

A Revision in the Monetary Base

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THE Monetary Control Act of 1980 mandated a substantial change in the structure of reserve requirements faced by depository institutions. The reserve requirement structure was phased in over a seven-year period from November 1980 to September 1987.

The adjusted monetary base, a measure of the Federal Reserve's influence on the money stock, has been revised to reflect this new structure. This article explains why the base series was revised and describes the difference between the previous and revised series.

THE ADJUSTED MONETARY BASE: PURPOSE AND COMPOSITION

The adjusted monetary base (AMB) is designed to be a single measure of all Federal Reserve actions that influence the money stock, including changes in reserve requirements. It is equal to the source base plus the reserve adjustment magnitude (RAM).

The source base consists of total currency outstanding (held by the public and in the vaults of depository institutions) plus the reserve balances of depository institutions at Federal Reserve Banks.¹ The level of the money stock (currency in the hands of the public plus checkable deposits) that can be supported with a given level of the source base depends on reserve requirements. If required reserve ratios are reduced,

for example, a given level of the source base can support a higher level of the money stock.

RAM is specified in terms of the reserve requirements in effect in a base period. It equals the reserves that would be required (given current deposit liabilities) if the reserve requirements of a base period were in effect minus the reserves that are actually required. RAM rises (falls) if reserve requirements are lowered (raised). Including RAM in the AMB removes the effects of reserve requirement changes from the relationship between the money stock and the AMB, even though such changes affect the relationship between the money stock and the source base.

THE IMPLICATIONS OF RESERVE ACCOUNTING FOR AN APPROPRIATE MEASURE OF RAM

The money stock is the product of the monetary base multiplier and the AMB. The issues involved in developing an appropriate measure of RAM can be analyzed in terms of the determinants of the monetary base multiplier. This section discusses the relationships between the structure of reserve requirements, the equations for measuring RAM, and the determinants of the AMB multiplier. The appendix presents the specific equations used for measuring RAM and derives the determinants of the AMB multiplier associated with each specification.

The AMB measures all three policy actions that influence money growth: open market operations, discount window lending and changes in reserve requirements. The monetary base multiplier reflects the effects that choices of both depository institutions and the public have on the money stock. The determinants

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¹Reserve balances of depository institutions included in the source base are net of required clearing balances and balances held to compensate for float.

of the multiplier include the ratio of currency in the hands of the public to checkable deposits, the composition of deposits and the excess reserves held by depository institutions.

These determinants depend on how RAM is measured. The appropriate specification of RAM, in turn, depends on the structure of reserve accounting in effect. This principle can be illustrated for two features of reserve accounting: the reserve requirements of members and nonmembers and those on time and savings deposits.

Prior to 1980, only banks that were members of the Federal Reserve were subject to the Fed's reserve requirements; nonmember institutions were exempt from these requirements.² Thus, shifts of deposits between members and nonmembers affected the level of deposits that could be supported by a given level of bank reserves. Also, since there were reserve requirements on the time and savings deposits of member banks, shifts of deposits between demand deposits and time and savings deposits at member banks affected the amount of checkable deposits that could be supported by a given level of bank reserves. Because these deposit shifts represented the public's rather than the Federal Reserve's actions, the AMB series was constructed so that the deposit shifts affected the AMB multiplier; the effects of these shifts are demonstrated algebraically in the appendix. This AMB series was appropriate for periods before 1980.³

The Monetary Control Act of 1980, however, imposed identical reserve requirements on both member and nonmember institutions. With the new structure of reserve requirements fully phased in, as of September 1987, a deposit shift between members and non-

members no longer affects the amount of checkable deposits that can be supported with a given amount of reserves.⁴ Maintaining the old RAM measure would continue to make the money multiplier a function of the distribution of deposits between member and nonmember institutions; this distinction, however, has no relevance under the current system of reserve accounting. Thus, the current measure of RAM must be changed to make the AMB multiplier invariant to these deposit shifts.

Under the new structure, the only categories of time and savings deposits subject to positive reserve requirements are Eurodollar liabilities and nonpersonal time and savings deposits with initial maturities of 18 months or less.⁵ With these exceptions, shifts of deposits between checkable deposits and time and savings deposits do not affect the amount of checkable deposits that can be supported with a given amount of reserves. In the new equation for RAM, the base period reserve requirement on all time and savings deposits is zero. This feature removes the ratio of time and savings deposits to checkable deposits as a determinant of the money multiplier.

There is a problem, however, with the use of this new equation for RAM in measuring the AMB before 1980. The new equation eliminates as determinants of the AMB multiplier the distribution of deposits between members and nonmembers and the distribution of deposits at member banks between demand deposits and time and savings deposits. This produces an undesirable revision in the time series relationship between the money stock and the AMB prior to 1980.

THE SOLUTION: LINK TWO DIFFERENT AMB SERIES TOGETHER

The major challenge in revising the AMB series is creating a continuous series while maintaining the determinants of the AMB multiplier that are appropriate for periods both before and after November 1980. The solution is to link together, at the week ending November 19, 1980, two series based on different equations for RAM. (November 19, 1980, was the first reserve

²Before 1980, state-chartered nonmember banks were subject to the reserve requirements of the state in which they were chartered. For information on the levels of the state reserve requirements and their effects, see Gilbert and Lovati (1978) and Gilbert (1978).

³Given the nature of the prior measure of RAM, some actions of the public, such as shifts of deposits among banks, did not affect the multiplier. The structure of reserve requirements on member bank deposits in effect prior to November 1972 was based on the location of member banks. Shifts of deposits among member banks in cities of different size changed the average reserve requirement on member bank deposits, but did not affect the AMB multiplier.

Under the structure of reserve requirements adopted in November 1972, there was a graduated structure of reserve requirements on demand deposits at member banks. Shifts of demand deposits between large and small member banks changed the average reserve requirement on member bank demand deposits. Changes in the average reserve requirement on member bank demand deposits did not affect the multiplier.

⁴One exception involves nonmember institutions in Hawaii that were in operation on or before August 1, 1978; their reserve requirements will be phased in through January 1993.

⁵Also subject to reserve requirements are nonpersonal ineligible acceptances and obligations of affiliates with initial maturity greater than seven days.

settlement week under the reserve requirements specified in the Monetary Control Act.) Using seasonally unadjusted observations for that week, the value of the AMB derived from the new equation for RAM is divided by the value based on the prior equation for RAM; that ratio equals 0.9704. The AMB for each period through November 12, 1980, based on the prior equation for RAM, is then multiplied by that ratio.⁶ This adjustment leaves unchanged the growth rates of the AMB series between any two points in time prior to November 1980; it also adjusts the level of the AMB series prior to November 1980 to avoid a break in the series on that date due to the change in the equation for RAM.

The new measure of RAM alters the seasonal patterns in the AMB. The revised series is not seasonally adjusted as one continuous series. Instead, the data through October 1980 are seasonally adjusted without incorporating data with the new measure of RAM, and the data since November 1980 are seasonally adjusted with observations based entirely on the new measure of RAM.

THE DATA

Table 1 presents quarterly growth rates of these series from 1981. As the table shows, the growth rates of these series generally rise and fall together. On average, the new series grew slightly faster than the old series over this period. Data are not presented for periods prior to November 1980, since the construction of the revised series keeps the growth rates unchanged.

CONCLUSIONS

The revision of the adjusted monetary base (AMB) involves a new equation for the reserve adjustment magnitude (RAM), the component of the AMB that reflects the effects of changes in reserve requirements. The new measure of RAM reflects the structure of reserve requirements specified in the Monetary Control Act of 1980, which were phased in between November 1980 and September 1987.

⁶For a discussion of this method of linking together distinct measures of the AMB, see Tatom (1980).

Table 1
Quarterly Growth Rates of the Adjusted Monetary Base (compounded annual rates of change, seasonally adjusted)

Quarter	Old series	New series
1981 1	2.9%	2.4%
2	6.5	7.9
3	4.7	3.8
4	3.9	3.2
1982 1	8.6	8.4
2	8.5	6.7
3	6.8	5.8
4	8.8	9.6
1983 1	11.7	12.0
2	11.3	12.2
3	7.3	8.3
4	7.9	8.5
1984 1	9.0	9.8
2	8.1	7.1
3	6.8	5.6
4	5.4	4.6
1985 1	8.0	7.7
2	7.3	7.5
3	9.0	10.4
4	7.3	8.9
1986 1	7.3	7.0
2	8.2	9.7
3	8.8	10.6
4	9.7	11.2
1987 1	10.5	11.3

Data prior to November 1980 are calculated using the prior measure of RAM. In this revision of the AMB, therefore, the series through October 1980 is distinct from the series from November 1980 to the present. The two distinct series are linked together in November in a way that makes the revised AMB one continuous series. The prior measure of RAM is used for periods prior to November 1980 to retain the determinants of the monetary base multiplier ($M1 \div AMB$) that are appropriate for the reserve requirement structure then in effect.

REFERENCES

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Appendix

Two Equations for the AMB and the Corresponding Monetary Base Multipliers

This appendix presents the equation for the AMB adopted in 1980 and the new equation that is now used to measure the AMB for the period from November 1980 to the present. The determinants of the AMB multiplier are derived for each measure of the AMB. See table A1 for definitions of the terms used in specifying the AMB and its money multiplier.

OLD MEASURE OF THE AMB

In a revision of the monetary base in 1980, the AMB was measured as follows:

$$(A1) \text{ AMB}_t = \text{SB}_t + 0.12664 (\text{TDM})_{t-14} + 0.031964 (\text{TSM})_{t-14} - \text{RR}_t$$

The deposit data, which are for member banks only, are lagged 14 days to reflect the fact that the required reserves for each week were based on deposits of two weeks earlier. The weights on the transaction deposits of member banks (0.12664) and the time and savings deposits of member banks (0.031964) are the average reserve requirements on these categories of deposits in the period from January 1976 through August 1980.¹

In deriving the multiplier associated with the AMB series specified in equation A1, the time lags on the deposit data are ignored to simplify the equation. The first step in deriving the multiplier involves expressing the source base as the sum of its components.

$$(A2) \text{ SB} = \text{CP} + \text{RR} + \text{E}$$

$$\begin{aligned} \text{AMB} &= \text{SB} + \text{RAM} \\ &= \text{CP} + \text{RR} + \text{E} + 0.12664 (\text{TDM}) + \\ &\quad 0.031964 (\text{TSM}) - \text{RR} \end{aligned}$$

$$(A3) \quad = \text{CP} + \text{E} + 0.12664 (\text{CDM} + \text{FM} + \text{GM}) + 0.031964 (\text{TSM})$$

Total checkable deposits, the deposit component of M1, equals the checkable deposits of members plus those of nonmembers. Using lower case "n" as the fraction of checkable deposits at nonmembers, the components of the AMB in equation A3 can be respesified as follows:

Table A1

Terms Used in Specifying the Adjusted Monetary Base and the Monetary Base Multiplier

Term	Description
AMB	Adjusted monetary base
SB	Source base
RAM	Reserve adjustment magnitude
CDM	Checkable deposits of member banks
FM	Demand deposits of member banks due to foreign banks and official institutions
GM	Demand deposits of member banks due to the U.S. Treasury
TDM	Transaction deposits of member banks = CDM + FM + GM
TSM	Time and savings deposits of member banks
RR	Required reserves
CP	Currency in the hands of the public
E	Excess reserves, including the vault cash of nonmember banks
n	Share of total checkable deposits at nonmember banks
CD	Total checkable deposits — those at members and nonmembers
k	CP - CD
e	E + CD
fm	FM - CD
gm	GM - CD
tm	TSM - CD
F	Demand deposits of all depository institutions due to foreign banks and official institutions
G	Demand deposits of all depository institutions due to the U.S. Treasury
TD	Transaction deposits at all depository institutions = CD + F + G
f	F + CD
g	G + CD

¹ See Gilbert (1980) for a description of this measure of the AMB.

$$(A4) \text{AMB} = \text{CD} (k + e + 0.12664 (l - n + fm + gm) + 0.031964(tm))$$

The AMB multiplier can be specified as follows:

$$(A5) \frac{M1}{\text{AMB}} = \frac{1 + k}{k + e + 0.12664(l - n + fm + gm) + 0.031964(tm)}$$

Thus, given the equation for the AMB adopted in 1980, the AMB multiplier is a function of:

1. the ratio of currency in the hands of the public to checkable deposits (*k*),
2. the ratio of excess reserves to checkable deposits (*e*),
3. the fraction of checkable deposits at nonmember institutions (*n*),
4. the ratio of the demand deposits of member banks due to foreign banks and official institutions divided by total checkable deposits (*fm*),
5. the ratio of the demand deposits of member banks due to the U.S. Treasury divided by total checkable deposits (*gm*), and
6. the ratio of time and savings deposits at member banks to checkable deposits (*tm*).

The revised measure of the AMB prior to November 1980 is obtained by multiplying the measure described above by a specific ratio; this ratio is the level of the new measure of the AMB divided by the level of the prior measure for the week ending November 19, 1980. Multiplying the AMB specified above by this fixed ratio alters the *level* of the AMB multiplier for periods prior to November 1980; however, this procedure leaves both its determinants and its growth rate unchanged.

THE NEW MEASURE OF THE AMB

Reserve Accounting

The timing of data in the new equation for calculating the AMB is different for the periods under lagged and contemporaneous reserve requirements. For the periods under lagged reserve requirements, that is, for the weekly reserve maintenance periods through the week ending February 1, 1984, the AMB is calculated as indicated in equation A6.²

²The deposit component of equation A6 is transaction deposits of all depository institutions for the week ending on a Wednesday, 14 days before the end of the current maintenance period. Historical data are no longer available on transaction deposits for weeks ending on Wednesdays. When the Federal Reserve adopted contemporaneous reserve requirements in February 1984, the weekly data series on deposits, currency and vault cash of depository institutions were converted from averages for weeks ending on Wednesdays to averages for weeks ending on Mondays. It is possible to derive a series for deposits in weeks ending on Wednesdays (TD_{t-14}) from the data on transaction deposits for weeks ending on the surrounding Mondays (TD_{t-16} and TD_{t-9}), as indicated in the following equation:

$$TD_{t-14} = (5/7) TD_{t-16} + (2/7) TD_{t-9}$$

Data on transaction deposits derived in this manner are used in the calculation of the AMB through February 1, 1984.

$$(A6) \text{AMB}_t = \text{SB}_t + (0.12) \text{TD}_{t-14} - \text{RR}_t$$

The base period reserve requirement on transaction deposits, 12 percent, is the marginal reserve requirement on most of the transaction deposits of depository institutions under the new structure of reserve requirements.

Contemporaneous reserve requirements became effective the week ending February 8, 1984. The method for calculating the AMB in this period is presented in equation A7.³

$$(A7) \text{AMB}_t = \text{SB}_t + (0.12) \text{TD}_{t-2} - \text{RR}_t$$

Seasonal Adjustment

Contemporaneous reserve requirements altered the seasonal patterns of the AMB. In a previous revision of the AMB, Gilbert (1985) described a method for deriving seasonal factors for the period after February 1984. That method is applied to this new series on the AMB. It involves developing a counterfactual series for weeks prior to February 1984 that reflects estimates of the seasonal patterns in the AMB if contemporaneous reserve requirements had been in effect. The counterfactual series is calculated for the period January 1975 through January 1984. Observations for that series are combined with actual values of the AMB for the period since February 1984 to derive seasonal factors that are used for seasonally adjusting the AMB data for the period since February 1984.

The New AMB Multiplier

Using steps similar to those in equations A2 and A3, the new measure of the AMB can be specified as follows:

$$(A8) \text{AMB} = \text{CP} + \text{E} + 0.12 (\text{CD} + \text{F} + \text{G})$$

The AMB multiplier can be expressed as follows:

$$(A9) \frac{M1}{\text{AMB}} = \frac{1 + k}{k + e + 0.12 (1 + f + g)}$$

The AMB multiplier, based on the new equation for the AMB (equations A6 and A7), is a function of:

1. the ratio of currency in the hands of the public to checkable deposits (*k*),
2. the ratio of excess reserves to checkable deposits (*e*),
3. the ratio of demand deposits of depository institutions due to foreign commercial banks and official institutions to checkable deposits (*f*), and
4. the ratio of U.S. Treasury deposits at depository institutions to checkable deposits (*g*).

³For a description of contemporaneous reserve requirements, see Gilbert and Trebing (1982). For an earlier discussion of the implications of contemporaneous reserve requirements for the measurement of RAM, see Gilbert (1984).