.$$

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[3] Recent estimates of reduced form relations can be found in Michael Hamburger, "Behavior of the Money Stock: Is There a Puzzle?" Journal of Monetary Economics, Vol. 3, No. 3 (1977).

[4] The reduced form relations used throughout this article include only the current value of a monetary aggregate as an independent variable. Most reduced form equations are substantially more complex than this. Regardless of how complex the reduced form equation that is estimated, however, it is always possible to derive a simple relation between the current growth rate of a monetary aggregate and the current growth rate of GNP so long as the values of other explanatory variables are known. Thus, the simple relations assumed in this article involve no loss in generality; the basic procedure analyzed in the article could be used regardless of the complexity of the estimated reduced form equation.

The relation in (2) indicates that a 6 per cent M1 growth rate is required to achieve the desired 12 per cent growth rate in GNP (i.e., 12 = 6.0 + (1.0) (6)). Similarly, the relation in (3) indicates that a 10 per cent M2 growth rate is required (i.e., 12 = 7.0 + (0.5) (10)). These estimates imply that a monetary policy based on target growth rates of 6 per cent for M1 and 10 per cent for M2 would be most conducive to attainment of ultimate policy objectives.

Choosing Targets When M1 and M2 Growth Rates are Interdependent

The analysis of the procedure for establishing M1 and M2 targets outlined above assumed that monetary targets could be chosen independently. This assumption is unwarranted when M1 and M2 growth rates are interrelated, that is, when a particular growth rate in one monetary aggregate tends to be accompanied by a certain growth rate in the other. In these circumstances, the procedure for establishing monetary targets must be amended to allow for the interdependence between M1 and M2 growth rates.

Interdependence between M1 and M2 growth rates arises to the extent that there are an insufficient number of policy instruments available for use in achieving short-run monetary objectives. There are a number of monetary policy instruments, such as reserve requirements and open market operations, that are controlled by the Federal Reserve. Each of these instruments has a somewhat different impact on M1 growth than on M2 growth. It would be possible for the Federal Reserve to achieve independently chosen M1 and M2 growth rates if all of these policy instruments were effective tools of short-run monetary control. Many of the policy instruments, however, are not effective for achieving

short-run monetary objectives. It may be impractical, for instance, to vary reserve requirements on member bank deposits frequently enough for changes in reserve requirements to contribute to short-run monetary control. The adjustment costs incurred by banks in responding to frequent changes in reserve requirements may be considered too high a price to pay for marginal improvement in achieving short-run monetary objectives. Due to the limited short-run effectiveness of many of the policy instruments, the Federal Reserve has relied primarily on open market operations to achieve desired short-run monetary growth rates.

The relative growth rates of **M1** and **M2** that result from a particular open market operation depend on choices of commercial banks and the public that are largely beyond the control of policy actions. For this reason, open market operations designed to affect the growth rate of one monetary aggregate necessarily affect the growth rate of the other. Thus, there results an interdependence between **M1** and **M2** growth rates.

When the reason for establishing both **M1** and **M2** targets is uncertainty as to which is more closely related to GNP, the interdependence between monetary growth rates necessitates a compromise between the **M1** and **M2** target growth rates that would be established if targets could be chosen independently. The need to compromise can be demonstrated by reference to the example discussed previously. As was demonstrated, the relation in **(2)** indicates that a 6 per cent **M1** growth rate is required to achieve the desired 12 per cent growth rate in GNP, and the relation in **(3)** indicates that a **10** per cent **M2** growth rate is required to achieve the desired GNP growth rate. **M1** growth of **6** per cent may not be consistent with **M2** growth of **10** per cent, however. Assume, for instance, that the estimated relation between **M1** and **M2** growth rates is:

$$(4) \qquad \dot{M2} = 4.5 + 1.5\ \dot{M1}.$$

This relation indicates that open market operations necessary to attain a 6 per cent growth rate for **M1** would inevitably lead to an **M2** growth rate of 13.5 per cent **(M2 = 4.5 + 1.5 Ṁ1 = 4.5 + (1.5)(6) = 13.5).**Similarly, open market operations necessary to attain a **10** per cent **M2** growth rate would yield **M1** growth of less than **4** per cent. Since it is impossible to attain the desired combination of **M1** and **M2** growth rates that are derived from the reduced form relations between GNP and **M1** or **M2,** setting target growth rates for **M1** and **M2** by using only the reduced form equations would result in inconsistent short-run monetary objectives.

Weighting **M1** and M2 to Ensure Consistent Targets

The inconsistency between desired **M1** and M2 growth rates may be resolved by using a weighting scheme that reflects the relative importance attached to **M1** and **M2** as policy guides. Resolution of the inconsistency necessitates a compromise in one or both of the desired monetary growth rates, however. Suppose, for example, the weighting scheme indicates that **M1** is considered to be very important and that M2 is believed to have little, if any, significance. In this case, the **M1** target would be set equal to the **M1** growth rate believed necessary to achieve ultimate policy goals. The corresponding **M2** target would necessarily be the **M2** growth rate that would result from policy actions necessary to achieve the **M1** target. In terms of the previous example, total reliance on **M1** as a policy guide would result in an **M1** target growth rate of 6

per cent and an **M2** target growth rate of **13.5** per **cent.**[5]

A monetary policy based on exclusive use of **M1 as** a policy guide would result in attainment of ultimate policy goals if the relation between **M1** and **GNP** proves to be valid in the period for which monetary targets are established. If **(2)** proves to be an accurate. representation of the relation between GNP and **M2** in the period for which targets are established, achieving the **6** per cent target growth rate in **M1** would lead to the desired **12** per cent growth in GNP. However, large policy errors would result if the confidence in **M1** as a policy guide proves to be unfounded and, instead, the relation between GNP and **M2** is valid. The **13.5** per cent growth in **M2** that necessarily accompanies **M1** growth of **6** per cent would, according to the estimated relation between **M2** and GNP in **(3),** result in GNP growth of **13.75** per cent, substantially above the desired **12** per cent GNP growth rate.

Similarly, exclusive' reliance on **M2** as a policy guide would lead to the desired growth in GNP if the relation between **M2** and GNP proves to be valid. If the relation between **M2** and GNP in **(3)** accurately represents the influence of policy actions on the economy, achieving a **10** per cent growth rate in **M2** would result in the desired **12** per cent growth in GNP. If the relation between **M1** and GNP proves. to be accurate, however, large policy errors would result from exclusive reliance on **M2** as .a policy guide. The **3.67** per cent **M1** growth rate that necessarily accompanies **M2**

growth of **10** per cent would lead to GNP growth of only **9.67** per cent according to the relation in **(2),** well below the desired GNP growth rate of **12** per cent. Thus, exclusive reliance on either **M1** or **M2** would lead to substantial deviation from the desired GNP growth rate if the confidence in the relation between GNP and the aggregate chosen **as** a policy guide proves to be unfounded.

As an alternative to exclusive reliance on one aggregate, the weighting procedure used .to ensure the consistency of **M1** and M2 targets could reflect partial reliance on each aggregate. In this case, the potential impact of both **M1** and **M2** on GNP would be taken into account to some degree in establishing **targets.**[6] The **M1** and **M2** targets resulting from partial reliance on each aggregate would not be the same as the targets resulting from total reliance on either aggregate. The **M1** target resulting from partial reliance on each aggregate would be between the **3.67** per cent target growth rate that would

[5] **The M2** target would be supeffluous if the conduct of policy were dictated entirely by the desire to achieve an **M1** growth rate believed to be consistent with ultimate policy goals. This example of setting targets for both, aggregates, even though only one of the targets has any significance for the conduct of policy, is discussed for illustrative **purposes** only. The targets resulting from exclusive reliance on one aggregate provide an interesting contrast to targets resulting from partial reliance on both aggregates, a case that is **discussed** later.

[6] The same weighting procedure used to **establish** the monetary targets initially can be used to determine the appropriate policy response to deviations from those targets. In general, a policy response will be elicited if the growth rate of either aggregate **differs** from its' target growth rate. Open market operations intended to counteract the divergence between the actual and desired growth rates for one aggregate necessarily affect the growth rate of the other aggregate. Thus, the same type of conflict between monetary objectives that necessitated the initial weighting procedure used to establish consistent targets arises when responding to deviations, from the established targets. The same reasoning that leads to weighting **M1** and M2 in determining the appropriate set of monetary targets also leads to weighting deviations from those targets in determining the appropriate policy response to unexpected behavior of one or both monetary aggregates. The determinants of the relative weights are also the same in the two cases. The relative priorities assigned to reducing deviations from **M1** and **M2** targets would be based on the relative confidence in the closeness of their relations to GNP. If **M1** were considered a much better policy guide than **M2**, for example, open market policy would be designed to maintain the **M1** growth rate close to its target even though this policy might cause substantial deviation of the **M2** growth rate from its target.

be established if total reliance were placed on M2 as a policy guide and the 6 per cent target growth rate that would be established if total reliance were placed on M1 as a policy guide. Similarly, the M2 target resulting from partial reliance on each aggregate would be between the 10 per cent and 13.5 per cent target growth rates that would be established if total reliance were placed on one aggregate or the other. The greater the weight given to M1 relative to M2, for instance, the closer would be the M1 target to 6 per cent and the further would be the M2 target from 10 per cent.

Partial reliance on each aggregate reduces the possibility of major policy errors. To illustrate, suppose the weighting procedure reflecting partial reliance on each aggregate leads to establishing an M1 target growth rate of 5 per cent and an M2 target growth rate of 12 per cent.' The relation between M1 and GNP in (2) implies that M1 growth of 5 per cent would result in GNP growth of 11 per cent, slightly lower than the desired GNP growth rate of 12 per cent. The relation

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[7] The combination of a 5 per cent growth rate target for M1 and a 12 per cent growth rate target for M2 results from equal weighting of M1 and M2. If M1 and M2 are considered to be equally effective as policy guides, the best estimate of the GNP growth rate resulting from policy actions necessary to achieve 5 per cent M1 growth and 12 per cent M2 growth is the average of the GNP growth rates indicated by the M1 and M2 relations in (2) and (3). Thus,

$$E(GNP) = .5(6.0 + 1.0 \dot{M}1) + .5(7.0 + 0.5 \dot{M}2),$$

where E(GNP) is the expected value of GNP growth resulting from given M1 and M2 growth rates. It can easily be shown from the expression above that the only consistent set of targets that yields an expected GNP growth rate of 12 per cent when M1 and M2 are weighted equally is an M1 growth rate of 5 per cent and an M2 growth rate of 12 per cent. More generally, the expected GNP growth resulting from any set of consistent targets can be determined by weighting the predicted outcomes from each of the reduced form relations by the likelihood of their occurrence. There is, in fact, always some consistent set of targets that leads to expected GNP growth at the desired rate regardless of the relative weights given M1 and M2.

between M2 and GNP in (3), on the other hand, implies that M2 growth of 12 per cent would lead to GNP growth of 13 per cent, slightly above the desired rate. Neither the M1 nor the M2 relation indicates that policy actions necessary to achieve growth rates of 5 per cent for M1 and 12 per cent for M2 would result in precisely the GNP growth rate that is desired. Neither of the relations, however, indicates that a policy 'based on this set of targets would lead to errors as great as those that could occur in the case of exclusive reliance on one aggregate. Thus, the possibility of major policy errors is reduced by partial reliance on each of the estimated relations between GNP growth and monetary growth.

Determinants of the Weights for M1 and M2

The relative weights assigned to M1 and M2 would depend on their relative effectiveness as policy guides and on the degree to which policy is designed to avoid large errors. Suppose, for example, that M1 is considered to be a much more effective policy guide than M2 and that the risk of committing major policy errors by disregarding the behavior of M2 is acceptable. In these circumstances, 'exclusive reliance on M1 as a policy guide would be appropriate. If, on the other hand, M1 and M2 are considered equally effective as policy guides and policy is designed to minimize the possibility of substantial deviation from the desired GNP growth rate, equal weighting of M1 and M2 would be appropriate.

As demonstrated above, the degree to which a monetary aggregate would be effective as a policy guide depends on how closely the aggregate is related to GNP. The closeness of the relation between a monetary aggregate and GNP can be measured by the predictive accuracy of a reduced form GNP equation that

includes the monetary aggregate as an independent variable. Thus, if the prediction errors were about the same for the **GNP/M1** equation as for the **GNP/M2** equation, equal weights would be given to **M1** and **M2** in determining the monetary targets most conducive to attainment of ultimate policy goals.

ESTABLISHING MULTIPLE TARGETS TO REFLECT LIQUIDITY

A second possible reason for establishing target growth rates for both **M1** and **M2** is that a monetary measure based on some combination of **M1** and **M2** may be a better policy guide than either aggregate individually. One such measure is a monetary aggregate that is defined as a weighted average of **M1** and **M2,** or equivalently, as a weighted average of **M1** and the time deposit component of **M2.**[8] This type of weighted monetary aggregate might be more closely related to GNP than either **M1** or **M2.** If, for example, total liquidity is an important determinant of economic performance, the various components of **M1** and **M2** would affect the economy in proportion to the degree of liquidity they provide. In these circumstances, a weighted aggregate reflecting the relative liquidity of **M1** assets and the time deposit component of **M2** might be a better policy guide than either **M1** or **M2** separately.

A Method for Determining Desirable M1 and M2 Growth Rates

The closeness of the relation between a **weighted average monetary** aggregate **and GNP**

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[8] A good summary of the literature on weighted average monetary aggregates can be found in Alfred Broaddus, "Aggregating the Monetary Aggregates: Concepts and Issues," *Federal Reserve Bank of Richmond Economic Review,* November/December 1975.

can be determined by including the weighted aggregate as the monetary measure in a reduced form **GNP** equation. Having obtained estimates of the parameters, the reduced form relation can be used to derive an estimate of the growth rate of the weighted average monetary aggregate necessary to achieve the desired growth rate of **GNP.** Assume, for example, that the estimated relation between **GNP** and the weighted aggregate is:

$$(5) \quad \dot{GNP} = 6.4 + 0.7\ \dot{MW},$$

where **MW** is the growth rate of the weighted average monetary aggregate.

The relation in **(5)** implies that an 8 per cent growth rate in the weighted average monetary aggregate is necessary to achieve the desired **12** per cent growth rate in **GNP** (i.e., $12 = 6.4 +$ (0.7) (8)). Since the weighted aggregate, **MW,** is assumed to be a weighted average of M1 assets and the time deposit component of **M2,** the short-run monetary objectives implied by the use of this type of monetary measure as a policy guide can be expressed as target growth rates for **M1** and **M2.** According to the estimated relation in **(5), M1** and **M2** target growth rates that yield an 8 per cent growth rate of the weighted average monetary aggregate are most conducive to attainment of ultimate policy goals.

Weighting M1 and M2 to Ensure Consistent Targets

Interdependence between **M1** and **M2** growth rates must be taken into account in setting targets that would yield the desired growth in liquidity. As in the uncertainty case discussed previously, a weighting procedure can be used to ensure that the **M1** and **M2** targets are consistent. Unlike the uncertainty case, however, the weighting procedure does not

require a compromise between the desired **M1** and **M2** growth rates. A compromise is unnecessary because there are numerous combinations of **M1** and **M2** growth rates that would yield the desired growth rate in the weighted average monetary aggregate. All of these combinations are equally acceptable as targets. Thus, the weighting procedure in this case is used only to determine which of the acceptable combinations of **M1** and **M2** growth rates would result in a consistent set of targets.

The example in the preceding section can be used to illustrate how a weighting procedure can be used to determine consistent targets. The relation in (5) indicates that an 8 per cent growth rate in **MW** would be required to achieve the desired **12** per cent growth rate of **GNP**. Assume that the weights assigned to **M1** and **M2** in defining **MW** imply that the growth rate of **MW** is equal to the simple average of the **M1** and **M2** growth rates (**MW** = .5 **M1** + .5 **M2**). Combinations of **M1** and **M2** growth rates that yield an 8 per cent growth rate in the weighted aggregate might then include an **M1** growth rate of 7 per cent and an **M2** growth rate of 9 per cent, an **M1** growth rate of **4.6** per cent and an **M2** growth rate of **11.4** per cent, and **M1** and **M2** growth rates of 8 per cent. Each of these combinations — and numerous others—could serve equally well as monetary targets. Only one combination, however, would satisfy the relation posited in (**4**) which states that there is an interdependence between **M1** and **M2** growth rates. The only consistent combination of **M1** and **M2** growth rates that provides the desired 8 per cent growth in **MW** is an **M1** growth rate of **4.6** per cent and an **M2** growth rate of **11.4** per cent (i.e., **11.4** = **4.5** + (**1.5**) (**4.6**) as required by the relation in (4)). These growth rates would then be the target growth rates chosen. Thus, the interdependence between **M1** and **M2** growth rates can be taken into account in establishing

monetary targets by choosing the unique combination of consistent **M1** and' **M2** growth rates that result in the desired growth in the weighted average monetary aggregate.

Even though a compromise of short-run monetary objectives is not necessary in the case where **M1** and **M2** targets are established to reflect the relative liquidity of different assets, the interdependence of **M1** and **M2** growth rates still requires that a weighting procedure be used to determine **monetary** targets. The weights assigned to the components of **M1** and **M2** in constructing **MW** necessarily determine the relative importance given to **M1** and **M2** in achieving the monetary growth most conducive to attainment of ultimate policy goals. Thus, the weighting procedure used to establish consistent monetary targets is derived from the weighting procedure used to define the weighted aggregate that serves as a policy guide.[9] As in the case of weighting monetary aggregates to reflect the relative confidence in **M1** and **M2** as policy guides, the weighting procedure used when a weighted average monetary aggregate is the policy guide could be based on exclusive concern with one aggregate or on partial weighting of both **M1** and **M2** growth rates.

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[9] **The same weighting procedure that is used to establish M1 and M2 targets can be used in responding to deviations from those targets. Since the monetary targets are assumed to be derived from the desired growth rate of a weighted average aggregate, deviation of either M1 or M2 from its target would result in an undesired change in the growth rate of the weighted average aggregate, unless offset by, policy actions. The interdependence between M1 and M2 growth rates does not; however, require a compromise of the liquidity objective. By increasing open-market purchases in response to a slowdown in the growth of one or both aggregates, for example, it is always possible to achieve an average growth of M1 and M2 consistent with the desired growth in the weighted aggregate. The magnitude of offsetting policy actions necessary to compensate for deviations from M1 or M2 targets can be determined by using the same weights for M1 and M2 growth rates as were used in establishing the initial targets.**

Determinants of the Weights for M1 and M2

In general, the weights given to **M1** and **M2** in constructing the weighted average monetary aggregate would depend on the relative liquidity of **M1** assets and the time deposit component of **M2.** Although the relative liquidity of **M1** assets and time deposits cannot be measured directly, it can be inferred from the public's reaction to changes in the relative yields on assets. For instance, if individuals consider the interest rate on time deposits to be the opportunity cost of holding demand deposits and currency, the yield on time deposits measures the price of obtaining additional liquidity. The degree to which households and businesses substitute **noninter**-est-bearing assets for time deposits in response to a change in the rate paid on time deposits indicates the public's perception of the relative liquidity of the two types of assets.[10]

CONCLUSION

An important conclusion of the foregoing analysis is that there are numerous circumstances in which it is desirable to consider the behavior of both **M1** and **M2** in implementing monetary policy. Exclusive focus on either **M1** or **M2** might lead to incorrect policy actions if there is uncertainty about which aggregate is more closely related to GNP or if a weighted average of **M1** and **M2** is more closely related to GNP than either aggregate individually. In both cases, policy actions based on targets for both **M1** and **M2** are more likely

to result in attainment of ultimate policy goals than policy actions based on a single target.

Another implication of the analysis is that the evaluation of the economic impact of alternative combinations of **M1** and **M2** target growth rates and the relative importance assigned to each aggregate depend on the rationale underlying the use of multiple targets." If targets are established for both **M1** and **M2** because of uncertainty as to which is the better policy guide, the potential economic impact of each aggregate is evaluated without reference to the behavior of the other aggregate. The effect of **M1** on GNP is evaluated by using a reduced form relation including **M1** as the sole monetary variable, and the effect of **M2** on GNP is evaluated by using a reduced form relation including **M2** as the sole monetary variable. Potential impact of a particular **M1** target growth rate, for example, can be determined directly from the **M1** reduced form relation and does not depend in any way on the corresponding **M2** target. The relative importance attributed to each aggregate in the uncertainty case reflects the relative confidence in the alternative reduced form relations as accurate representations of the effect of policy actions on the economy.

If targets are established for both **M1** and **M2** because both are **believed** to contribute to total liquidity, on the other hand, the potential economic impact of a particular target growth rate for one aggregate cannot be evaluated in isolation from the corresponding target growth rate of the other aggregate. When GNP growth is assumed to depend on the growth in total liquidity rather than the growth in either **M1** or **M2** individually, the economic impact of alternative sets of **M1** and **M2** growth rates is determined by the combined impact of the **M1** and **M2** growth rates on the growth in liquidity. Thus, the relative importance attributed to **M1** and **M2,** in these circumstances, depends on

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[10] For a comprehensive survey of the studies that have estimated the substitutability between M1 assets and time deposits, see Edgar L Feige and Douglas K. Pearce, "The Substitutability of Money and Near-Monies: A Survey of the Time Series Evidence," *Journal of Economic Literature, Vol.* **15,** *No.* **2** (June 1977).

the degree to which each aggregate contributes to the desired growth in total liquidity.

In summary, when short-run monetary policy decisions are based on target growth rates for **M1** and M2, the course of monetary policy depends both on the method used to evaluate the economic effects of alternative **M1** and M2

growth rates and on the relative importance attributed to each aggregate. Since both of these determinants of policy actions depend on the rationale underlying the use of multiple targets, the policy actions deemed appropriate under the uncertainty rationale might differ from the policy actions deemed appropriate under the liquidity rationale.

Although the current procedure for implementing monetary policy is not precisely equivalent to the use of monetary targets, several interesting comparisons can be made between current methods for implementing monetary policy and those that might be employed if a strict monetary target approach to policy were adopted by the Federal Reserve. The policy implications of the two alternative reasons for establishing targets for both **M1** and M2 have been shown to be somewhat different. These differences are relatively minor, however, in comparison to the difference between exclusive reliance on one aggregate and partial reliance on both aggregates. Whether because of uncertainty as to which aggregate is a better policy guide or because both aggregates are believed to contribute to total liquidity, the FOMC has chosen not to rely exclusively on either **M1** or M2 in assessing the impact of monetary policy on the economy. Furthermore, the current method of implementing monetary policy is roughly consistent with the method implied by either of the reasons for using multiple targets discussed in this **article.** [12]

11 The optimal structure of reserve requirements on bank deposits also depends on the reason for establishing targets for both **M1** and **M2.** The relative magnitude of **reserve** requirements on demand deposits and time deposits is an important determinant of the degree of monetary control exercised by the Federal Reserve.

Under the assumption that the Federal Reserve **uses** some reserve aggregate as the instrument of monetary control, it can be shown that **M1** growth can most easily be controlled if there are no reserve requirements on time deposits and that **M2** growth can most easily be controlled if reserve requirements on time deposits are equal to reserve requirements on demand deposits. When target growth rates are established for both **M1** and **M2,** the structure of reserve requirements most conducive to attainment of the dual monetary objectives would, under the assumption of a reserve aggregate instrument, include reserve requirements on time deposits that are neither **zero nor** equal to reserve requirements on demand deposits. The optimal relation between reserve requirements on different classes of bank deposits when targets are established for both **M1** and **M2** depends both on the reason for establishing multiple targets and on the relative weights assigned to those targets. The greater the weight given to **M1** relative to **M2,** *ceteris paribus,* the greater would be reserve requirements on demand deposits relative to reserve requirements on time deposits in both cases, since demand deposits are a larger component of **M1** than of **M2.** For any specified set of relative weights for **M1** and **M2 growth** rates, the differential between reserve requirements on demand deposits and time deposits would be greater if those weights represent the relative confidence in **M1** and **M2** as policy guides than if those weights represent **the** relative contribution of the **M1** growth rate and the **M2** growth rate to the growth rate of total liquidity. Equal weighting of **M1** and **M2** growth rates, for example, would imply that the optimal ratio of reserve requirements on demand deposits to reserve requirements on time deposits is about 6 in the uncertainty case and 3% in the liquidity case.

It is possible, however, that the structure of reserve requirements most conducive to monetary control would depend on the type of policy instrument used. Therefore, the results in the preceding paragraph might be changed somewhat. if it is assumed that something other than a **reserve** aggregate is used as the instrument of monetary control.

12 It is interesting to note that the existing structure of reserve requirements, too, seems roughly consistent with a monetary policy based on targets for both **M1** and **M2.** The average level of reserve requirements on member bank demand deposits is approximately four times as high as the average level of reserve requirements on member bank time deposits. While this ratio is not conducive to maximum control over either **M1** or **M2** separately, it might contribute to the ability to achieve desired *combinations* of **M1** and **M2** growth rates.