New Seasonal Factors for the Adjusted Monetary Base

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THE February 1984 adoption of contemporaneous reserve requirements (CRR), which changed the timing between deposit liabilities and required reserves, has altered the seasonal patterns in the adjusted monetary base (AMB).[1] Weekly variability in the AMB has been substantially higher since that date, which suggests that seasonal factors based on past data do not reflect the seasonal patterns in the AMB under CRR.[2] This article describes a new method of deriving seasonal factors for the AMB that reflects the timing of reserve accounting under CRR.[3]

THE CALCULATION OF THE ADJUSTED MONETARY BASE

The AMB is designed to be a single measure of all Federal Reserve actions, including changes in reserve requirements, that influence the money stock. It is equal to the source base plus a reserve adjustment magnitude (RAM) that accounts for changes in reserve requirements by the Federal Reserve.[4]

RAM is the difference between the reserves that would be required (given current deposit liabilities) if the base period's reserve requirements were in effect and the reserves that are actually required given current reserve requirements. Adding RAM to the source base produces a series that shows what the source base would have been in each period if reserve requirement ratios had been those of the base period.[5] This procedure converts the impact of reserve requirement changes into equivalent changes in the source base, holding reserve requirements constant.[6]

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[1]A general description of CRR appears in Gilbert and Trebing (1982).

[2]The average absolute value of weekly changes in the AMB from January 1982 through January 1984 was $492 million. This measure of weekly variability was $1,723 million for the period February 1984 through December 1985, more than three times larger than in the earlier period.

[3]An earlier paper by Farley (1984) presents a different method of deriving seasonal factors that reflect the timing of reserve accounting under CRR.

[4]The following articles describe and explain the AMB in greater detail: Gilbert (1980, 1983 and 1984) and Tatom (1980).

[5]The source base equals the reserve balances of depository institutions with Federal Reserve Banks, which excludes their required clearing balances and balances held to compensate for float, plus total currency in circulation, whether held by depository institutions or the public. It is derived from the combined balance sheets of the Federal Reserve Banks and the U.S. Treasury.

[6]The base period for calculating RAM is January 1976 through August 1980. Base period reserve requirements are the average reserve requirements over that period for two categories of deposit liabilities: transaction deposits and total time and savings deposits. For member banks, the average required reserve ratio was 12.664 percent on transaction deposits and 3.1964 percent on total time and savings deposits. For nonmember institutions, base period reserve requirements were zero, since they were not subject to reserve requirements of the Federal Reserve in the base period. Thus, RAM is calculated as the current transaction deposits of member banks multiplied by 0.12664, plus the current total time and savings deposits of member banks multiplied by 0.031964, minus the current required reserves of all depository institutions.

Under the Prior System of Lagged Reserve Requirements

Calculation of the AMB under lagged reserve requirements (LRR) is illustrated in equations 1 through 3. Definitions of the terms in these equations are presented in table 1. Equation 1 shows how RAM is calculated for each reserve maintenance period under LRR.

$$(1) \quad RAM_t = BRTR\ (TR_{t-14}) + BRTS\ (TS_{t-14}) - RR_t$$

The source base is equal to total currency outstanding (that held by the public and in the vaults of depository institutions) plus the reserve balances of depository institutions. Under LRR, the items that could be used to meet required reserves in the current maintenance period were reserve balances held in the current period (RB_t) plus vault cash held in the week ending 14 days earlier (V_{t-14}). This sum is thus equal to required reserves (RR_t) plus excess reserves (E_t). Consequently, the source base can be expressed as shown in equation 2.

$$(2) \quad SB_t = CP_t + V_t + RB_t$$
$$= CP_t + V_t + RR_t + E_t - V_{t-14}$$

Thus, the AMB under LRR is shown in equation 3.

$$(3) \quad AMB_t = SB_t + RAM_t$$
$$= CP_t + E_t + V_t - V_{t-14} + BRTR\ (TR_{t-14}) + BRTS\ (TS_{t-14})$$

Under the Current System of Contemporaneous Reserve Requirements (CRR)

The reserve maintenance periods, during which average reserves must equal or exceed required reserves, have been lengthened under CRR to two-week periods ending every other Wednesday. Required reserves on transaction deposits for the current two-week maintenance period are based on daily average transaction deposits for the 14-day period ending two days before the end of the current maintenance period. In contrast, required reserves on time and savings deposits are based on daily average deposits over a 14-day period ending 30 days before the end of the current maintenance period. The assets of depository institutions that count toward meeting their reserves in the current maintenance period are their reserve balances in the current maintenance period plus average vault cash over the 14-day period ending 30 days before the end of the current maintenance period. Equation 4 illustrates the calculation of the AMB under CRR.

Table 1

Definitions of Terms Used in Specifying the Adjusted Monetary Base

SB_t	— the source base over the maintenance period ending on day t
RAM_t	— reserve adjustment magnitude for the maintenance period ending on day t
BRTR	— base period required reserve ratio on the transaction deposits of member banks
TR_{t-14}	— transaction deposits of member banks in the week ending 14 days before day t
BRTS	— base period required reserve ratio on the time and savings deposits of member banks
TS_{t-14}	— time and savings deposits of member banks in the week ending 14 days before day t
RR_t	— required reserves of all depository institutions in the maintenance period ending on day t
RB_t	— balances of depository institutions in their reserve accounts at Federal Reserve Banks in the maintenance period ending on day t
V_t	— vault cash of depository institutions in the maintenance period ending on day t
V_{t-14}	— vault cash of depository institutions in the week ending 14 days before the end of the current maintenance period
E_t	— excess reserves in the maintenance period ending on day t; prior to the imposition of reserve requirements of the Federal Reserve on all depository institutions in 1980, it includes the vault cash of nonmember institutions, held in the week ending 14 days earlier
CP_t	— currency held by the public in the maintenance period ending on day t
TR_{t-2}	— transaction deposits of member banks over the 14 days ending two days before the end of the current maintenance period
TS_{t-30}	— time and savings deposits of member banks over the 14 days ending 30 days before the end of the current maintenance period
V_{t-30}	— vault cash over the 14 days ending 30 days before the end of the current maintenance period

$$(4) \quad AMB_t = SB_t + RAM_t$$
$$= CP_t + E_t + V_t - V_{t-30} + BRTR\ (TR_{t-2}) + BRTS\ (TS_{t-30})$$

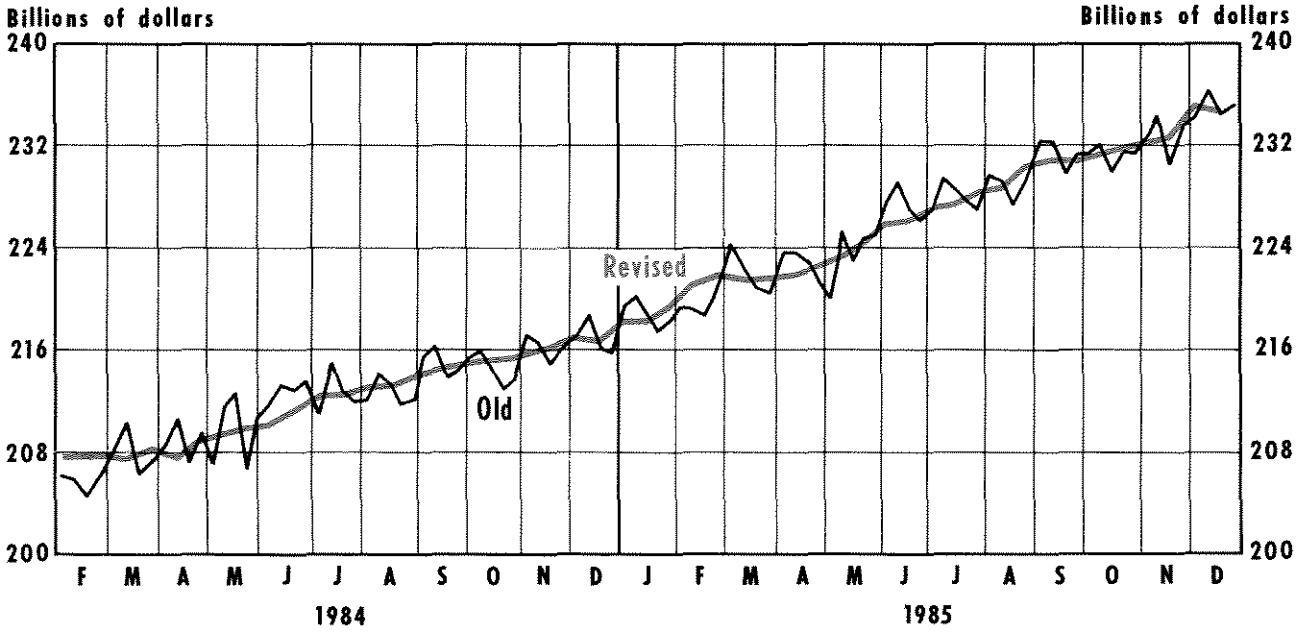
EFFECTS OF CRR ON SEASONAL PATTERNS IN THE AMB

If the seasonal patterns of transaction deposits and time and savings deposits are not changed by th

Chart 1

Seasonally Adjusted Monetary Base

Old and Revised Series



NOTE: The old series is weekly; the revised series is biweekly, covering reserve maintenance periods.

switch from LRR to CRR, seasonal movements in the AMB will be different under CRR. For example, an increase in transaction deposits will lead to a rise in the AMB about two weeks earlier under CRR than under LRR. In contrast, a rise in time and savings deposits will lead to a rise in the AMB about two weeks later under CRR than under LRR.

Through 1985, seasonal factors for the AMB were derived by applying the X-11 seasonal adjustment program to past AMB data, the bulk of which were for the period prior to February 1984.[7] Thus, these data are generally inappropriate in calculating seasonal factors for the period since February 1984.

Alternative seasonal factors for the period since February 1984, however, can be derived by a simple procedure. The procedure requires the calculation of a counterfactual AMB series for several years prior to February 1984 that reflects what the AMB's seasonal patterns would have been if CRR had been in effect during the earlier period. The counterfactual AMB series is derived by adding to the AMB (as calculated before February 1984) the adjustments necessary to convert the timing of reserve accounting to that under CRR. Equation 5 shows how this counterfactual AMB series is derived. Note that equation 5 reduces directly to equation 4 when components with opposite signs are cancelled.

$$(5)\quad AMB_t = CP_t + E_t + (V_t - V_{t-14}) + BRTR\,(TR_{t-14}) + BRTS\,(TS_{t-14}) + (V_{t-14} - V_{t-30}) + BRTR\,(TR_{t-2} - TR_{t-14}) + BRTS\,(TS_{t-30} - TS_{t-14})$$

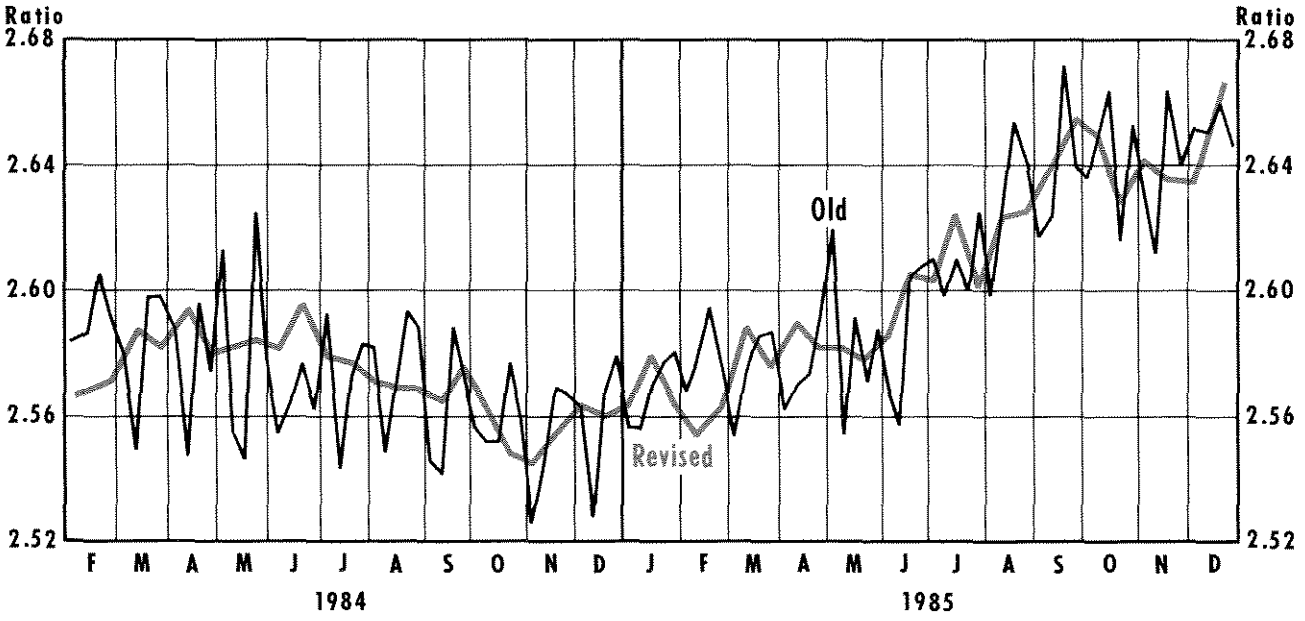
The counterfactual AMB series for periods prior to February 1984 is calculated as shown in equation 5, with one modification. The modification involves an adjustment for the change in the timing of reserve accounting on vault cash $(V_{t-14} - V_{t-30})$. The term V_{t-14} is for weeks ending on Wednesdays, whereas V_{t-30} is for weeks ending on Mondays. The time series currently maintained on weekly vault cash is for weeks ending on Mondays, which is available back to 1975. An approximation to $(V_{t-14} - V_{t-30})$ in equation 5 is derived as $(V_{t-16} - V_{t-30})$, using data on the vault cash of all commercial banks from 1975. The counterfactual series on the

[7]The weekly seasonal factors for the AMB are derived from a version of the X-11 program that has been modified by the staff of the Federal Reserve Board to derive weekly seasonal factors from monthly seasonal factors.

Chart 2

M1 Multiplier

Old and Revised Series



NOTE: The old series is weekly; the revised series is biweekly, covering reserve maintenance periods.

AMB does not include an adjustment for the change in the timing of reserve accounting for vault cash in the years 1969 through 1974. The counterfactual AMB series for several years prior to February 1984 is combined with the AMB as calculated since February 1984. Seasonal factors are derived from this series and applied to the AMB, not seasonally adjusted, since February 1984.[8]

Much of the increase in short-run variability in the AMB since February 1984 is eliminated by using seasonal factors based on the counterfactual series. Furthermore, AMB data for the two-week reserve maintenance periods are less variable than in the weekly data. Chart 1 shows the difference between weekly data on the AMB as published through 1985 and the biweekly series with the new seasonal factors based on the counterfactual method. Chart 2 presents a similar contrast between the alternative M1 multipliers. Table 2 indicates a lower incidence of large changes with the alternative seasonals, especially for the biweekly series.

CONCLUSIONS

The weekly adjusted monetary base has been more variable since the Federal Reserve adopted contemporaneous reserve requirements in February 1984. The increase in its weekly variability appears to reflect problems with estimating the seasonal patterns in the AMB using data prior to February 1984. New seasonal

[8]The counterfactual observations for the AMB in periods prior to February 1984 are calculated for weekly periods. For the purpose of calculating seasonal factors, observations on the AMB since February 1984 are calculated for each week (seven-day periods ending on Wednesdays), by adding the source base for the week to the biweekly observation for RAM that includes that week. The X-11 program is used to derive weekly seasonal factors from this weekly series. The weekly seasonal factors are used for calculating the biweekly observations for the AMB, seasonally adjusted, since February 1984.

Data on the transaction deposits and on time and savings deposits of member banks are available for weeks ending on Mondays since 1979. Data from 1979 through 1985 provide enough weekly observations for the calculation of the weekly seasonals, but monthly data are needed over a longer period to get meaningful results from the X-11 program. Monthly average observations for the counterfactual series on the AMB for the years 1969 through 1978 are derived by using data on deposits for weeks ending on Wednesdays as approximations for observations on deposits for weeks ending on Mondays.

Table 2

Incidence of Large Changes in the Adjusted Monetary Base Series with Two Sets of Seasonal Factors

Percentage of periods in which the absolute value of the changes exceeded:	Weekly Series (98 periods)		Biweekly Series (48 periods)	
	With old seasonal factors	With revised seasonal factors	With old seasonal factors	With revised seasonal factors
$1 billion	64.3%	48.9%	75.0%	14.6%
2 billion	35.7	23.4	25.0	2.1
3 billion	14.3	7.1	10.4	0

factors have been derived from a counterfactual AMB series designed to reflect the timing of reserve accounting under CRR. Short-run variability in the AMB is reduced substantially by averaging the AMB over the two-week reserve maintenance periods in effect since February 1984 and by using seasonal factors derived from the counterfactual AMB series.

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