

# M1 Revisions, and Cones versus Tunnels

In presenting the 1985 monetary targets to Congress this February, Chairman Volcker noted that the conventional cone charts for the monetary aggregates—which are very narrow early in the year but widen as the year progresses—could lead the financial markets to attach policy importance early in the year to short-run movements in the monetary aggregates that in fact have no significance. Chairman Volcker's prepared statement presented the 1985 targets both in terms of the conventional cones and in terms of tunnels or bands drawn with a constant width throughout the year.<sup>1</sup> (Chart 1 compares the 1984 and 1985 M1 targets as cones and tunnels.) As this note shows, the monthly M1 growth rates have been subject to a large degree of revision, particularly over the first four months of the year. For that reason it might be especially useful for market participants to view the annual M1 target as a tunnel rather than as a cone.<sup>2</sup> The starting point will be

<sup>1</sup>Any pictorial presentation of the annual target ranges, of course, is arbitrary. For more detail, see Chairman Volcker's statement before the U.S. Senate Committee on Banking, Housing, and Urban Affairs, February 20, 1985, pages 22-23 and Attachment IV.

<sup>2</sup>Even if revisions and random variation were spread evenly over the year, a case could be made that tunnels would be more useful than cones because they would not give increased emphasis in the early part of the year to such developments. Over the first four months of the year, the average difference between the upper or lower limits of the tunnel chart and the upper or lower limits of the cone chart is \$5.9 billion. Through April, M1 could grow 2.1 percentage points more rapidly than the upper limit of the cone chart and still not exceed the upper limit of the tunnel chart, or M1 could grow 2.1 percentage points more slowly than the lower limit of the cone chart and still not be below the lower limit of the tunnel chart.

a look at the revisions to M1 for 1984 that the Board of Governors staff recently released.

Monthly M1 growth was quite erratic in 1984. On a first-published basis, M1 was quite strong in January, May, June, and December, but very weak (or declining) in April, July, August, and October. For the year as a whole, monthly M1 growth, as first published, averaged 5.1 percent with a standard deviation of six percentage points. In February, the Board staff released revisions to the M1 series for 1984. As the monthly series now stands, the average growth rate is 5.7 percent in 1984 with a standard deviation of 5.2 percentage points. The growth rates for the four strongest months were all reduced and similarly, for the months M1 was weak or declining, the growth rates increased. This, of course, contributed largely to the reduction of the standard deviation.

Was the volatility in M1 growth for 1984, as well as the reduction in volatility resulting from the revisions, out of line with past experience? The answer to this question is not straightforward. Comparing this year's M1 volatility with earlier years is difficult because the statistics for earlier years have been revised more than once. Each February, the Board staff revises not only the previous year's M1 growth rates, but the statistics for prior years as well. Nevertheless, some idea of how much the monthly M1 growth rates have been revised over time can be obtained by comparing the first-published with the current series. The volatility of M1 growth in 1984 on a first-published basis can also be compared with earlier years by using a series of first-published growth rates compiled for several years.

On a first-published basis, the standard deviation of the monthly M1 growth rates in 1984 was somewhat less than the average standard deviation over the thirteen-year period from 1972-84 (Table 1, second column). Four of the previous twelve years, however, did have less volatility than 1984 had on a first-published basis. 1980 stands out as the year with the most volatility in M1 growth—a year marked by the credit restraint program, a short but sharp recession, and wide fluctuations in interest rates.

Subsequent revisions to the first-published M1 series have generally reduced the volatility of the monthly M1

growth rates by about 30 percent (Table 1, column 4). On average, the standard deviation of the current series is 1.7 percentage points less than that of the first-published series (2.0 percentage points if 1980 is excluded). For some years the difference has been as much as 4 percentage points (Table 1, third column). Again 1980 stands out. It is the only year for which subsequent revisions have increased the volatility of M1, illustrating how difficult it was to sort out seasonal from other influences on M1 growth that year.<sup>3</sup>

Subsequent revisions change the pattern of the monthly M1 growth rates basically for two reasons:

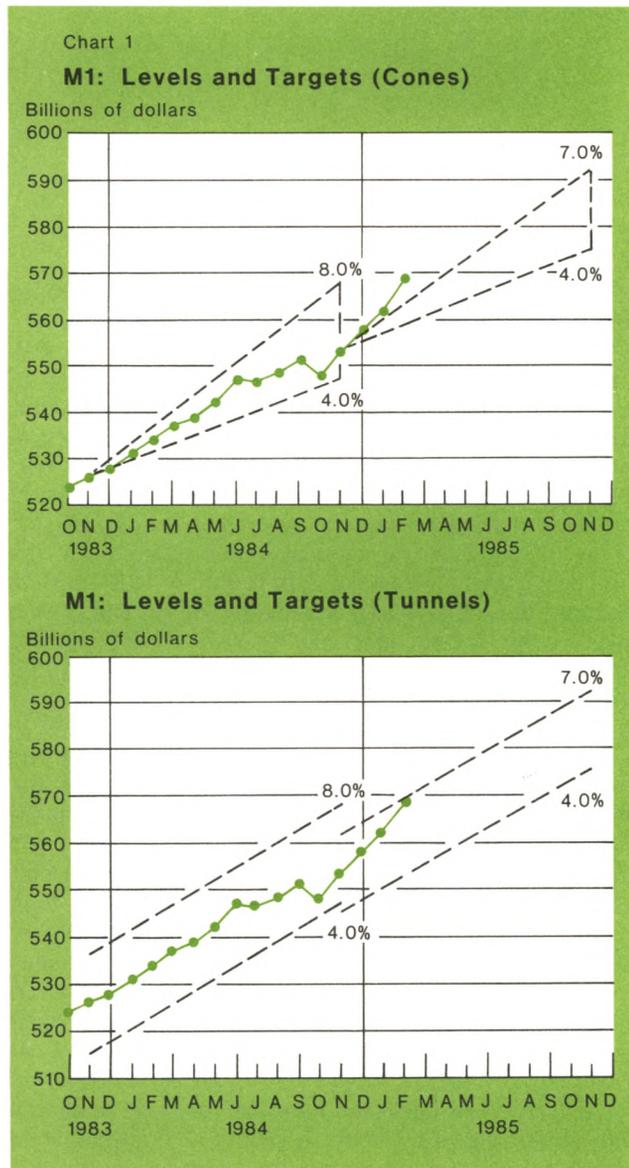
- Revisions to the seasonal factors which change the pattern of M1 growth within the year, but do not change the average growth rate for the year as a whole.
- Benchmark revisions which incorporate additional data not available each week or month that can affect the average growth rate for the year as a whole, as well as the pattern of M1 growth within the year.<sup>4</sup>

A general idea of how important these two factors have been overall can be obtained by looking at the correlation between the current series and the first-published and also by looking at the average absolute difference between the two series. The  $R^2$  obtained from regressing current M1 growth on first published is fairly high (0.67) over the 1972-83 period (Table 2, column 1). The correlation for individual years, however, can vary considerably. For example, for 1980 the  $R^2$  is very high at 0.98, but for 1974 there is virtually no correlation between the first-published statistics and the current M1 series. In general, more recent years tend to have higher correlation than earlier years. What this suggests is that the more times a given year has been revised, the less the current pattern of M1 growth within a given year resembles the first-published pattern.

On average, over the 1972-83 period, the monthly M1 growth rates have been revised by about 3.0 percentage points (Table 2, column 2). Compared with this, the 1.7 percentage-point revision for 1984 looks rather small. But this is only the first time 1984 has been revised. Subsequent revisions could make the difference considerably larger. For example, last year when 1983 was revised for the first time, the monthly growth rates changed by an

<sup>3</sup>For more detail, David A. Pierce and William P. Cleveland, "Intervention Analysis and Seasonal Adjustment of the Monetary Aggregates: The 1980 Credit Control Experience", Special Studies Paper 163, Federal Reserve Board, May 1981.

<sup>4</sup>Definitional changes, such as occurred in 1979 when interest-bearing checking deposits (for example, NOW accounts) were included in M1, also can affect how the current series compares with the first published.



average of 3.2 percentage points. After this year's revision, the average absolute difference has increased to 4.9 percentage points. Such large changes raise questions about how much importance should be attached to a single month's M1 growth when it is first released.<sup>5</sup>

In addition to looking at the size of the revisions for individual years, it is also possible to look at the magnitude of the revisions for each month across years. Some months have been revised considerably more than the average of 3.0 percentage points (Chart 2). In particular, January, February, and April (which occur early in the year when the spread between the upper and lower limits of a cone chart is very narrow) have been revised by the greatest amounts and are between 4.4 and 5.2 percentage points different, on average, from the values that were first published. It is not clear why January and February have been revised so much, although changes over time in the speed and timing of the post-Christmas rundown in money balances could play a role. The revisions to April probably reflect the difficulties associated with adjusting for the timing and varying amounts of tax payments.<sup>6</sup>

In any event, these months have extremely large seasonal variation to begin with (Chart 3). For each month the average difference between the seasonally adjusted and not seasonally adjusted monthly M1 growth rates provides a rough measure of underlying seasonal variability for which the seasonal factors adjust. The not seasonally adjusted rundown in money balances over the January-February period (the seasonal factors have added, on average, 26.5 percentage points to M1 growth over those two months) is the sharpest for any two-month period, and the 56 percentage point seasonal swing (from subtracting to adding) from April to May is the largest for any consecutive two months. It is not surprising, given the magnitude of these seasonal movements, that January, February, and April would have the largest revisions over time.

Thus far the revisions have been examined in terms of averages for years or across the months of the year. The magnitudes of the revisions in terms of particular months are also quite impressive. January 1973 was first published as zero; it now stands at 11.9 percent. November 1978 was first released as -4.6 percent; currently it is 6.0 percent. April 1983 has changed over time from -3.1 percent to 8.2 percent, while May of that year has decreased from 26.3 percent to 15.9 percent.

<sup>5</sup>Even three-month growth rates are revised considerably. The average absolute difference between the current and first-published series is 2.1 percentage points over the 1972-83 period.

<sup>6</sup>For more detail on this and other aspects of M1 seasonal factor revisions, see Timothy Q. Cook, "The 1983 M1 Seasonal Factor Revisions: An Illustration of Problems That May Arise in Using Seasonally Adjusted Data for Policy Purposes", *Economic Review*, Federal Reserve Bank of Richmond, March/April 1984.

That is, even double-digit revisions to the monthly M1 growth rates are possible.

In general, it appears that months which deviate the furthest from the mean when first published are revised the most. To illustrate this, the differences between the

Table 1

### Standard Deviations of Monthly M1 Growth, 1972-84

| Year             | (1)<br>Current | (2)<br>First-published | (3)=(1)-(2)<br>Difference | (4)<br>Difference as a percent of first-published |
|------------------|----------------|------------------------|---------------------------|---|
| 1972             | 3.4            | 4.7                    | -1.3                      | -27.7   |
| 1973             | 4.5            | 5.1                    | -0.6                      | -11.8   |
| 1974             | 1.7            | 4.5                    | -2.8                      | -62.2   |
| 1975             | 6.1            | 8.0                    | -1.9                      | -23.8   |
| 1976             | 3.9            | 5.4                    | -1.5                      | -27.8   |
| 1977             | 2.6            | 6.6                    | -4.0                      | -60.6   |
| 1978             | 3.8            | 6.7                    | -2.9                      | -43.3   |
| 1979             | 5.5            | 6.9                    | -1.4                      | -20.3   |
| 1980             | 12.7           | 10.7                   | +2.0                      | +18.7   |
| 1981             | 6.8            | 8.1                    | -1.3                      | -16.0   |
| 1982             | 8.8            | 9.3                    | -0.5                      | -5.4  |
| 1983             | 3.8            | 9.0                    | -5.2                      | -57.8   |
| 1984             | 5.2            | 6.0                    | -0.8                      | -13.3   |
| Average          | 5.3            | 7.0                    | -1.7                      | -27.0   |
| (Excluding 1980) | (4.7)          | (6.7)                  | (-2.0)                    | (-30.8)   |

Table 2

### Comparison of Current M1 Series with First-Published

(Monthly Growth Rates, 1972-84)

| Year          | (1)<br>R <sup>2</sup> , current on first-published (monthly) | (2)<br>Average absolute difference |
|---------------|--|------------------------------------|
| 1972          | 0.38   | 3.1                                |
| 1973          | 0.33   | 3.1                                |
| 1974          | 0.08   | 3.3                                |
| 1975          | 0.76   | 2.8                                |
| 1976          | 0.65   | 2.7                                |
| 1977          | 0.27   | 3.9                                |
| 1978          | 0.52   | 4.2                                |
| 1979          | 0.71   | 2.8                                |
| 1980          | 0.98   | 2.1                                |
| 1981          | 0.81   | 2.8                                |
| 1982          | 0.94   | 1.9                                |
| 1983          | 0.71   | 4.9                                |
| Entire period | 0.67   | 3.1                                |
| 1984          | 0.82   | 1.7                                |

Chart 2  
Average Absolute Difference Between Current and First-Published Monthly M1 Growth Rates

1972-84

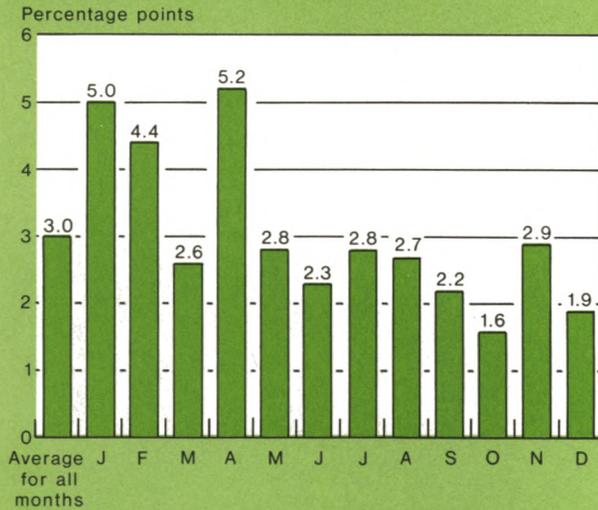


Chart 3  
Average Difference Between Seasonally Adjusted and Not Seasonally Adjusted Monthly M1 Growth

1972-84

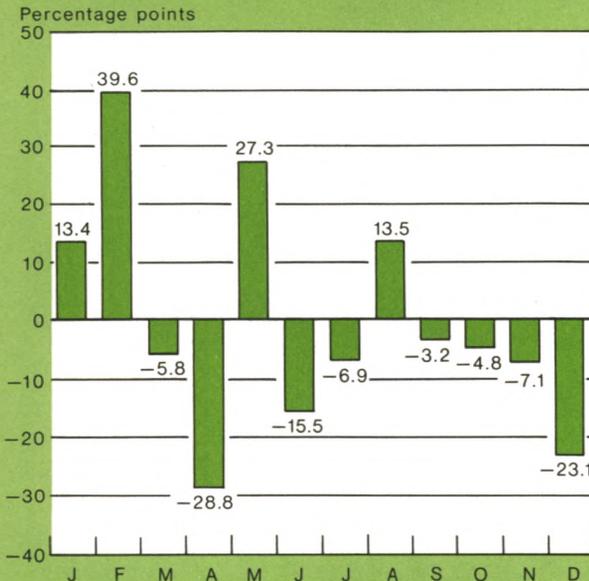


Table 3

Average Absolute Revisions to M1 Growth Rates, 1972-84

| Number of standard deviations of first-published M1 growth rates from mean | Number of observations (percent of total) | Average absolute revision |
|--|---|---------------------------|
| + or - 0 to 1/2  | 58 (37.2)                                 | 2.4                       |
| + or - 1/2 to 1  | 47 (30.1)                                 | 2.7                       |
| + or - 1 to 1 1/2  | 30 (19.2)                                 | 3.5                       |
| + or - 1 1/2 to 2  | 13 (8.3)                                  | 4.8                       |
| + or - 2 or more   | 8 (5.1)                                   | 5.6                       |
| Total  | 156 (100)                                 | 3.0                       |

current and first-published monthly M1 growth rates were classified according to how many standard deviations the first-published statistics were from the mean for the total period of 6.2 percent (Table 3). As the number of standard deviations from the mean increases, the number of observations falls (as would be expected statistically), and the average size of the revisions increases from 2.4 percentage points to about 5.6 percentage points. In other words, first-published "outliers" have been revised by about twice as much as first-published growth rates that were near the mean.

Thus, whether viewed in terms of the large revisions to "outliers" or in terms of the 3.0 percentage point average absolute revision over 1972-84, the lesson seems to be that monthly M1 growth rates are quite unreliable as first published. They are likely to look considerably more smooth and to change substantially as they are revised over time.<sup>7</sup> Since this applies in particular to three of the first four months of the year, when the spread between the upper and lower limits of a cone chart are very narrow, it appears that the tunnel approach might reduce the tendency in the financial markets to attach policy importance to short-run movements in M1.

<sup>7</sup>For a more technical presentation of these results, see David A. Pierce, "Trend and Noise in the Monetary Aggregates", *New Monetary Control Procedures*, Volume II, Board of Governors of the Federal Reserve System, February 1981.

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