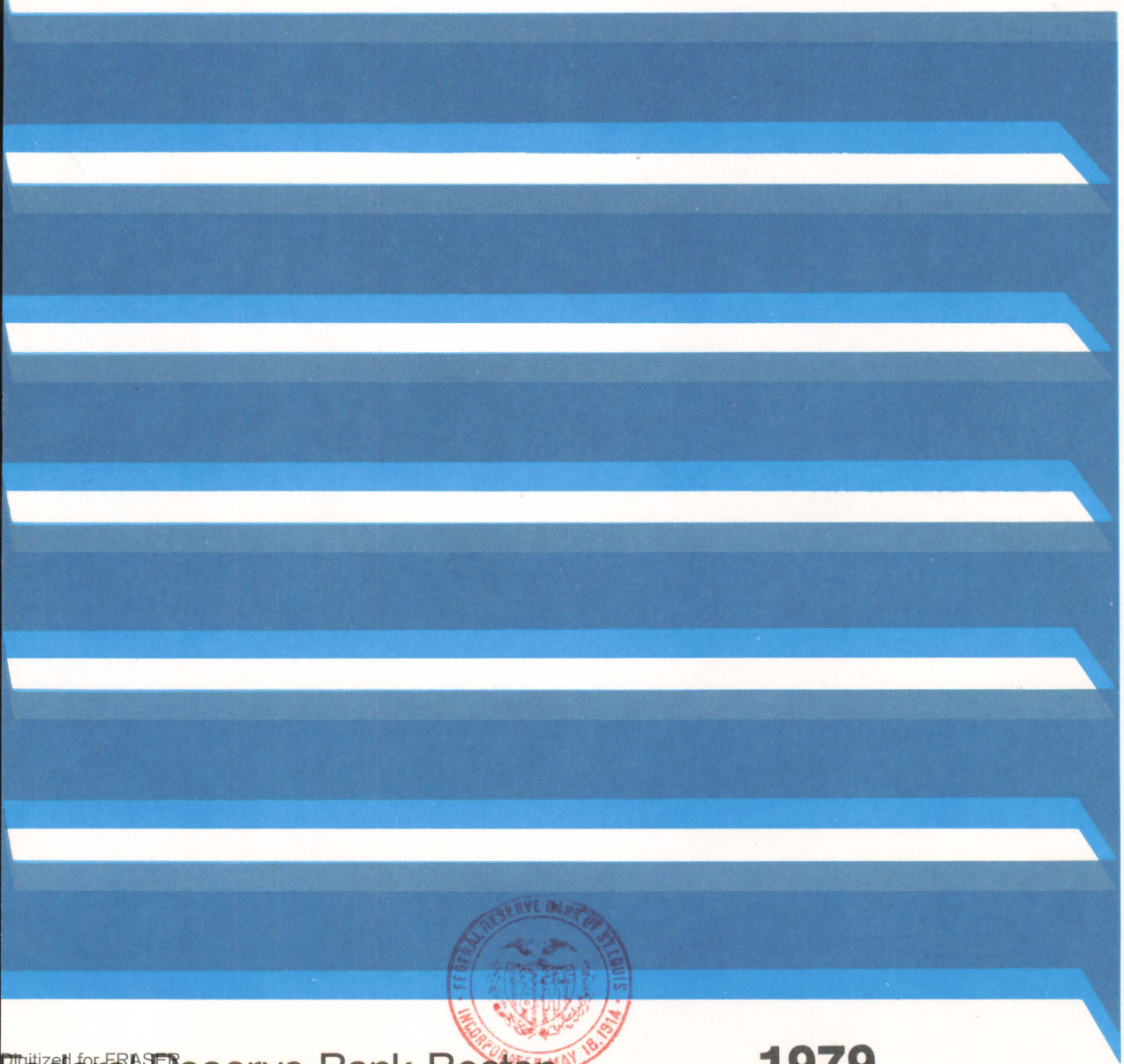
New England Economic Review

January/February



Federal Reserve Bank Boston

1979

The **New England Economic Review** is produced in the Research Department, and is edited by Mrs. Ruth Norr. The views expressed are those of the individual authors, and do not necessarily reflect official positions of the Federal Reserve Bank of Boston or the Federal Reserve System. The authors will be glad to receive comments on their articles.

The Review is available without charge. Requests to be placed on the mailing list or for additional copies should be sent to the Research Department, Federal Reserve Bank of Boston, Boston, Massachusetts, 02106.

New England Economic Review

January/February 1979

In this issue . . .

Currently Available

What Is the Balance of Payments?

Norman S. Fieleke

This special study, first published in July 1976, explains the general principles of balance-of-payments accounting and illustrates those principles through the construction of a hypothetical balance-of-payments statement. Balances on component accounts are computed and interpreted.

Copies of the study are available on request to:

Research Department
Federal Reserve Bank of Boston
Boston, Massachusetts 02106

The Skills Development Center: Entry Level Training as a Form of Affirmative Action has just been published by the Bank. This illustrated brochure, written by Edwin C. Gooding and Geraldine Werner of the Bank's Urban Affairs unit, describes the Bank's approach to in-house training of the disadvantaged. This approach, which provides for individualized entry and personalized training, has proved to be an effective way for the Bank to train the disadvantaged for clerical and secretarial positions.

Copies are available without charge from:

The Skills Development Center
Federal Reserve Bank
Boston, Mass. 02106.

The Money Stock: Out of Control or What?

By Neil G. Berkman and Richard W. Kopcke*

EACH quarter the Federal Reserve Board announces its desired yearly growth rate ranges for several measures of the money supply. The public has naturally come to use these ranges as a guide to determining whether or not money growth is "on track." However, despite the Fed's explicit statement that the desired ranges are intended to apply only to the year-over-year rate of growth of the quarterly average money stock, many analysts cite annualized monthly and even weekly rates of growth as an indication of the appropriateness of current monetary policy.[1] Because money growth rates measured over short intervals are subject to larger random influences than those reflected in the desired yearly ranges, this monitoring procedure can frequently provide misleading indications of the likely future course of the money stock and Federal Reserve behavior. By estimating the contribution of purely random influences to money growth rates measured over various intervals, this paper provides a framework for interpreting money stock data intended to avoid the possibility of misunderstanding inherent in many analysts' present approach.

I. The Effect of Averaging on Observed Money Growth Rates.

The growth rate of the money stock for any week, expressed at an annual rate, is more variable than the money stock's rate of increase for an entire year. This is true because the year's growth rate equals the *average* of the annual rates of increase for all 52 weeks of the year. Although money growth can be highly volatile for any individual week, random weekly disturbances are diluted when average rates of increase are computed over a span of many weeks. The more weeks averaged, therefore, the less volatile is the growth of the money stock. Accordingly, weekly money growth rates are more variable than monthly growth rates which, in turn, are more volatile than quarterly rates, and, finally, rates of increase for an entire year are influenced least by weekly nonrecurring events.

The following example illustrates how averaging reduces the influence of random events. A

* The authors, economists at the Federal Reserve Bank of Boston, wish to thank Barbara Grosh for research assistance.

[1] The minutes of the April 18, 1978 meeting of the Federal Open Market Committee published in the June 1978 issue of the *Federal Reserve Bulletin* contain this statement of the desired yearly money growth ranges: "The Committee adopted the following ranges for rates of growth in monetary aggregates for the period from the *first quarter of 1978 to the first quarter of 1979:* M_1, 4 to 6½ percent; M_2, 6½ to 9 percent; and M_3, 7½ to 10 percent." (p. 473, emphasis added).

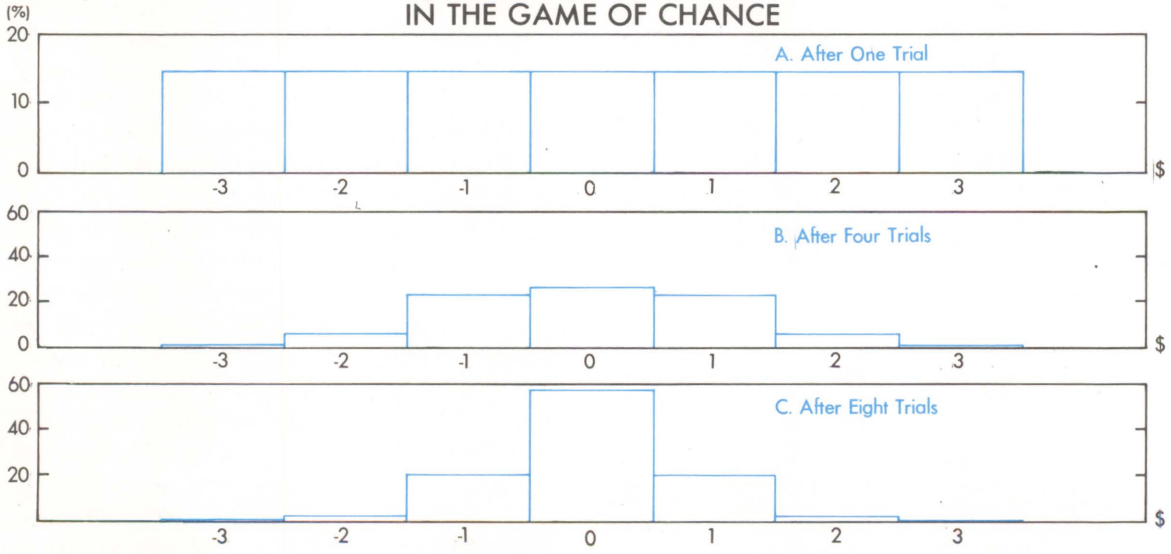
game of chance offers rewards ranging from zero to $6 in steps of $1, after payment of $3 admission fee for each trial. All rewards are equally likely to occur. Under these conditions, Chart 1, panel A describes what can happen after one trial of the game. Any participant can be as much as $3 richer or $3 poorer. Because all rewards are equally probable, all payoffs receive equal weight, and the range of likely payoffs is wide. As a result, participants who generalize their experiences after one trial will entertain substantially different projections of their future fortunes.

Panel B of Chart 1 describes what can happen after four trials of the game. The *average payoff per trial,* in panel B, is more likely to be zero than $3, and the range of highly probable payoffs is more limited. Consequently, participants who now generalize their experience after four trials will tend to entertain only modestly different projections of future fortunes.

Finally, Chart 1, panel C describes what can happen after eight trials of the game. Large wins and losses are frequently combined with payoffs which either offset or dilute the influence of the more extreme outcomes. The average payoff per trial is, therefore, highly concentrated around zero. The range of probable payoffs is now very narrow, and the participants' experiences are quite similar. Because large wins and losses are as likely to occur as any other reward, for a small number of trials these extreme events can dominate the average payoff per trial of the game. As the game is repeated, however, strings of large wins and losses become increasingly improbable outcomes. The occasional reward of $3 is diluted by long strings of more moderate wins and losses. For this reason, the graphs in Panels A, B, and C become progressively more concentrated as the number of trials increases. For instance, in panel A, there is a 57 percent chance that the average payoff either exceeds $1

Chart 1

AVERAGE REWARD PER TRIAL IN THE GAME OF CHANCE



or falls below minus $1. In panel C, there is less than a 5 percent chance that the average reward will be so great or so little.

Much like the payoffs in this game, the change in the money stock is influenced by random events. For any particular week, the probability of experiencing a large increase or decrease is considerable. For example, large and unusual shifts in patterns of retail sales and government transfer payments to consumers, or strikes and other "technical factors" cause substantial variations in the weekly money stock.[2] Accordingly, the range of likely annual money growth projections, based on one week's data, can be very large. With the accumulation of more weeks of data, however, the average rate of money growth is less likely to reflect extreme events, and the range of annual growth projections becomes more concentrated. The greater the number of weeks averaged together, the less likely it is that random events will influence heavily the measured growth rate of the money stock.

This principle also applies to monthly and quarterly money stock data. For example, in computing the annual rate of change of the money stock from one month to the next, extreme and unusual events are likely to influence the growth rate substantially. Although annual rates of growth calculated from monthly or quarterly data are not as volatile as those calculated from weekly data, monthly and quarterly growth rates themselves become progressively less variable when measured over longer-time intervals. Unusual random disturbances occurring in February can cause the annual rate of change of the money stock from January to February to be more volatile than the rate of change from January to March, and by June, February's disturbances will exert only a minor influence on the measured annual growth rate.

[2] Other common examples include erratic changes in Treasury cash balances at commercial banks, delays in processing and clearing checks, reporting errors by member banks, and sudden shifts between time and demand deposits by the public. In addition, any unsystematic shift in the pattern of weekly economic activity from year-to-year will not likely be well represented by current seasonal factors; the discrepancy between true seasonal patterns and estimated seasonal factors can give rise to erratic changes in M_1 data.

II. Separating Random From Systematic Movements in Observed Money Growth Rates

The preceding analysis showed that the size of random relative to systematic movements in the money stock depends on the time interval over which money growth rates are measured. Thus, without some notion of the size of the contribution that each source of fluctuation is expected to make to money growth rates computed over various intervals, it is difficult to determine if the extreme annualized weekly and monthly growth rates that are occasionally reported are due to systematic "explosions" in the money stock or simply to normal random movements that will disappear over time. Statistical analysis of the relationship between observed money growth rates and the systematic determinants of the demand for money suggested by economic theory provides a solution to this problem. In particular, by removing the systematic component of changes in the money stock from the overall growth rate, the random component may then be isolated and its typical contribution to money growth quantified.

The most common model of the demand for money is based on the observation that the benefits from holding money balances as a medium of exchange and a store of value must be weighed against the costs of holding money rather than a higher-yielding financial asset. Since income is generally received in lump sums at regular intervals — once each month, for example — but payments to finance consumption must be made more or less continuously, money balances serve as a convenient means of

translating "lumpy" receipts into "smooth" expenditure streams. Thus, one important determinant of the demand for money is the value of the transactions that must be financed in the interval between income payments, where the desired level of money balances will increase as the value of transactions increases.

Another factor influencing the size of desired money balances is the opportunity cost of holding money, represented by the yield available on such alternative financial assets as savings deposits and Treasury bills. If the yield on these assets exceeds the transactions costs (brokerage fees, time spent waiting in line at the bank and the like) incurred in switching from money to higher-yielding alternatives and back again, then it is profitable for money-holders to maintain lower balances than they would otherwise hold to finance any given level of transactions. As a result, desired money balances will decline as the yield on alternative assets increases.

If the value of transactions and the yield on alternative assets never changed, or if they changed only in a smooth and easily predictable manner, and if the costs of switching in and out of money were zero, then moneyholders would always maintain balances at precisely their desired level. Of course, economic events seldom progress in a smooth and easily predictable manner, nor is it costless to switch in and out of money, so that actual money balances will frequently differ from the level desired in a perfectly frictionless world. Money-holders will therefore adjust their balances from time to time to reflect changes in the economic environment, although the presence of positive transactions costs will lead them to spread the adjustment out over time.

This view of the demand for money suggests that the systematic component of changes in the money stock may be regarded as the outcome of a process of adjustment of last period's money balances toward their currently desired level, and since the desired level is itself always changing as the economy evolves, so also will the adjustment of money balances continue from period to period.[3] However, not all of the observed growth in the money stock will be explained by movements in its systematic determinants. While it is true that an increase in the value of transactions or a decrease in alternative yields in any given period will lead to an increase in desired money holdings, the exact timing and amount of the increase will depend on many factors unique to that period. For example, someone might take delivery of a good in one week, increasing the value of transactions in that week, but not make payment for the good until the following week, increasing the

---

[3] More formally, the model may be represented as follows. The desired level of real money balances (m*) is determined by:

$$(1)\quad \ln m_t^* = a_1 + a_2 \ln \left(\frac{Y_t}{P_t^*}\right) + a_3 \ln r_t$$

where Y_t = nominal value of transactions to be financed in period t, r_t = yield on alternative assets in period t, and P_t^* = expected price level in period t. Desired real cash balances are thus dependent on the expected real value of transactions to be financed and on alternative yields. The growth in nominal money balances (M) depends on the gap between actual and desired balances:

$$(2)\quad \ln M_t - \ln M_{t-1} = \alpha (\ln M_t^* - \ln M_{t-1})$$

where α is the "speed of adjustment" coefficient whose value depends on the magnitude of adjustment costs. Since $M^* = m^* P_1^*$, equation (1) may be substituted into equation (2) to yield:

$$(3)\quad \ln M_t - \ln M_{t-1} = \alpha a_1 + \alpha a_2 \ln Y_t + \alpha a_3 \ln r_t - \alpha \ln M_{t-1} + \alpha(1-a_2)\ln P_t^*$$

Equation (3) may be estimated once the mechanism generating the expected price level P* is specified. The most straightforward assumption is:

$$P_t^* = \sum_{i=0}^{N} w_i P_{t-i}$$

making the expected prive level a weighted average of past prices. This version of the Tobin-Baumol partial adjustment transactions demand for money model is described in detail in Steven M. Goldfeld, "The Case of the Missing Money," Brookings Papers on Economic Activity, 1976: 3, pp. 683-730.

demand for money a week later. Alternatively, this individual may choose to increase his money balances in advance of delivery, again introducing some "slippage" into the relationship between changes in the value of transactions and changes in money demand. Thus, because events such as these are unpredictable, part of the growth in the money stock observed in any period is randomly determined. It follows from this that the random component of money growth is simply the difference between the actual growth rate reported over a particular interval of time and the growth that can be attributed to the behavior of the systematic determinants of money demand — the value of transactions, alternative yields, and last period's money stock — over the same time interval.[4]

In principle, this method of separating random from systematic movements in observed money growth rates applies to all measurement intervals. In fact, however, two problems with the procedure must be recognized. First, because investing a theory of the demand for money with specific empirical content requires the selection of appropriate data to represent the various concepts involved, and because such data are not uniformly available for the weekly, monthly, and quarterly intervals over which growth in the money stock is most commonly measured, compromises in the estimation of the model are unavoidable. For example, GNP, generally used to represent the value of transactions in equations estimated with quarterly data, is not available in weekly or monthly form, nor do weekly or monthly time deposit rate data currently exist. Assuming that the model being estimated accurately represents all of the systematic determinants of money demand, then over short intervals, the difference between actual money growth and the growth accounted for by systematic factors will reflect not only the purely random component but also that portion of the systematic component that cannot be adequately measured due to the absence of relevant data. As a result, the contribution of the random component to observed weekly and monthly money growth may be overestimated.[5]

The second problem concerns the effect of the accuracy of the model used to represent the systematic components of money demand on the estimated size of the random component. Even if mutually consistent data were available for every desired measurement interval, the systematic determinants of the demand for money may differ from one interval to another. Weekly growth in the money stock may be systematically related to the volume of trading in stocks and bonds, for example, as investors draw down their checking accounts to finance anticipated levels of securities trading, but this source of systematic variation will typically "average out" over longer intervals and thus become relatively less important in explaining monthly or quarterly money growth. The exclusion of such data from a weekly model will lead to an overestimate of the contribution of the weekly random component to observed money growth, while their inclusion in a quarterly model will lead to an underestimate of the contribution of the quarterly random component to observed money growth. Because the extent of these biases and the biases due to deficiencies in the data cannot be known a priori, the estimates presented below should be interpreted with caution. In particular, although the *relative* magni-

[4] Specifically, the standard error from a regression equation such as (3) in footnote 3 may be viewed as a measure of the average size of the random component. Other approaches to estimating the contribution of the random component are possible. For an extensive discussion, see Richard D. Porter, Agustin Maravall, Darrell W. Parke, and David A. Pierce, "Transitory Variations in the Monetary Aggregates," in *Improving the Monetary Aggregates,* Board of Governors of the Federal Reserve System, 1978, pp. 1–33.

[5] An extensive discussion of the data problems encountered in estimating weekly money demand equations may be found in Neil G. Berkman, "On the Significance of Weekly Changes in M_1," *New England Economic Review,* May/June 1978.

tudes of the estimated random components are probably close to the "true" values, the *absolute* figures may be only approximately correct.[6]

Table 1 presents estimates of the average size of the random component of money growth derived from equations fitted to weekly, monthly, quarterly, and yearly data for periods ending in the third quarter of 1977 (detailed results are provided in the Technical Appendix). The table shows that on average, the random component contributes nearly 26 percentage points to the annualized rate of growth of the money stock measured from one week to the next, 3.3 percentage points to the annualized rate of growth measured from month to month, 1.7 percentage points to the annualized rate of growth measured from one quarter to the next, and only 0.8 percentage points to money growth measured year over year. The effect of data averaging on reducing the importance of random fluctuations is also evident when each measurement interval is considered individually. For example, the random component contributes less than 1 percentage point to money growth measured between a given quarter and the quarter four periods earlier, one-half its contribution to the annualized rate of growth of the money stock between two adjacent quarters. Similarly, if money growth is measured between the current week and the corresponding week one year earlier rather than between two adjacent weeks, the contribution of the random component declines from 26 to only 3.6 percentage points.[7]

One important implication of these results is that observed rates of change in the money stock, particularly when measured over short-time intervals, may be a very poor indicator of the underlying trend in money growth. To illustrate, suppose the systematic determinants of money demand were such as to produce an annualized week-over-week growth rate of 5¼ percent. The results in Table 1 suggest that in this case *observed* money growth could easily range from 56 to –46 percent simply because of random disturbances.[8] Thus, without knowledge of the probable magnitude of the contribution of the random component, announced growth in the money stock may easily be misinterpreted. Because some analysts apparently attach great significance to changes in the rate of money growth, a procedure for analyzing announced growth rates which explicitly incorporates the contribution of random disturbances is needed.

III. Interpreting Money Growth

The contribution of unsystematic or random events to weekly, monthly, and quarterly money growth is substantial; therefore, the annual rate of growth of M_1 over short intervals of time can be dominated by the influence of nonrecurring disturbances. Over longer intervals of time, however, these unusual random events tend to be diluted, so their capacity for influencing measured money growth diminishes — systematic trends become relatively more important. Because random events can have a significant and variable impact on measured M_1 growth

[6] The results in this paper are based on within-sample standard errors. They therefore understate the average size of the random component that must be accounted for in the context of money growth *forecasts*.

[7] The standard deviation of random events in the weekly data over four weeks is much higher than the standard deviation in monthly data because the weekly figure in column "t+4" represents the contribution of random shocks to the growth rate from one week to another four weeks later. The monthly number appearing in column t+1 represents the growth rate from one month's *average* to the next month's *average* money stock. Just as end-of-the-month stock prices are more volatile than monthly *averages*, weekly money data are inherently more volatile than monthly and quarterly data.

[8] According to standard normal statistical theory, money growth in this example could range from 56 to –46 percent (plus or minus two standard errors) with a probability of 95 percent. Moreover, with a probability of 50 percent, annualized weekly money growth will either exceed 22 percent or fall below –12 percent.

TABLE 1
Estimates of the Average Size of the Random Component of Money Growth for Four Measurement Intervals

Measurement Interval for M_1:	*Average Contribution (Percentage Points, Annual Rate) of Random Component to M_1 Growth Measured from Period t to Period:*						
	t+1	*t+2*	*t+3*	*t+4*	*t+12*	*t+13*	*t+52*
Yearly	0.8						
Quarterly	1.7	1.2	1.0	0.9			
Monthly	3.3	2.3	1.9		1.0		
Weekly	25.6			12.8		7.1	3.6

NOTE: The "average contributions" of the random components are derived from the standard errors of the regressions reported in the Technical Appendix.

rates, the interpretation of weekly, monthly, or quarterly changes in M_1 requires caution.

Chart 2 describes the behavior of M_1 growth during the fourth quarter of 1977. Early in the quarter the Federal Open Market Committee of the Federal Reserve System (the FOMC) announced a desired range of 4 to 6.5 percent for M_1 growth from the third quarter of 1977 to the third quarter of 1978. The two solid horizontal lines represent this range for the fourth quarter.[9] The blue line represents the actual money growth: In the top panel, each week's growth rate is calculated by comparing the announced money stock with the level of the money stock for August 17, the middle week of the base quarter; in the lower panel, growth rates are calculated by comparing the average money stock for the most recent four weeks with the average for the weeks of August 10 through August 31.

To determine whether or not M_1 is "under control," analysts frequently compare measured M_1 growth at an annual rate with the FOMC's desired range. According to Chart 2, the money stock in October was increasing at a pace much faster than 6.5 percent. Articles in the *Wall Street Journal* reported:

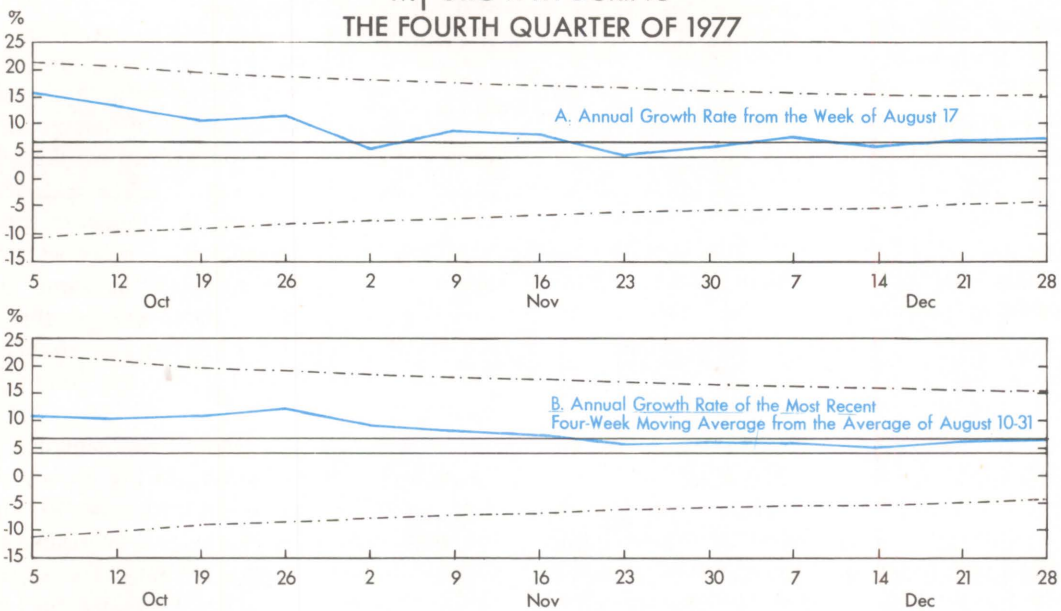
> The nation's money supply ballooned in the week ended October 5 . . .
>
> In the past four weeks M_1 has soared at an 11.1 percent annual rate . . .
>
> After two weeks of relatively quiet behavior the nation's money supply measures surged, sending their growth rates well above what the Federal Reserve System has said it will tolerate.
>
> The Fed reported yesterday that M_1, the basic money supply, jumped $1.4 billion in the week ended October 26 . . .
>
> The growth has been sharp. In the past four weeks M_1 has risen at a 14.6 percent annual rate . . .[10]

[9] As noted in the introduction and in footnote 1, this interpretation of the desired yearly growth rate range differs from that specified by the FOMC. Short-term growth in M_1 is actually monitored with a two-month range established at each FOMC meeting. These ranges are wider than the yearly ranges because the influence of random events on measured money growth rates is larger for monthly than for quarterly data (see Table 1). For example, at its September 20, 1977 meeting, the Committee voted to apply a desired M_1 growth rate range of 2 to 7 percent (annual rate) to the September/October period; at the following meeting on October 17, the desired range for the October/November period was set at 3 to 8 percent; at the November 15 meeting, a range of 2½ to 8½ percent was selected for the November/December period. The yearly ranges are used in the example in the text simply for ease of exposition; as a glance at Chart 2 will confirm, the essential point illustrated by this example will not be altered in any way if the wider and technically more appropriate two-month ranges are used instead.

[10] Excerpts from articles appearing in the October 14, 1977 issue, page 37 and the November 4, 1977 issue, page 22.

Chart 2

M_1 GROWTH DURING THE FOURTH QUARTER OF 1977



Source: See Technical Appendix.

The large discrepancy between M_1's increase in October and the 4 to 6.5 percent money growth range concerned many observers at that time. In order to interpret these increases, however, it is important to ascertain how much of the rise reflects systematic trends and how much merely represents nonrecurring events. In view of the sizable random disturbances which influence the money stock, it is not appropriate to compare growth rates over relatively short-time intervals with ranges which apply for an entire year, and, for this reason, the two horizontal lines in Chart 2 are not appropriate for determining whether M_1 is "on track."

For instance, if interest rates and the value of transactions were behaving in such a way that together they were causing M_1 to increase 5¼ percent per year, then the systematic component of M_1 would increase approximately $330 million per week. According to the estimates in Table 1, the random weekly shocks can easily vary from $2.7 billion to minus $2.7 billion.[11] The magnitude of these potential shocks is not surprising since similar changes are commonplace in weekly money stock data. When these two effects are combined, the annual rate of money growth for any particular week could be as large as 48 percent or as low as minus 37 percent even though M_1 is fundamentally "on track."[12] After four weeks, the systematic com-

[11] During August 1977, M_1 averaged approximately $327 billion. At a 5¼ percent growth rate, therefore, M_1 would increase about $17 billion over a year, or $330 million per week. According to footnote 11, the contribution of random events to weekly money growth is likely to fall within the range of ±1.66 (25.6) = ±42.5 percent at an annual rate. Thus these random events can bring about week-to-week changes in the *level* of M_1 equal to ±(.425/52) $327 billion = ±$2.7 billion.

[12] According to the estimates in Table 1, the contribution of random events to weekly money growth (at an annual rate) has a standard deviation of 25.6 percent. With probability 90 percent, actual weekly money growth will fall within a range defined by one and two-thirds standard deviations on either side of the 5.25 percent trend line. The range therefore equals 5.25±1.66(25.6) or 48 to -37 percent.

ponent of M_1 would rise $1.2 billion; the random shocks, though, tend to offset one another. Therefore, using the estimates for weekly money growth from Table 1, the annual rate of money growth for any four-week interval may range from 26 percent to minus 16 percent, and, over a quarter, this range is narrower still: 17 percent to minus 7 percent. The dilution of random shocks over longer-time intervals causes measured money growth to more closely reflect systematic trends rather than random weekly events. Thus, using the estimates in Table 1 for monthly money growth, it is likely that the annualized month-to-month growth rate will range from 11 to zero percent, but over a year this range is reduced to 7 to 4 percent. Similarly, annualized quarter-to-quarter money growth rates can range from 8 to 2 percent, whereas the range is narrower, 6.7 to 3.8 percent, over a year. This last tolerance range closely matches the spread in the Fed's desired annual growth range for quarterly data.

The two solid lines in Chart 2 are not appropriate for determining whether M_1 is "on track" because they do not recognize that measured growth rates become more volatile over shorter time intervals. The dotted lines in Chart 2 take the changing role of random events into account. Because seven weeks separate August 17 and October 5, even if the interaction of interest rates and the value of transactions cause M_1 to grow 5¼ percent annually, measured growth will likely be as large as 21 percent or as low as minus 11 percent in the top panel.[13] An observed 15 percent rise should not be very surprising. Had the week of October 5 yielded a 25 percent increase, on the other hand, it would have been unlikely that so large an increase could have been produced by random shocks alone.[14] The dotted lines approach each other, forming a "trumpet," during the fourth quarter because the influence of random shocks decays as more weeks are included in the measurement of growth rates. Just as the spread of likely payoffs in Chart 1 becomes more concentrated when more trials are averaged, the impact of random events is less wide-ranging as more weeks are averaged. The story is much the same in the lower panel of the chart, except that the measured growth rates are less volatile because four-week moving averages further smooth the weekly M_1 data.[15]

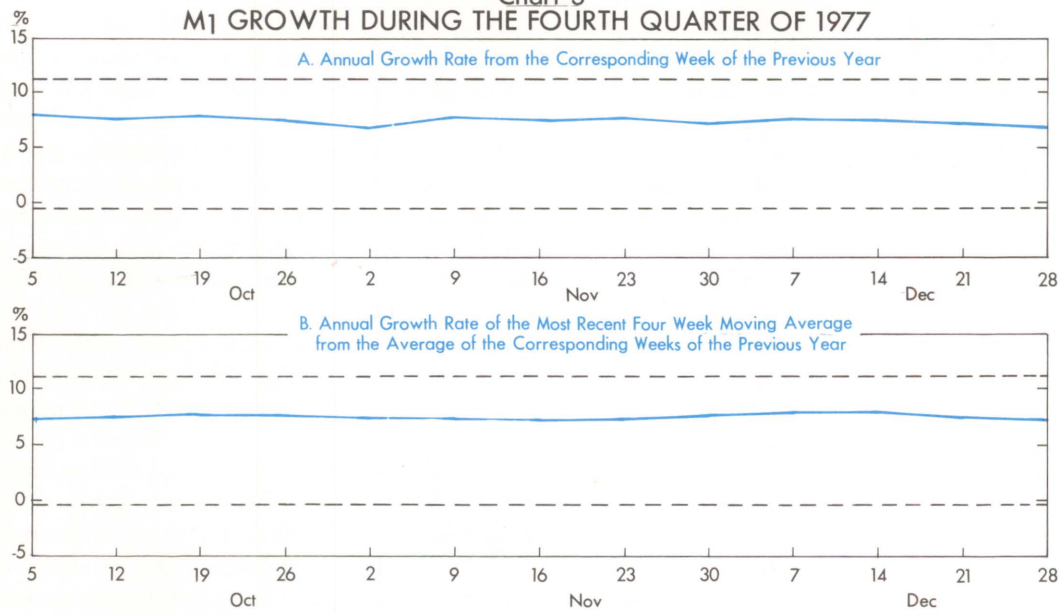
The dotted lines suggest how "signals" may be separated from "noise" in the money stock data. Growth rates falling within the "trumpet" are consistent with M_1 being "on track," and this band incorporates a tolerance for the inevitable random disturbances. Growth rates falling outside the "trumpet" are not consistent with 5¼ percent M_1 growth because it is unlikely that random disturbances alone could have caused such extreme occurrences. The use of the two solid lines for evaluating M_1 growth is highly misleading because they fail to account for the impact of random disturbances. In fact, they are so narrow at the beginning of the quarter that

[13] The estimated standard deviation of random shocks to weekly money growth is 25.6 percent. Therefore, the standard deviation of the average random shock over seven weeks is $25.6/\sqrt{7} = 9.7$ percent. Since the control bands are defined by 1.66 standard deviations of the shock on either side of the 5¼ percent trend, the range of likely growth rates is 21 to minus 11 percent. For a more complete discussion, see the Technical Appendix.

[14] If the shocks are independently normally distributed from week to week, then only with probability approximately equal to 10 percent will a disturbance either exceed 1.66 its standard deviation or fall below minus 1.66 times its standard deviation. This means if money growth is "on track," the probability of recording 25 percent money growth for the week of October 5 is relatively low. Any growth rate either exceeding 21 percent or falling below minus 11 percent would have been sufficiently unusual, in this example, to strongly challenge the assumption that money growth is "on track."

[15] The fact that growth rates tend to "bunch up" and consistently run near the high side of the control band in Chart 2 (and later in Chart 3) does not necessarily mean that money growth exhibits a bias favoring growth rates exceeding 5¼ percent. The observations plotted in the charts are not mutually independent: a positive shock, or a series of above-average disturbances, will have an effect which will tend to erode only slowly with time because it influences the measured money growth for each succeeding week.

Chart 3
M1 GROWTH DURING THE FOURTH QUARTER OF 1977



Source: See Technical Appendix.

money growth will certainly appear to be "out of control" and news articles will report M_1 "bulges" or "undershoots" when standards like the horizontal band are employed.

Another way to look at money growth during the fourth quarter compares recent levels of M_1 with its values a year earlier. This is done in Chart 3. The top panel reports the rate of growth of M_1 for each week in the last quarter of 1977 over the corresponding week a year earlier. In the lower panel, growth rates are calculated by comparing the average money stock for the most recent four weeks with the average money stock 52 weeks earlier.[16] There are two important differences between the second and third charts. First, measured growth rates reported during the fourth quarter are much less volatile in this last chart because each is calculated over the period of one year. The random disturbances unique to any given week can exert only a minor influence on M_1's rate of growth for an entire year. When increases in the money stock over time intervals shorter than a year are extrapolated at annual rates, however, peculiar weekly shocks are more influential because they are weighed more heavily. The second difference is related to the first: Because M_1 growth is calculated for an interval of constant length, in this case one year, the dotted lines, or "control band," no longer describe a "trumpet." The control band in Chart 2, on the other hand, collapses with time inasmuch as each new week adds to the length of the period over which M_1 growth is measured, reducing the weight given to any one week's random disturbances, and producing the now familiar "averaging effect."

The evidence is this last chart corroborates the

[16] This chart may be less useful than the previous chart for determining whether or not M_1 is on track. Because the FOMC can reset its growth targets four times a year and a new base for calculating money growth is established on those occasions, this last chart may not properly accommodate the objective of monetary policy.

analysis in Chart 2. Although many analysts may have been concerned about M_1 growth during October 1977, the rather large annual rates of growth may have reflected the dominant role of random shocks for short intervals of time; for this reason, these rates of growth must be interpreted with a degree of caution and tolerance.

IV. Summary and Conclusions

Due to the smoothing effect produced by averaging, the effect of random movements on observed money growth rates steadily decreases as the interval over which growth is measured increases. The familiar "tolerance band" often used to track money growth therefore misrepresents the behavior of the money stock, since it implies that the random deviation of one week's annualized growth rate from the desired path will in general be no larger than the deviation of the yearly average growth rate from the desired path. In the past, this misrepresentation has created confusion about the cause of large short-run changes in money growth, as for example in the case of the infamous "bulge" of late 1977. Had it been more generally known that these relatively high weekly growth rates often occur simply by chance, they may not have been mistaken as a signal that the Fed had "lost control" of the money supply.

An alternative representation of the tolerance band is presented in this paper, one which explicitly recognizes the important and variable contribution of random "disturbances" to observed money growth rates. In particular, to reflect the relative improvement in accuracy that accompanies a lengthening of the measurement interval, the tolerance band surrounding the midpoint of the currently desired growth rate range should be wide in the weeks immediately following the Federal Open Market Committee meeting and become gradually narrower as the end of the year is approached. The tolerance band should thus form a "trumpet," whose width depends on the potential impact of random events on observed changes in the money supply. Such a procedure, by distinguishing truly exceptional money stock changes from normal random perturbations, would greatly simplify the "signal extraction" problem encountered in attempting to interpret announced rates of money growth.

An important question that has been neglected in the analysis up to this point is why the public is concerned with monitoring money growth in the first place. While the trend rate of growth of the money supply is a primary determinant of the pace of economic activity in the long run, even the most devout monetarist would agree that short-lived "bulges" and "shortfalls" do not exert a decisive influence on output, employment, or prices. On the other hand, many observers apparently believe that the tolerance band can be used as a guide to anticipating short-term changes in monetary policy. At this point the distinction between *monitoring* and *controlling* money growth must be emphasized. In and of itself, a tolerance band, however defined, is not a control device; rather, it is useful only as an analytical tool in determining whether or not the present rules for setting the instruments of control — the discount rate, required reserve ratios, and the Federal funds rate — are producing the desired outcome. Changes in policy need not occur only when growth in the money supply violates the tolerance band. Because the economy is dynamic, the policy stance that was appropriate in one set of circumstances may have to be altered in response to a change in the environment even when the money numbers are well within the desired range. Whatever the Fed's control rule may be, the band only provides a means of evaluating money growth; it

More on the Distinction between Monitoring and Control

The principal goal of monetary policy is to advance the nation's welfare through its influence on credit flows and interest rates. The desired money growth range represents the FOMC's appraisal of how much the money stock should expand to achieve and maintain the most favorable balance of employment, economic expansion, and inflation given prevailing business conditions. The desired money growth range, therefore, is based upon forecasts of economic activity as well as upon assumptions about the links which tie money growth to inflation and the expansion of employment. In the jargon of optimal control theory, the FOMC must choose that money growth rate which maximizes its perception of the nation's welfare function subject to its model of the economy.

Having announced its desired money growth range, the FOMC will monitor the money stock, among other variables, for two reasons: First, to determine whether the expansion of the money stock is "on track"; and second, to determine whether employment, inflation, and economic activity are progressing as anticipated. Specifying an appropriate reaction to these readings of the economy is not so clear cut, however. For example, sluggish money growth may reflect an overly restrictive monetary policy, or it may reflect unforeseen weakness in business activity. To further complicate matters, the links between money growth and business conditions are sufficiently loose that M_1 may fall within the desired growth range, but economic growth or inflation may be deviating considerably from their anticipated paths. Finally, the FOMC may be confronted with evidence that future money growth, economic activity, or inflation may diverge from desired paths even though the current data are "on track."

In each of these cases, it is clear that a successful monetary policy cannot simply rely on monitoring money growth. The selection of the best policy, and reaction to unexpected events, will depend on the relative weights the FOMC places on high employment, low inflation, and a high expansion of living standards. While the initial policy is summarized by an announced desired money growth range, whether money growth falls within this range depends on the accuracy of preliminary forecasts and the assumptions tying money growth to those forecasts. Furthermore, even though current money growth may match expectations, interest rates may rise or fall in response to recent economic data to ensure that future money growth remains "on track."

The control bands described in the article provide a useful score card for interpreting ongoing money growth, but they do not constitute a complete money control mechanism.[1]

[1] See, e.g., Ben Friedman, "The Inefficiency of Short-Run Monetary Targets for Monetary Policy," *BPEA* 2:1977, pp. 293–335.

cannot and should not be confused with the control rule itself.[17]

Since the problems of monitoring and control are both conceptually and operationally distinct, a tolerance band cannot be relied upon to provide guidance about the future course of interest rates and monetary policy. In its role as a monitoring device, however, the tolerance band must incorporate the random characteristics of measured money growth rates described in this paper. Properly specified, the tolerance band can provide valuable guidance in the conduct and interpretation of monetary policy. Improperly specified, the tolerance band will frequently lead to confusion and unwarranted claims that the money supply is "out of control."

[17] For a description of the current control procedure see William Poole, "The Making of Monetary Policy: Description and Analysis," *New England Economic Review*, March/April 1975, pp. 21–30; see also *Open Market Policies and Operating Procedures — Staff Studies*, Board of Governors of the Federal Reserve System, July 1971.

Technical Appendix

I. Estimated Money Demand Equations

Using annual data: 1953–1976

$$\ln M_t - \ln M_{t-1} = \underset{(2.73)}{0.472} + \underset{(6.52)}{0.564}\ln GNP_t - \underset{(2.28)}{0.022}\ln RTB_t$$
$$- \underset{(5.22)}{0.165}\ln RTD_t - \underset{(3.87)}{0.567}\ln M_{t-1}$$
$$+ \underset{(2.35)}{0.588}\ln IPD_t - \underset{(3.34)}{0.817}\ln IPD_{t-1}$$

$\bar{R}^2 = .71$ D.W. = 1.89 $\rho = .56$ S.E. = .00844

Using quarterly data: 1952: II–1977: III

$$\ln M_t - \ln M_{t-1} = \underset{(1.22)}{0.056} + \underset{(4.53)}{0.137}\ln GNP_t - \underset{(3.86)}{0.011}\ln RTB_t$$
$$- \underset{(3.20)}{0.034}\ln RTD_t - \underset{(2.25)}{0.093}\ln M_{t-1} + \underset{(0.58)}{0.072}\ln IPD_t$$
$$- \underset{(1.34)}{0.181}\ln IPD_{t-1} + \underset{(1.34)}{0.206}\ln IPD_{t-2}$$
$$- \underset{(0.11)}{0.016}\ln IPD_{t-3} - \underset{(1.39)}{0.174}\ln IPD_{t-4}$$

$\bar{R}^2 = .37$ D.W. = 1.85 $\rho = .43$ S.E. = .00424

Using monthly data: April 1952–September 1977:

$$\ln M_t - \ln M_{t-1} = \underset{(2.28)}{0.046} + \underset{(5.46)}{0.051}\ln PI_t - \underset{(6.04)}{0.004}\ln RTB_t$$
$$- \underset{(3.69)}{0.012}\ln RTD_t - \underset{(2.93)}{0.036}\ln M_{t-1} + \underset{(1.69)}{0.457}\ln CPI_t$$
$$- \underset{(1.11)}{0.808}\ln CPI_{t-1} + \underset{(0.47)}{0.439}\ln CPI_{t-2}$$
$$- \underset{(0.08)}{0.059}\ln CPI_{t-3} - \underset{(0.24)}{0.065}\ln CPI_{t-4}$$

$\bar{R}^2 = .30$ D.W. = 2.00 $\rho = .04$ S.E. = .00271

Using weekly data: First week in January 1976–last week in September 1977:

$$\ln M_t - \ln M_{t-1} = \underset{(0.41)}{-0.008} + \underset{(1.70)}{0.011}\ln RS_t - \underset{(1.25)}{0.010}\ln RTB_t$$
$$- \underset{(3.88)}{0.410}(\ln M_{t-1} - \ln M_{t-2}) - \underset{(3.16)}{0.346}(\ln M_{t-2} - \ln M_{t-3})$$
$$- \underset{(1.91)}{0.203}(\ln M_{t-3} - \ln M_{t-4})$$

$\bar{R}^2 = .15$ D.W. = 2.01 $\rho = .00$ S.E. = .00492

NOTES: all equations were fit by generalized least squares with first order autocorrelation correction. t-statistics are in parentheses.

M = M_1 (basic money supply)
GNP = nominal gross national product
PI = nominal personal income
RS = nominal retail sales
RTB = yield on 3-month Treasury bills
RTD = weighted average yield on passbook and time deposits at commercial banks, savings and loans, and mutual savings banks
IPD = implicit price deflator for GNP
CPI = consumer price index
All data seasonally adjusted.

DATA SOURCES: Monthly, quarterly, and annual data: NBER data base; Weekly data: DRI data base.

II. Derivation of Charts 2 and 3

According to the analysis of weekly data reported above, the estimated standard deviation of random events in week-to-week money growth is .492 percent, or 52 × (.492) = 25.6 percent at an annual rate. Denoting the magnitude of the random shock occurring in any particular week ϵ_t, the effect of independent random shocks over k consecutive weeks is

$$\sum_{i=1}^{k} \epsilon_{t+k},$$

and the standard deviation of this quantity is $\sqrt{k}$ (.492) percent, or $(52/k)\sqrt{k}(.492) = (52/\sqrt{k})$ (.492) percent at an annual rate, because there are (52/k) of these k-week periods in one year. From this last formula, it is evident that the standard deviation of random shocks must drop as the number of weeks in the interval increases. (Although lagged values of M_1 appear on the right-hand-side of the weekly equation — implying that the influence of any week's random shock may persist over several subsequent weeks — the sum of the lag coefficients on lnM is approximately zero; so, one week's shock has, at best, a modest and short-lived influence on subsequent money growth.)

For the purpose of deriving the control band in Chart 2, panel A, k equals seven for the week of October 5; therefore the standard deviation is 9.7 percent at annual rate. If these random shocks are normally distributed and the underlying growth rate of M_1 is 5.25 percent, then according to standard statistical theory, observed M_1 growth will either exceed 21.5 percent or fall below minus 10.8 percent with probability 10 percent. The upper and lower boundaries of this control band are 1.66 standard deviations above and below the 5.25 percent trend line.

Similary, for the week of October 12, k equals eight, and the standard deviation is 9 percent. Therefore the upper and lower control limits equal 5.25±(1.66)(9), or 21.3 and minus 9.8 percent, respectively.

In Chart 3, panel A, k always equals 52. Therefore the standard deviation is a constant 3.5 percent, and the upper and lower control limits equal 5.25±(1.66)(3.5), or 11.1 and minus .6 percent throughout the fourth quarter.

A four-week average of M_1 data also averages the random shocks during the four weeks. If the level of the money stock is initially M_0, then, ignoring any underlying trend growth, the money stock will equal

$M_0e^{\epsilon_1}$, $M_0e^{\epsilon_1+\epsilon_2}$, $M_0e^{\epsilon_1+\epsilon_2+\epsilon_3}$, and

$M_0e^{\epsilon_1+\epsilon_2+\epsilon_e+\epsilon_4}$

in the next four weeks, respectively. The average money stock approximately equals

$$M_0e^{(4\epsilon_1+3\epsilon_2+2\epsilon_3+\epsilon_4)/4}.$$

The four-week average of the money stock k weeks later is approximately

$$M_0e^{\sum_{i=1}^{k}\epsilon_i}e^{(4\epsilon_{k+1}+3\epsilon_{k+2}+2\epsilon_{k+3}+\epsilon_{k+4})/4}$$

Thus, the standard deviation of random shocks on observed money growth using these two four-week averages is

$$.492\sqrt{(k-4)+\sum_{i=1}^{4}(5-i)^2/16+\sum_{i=2}^{4}(i-1)^2/16} \quad \text{or}$$

$$.492\sqrt{(k-4)+2.75} \text{ percent.}$$

Expressed at annual rate, this last standard deviation equals $(52/k).492\sqrt{k-1.25}$. Once again, as k increases this standard deviation must decline. For the purpose of deriving the control band in Chart 2, panel B, k equals five for the week of October 5 (August 3 is week zero); therefore, the standard deviation equals 9.9 percent at an annual rate. Accordingly, the upper and lower limits equal 5.25±(1.66)(9.9), or 21.7 and minus 11.2 percent. The control band is wider for the week of October 5 than that in panel 4, because the interval of time over which money growth is measured is shorter in panel B. Had the four-week base ended the week of August 17 — matching that of panel A — k would equal 7 for October 5 in both panels, and panel B's standard deviation would equal 8.8 percent. The use of four-week averages, therefore, reduces the volatility of M_1 growth, but to the extent the use of four-week averages shortens the interval between the base and each week's observation, measured M_1 growth will tend to become more volatile. In Chart 2, the second effect dominates the first.

In Chart 3, panel B, k always equals 52. Therefore the standard deviation is a constant 3.48 percent, and the upper and lower control limits equal 5.25±(1.66)(3.48), or 11.0 and minus .5 percent, respectively.

Investment Incentives for State and Local Governments

By Richard W. Kopcke and Ralph C. Kimball*

A primary goal of national policy is to increase the rate of capital investment during the coming decade. While attention has focused on private investment, state and local governments also make substantial investments, much of it for purposes such as roads, bridges, sewers, ports, and airports which contribute directly to the efficiency of the private sector.[1]

This article examines the relative efficiency of three different investment incentive programs for state and local governments. Section I examines the existing tax-exemption subsidy on state and local government debt. Since most debt issues are tied to capital projects, the tax-exemption feature acts as an investment incentive. Section II considers the advantages of the proposed taxable bond and taxable income options as inducements for capital formation. Section III then discusses a program of direct investment grants similar to the investment tax credit which private firms now enjoy. Section III also compares the circumstances under which different types of investment grants are most efficient. Section IV briefly discusses certain arguments against reform of the existing tax-exemption subsidy mechanism. Section V summarizes the analysis and concludes that replacing existing interest rate subsidies with first-year investment grants could increase the value of Federal subsidies to municipal authorities by as much as one-fourth to one-third without increasing the present revenue losses to the U.S. Treasury.

Section I — The Tax-Exemption Subsidy Mechanism

Virtually all interest payments on bonds issued by state and local governments are exempt from Federal income taxes.[2] Because investors are willing to accept lower yields to obtain tax free income, this tax-exemption feature functions as a mechanism through which the Federal Government partially subsidizes the borrowing costs of state and local governments. This subsidy takes the form of reduced borrowing costs for the issuer of the bonds equal to the difference between the yield which would have

* Richard W. Kopcke is an Economist and Ralph C. Kimball is an Assistant Vice President and Economist, both of the Federal Reserve Bank of Boston. The views expressed are the authors' and not necessarily those of the Federal Reserve Bank of Boston or the Federal Reserve System.

[1] See Richard W. Kopcke and Richard F. Syron, "Tax Incentives: Their Impact on Investment Demand and Their Cost to the Treasury," *New England Economic Review*, January/February 1978, pp. 19–32.

[2] The exception is arbitrage bonds which are issued solely for the purpose of investing in higher-yielding taxable issues.

been paid if the interest had been taxable, and the lower yield actually paid due to the tax-exemption feature.

The cost of this subsidy to the U.S. Treasury is equal to the lost tax revenue which would otherwise have been generated if the bond had been issued as a taxable security. The most often used measure of the subsidy received by state and local governments for the tax-exemption feature is the difference between comparable taxable and tax-exempt yields, expressed as a percentage of the taxable yield. This rate measures the percentage reduction in borrowing costs received through use of the exemption feature and is often called the "tax-exemption premium." Since this percentage rate also measures the reduction in gross pre-tax yields which investors in state and local bonds give up to obtain tax-exempt income, it is often also referred to as the "implicit tax rate" paid by investors.[3]

Since most state and local governments are legally required to fund operating expenditures from current revenues, most state and local long-term borrowing is for the purpose of financing capital expenditure.[4] Because most state and local debt issues are tied to capital expenditures, the tax-exemption subsidy is in effect an investment incentive which encourages state and local governments to increase capital expenditures more than they otherwise would.

At first glance the investment incentives received by state and local governments through participation in the tax-exempt bond market would appear to be unnecessary and undesirable. Since the tax-exemption feature reduces the borrowing rate of state and local governments below that of private investors, state and local governments may invest at the margin in projects with a lower rate of return than will private investors, resulting in over-investment in state and local capital projects and a misallocation of scarce resources.

The tax-exemption feature of state and local bonds does reduce the borrowing rate of state and local governments below that of the private sector, but only on a before-tax basis. Because private investors can deduct interest payments, the private before-tax borrowing rate is reduced by a percentage equal to the applicable marginal tax rate of the private borrower. Most private capital formation is carried out by the corporate sector, and since the corporate tax rate exceeds the implicit tax rate on tax-exempt bonds, the after-tax borrowing rate of these corporations is considerably below that of state and local governments. Furthermore, private investors receive additional subsidies through such mechanisms as the investment tax credit and accelerated depreciation, although the effect of these subsidies is somewhat offset by the fact that private net revenues from investment projects are subject to tax, while state and local net revenues are not.

A second argument in favor of investment incentives for state and local governments deals with the nature of state and local capital investments and the proper role of the government in the economy. Many state and local capital investments are in projects such as flood control, airports, roads and bridges, and health and educational facilities which generate benefits to those not living within the jurisdiction of the entity making the investment. Since often the state or local government cannot obtain compensation for use of these facilities by outsiders,

[3] If r_m is the tax-exempt yield, and r_t the comparable taxable yield, the implicit tax rate t' is equal to $(r_t - r_m)/r_t$.

[4] If a deficit does occur, a state or local government may seek to fund this deficit and moderate the necessary tax increase by issuing debt to be paid off over a number of years. However, as the New York City crisis has shown, it is impossible for a state or local government to successfully finance a recurring deficit since investors will become increasingly reluctant to absorb the debt.

Many state and local governments routinely issue short-term debt in anticipation of tax revenues, but these notes are retired before the end of the fiscal year. During 1977 many state and local governments took advantage of declines in interest rates to refinance issues sold earlier at higher yields.

there will be underinvestment unless the Federal Government subsidizes their cost through taxation of the general populace.

If the tax-exemption feature of state and local bonds functions mainly as an investment incentive for state and local capital formation, then an evaluation of its effectiveness and efficiency as an incentive mechanism is desirable. Unfortunately, when analyzed as an investment incentive, the tax-exemption subsidy has several weaknesses. The implicit tax rate measuring the subsidy received by state and local governments varies cyclically. Moreover, the reduction in borrowing costs received by issuers equals only a fraction of the revenues foregone by the Treasury. Finally, the benefits received by state and local governments vary with the amount of debt issued rather than with the amount invested, encouraging the use of debt and discriminating against those jurisdictions which choose to finance capital expenditures from current revenues.

Because the subsidy rate received by state and local governments is determined by the relative yields on tax-exempt and comparable taxable bonds, movements in these yields cause fluctuations in the subsidy rate. As shown in Table 1, the subsidy rate declines with maturity, and more importantly, varies cyclically, decreasing during periods of restrictive monetary policy, and increasing during periods of ease.

The effect of cyclical fluctuations and maturity interact to greatly increase the relative variability of the subsidy rate in the longer maturities. As shown in Table 1, the coefficient of variation, defined as the ratio of the standard deviation to the mean, is more than two and one-half times as large for the 20-year maturity as for the 5-year maturity.

The cyclical variation in the subsidy rate is due to fluctuations in investor demand for tax-exempts. Both institutional and private investor demand for tax-exempt bonds are determined by the amount of income or earnings subject to tax, the applicable marginal tax rate of each class of investors, and the implicit tax rate on tax-exempt bonds and on alternative forms of tax shelters.

Among the different investors in tax-exempts,

TABLE 1

Implicit Tax Rates Equating Yields on Prime Tax-Exempt Bonds vs. U.S. Government Bonds, 1958–77

	Maturity			
	1 year	*5 year*	*10 year*	*20 year*
1958	.40	.33	.27	.19
1959	.44	.38	.29	.22
1960	.42	.37	.30	.23
1961	.48	.39	.28	.19
1962	.48	.42	.36	.25
1963	.47	.41	.35	.26
1964	.45	.38	.33	.27
1965	.42	.35	.32	.27
1966	.34	.32	.27	.23
1967	.37	.32	.29	.24
1968	.40	.33	.28	.22
1969	.35	.28	.21	.13
1970	.38	.35	.26	.10
1971	.41	.39	.29	.13
1972	.44	.39	.33	.15
1973	.45	.37	.34	.28
1974	.42	.37	.30	.28
1975	.41	.37	.27	.22
1976	.47	.42	.36	.28
1977	.51	.44	.41	.32
Range	.34–.51	.28–.44	.21–.41	.10–.32
Mean	.43	.37	.31	.22
Std. Dev.	.04	.04	.04	.06
Coeff. of Var.	.10	.10	.14	.26

NOTE: Data represent annual averages of monthly data.
SOURCE: Salomon Brothers.

the commercial banks are the most important and most volatile in their demand. The potential tax liability of commercial banks fluctuates with the margin between interest earned on assets and paid on liabilities, and the amount of loan losses. As shown in Table 2, during years such as 1975 and 1976 when low rates narrowed interest margins and loan losses exceeded expectations, banks may find themselves with a low tax liability and more tax-exempt bonds than they desire and cut back on their purchases. In addition the growth of commercial bank leasing operations has also affected bank demand for tax-exempts.[5] Leasing offers the opportunity to reduce taxable income and tax liabilities through accelerated depreciation and investment tax credits. Since to the bank customer a lease arrangement represents an alternative to a loan, the volume of leasing increases most rapidly when business loan demand is brisk. Commercial bank demand for tax-exempts is affected by the interaction of all these factors. Thus, while sluggish in 1975 and 1976, commercial bank demand for tax-exempts increased strongly in 1977 as interest margins widened and loan losses fell sharply while loan demand and the volume of leasing rose only moderately.

Private individuals, either directly or through tax-exempt bond mutual funds, absorbed almost 32 percent of the net increase in tax-exempt securities coming to market in the period 1974–77. The increased demand for tax-exempts exhibited by individuals in recent years is due to several different factors. First, inflation induced increases in nominal income have shifted many individuals into higher marginal tax brackets where tax-exempts become attractive investments. Second, tax-reform legislation and administrative action by the Internal Revenue Service have seriously reduced the availability and attractiveness of other tax-shelters suitable for small investors. Finally, recent enabling legislation has resulted in the formation of a new type of financial intermediary, the tax-exempt bond mutual fund. Those professionally managed funds offer the small investor greater liquidity and diversification than direct ownership, and the growth of these funds has been extremely rapid.

The demand for tax-exempt bonds by fire and casualty insurance companies depends on the success of these companies in generating earnings, since tax exemption is not needed if no tax liability exists. The earnings of these companies in turn depend upon their rate structure and casualty losses. Because the fire and casualty insurance industry is regulated in most states, rates are set periodically to earn some normal rate of return based on past losses. However, due to inflation-connected secular increases in casualty losses, earnings at fire and casualty insurance companies have increased sharply in years when rates are set and then eroded in subsequent years as casualty losses exceed those estimated when rates were approved. The result is a sharp increase in fire and casualty insurance company demand for tax-exempts in certain years with subsequent declines until the rate schedule is again shifted upward.

At present the subsidy rate on tax-exempt bonds is determined by the vagaries of the business cycle and the earnings position of private financial institutions and investors rather than by government policy. As a result there is no guarantee that the subsidy rate received by state and local governments is optimal from the viewpoint of society. Moreover, in the past the tax-exempt subsidy rate has varied inversely with the business cycle, decreasing during periods of restrictive monetary policy and increasing dur-

[5] See Ralph C. Kimball, "Commercial Banks, Tax Avoidance, and the Market for State and Local Debt Since 1970," *New England Economic Review*, January/February, 1977.

TABLE 2

Purchases of Tax-Exempt Bonds, 1974–77
($ billions)

	1974	*1975*	*1976*	*1977*	*Total 1974–77*
Households	8.9	5.0	4.2	5.5	23.6
Commercial Banks	5.5	1.7	3.0	12.4	22.6
Casualty Insurance Co.	2.2	2.6	4.2	9.4	18.4
Other	0.5	4.3	3.7	0.8	9.3
Total	17.1	13.6	15.1	28.1	73.9

SOURCE: Flow of Funds Section, Board of Governors of the Federal Reserve System.

ing periods of expansion. It is possible to view these cyclical variations in the subsidy rate as a form of automatic stabilizer acting to decrease state and local investment spending during periods when private investment is growing strongly, and increasing state and local investment expenditure when private investment spending is weak. But even if cyclical variations in the subsidy rate are desirable, variations in the state and local subsidy rate are much larger than cyclical variations in private investment incentives, so that state and local investment spending may bear a disproportionate burden of cyclical adjustment.

Another weakness of the tax-exempt bond as an investment incentive is that state and local borrowing costs are reduced by only a fraction of the revenue lost to the Treasury. The remainder accrues as a windfall to investors in high marginal tax brackets in the form of greater after-tax yields on tax-exempt securities than is necessary to induce them to enter the tax-exempt market. The inefficiency of the tax-exempt bond subsidy mechanism occurs because investors owning the bulk of the tax-exempts have marginal income tax rates which exceed the implicit tax rate on tax-exempts. Thus, if an investor with an effective marginal tax rate of 50 percent purchases a tax-exempt bond yielding 6 percent instead of a comparable corporate bond yielding 9 percent, the annual cost to the Treasury in terms of tax revenue foregone is equal to 4.5 percent of the par value of the bond, while the reduction in yield the issuer receives is only 3 percent of the tax-exempt bond's par value.

A concept often used as a measure of the windfall gain received by investors in tax-exempts is that of transfer efficiency, defined as the ratio of benefits received by state and local governments to the revenue foregone by the U.S. Treasury.[6] Because, as shown in Table 1, the tax-exemption premium varies with maturity, and because investors with varying maturity preferences have different marginal tax rates, Table 3 presents estimates of transfer efficiency

[6] See Frank E. Morris, "The Case for Broadening the Financial Options Open to State and Local Governments — Part II," in *Financing State and Local Governments*, Federal Reserve Bank of Boston, Conference Series No. 3, 1970, pp. 125–146.

TABLE 3

Estimated Transfer Efficiency of the Tax-Exempt Bond Market, by Maturity Class

Maturity Class			
1–10 yrs.	11–20 yrs.	21–30 yrs.	All
100	83	61	84

SOURCE: Appendix A.

for three different maturity classes.[7] From these estimates the tax-exempt market appears to have a high degree of transfer efficiency in the short maturities, but less in the long. The windfall gain accruing to investors is a substantial $1.8 billion per year based on $239 billion of outstanding state and local bonds with maturities of one year or more as of year-end 1977.

Since the benefits state and local governments receive from the tax-exemption privilege vary with the amount of debt issued rather than the amount of investment undertaken, jurisdictions have an incentive to finance capital expenditures through debt rather than from current expenditures, leading to abnormally high debt loads. Because the interest payments necessary to service these debt loads are fixed, lower tax revenues resulting from a change in business conditions can create pressure to increase taxes or cut current expenditures. Moreover, those jurisdictions which prefer to fund capital expenditures from current revenues are disadvantaged since they receive no subsidy at all.

In addition, the benefits state and local governments receive vary with the perceived quality of the issuer. During 1975, for example, the Aaa-rated 20-year tax-exempt rate averaged 288 basis points less than the comparable corporate utility rate, while A-rated 20-year tax-exempt revenue bonds sold on average for 326 basis points less than the comparable corporate utility rate. Thus, two local governments contemplating identical investment projects may receive different investment incentives depending upon their capacity to issue additional debt, and the rating assigned by the private rating service.

[7] The assumptions behind these estimates are discussed in Appendix A, and in the Box.

Section II: Other Types of Interest Rate Subsidies: The Taxable Bond and Taxable Income Options

The tax-exemption mechanism is only one of a number of ways the Federal Government might choose to subsidize state and local government interest costs. This section describes two alternative interest rate subsidy mechanisms: the taxable bond option, and the recently suggested taxable income option.

The Taxable Bond Option

The enactment of a taxable bond option has been proposed as a means of stabilizing excessively large fluctuations in long-term tax-exempt bond yields, and adding an alternative source of funds to offset cyclical fluctuations in the demand of commercial banks and fire and casualty insurance companies.[8] Recently it has also been suggested that the taxable bond option may be a means of providing support to problem borrowers.[9]

The proposed taxable bond option program would allow each state or local government the choice of issuing either tax-exempt or taxable bonds. The governmental units which choose to issue taxable bonds would be reimbursed by the

[8] See Peter Fortune, "Tax-Exemption of State and Local Interest Payments: An Economic Analysis of the Issues and An Alternative," *New England Economic Review*, May/June 1973, pp. 3–31.

[9] See Ralph C. Kimball, "The Effects of a Taxable Bond Option on Borrowing Costs of State and Local Governments in the Northeast," *New England Economic Review*, March/April 1978, pp. 21–31.

U.S. Treasury for a fixed proportion of the interest costs of the taxable issue, with reimbursement rates most often mentioned ranging from 35–45 percent. Issuers would have discretion to choose between taxable and tax-exempt bonds, and their choice would not be subject to approval by the Treasury. Subsidy payments would continue for the life of the issue and would not be subject to change.

The choice to issue either tax-exempt or taxable bonds depends upon the relationship between tax-exempt and comparable taxable yields, and the reimbursement rate. If the premium received for tax-exemption is less than the reimbursement rate, it would be to the issuer's advantage to sell taxable bonds. If the reimbursement rate is less than the tax-exemption premium, the net cost to the issuer will be minimized by issuing tax-exempts. Since issuers will choose to sell taxables whenever the reimbursement rate exceeds the percentage premium on tax-exempts, the effect of a taxable bond option is to place a federally supported floor under the subsidy rate received by state and local governments.

Since the tax-exemption premium decreases with maturity, the proportion of state and local debt issued as taxables will increase with maturity. Issuers will find it advantageous to issue tax-exempts in the shorter maturities where the premium received for tax-exemption exceeds the reimbursement rate, and to issue taxable bonds in the longer maturities where the reimbursement rate exceeds the premium paid for tax-exemption.

A mixture of both taxable and tax-exempt debt is likely to be issued even in the longer maturities, although individual issues will be either tax-exempt or taxable. As issues are switched to the taxable market, the supply of long-term tax-exempts will decrease and the premium paid for tax-exemption will increase until issuers are indifferent between issuing debt in tax-exempt or taxable form and the premium paid for tax-exemption approximates the reimbursement rate. Thus the long-run effect of the taxable bond option will be to shift down the tax-exempt yield curve in the longer maturities. This reduction in tax-exempt yields will benefit all issuers of tax-exempts, not just those who actually issue taxables.

The taxable bond option would also increase the efficacy of the tax-exemption subsidy as an investment incentive mechanism. Since the taxable bond option would place a floor below the premium paid for tax-exemption, the cyclical variation in the subsidy rate would be greatly reduced, at least in the longer maturities. Since the tax-exemption premium could continue to fluctuate at levels exceeding the reimbursement rate, some variation in the subsidy rate would continue but within a much narrower range than previously. In addition since all issuers would be guaranteed some minimum subsidy rate, the variations in subsidy rates received by different issuers would also be reduced.

In addition, the implementation of a taxable bond option would, by shifting the tax-exempt yield curve downwards in the longer maturities, increase the premium paid by investors for the tax-exemption privilege, and thus increase the transfer efficiency of the tax-exemption subsidy mechanism. Since some investors would still own tax-exempts with marginal tax rates exceeding the reimbursement rate, the transfer efficiency of the tax-exemption subsidy mechanism would still be less than perfect, but substantially greater than without a taxable bond option. However, while a taxable bond option would increase the effectiveness of the tax-exemption subsidy mechanism as an investment incentive by reducing the cyclical variation in the subsidy rate and by increasing transfer efficiency, the benefits received by state and local governments would continue to vary with the amount of debt issued rather than with the

amount of capital formation undertaken. Thus, the incentive would continue to increase debt loads above levels which would otherwise exist.

The Taxable Income Option

Recently, an alternative to the taxable bond option has been suggested which would have the same benefits in reducing the cyclical variation in the subsidy rate and increasing transfer efficiency, but would not involve the Federal Government in direct contact with state and local governments, nor would it reduce the volume of tax-exempts sold. This alternative might be described as a taxable income option.

With the implementation of a taxable income option, each taxpayer would have the choice between continuing to treat interest on state and local bonds as tax-exempt, and reporting such income, grossed up by a multiplicative factor, as taxable income and receiving in return a tax credit. For example, if the multiplicative factor was .67, the taxpayer would have the option of reporting taxable income of $1.67 for each dollar of tax-exempt interest received and receiving in return a tax-credit of $.67. The gross subsidy received by the investor, expressed as a percentage of before-tax yield, is equal of $.67/$1.67, or 40 percent.[10]

The choice between reporting the state and local interest payments as taxable or tax-exempt income will depend upon the relationship between the taxpayer's marginal tax rate and the gross subsidy rate. In the example reported above, the taxpayer will prefer the taxable income option if the $.67 tax credit exceeds the additional tax liability on the $1.67 of reported taxable income, or if his marginal income tax rate is less than 40 percent. In general, an investor owning tax-exempts will prefer the taxable income option if the gross subsidy rate exceeds his marginal tax rate.

At present investors in lower tax brackets do not purchase a significant amount of state and local bonds because the difference in gross yields, expressed as a percentage of the fully taxable yield, is greater than their marginal tax rate. Thus, an investor in a 20 percent marginal tax bracket would prefer to purchase a fully taxable bond paying 10 percent to a comparable tax-exempt paying 7 percent. The taxable income option would affect investor demand by making tax-exempts more attractive than taxables to investors in lower income tax brackets so long as the gross subsidy rate paid by the government exceeds the premium paid for tax-exemption. For example, if the multiplicative factor used to gross up tax-exempt interest income for reporting purposes is .67 and the gross subsidy rate is 40 percent, then an investor in the 20 percent bracket holding a 7 percent tax-exempt bond and selecting the taxable income option will receive a gross rate of return consisting of interest and tax credit of about 11.7 percent, and an after-tax rate of return of 9.35 percent, considerably above the 8 percent after-tax rate of return obtainable on a fully taxable private security.

Many substantial investors in long-term bonds are taxed at low marginal rates, as in the case of life insurance companies, or are themselves tax-exempt, as in the case of pension funds. If a taxable income option should be implemented, those investors such as life insurance companies who are taxed at low marginal rates will prefer state and local bonds to private corporate bonds whenever the gross subsidy rate on tax-exempts exceeds the premium paid for tax-exemption. Investors who are themselves tax-exempt, such as the pension funds, will also prefer state and local bonds if the tax credit is

[10] In general, if the percentage factor used to compute the tax credit is s, then the investor will receive 1+s dollars in the form of interest payments and tax credits for each dollar of tax-exempt income reported as taxable income, so that the gross subsidy from the government, expressed as a percentage of pretax income, as s/1+s.

made refundable whether or not a tax liability exists. Overall, the demand for state and local bonds by the large insurance companies and pension funds will be substantially increased. As these investors purchase state and local bonds, the yields on tax-exempts will fall relative to those on private taxable bonds and the premium paid for tax-exemption will increase. In the long run, investors will adjust their portfolios until the after-tax yield on state and local and private corporate bonds are equivalent, or until the premium paid for tax-exemption just equals the gross subsidy rate. Thus, just as in the case of the taxable bond option, the effect of the taxable income option is to place a federally subsidized floor below the premium paid for tax-exemption.

By placing a federally subsidized floor below the subsidy received by state and local governments, the taxable income option would have many of the beneficial effects associated with the taxable bond option. Cyclical variations in the subsidy rate would be greatly reduced, and transfer efficiency would be increased. However, unlike the taxable bond option, there would be no direct contact between the Federal Government and the state and local government issuing debt, and there would be no reduction in the amount of tax-exempts issued, so that the possibilities of Federal interference or disruptive impacts would not exist. Thus, the taxable income option would improve the effectiveness of the present tax-exemption subsidy mechanism as an investment incentive while avoiding several serious objections to the taxable bond option. However, as with the taxable income option, the transfer efficiency of the subsidy mechanism would still be less than perfect, and the benefits received by state and local governments would continue to vary with the amount of debt issued rather than the amount of capital formation undertaken.

Section III: The Use of Grants as an Investment Subsidy

Interest rate subsidies are not the only means of encouraging state and local government investment spending. The Federal Government also subsidizes state and local investment projects with direct investment grants. In fact, during 1977 Federal investment grants of $16.4 billion were awarded to state and local authorities, whereas the cost of subsidizing tax-free municipal debt was approximately $5 billion. Although the volume of direct grants greatly exceed interest subsidies, for the most part these grants are tied to qualified projects which satisfy requirements specified by Federal policy. For example, approximately two-thirds of the investment grants support highway construction, waste-treatment facilities, and urban mass transportation. Consequently, these subsidies traditionally have had limited applications, and they have required state and local authorities to comply with Federal standards to receive funding.

Interest rate subsidies, on the other hand, are not linked to any specific program because any investment project undertaken by state or local governments qualifies for this benefit. An interest rate subsidy is essentially an investment grant which is extended over a project's lifetime rather than concentrated at the project's inception. Unlike an investment grant, however, the value of an interest rate subsidy will vary with the proportion of the investment which is financed by debt. Rate subsidies will be most substantial for highly levered ventures, and they will be least rewarding for projects heavily financed by state and local government revenues. Furthermore, with direct investment grants, each dollar the Federal Government loses in net revenue supports state or local capital formation, whereas the existing interest

subsidies divide the Federal aid between municipal bond holders with high marginal tax rates and municipal authorities.

For these reasons, among others, a particularly appealing means of subsidizing state and local investment projects would combine the more attractive attributes of the existing investment grants and interest rate subsidies. Rather than subsidizing taxable municipal bonds, the Federal Government could replace all interest subsidies with *general* investment grants. These grants, resembling the investment tax credits or depreciation allowances currently claimed by business, would convey the entire Federal subsidy to state and local authorities. Moreover, the size of these subsidies would not vary with the use of debt financing nor would prospective investment projects have to satisfy special eligibility requirements. All public investment undertaken by state and local authorities would receive the general investment grants.

The investment grant takes one of two different forms. It can be paid in full during the year that public authorities purchase the capital goods — much like an investment tax credit for business — or it may be paid over many years during the project's lifetime — much like business depreciation allowances. If the grants are paid over several years, like depreciation allowances, they can be concentrated in the years immediately following the purchase of the capital goods or they may be stretched out so that the annual subsidies are more nearly equal in size. As examples of these two methods of paying extended investment grants, this article will use the sum-of-the-years'-digits and straight-line schedules to describe the stream of subsidies.[11]

In addition to its other attributes, an investment grant offers policy-makers a variety of arrangements for subsidizing public capital formation by state and local governments. This flexibility is an important feature, because the subsidy can be designed to provide support to state and local investments at the least cost to the Federal Government. Therefore, not only do grants more effectively direct subsidies to municipal authorities, but they also permit a more efficient timing of the payments so that municipal authorities will receive the greatest benefit.

Although the Federal Government can directly influence state and local government capital spending by offering interest rate subsidies or investment grants, these two options are not equally efficient. For example, interest rate subsidies can cost the Federal Government more than a first-year investment grant which provides the same amount of stimulus to municipal authorities. Selecting the most efficient policy requires two calculations. First, it is necessary to determine the timing and relative magnitude of the various general investment grants which are as attractive to state and local authorities as the existing interest subsidies. Then, the cost to the Federal Government of the different measures must be compared.

The Value of Investment Grants to State and Local Governments

In deciding whether or not to proceed with a particular investment project, state and local authorities must compare the project's prospective rewards with its expense. The more ample the stream of returns relative to the cost of the

[11] With a straight-line payment schedule, the investment grant would be disbursed in equal instalments in each year of the asset's life. With the sum-of-the-years'-digits payments, more of the grant is awarded early in the asset's life. The proportion of the total grant disbursed in each year is a fraction, the denominator is the sum of the digits representing each of the years in the asset's life (e.g., for a ten-year asset the denominator equals 10+9+8+...+2+1), the numerator is the number of years remaining in the asset's life. Accordingly, for a ten-year asset, the denominator is 55, so 10/55 or 18 percent of the grant is paid in the first year, 9/55 or 16 percent of the grant is paid in the second, and so forth.

necessary real estate, buildings, and equipment, the more attractive is the project. If the present value of the prospective rewards exceeds the facility's cost, public officials will ordinarily proceed with the investment.

The value of any investment project depends on several factors. Foremost is the stream of public services which state and local authorities expect to receive from the proposed facility. However, two other benefits also play important roles. First, to the extent capital expenditures are financed by debt, public authorities receive interest rate subsidies over a substantial portion of the project's useful life. Second, the project may qualify for Federal grants-in-aid. If existing interest rate subsidies are replaced by *general* investment grants, these grants must be large enough to compensate state and local governments for the loss of their right to issue tax-free debt.

Tables 4 and 5 show the relative sizes of first-year, sum-of-the-years'-digits, and straight-line investment grants which are required to match the value of existing interest rate subsidies to state and local authorities. For an investment in equipment with a ten-year lifetime and 75 percent debt financing, the sum of the interest rate subsidies is 15 cents per dollar of expenditure. Because these subsidies are spread over the life of the project, with a 6 percent discount rate, their present value is equal to that of a first-year grant of 11.7 cents per dollar of investment expenditure. By awarding the subsidies sooner rather than later, first-year investment grants are worth more to municipal authorities; thus, they need not be as large to be as attractive as interest rate subsidies.

If the investment grants are not paid entirely in the first year but are extended over several years, according to the sum-of-the-years'-digits or straight-line schedules, a given amount of subsidy is worth less to municipal authorities. Therefore, with these alternative payment schedules, the amount of investment subsidy must exceed that of first-year grants so that they are as attractive to states and municipalities as interest subsidies and first-year grants. As shown in Tables 4 and 5, the size of the grants rises as the payments are extended. For example, an investment in equipment with a ten-year

TABLE 4

Investment Grants Equivalent to Interest Rate Subsidies for Equipment

	5-Year Lifetime			*10-Year Lifetime*			*15-Year Lifetime*		
After-Tax Discount Rate	*First-Year Grant*	*Sum-of-the-Years'-Digits Grant*	*Straight-Line Grant*	*First-Year Grant*	*Sum-of-the-Years'-Digits Grant*	*Straight-Line Grant*	*First-Year Grant*	*Sum-of-the-Years'-Digits Grant*	*Straight-Line Grant*
3%	7.2%	7.7%	7.9%	13.1%	14.7%	15.4%	18.8%	22.1%	23.6%
6	6.7	7.7	8.0	11.7	14.6	15.9	16.1	21.9	24.8
10	6.2	7.7	8.2	10.2	14.6	16.7	13.4	21.7	26.3

This table shows the size of investment grants, as a percent of investment expenditure, which matches the present value of interest subsidies. The grants are paid either entirely in the first year, according to a sum-of-the-years'-digits schedule, or in equal instalments for the life of the asset. Investments are financed 75 percent by municipal bonds with yields 40 percent below those on comparable taxable securities; by assumption, these shorter-term municipal securities yield 5.0 percent.

SOURCE: Appendix B.

TABLE 5

Investment Grants Equivalent to Interest Rate Subsidies for Structures

	20-Year Lifetime			*30-Year Lifetime*		
After-tax Discount Rate	*First-Year Grant*	*Sum-of-the-Years'-Digits Grant*	*Straight-Line Grant*	*First-Year Grant*	*Sum-of-the-Years'-Digits Grant*	*Straight-Line Grant*
3%	19.1%	23.5%	25.7%	27.2%	36.5%	41.7%
6	15.7	23.1	27.3	20.6	32.8	45.0
10	12.5	22.7	29.2	15.2	34.4	48.4

This table shows the size of investment grants, as a percent of investment expenditure, which matches the present value of interest subsidies. The grants are paid either entirely in the first year, according to a sum-of-the-years'-digits schedule, or in equal instalments for the life of the asset. Investments are financed 75 percent by municipal bonds with yields 30 percent below those on comparable taxable securities; by assumption, these longer-term municipal securities yield 6.0 percent.

SOURCE: Appendix B.

lifetime requires an 11.7 percent first-year grant to match the value of interest rate subsidies if the discount rate is 6 percent. However, if the payments are extended according to the sum of the years' digits formula, the total subsidy must increase to 14.6 percent of investment expenditure. Finally, for the schedule which delays grant payments the most, the straight-line formula, the total subsidy must rise to 15.9 percent of the cost of the equipment.

As is evident in Tables 4 and 5, the present value of the interest subsidy increases with the lifetime of investment goods. Longer-lived assets are financed by loans with longer maturities; consequently, the amount of interest paid to creditors and the present value of this interest obligation rises with an investment project's lifetime. As a result, the value of interest rate subsidies is higher for longer-lived projects. For instance, the present value of interest rate subsidies is 11.7 cents per dollar of expenditure on equipment with a 10-year lifetime at a 6 percent discount rate, according to Table 4. The comparable figure for equipment with a 15-year lifetime is 16.1 cents. Therefore, the size of the first-year investment grant must increase with the capital asset's lifetime to remain as attractive as interest rate subsidies to state and local authorities.[12]

Just as the size of first-year grants must increase with assets' lives so must the extended sum-of-the-years'-digits and straight-line grants. However, these alternative schedules spread the subsidy over a number of years which increases as investment lifetimes grow longer. Therefore, the total subsidy relative to the project's cost must rise faster for the sum-of-the-years'-digits and straight-line schedules than it does for the first-year grant to match the rising value of interest rate subsidies. According to Table 4, for ten-year equipment, an 11.7 percent first-year grant, a 14.6 percent sum-of-the-years'-digits grant, and a 15.9 percent straight-line grant are

[12] Although the first-year grant increases with asset lifetime for the projects shown in either Table 4 or Table 5, the size of the grant falls in passing from the 15-year project in Table 4 to the 20-year project in Table 5. This discontinuity is caused by our assumption that shorter-term municipal bonds have yields 40 percent below comparable taxable securities whereas longer-term municipals have yields only 30 percent below competing taxables. See the discussion of rate subsidies by maturity in Section I and Table 1.

all equally attractive with a 6 percent discount rate. For a 15-year machine, the first-year grant rises to 16.1 cents per dollar of investment expenditure (a 38 percent increase), the sum-of-the-years'-digits grant rises to 22 cents (a 50 percent increase), and the straight-line grant rises to 24.8 cents (a 56 percent increase).

While these particular magnitudes are appropriate for these three examples of investment grants, the tables illustrate two general principles. The first has been discussed above: longer-asset lifetimes require higher investment grants to match the value of interest rate subsidies to state and local authorities, and the more the payment of the grant is extended, the more the grant must increase.

The second principle is related to the first. With higher discount rates, the value of a particular stream of investment subsidies is lower the longer the payment is delayed. For this reason, the size of the first-year investment grant needed to match the value of interest subsidies on ten-year equipment falls as the discount rate rises. Interest subsidies are extended over many years and with higher discount rates, their value to state and local authorities diminishes; consequently, the corresponding first-year grant falls with rising discount rates. On the other hand, because straight-line grants delay payments even more than interest subsidies, the present value of these grants falls faster than the present value of interest subsidies with higher discount rates. Therefore, straight-line grants must rise as the discount rate rises to remain as attractive as interest subsidies to municipal authorities. Because the schedule of the sum-of-the-years'-digits grant payments corresponds closely to that of interest subsidies, a change in the discount rate alters the value of each by nearly identical amounts. Consequently, for the various discount rates shown in Tables 4 and 5 the sum-of-the-years'-digits grants change relatively little to match the value of interest subsidies.

From the viewpoint of state and local authorities, both investment grants and interest rate subsidies can provide attractive investment incentives. By way of example, Tables 4 and 5 show what combinations of interest subsidies and investment grants municipal authorities will find equally acceptable for several different discount rates and asset lifetimes. Given this information, the Federal Government may select the least expensive means for subsidizing state and local capital formation.

The Cost of Investment Grants to the Federal Government

From the Federal Government's viewpoint, the relative costs of interest rate subsidies, and the various investment grant schemes depend on the difference, if any, between state and local government and Federal Government discount rates.[13] The Treasury analyzes the cost of each policy much as municipal authorities value its benefit. A program which subsidizes municipal investment spending by a certain amount each year must reduce Federal net revenues by an equal amount.[14] Just as municipal authorities discount the stream of prospective subsidies or grants to assess its potential benefits, the Treasury discounts the corresponding net revenue losses to determine the cost of each policy option.

To offer state and local authorities identical incentives, interest subsidies and investment grants must offer streams of rewards which have

[13] In this context the most "efficient" policy for stimulating investment is simply the one which increases Federal debt the least. So defined, an "efficient" policy does not necessarily increase the Nation's productive capacity, real wealth, or living standards more than any other means of stimulating investment spending.

[14] We do not take into account any secondary "ripple" or "multiplier" effects whereby increased municipal investment spending generally increases national income and Federal income taxes. All subsidy schemes designed to achieve a particular level of municipal capital spending will have equal secondary effects on national income.

identical present values. If state and local governments and the Federal Government discount rates are equal, not only would the alternative programs be equally attractive to municipal authorities, but they would be equally expensive for the Treasury as well. In this case all the incentives are equally efficient. However, as discussed below, municipal and Federal discount rates may diverge. If the Federal discount rate is less than that of a municipal authority, first-year grants provide the most efficient investment subsidy.[15] On the other hand, if the Federal Government's discount rate is greater than that of a municipal authority, straight-line grants are most efficient.

Tables 4 and 5 illustrate this simple principle. For example, if the municipal discount rate is 6 percent, then for a machine with a ten-year lifetime, any first-year grant less than 11.7 percent is less attractive to municipal authorities than interest subsidies. In other words, the Federal Government must offer a first-year grant at least as large as 11.7 percent to encourage state and local investment spending as much as interest rate subsidies. If the Federal Government's discount rate is only 3 percent, then, from its viewpoint, the interest subsidy is as expensive as a 13.1 percent first-year investment grant. Therefore, the Federal Government would be willing to pay a first-year grant as high as 13.1 percent in lieu of subsidizing municipalities' interest costs. In this case, if the interest subsidy were replaced by a 13.1 percent first-year grant, the discounted cost of subsidizing state and local capital formation would not increase, but the present value of investment subsidies to municipal authorities would increase by 12 percent. If the municipal discount rate were as high as 10 percent, the switch to a 13.1 percent first-year grant would raise the value of investment subsidies to state and local authorities by 28 percent without increasing the discounted cost to the Treasury.

The first-year grant offers these potential advantages because it advances the timing of the subsidy payments. By concentrating the subsidy in the year that investment expenditures take place, the Federal Government may fully exploit the gap between its discount rate and that of municipal authorities. Because of the higher state and local discount rate, state and local authorities value future subsidies less than the Federal Government values the corresponding expense. Consequently, "accelerating" the payments through first-year grants eliminates this discrepancy between the perceived benefits and costs of subsidizing investment.

Because the sum-of-the-years'-digits grant delays benefits almost as much as interest rate subsidies and straight-line grants defer benefits even more, neither of these schemes support investment spending as effectively as first-year grants, when the Federal Government's discount rate exceeds that of state and local authorities.

If the positions are reversed so that the Federal Government's discount rate is 6 percent and that of municipal authorities is 3 percent, straight-line grants are the most efficient investment stimulus. For municipal authorities, interest rate subsidies are as valuable as a 15.4 percent straight-line grant on ten-year equipment. The Treasury, however, would be willing to pay a straight-line grant as high as 15.9 percent in place of subsidizing municipal debt. In this case, by offering municipal authorities a 15.9 percent straight-line grant, the Federal Government could increase the value of investment subsidies to state and local governments without increasing the present value of its net

[15] If the investment stimulus is to last indefinitely, the Treasury may not be able to select a policy by discounting future revenue losses. If the growth rate of nominal investment spending is greater than the Federal Government's discount rate, then the present value of revenue losses for any policy is infinite. In this case, the growth rate of investment spending becomes the government's "discount rate" weighing the revenue gains and losses entailed by each of the different incentives.

revenue losses. The straight-line grant is so efficient because the value of the subsidy spread over the ten-year life of the equipment is relatively high at low municipal discount rates, but the Federal Government's high discount rate shrinks the perceived revenue losses so that the cost of the subsidy is relatively low. Neither the first-year nor the sum-of-the-years'-digits investment grants offer similar opportunities to profitably exploit the discrepancy between discount rates since they "accelerate" the payment of subsidies even more than interest subsidies.

Although these illustrations depend on the examples provided in Tables 4 and 5, the conclusion is general. The first-year investment grant must fall relatively rapidly as the discount rate rises if it is to remain as attractive as interest subsidies. On the other hand, straight-line grants must rise with the discount rate. Therefore, if the Federal Government's discount rate is less than that of state and local authorities, first-year investment grants provide the most efficient investment stimulus. If the Federal Government's discount rate exceeds that of municipal authorities, the straight-line grant is the most attractive policy. Finally, if Federal and state and local governments have equal discount rates, there is no difference in the cost of these programs.

The Benefits of Adopting First-Year Grants

Investment grants have two attractive features which make them a more efficient means of encouraging municipal capital formation than existing interest rate subsidies. First, grant payments are not tied to debt-service charges. Grants may be paid according to a variety of schedules; in particular, policy-makers may select a schedule which offers municipal authorities the most appealing timing of subsidies. Second, grants do not divide the Federal subsidy between municipal creditors with high marginal tax rates and state and local governments. Therefore, a switch to municipal investment grants would offer state and local authorities an undiluted subsidy, paid in a timely manner. This reform could increase the value of Federal subsidies to municipal governments by as much as one-fourth to one-third without increasing the present value of subsidy expenses to the Treasury. As much as one-half of this supplemental benefit is due to improving the timing of subsidy payments by adopting first-year investment grants.

Because both Federal and state and local governments represent a common constituency, the Nation's citizens and investors, economic theory suggests that their discount rates should be equal, implying that all policies would be equally efficient. In fact, however, market imperfections or the risks associated with varying economic conditions can cause municipal discount rates to exceed those of the Federal Government. For example, the difference between the relevant discount rates may be no smaller than the spread between the net cost of borrowed funds for state and local and Federal governments. During the 1960s and 1970s, the yields of long-term municipal bonds generally exceeded the net after-tax yields of long-term governments by 100 basis points or more.[16] Although the difference between shorter-term municipal bond yields and the after-tax yield on short-term

[16] See Salomon Brothers, *An Analytical Record of Yields and Yield Spreads*, Part III, Table 4. The calculation of after-tax yields on U.S. Government bonds uses the marginal statutory income tax rate for large corporations, currently 48 percent. Municipal yields in 1977 were only 30 percent lower than yields on U.S. Government bonds. Although this suggests that the corporate tax rate may overstate the marginal tax rate for new purchasers of Treasury securities, the comparison of relative yields provides an under-estimate of the implicit tax rate on U.S. Government bondholders because it ignores the tax treatment of capital gains and the effect of risk on municipal yields. See Ralph C. Kimball, *Commercial Bank Demand and Municipal Bond Yields* (Federal Reserve Bank of Boston, Research Report 63, 1977), especially Chapters II and III, and Appendix A of this article.

Treasury securities has been fairly volatile, with the exception of 1977 it has been positive during the postwar period. These data suggest that municipal discount rates exceed those of the Federal Government and that the gap is especially large for longer-term projects. Of course, for planning purposes the effective Federal and municipal discount rates may be somewhat higher than their net cost of funds. Municipal authorities may be even more reluctant than the Federal Government to fund projects with deferred rewards due to their less secure financial standing; consequently, the gap between municipal and Federal discount rates may well exceed the spread between their net after-tax bond yields.

According to the previous discussion concerning Tables 4 and 5, because the state and local government discount rate exceeds that of the Federal Government, the first-year investment grant is the most efficient means of subsidizing investment. The tables also suggest that the present value of Federal subsidies to municipal government could be increased at least 7 percent, and perhaps 14 percent or more, by switching to first-year grants. These increased benefits arise solely because the subsidy is paid in a more timely manner. The value of municipal subsidies would also rise by an additional 19 percent because the aid is no longer shared with bondholders seeking income-tax shelters.[17]

The switch to first-year grants from interest subsidies means that investment aid is no longer tied to the use of debt. In the discussion of Tables 4 and 5, it was clear that interest subsidies are more valuable for assets with longer lifetimes. The potential bonus equal to one-fourth to one-third of the present tax-exemption subsidy provided by first-year grants presumes that the grant increases with asset lifetimes, matching the rising expense of interest subsidies. Rather than setting very different grants for different classes of asset lifetimes, it is also possible for the first-year grants to be more nearly equal for all municipal investments. The subsidy for purchasing equipment would more nearly equal that for constructing buildings. Therefore, not only does the flexibility of investment grants allow more timely payment schedules but it permits the support of Federal aid to be more neutral among various investment goods, if desired.

Section IV. Arguments Against Reform

While both the taxable bond option and the extended investment grants would result in substantial increases in the benefits received by state and local governments, previous efforts at reform of the tax-exemption subsidy mechanism have been unsuccessful. In particular previous attempts to implement a taxable bond option have been opposed by substantial numbers of state and local governments themselves.[18] Those opposed to the taxable bond option have argued that implementation would result in increased administrative burdens and Federal controls and ultimately cause state and local governments to become dependent upon the Federal Govern-

[17] Table 5 shows that a municipal authority would swap the tax-exempt status of its securities for a 15.7 percent first-year grant on a 20-year project provided its discount rate is 6 percent. Because the Federal Government would be willing to offer a 19.1 percent first-year grant with a 3 percent discount rate, this table suggests that the value of investment subsidies to municipal authorities can be increased approximately 7 percent for each 100 basis points separating state and local and Federal Government discount rates: $(19.1/15.7-1)/3 \approx .072$. Because municipal bonds financing investment projects have an average maturity of 20 years or more, and because the gap between the two discount rates is as great as 100 or 200 basis points, the present value of municipal subsidies can be increased 7 to 14 percent through more timely payments.

In addition, according to Table 3, the transfer efficiency of tax-exempt bonds is only 84 percent. Therefore, the present value of municipal subsidies is increased another 16 percent by first-year grants because their transfer efficiency is 100 percent.

[18] The taxable bond option has also been opposed by most underwriters and dealers in tax-exempts.

ment. In particular opponents have argued that implementation of a direct Federal subsidy will result, either now or in the future, in the imposition of Federal standards of eligibility, so that state and local governments will find themselves subject to Federal restrictions and required to comply with various reporting requirements. Furthermore, there is the possibility that in the future Congress might choose to alter the subsidy rate or some other part of the program, reducing benefits to state and local governments.

Many of the arguments used against the taxable bond option also apply to the extended investment grants. The burden of reporting and documentation would likely be at least as great with the investment grants as with the taxable bond option, although these requirements would probably be no more stringent or complex than those required of private firms in order to claim the investment tax credit. Likewise, since Congress has varied the investment tax credit in the past as a means of moderating cyclical fluctuations, it could be tempted to follow similar policies with the extended investment grants.

The arguments for and against reform of the present subsidy mechanism can only be resolved through specific cost/benefit calculations. As demonstrated by the existing programs of Federal grants, most state and local governments are willing to accept Federal standards and reporting requirements if the expected benefits appear large enough. Thus, if state and local governments are to accept changes in the present subsidy mechanism, they must be persuaded, probably on an individual basis, that the increased benefits will far exceed the increased costs. Secondly, while it is entirely possible that having once instituted a program that Congress might choose to alter it, it should be remembered that state and local governments have been extremely effective in protecting their interests against Congressional action in the past. The fact that the taxable bond option has been successfully blocked for ten years may indicate that if the present subsidy mechanism were to be changed, Congress would be unlikely to quickly or arbitrarily alter it to the disadvantage of state and local governments.

Section V: Summary

The tax-exempt status of municipal debt acts to enhance state and local government capital formation by reducing the cost of financing investment projects. Unfortunately, this subsidy has several major weaknesses. Not only does the subsidy vary with business conditions, but the reduction in borrowing costs received by municipal authorities equals only a fraction of the revenues foregone by the Federal Government. Moreover, the benefits received by state and local governments are tied to the amount of debt they issue, not the amount of capital they purchase. This encourages debt financing and discriminates against those jurisdictions choosing to finance capital expenditures with internal funds.

One suggested remedy for these weaknesses is to offer municipal authorities the option of issuing taxable bonds in place of tax-exempt securities. To compensate state and local governments for their loss of implicit interest rate subsidies, those jurisdictions choosing to issue taxable bonds would receive a rebate from the Federal Government equal to a fixed proportion of their borrowing costs. Frequently mentioned rates of compensation vary between 35 and 45 percent. The taxable bond option would increase the proportion of Federal subsidies transferred to state and local governments and reduce cyclical variation in the subsidy rate. An alternative type of interest rate subsidy would allow taxpayers the option of reporting interest on state and local bonds as taxable income and receiving in return a tax credit. This taxable

income option would also increase transfer efficiency and reduce cyclical variation in the subsidy rate. However, with either the taxable bond option or the taxable income option, the reduction in state and local borrowing costs would still not equal the total revenue foregone by the Federal Government, and the benefits would still be linked to the amount of debt issued by municipal authorities.

Interest rate subsidies are not the only means of encouraging state and local government capital formation. A particularly appealing means of subsidizing municipal investment projects would replace all interest rate subsidies with first-year investment grants. These grants, resembling investment tax credits currently claimed by business, would convey the entire Federal subsidy to state and local authorities. Moreover, the size of these subsidies would not vary with the use of debt financing, and because these subsidies are not linked rigidly to schedules of interest payments, they may be paid in a more timely manner thereby enhancing their value to municipal authorities. For these reasons, first-year investment grants could increase the value of Federal subsidies to municipal governments by as much as one-fourth to one-third without increasing the present value of revenue losses to the Treasury. While a program of investment grants would substantially increase Federal subsidies to state and local governments, such a program would require the elimination of the tax-exempt status of newly issued state and local bonds. Such a proposal is likely to create stronger political opposition than less far-reaching proposals such as the taxable income option.

Difficulties in Estimating the Windfall Gain on Tax-Exempt Bonds

The estimates presented in Table III are subject to criticism since they assume that the statutory marginal tax rates of each class of investor are also the effective marginal tax rates. That is, the estimates of Table III are based on an implicit assumption that investors would purchase fully taxable securities and pay tax at their statutory marginal tax rates in the event the supply of tax-exempt bonds was reduced. However, because alternative tax-sheltered investments are available, an investor displaced by a reduction in the amount of tax-exempt bonds available may choose instead to purchase some other form of tax-sheltered investment and pay implicit and explicit taxes at rates considerably below that applicable on a fully taxable investment. Thus, it is possible that transfer efficiency should not be computed with statutory marginal tax rates, but effective marginal rates which take into account the existence of alternative tax shelters.

The use of effective marginal tax rates rather

than statutory ones presents several problems. Only very rough estimates can be made of effective marginal tax rates, and these estimates are in turn very sensitive to assumptions concerning the availability and substitutability of alternative tax-sheltered investments. For example, commercial banks held $118 billion of tax-exempt bonds as of year-end 1977, but only about $6 billion in leases outstanding, an alternative form of tax-sheltered investment. While commercial banks could certainly increase the volume of leases outstanding by aggressive promotion and accepting reductions in the rate of return on leases, it is likely that they might find it impossible to switch completely from tax-exempt bonds to leases. Moreover, the substantial decrease in the rate of return on leases accompanying any large increase in the volume of leasing would result in a significant increase in the implicit tax paid for the right to take accelerated depreciation and investment tax credits on leased assets. Likewise, private individuals could switch from tax-exempts to equities or real estate and attempt to take their returns as tax-preferenced capital gains. But many private investors in tax-exempt bonds are quite risk averse and strongly prefer the risk characteristics of debt to those of equity or real estate. Thus, if the supply of tax-exempts were to be reduced, some private investors would move to real estate or equities, but others might prefer to pay higher taxes while enjoying the lower risk of U.S. government or corporate debt.

In some sense the choice to use statutory or effective marginal tax rates to compute the windfall gain is really a choice between assumptions as to the probable course of tax reform. In both cases the windfall gain measures the increase in Treasury net revenues resulting from the simultaneous extinction of the tax-exemption privilege on state and local debt combined with the implementation of a program of direct payments by the Treasury to the state and local governments exactly equivalent to the benefits these governments were receiving from the tax-exemption privilege. If statutory rates are used in the computation, the implicit assumption is that not only tax-exempt bonds, but all other forms of tax-preferenced investments are being extinguished. The use of effective marginal tax rates, if they can be computed, contains an implicit assumption that only tax-exempt securities are outlawed, and that the supply of alternative tax-preferenced investments is very sensitive to small changes in their yields.

Appendix A. Calculation of Transfer Efficiency

In order to calculate the transfer efficiency of the tax-exempt subsidy mechanism, it is necessary to take into account both the effect of maturity on the relative yields of taxable and tax-exempt bonds, and the weighted average marginal tax rates and maturity preferences of different classes of investors. In this appendix a transfer efficiency index is calculated for three different maturity classes using not only the differing maturity-yield relationships, but also the statutory marginal tax rates applicable to each class of investors, weighted by each group's proportional holding of tax-exempts.

Table A-1 shows the estimated proportion of tax-exempts owned by each class of investors for three different maturity classes, and the statutory marginal tax rate applicable for each class. Data as to ownership by maturity class are available only for commercial banks. Both households and casualty insurance companies are assumed to have the bulk of their holdings of tax-exempts in the longer maturities. Table A-I also shows estimated statutory marginal tax rates applicable to each class of investor. Although no firm data exist, .50 is used as an estimate of households' weighted statutory marginal tax rate.[1]

While commercial banks, property and casualty insurance companies, and households hold 93 percent of the tax-exempts outstanding, small amounts are held by state and local governments and their retirement funds, mutual savings banks, savings and loan associations, life insurance companies, nonfinancial corporate businesses, and brokers and dealers. With the exception of the nonfinancial corporate businesses, many of these investors hold tax-exempts for reasons other than relative yield. Because both state and local governments and their retirement funds are themselves tax-exempt, and because many of the other small holders are subject to special tax laws which make their statutory marginal rate difficult to compute, it is assumed for simplicity that the statutory marginal rate applicable to these investors is zero.

The data contained in Table A-1 is used to compute weighted marginal tax rates by maturity class, as shown in Table A-2. Estimates of "normal" tax-exemption premiums by maturity class for tax-exempts versus taxable corporate bonds are also shown in Table A-2, and these estimates and those of the weighted marginal tax rates are then used to compute the estimates of transfer efficiency.

[1] Galper and Peterson estimate the weighted marginal tax rates of households holding tax-exampts to be .55. See Harvey Galper and George Peterson, "The Equity Effects of a Taxable Municipal Bond Subsidy," *National Tax Journal*, December 1973, p. 617.

TABLE A-1

Estimated Ownership of Tax-Exempts by Class of Investor and Maturity (Percent)

	Maturity Class				
Class of Investor	*1–10 yrs.*	*11–20 yrs.*	*21–30 yrs.*	*All*	*Statutory Marginal Tax Rate*
Commercial Banks	30	8	7	45	48.0
Households	4	10	15	29	50.0
Prop. & Cas. Ins. Cos.	3	8	8	19	48.0
Other	3	4	0	7	0.0
All	40	30	30	100	45.2

SOURCE: Authors' estimates.

TABLE A-2

Estimated Transfer-Efficiency of Tax-Exempt Bond Market

	Maturity Class			
	1–10 yrs.	*11–20 yrs.*	*21–30 yrs.*	*All*
Normal Tax-Exemption Premium	.450	.350	.300	.380
Weighted Marginal Tax Rate	.446	.423	.490	.453
Transfer Efficiency (percent)	100	83	61	84

SOURCE: Table A-1, and Authors' estimates.

Appendix B

The present value of interest rate subsidies per dollar of borrowing equals

$$PV = S\left[r/(1+d)+r\sum_{i=2}^{n}\left\{(1+r)^{i-1}-C(1+r)^{i-2}\right\}/(1+d)^{i}\right]$$

where S equals the interest subsidy rate; S = .4/(1–.4) for projects with lifetimes less than 20 years, S = .3/(1–.3) for projects with lifetimes 20 years or more.

r equals the municipal bond rate; r = 5 percent for projects with lifetimes less than 20 years, r = 6 percent for projects with lifetimes 20 years or more.

d is the discount rate

n is the lifetime of the project

C is the constant amortized loan payment per dollar of borrowing,

$$C = \left[\sum_{i=1}^{n}(1+r)^{-i}\right]^{-1}.$$

Assuming that all projects are financed 75 percent by borrowing, the first-year investment grant columns in Tables 4 and 5 show what percent of a project's purchase price should be refunded to municipal authorities to match the present value of interest subsidies, 75 percent of PV, for the various values of d and n.

If the investment grants are not paid in the first year but are paid in equal instalments over the life of the project, then the present value of the straight-line investment grant is

$$PV_{SL} = \sum_{i=1}^{n}(k/n)(1+d)^{-i}.$$

The straight-line grant columns in Tables 4 and 5 show what percent of the project's purchase price k must be to set PV_{SL} equal to 75 percent of PV for the various values of d and n. Finally, if the grants are paid according to the sum of the years' digits formula, then the present value of the grant is

$$PV_{SYD} = \sum_{i=1}^{n} k\left((n-i+1)/\sum_{j=1}^{n} j\right)(1+d)^{-i}.$$

The sum-of-the-years'-digits grant columns in Tables 4 and 5 show what percent of the project's purchase price k must be to set PV_{SYD} equal to 75 percent of PV for the various values of d and n.

Although the examples in Tables 4 and 5 assume amortized loans (or sinking funds), to the extent that capital projects are financed with "balloon" notes or bonds, the examples understate the potential benefits which accompany the switch to first-year grants when the Federal Government's discount rate exceeds that of a municipal authority.

Cities, Suburbs and Regions

By Lynn E. Browne and Richard F. Syron*

Last March President Carter announced a major new initiative to improve the fiscal and economic prospects of the Nation's cities. The Carter Plan was designed as a comprehensive solution to a variety of urban problems and includes a number of programs, ranging from a development bank to encourage industrial expansion in cities to provisions for increased educational and health assistance. Although many groups lobbied for its development, the Plan has met with mixed reviews and little of the proposed legislation has actually been enacted. Some advocates of increased aid to cities feel the Plan does not go far enough while critics doubt that the proposed increased spending will accomplish much. In the wake of Proposition 13 legislative leaders are also very wary of major new programs with no guarantee of success.

A major obstacle to the passage of any urban plan is the wide diversity of opinions on just how badly off cities are, who is responsible, and what if anything can be done to improve their outlook. There are strong philosophical differences between those who feel that major new urban programs are essential and those who are skeptical that any reasonable amount of money can restore cities to their past glory.

Some economists note that shifts in production technology and in individual preferences have changed the role that cities can be expected to play. Many industries now find it more efficient to operate in expansive single-level facilities than in the older multistory types of buildings found in most cities. Similarly, the substantial increases in family income in the postwar period have enabled more families to buy single-family homes, most of which have been built outside of cities.

One alleged reason for residents and businesses leaving cities is that taxes are often much higher than in surrounding areas without correspondingly superior services. Critics charge that many cities have brought this problem on themselves through inefficiencies and poor management, and there is widespread suspicion that the cost of public services is higher in cities because of political patronage and excessive wage settlements with municipal unions.

Some experts argue that the social and economic problems of cities are simply a reflection of the low income level of many of their residents. At the same time rural leaders point out that all the poor don't live in cities and that the level of poverty is quite high in many outlying areas. In their view the objective of

* Lynn E. Browne is an Assistant Vice President and Economist, and Richard F. Syron is a Vice President and Economist, both at the Federal Reserve Bank of Boston. The authors would like to thank Judith Caulmare and Richard MacCormack for their research assistance.

national policy should be to help people and not particular geographic areas. Thus, it is argued, what resources are available would more effectively be targeted to programs with a particular impact on the poor.

Finally, those who are suspicious of massive new programs to help cities argue that the pathology of urban decline is too complex and poorly understood to be able to do much about it: that given the limited success of previous efforts it would be foolhardy to divert scarce resources from other important priorities.

Those who advocate broad new urban initiatives disagree sharply with the charge that cities have caused their own problems. Some argue that the migration of industry and residents from the cities does not reflect market forces as much as the impact of Federal programs. Heavy Federal subsidies for the development of highway systems made firms less dependent on access to rail and water transit and thus expedited industrial development in nonurban areas. Similarly, Federal housing and tax policy have stimulated enormous new single-family home developments in the suburbs. It is argued that the impact of these and other Federal programs has undermined the competitive position of cities and diminished their tax bases.

City officials also claim that under the present welfare system the substantial difference in benefits in different localities has acted as an inducement for the poor to migrate to older urban areas. This influx has added significantly to the demands on fire, police, and other services. Commuters coming into the city for work or entertainment have also expanded the need for such services. To the extent that the cost of these services is not fully captured in local taxes, as is the case with tax-exempt institutions, there is a further drain on city revenues. These factors and not widespread mismanagement are seen to be the underlying reason for the fiscal difficulties of many cities. Urban leaders also point out that cities have always been service centers for the poor and that any strategy for helping the impoverished without taking into consideration where they live is naive.

While there is little agreement on the best course to follow, what happens to cities will have a major impact on most Americans. Although many cities have lost population in recent years, a substantial share of the Nation's population still resides in central cities and most Americans live in metropolitan areas. Similarly, a very large proportion of the workforce is employed by firms located in cities. This article takes a different perspective to examine the question of how badly off cities are and who is responsible for rejuvenating them. It asks to what extent does the decline of many older cities reflect regional shifts in economic growth and to what extent are cities islands of need in generally well-off metropolitan areas. It finds that the answers to these questions vary from one region of the country to another. Cities in the Northeast tend to differ much more from their surrounding areas in terms of economic and fiscal well-being than is the case in either the South or the West.[1]

Is There a City Problem?

The starting point for any discussion of whether the problems of cities warrant some form of special assistance must be an assessment of cities' present and future needs. Are cities, according to generally accepted measures of economic well-being, worse off than other parts of the country? Is this situation likely to persist, or is it merely a temporary condition —

[1] Since this article was first written we have become aware of several other studies examining city/suburban relationships to which the interested reader may wish to refer — in particular, Charles Adams and Richard P. Nathan, "Understanding Central City Hardship," *Political Science Quarterly*, Volume 91 (Spring 1978) and the Advisory Commission on Intergovernmental Relations, *Trends in Metropolitan America*, February 1977.

due to some unusual set of circumstances with the possibility of self-correction?

Table 1 compares the economic well-being, as measured by several common indicators, of the 58 largest cities with that of the country as a whole. Perhaps the most important piece of information revealed by the comparison is the diversity among cities. Per capita money income in San Francisco in 1974 was almost 80 percent higher than in Newark. In Seattle only 6 percent of families in 1969 had incomes below the poverty level; in New Orleans more than 20 percent were in poverty. In the five years, 1970–75, that Cleveland lost 15 percent of its population, San Jose expanded by more than 20 percent. The 1977 unemployment rate in Newark was almost four times that in Nashville. With this diversity, it is not surprising that according to each indicator some cities fare better than the country as a whole. This is particularly true of the income measures.

Of the 58 cities, 31 had higher than national average per capita money incomes in 1974. According to the *1970 Census of Population,* a similar number had a lower than average share of resident families with incomes below the poverty level. On the other hand, in a majority of cities per capita incomes have not grown as fast as in the country as a whole, and most large cities have a disproportionately large number of people receiving public assistance.

Interestingly, the number of cities where the proportion of families receiving public assistance exceeds the national level is substantially greater than the number where the proportion of poverty families is above average. This could mean that the cost of living is higher in cities or perhaps that money income, while an adequate measure of income in cities, may understate income in other, particularly rural, areas where income in kind is important. If either possibility were true, then the need for some form of assistance would be greater in cities than elsewhere. However, it could also be that large cities or the states in which they are located tend to have relatively generous public assistance programs. In either case, since public assistance is a component of money income, the high level of such income in large cities means that their per capita income figures are somewhat overstated relative to other areas. Nonetheless, despite these reservations, income figures do not support the proposition that cities, as a group, are unusually poor.

This is not to say that *some* cities are not disadvantaged. Moreover, there is a strong regional pattern to the distribution of these cities. Six of the seven large northeastern cities have per capita incomes below the national average; six have a higher-than-average share of families below the poverty level and all seven have had relatively slow income growth and exceed the country as a whole in terms of the proportion of families receiving public assistance. Several cities in the North Central region also fared relatively poorly according to all income measures and income growth in the region has been generally low. However, the median income of the North Central cities is slightly above the national average and the proportion of families living below the poverty level is less than the national share. The South is the most diverse of the regions. Cities like Washington, D.C. and Dallas have relatively high per capita incomes; others like El Paso and Birmingham are quite poor. The proportion of families below the poverty level ranges from 6 percent in Baton Rouge to over 20 percent in nearby New Orleans. However, most of the southern cities, whether rich or poor, have enjoyed above average income growth. Finally, in the West 12 out of 14 cities have per capita incomes above the national average.

Population growth is somewhat questionable as a measure of economic well-being. Differences in the rate of national increase or the

TABLE 1
The Economic Health of the 58 Largest Cities

	Per Capita Money Income 1974	Percent of Growth in Per Cap. Income 1969–74	Percent of Families Below Poverty Level 1969	Percent of Families on Pub. Assist. 1969	Population Growth 1960–70		Population Growth 1970–75		Unemployment Rate 1977
					Actual	Adj. for Annex. & Consol. (1960 base)	Actual	Adj. for Annex. & Consol. (1975 base)[e]	
United States	$ 4571	46.6%	10.7%	5.3%	13.3%		4.8%		7.0%
Northeast									
New York	4940	33.6	11.5	9.7	1.5		-5.2		10.0
Philadelphia	4330	43.5	11.2	8.6	-2.7		-6.8		9.7
Boston	4157	34.3	11.7	13.8	-8.1		-0.6		9.6
Pittsburgh	4426	44.1	11.1	9.4	-13.9		-11.7		8.2
Buffalo	3928	36.5	11.2	9.3	-13.1		-12.1		12.0
Newark	3348	42.1	18.4	18.5	-5.6		-11.0		15.9
Rochester	4335	39.9	8.9	6.7	-7.0		-9.8		8.7
Median	4330	39.9	11.2	9.4	-7.0		-9.8		9.7
North Central									
Chicago	4689	37.8	10.6	7.4	-5.2	-5.3	-8.0		7.4
Detroit	4463	39.5	11.3	8.3	-9.5		-11.7		9.9
Indianapolis	4843	41.0	7.1	2.9	56.3	-8.1	-4.0		6.1
Milwaukee	4680	47.0	8.1	5.9	-3.3	-4.2	-7.1		5.1
Cleveland	3925	39.0	13.4	8.6	-14.3		-14.9		8.7
Columbus	4333	43.3	9.8	6.2	14.5	8.9	-0.7		6.4
St. Louis	4006	47.0	14.3	10.0	-17.0		-15.6		7.8
Kansas City	4736	42.3	8.9	4.4	6.6	-8.1	-6.7		6.9
Cincinnati	4517	44.1	12.8	8.3	-10.0	-10.2	-8.8		7.3
Minneapolis	5161	48.3	7.2	7.6	-10.0		-12.9		4.9
Omaha	4887	49.3	7.2	4.8	15.2	-6.5	6.9	3.6	5.3
Toledo	4571	40.6	7.7	5.5	20.7	-6.0	-4.2		7.6
St. Paul	4931	45.2	6.4	5.9	-1.1		-9.7		4.6
Wichita	4951	52.1	8.2	3.3	8.6	-6.8	-4.3		5.0
Akron	4614	41.0	8.8	6.2	-5.1		-8.4		7.4
Median	4680	43.3	8.8	6.2	-3.3		-8.0		6.9
South									
Houston	5110	51.4	10.7	3.4	31.4	27.6	7.6	5.8	4.6
Baltimore	4330	50.6	14.0	10.1	-3.6		-6.0		8.7
Dallas	5285	43.0	10.1	4.6	24.2	22.6	-3.7		4.6

San Antonio	4795	48.4	17.5	7.3	11.3	8.8	18.2	9.1	7.1
Washington, D.C.	5659	47.3	12.7	6.4	–1.0		–5.9		9.7
Memphis	4383	57.7	15.7	7.3	25.2	–2.1	5.9	0.7	6.2
Jacksonville	4615	61.8	14.1	6.0	163.1	–18.3	6.2		6.6
New Orleans	4029	48.9	21.6	11.4	–5.4		–5.6		7.7
Nashville-Davidson	4606	53.2	10.4	3.8	162.2	–19.4	–0.2		4.3
Atlanta	4527	43.4	15.9	9.0	2.0	1.2	–12.3		9.6
El Paso	3479	45.6	16.8	3.3	16.5	16.4	19.9		11.6
Oklahoma City	4731	46.3	10.6	6.4	13.0	10.2	–		5.0
Miami	4416	56.2	16.4	12.9	14.8		9.0		10.2
Ft. Worth	4527	40.0	10.3	4.6	10.4	7.3	–8.9		6.1
Louisville	4302	45.5	13.0	8.1	–7.5	–10.7	–6.9		5.5
Tulsa	5173	48.1	9.0	5.5	26.7	–8.8	–		5.0
Austin	4379	45.9	11.0	3.9	35.0	11.1	19.4		4.7
Baton Rouge	4187	47.1	6.1	6.6	8.9	–4.6	77.1	8.3	6.3
Norfolk	4233	51.6	16.1	6.2	1.0		–6.8		6.1
Charlotte	4926	49.6	11.2	4.5	19.7	8.4	16.8	2.5	5.0
Tampa	4362	57.0	14.9	6.3	1.0	–4.0	0.7		8.4
Birmingham	4023	57.1	17.4	6.9	–11.7	–12.5	–8.3		7.9
Median	4472	48.7	13.5	6.4	12.2		–		6.3
West									
Los Angeles	5277	33.6	9.9	9.9	13.6	13.2	–3.2		9.0
San Diego	5016	42.6	9.3	6.6	21.6	19.8	11.0		9.1
Honolulu*	5065	45.6	7.2	3.7	25.7		11.9		7.3
Phoenix	4942	52.0	8.8	4.0	32.4	17.7	14.3	12.9	7.4
San Francisco	5990	41.5	9.2	9.9	–3.3		–7.1		8.3
San Jose	4972	46.4	6.7	8.0	118.3	79.1	24.7	20.5	7.7
Seattle	5800	43.2	6.0	5.8	–4.7		–8.3		8.4
Denver	5386	58.0	9.4	7.4	4.2	–7.3	–5.8		7.0
Long Beach	5652	42.9	8.2	7.7	4.2	1.9	–6.4		8.0
Oakland	5034	39.2	13.9	12.2	–1.6	–1.8	–8.6		10.1
Portland	5192	47.0	8.1	5.5	2.7	–1.4	–6.8		7.2
Tucson	4385	51.8	10.5	3.4	23.5	13.1	12.5		7.8
Albuquerque	4544	47.0	11.1	4.6	21.2	16.3	14.3		7.9
Sacramento	4765	40.8	10.5	13.3	32.7	–0.6	2.8		9.3
Median	5050	44.4	9.3	7.0	17.4		–0.2		8.0

e = estimated
* City and County of Honolulu.
SOURCES:
Unemployment rate — unpublished data from the U.S. Bureau of Labor Statistics and *Employment and Earnings*, January 1978.
Per capita money income 1974 and 1969–74 — U.S. Bureau of the Census, *Current Population Reports*, series P-25, Nos. 649–698.
Percent of families with income below poverty level in 1969 and percent of families receiving public assistance income in 1969 — U.S. Bureau of the Census, *Census of Population 1970, Characteristics of the Population, U.S. Summary*, T.182 and state volumes, T.90.
Population growth 1960–70 and population growth adjusted for annexations and consolidations to 1960 boundaries — *Census of Population 1970, Characteristics of the Population, U.S. Summary*, T. 40.
Population growth 1970–75 and adjustment for annexations and consolidations to 1975 boundaries — U.S. Bureau of the Census, *Statistical Abstract of the United States 1977*, T. 23 and *Current Population Reports*, series P-25, Nos. 649–698. An adjustment is made for annexations, consolidations and corrections if the 1970 population in the *Current Population Reports* is more than 5,000 *above* that listed in the *Statistical Abstract*.
The 58 cities are all those with 1975 populations in excess of 250,000 according to the *1977 Statistical Abstract of the United States*.

attraction of particular climates or lifestyles can create differences in population growth which are neither reflective of nor detrimental to economic health. On the other hand, a declining or very slow-growing population can be symptomatic of a decrease in employment opportunities and a deterioration in the quality of life. Moreover, where cities with large fixed costs are concerned, a declining population can place a severe fiscal burden on those residents and firms that remain. A declining population coupled with high unemployment and low incomes is a serious problem.

From 1960 to 1970, 22 out of the 58 cities recorded population gains greater than the national increase of 13.3 percent. Such a high proportion of relatively rapidly growing cities suggests than, once again, one cannot generalize about the weak performance of large cities. However, in this case a broad statement is appropriate. Many cities had large population increases because they annexed or consolidated with other areas. The population of Jacksonville increased 163.1 percent from 1960 to 1970, but all of the increase was the result of consolidation with the surrounding county. Had Jacksonville's boundaries remained unchanged, its population would have actually fallen 18.3 percent. If one looks only at the population growth within the area occupied by cities in 1960, one finds that 49 of the 58 cities grew more slowly than the Nation as a whole, and 37 had population decreases. Now, to the extent that the fiscal impact is the major problem associated with population decline, consolidation can largely eliminate the problem by adding new resources to the tax base. However, if the problem is also one of declining employment opportunities and increasing isolation of the poor in central cities, then consolidation may only obscure what is happening.

From 1970 to 1975 there were relatively few large annexations or consolidations, with the result that 38 cities, two-thirds of the total, had population declines over the five years. Many of those 38 cities had also lost population in the sixties. For some the cumulative loss has been substantial. Pittsburgh, Buffalo, Cleveland, St. Louis, and Minneapolis have all had population decreases in excess of 20 percent since 1960.

Thus, population loss is a fairly common phenomenon among large cities. It has been particularly marked in the seventies, but it is really not a new development. The number of annexations and consolidations in the sixties simply made it less apparent during that period. No part of the country has been unaffected: cities in all four regions have had population declines. However, as with income, there is a distinct regional character to the population changes. Population decreases have been more frequent and more severe in the Northeast and the North Central regions than in the South and West. From 1970–75 all seven large cities in the Northeast experienced population declines; 14 of 15 North Central cities also lost population, but only half of the cities in the South and the West had decreases. Of the five cities mentioned earlier as having lost more than 20 percent of their population since 1960 two are in the Northeast, three in the North Central. One reason for this pattern is that consolidations and annexations tend to be more common in the South and West. Since 1960 no boundary changes have occurred in the seven northeastern cities, whereas most southern cities experienced at least minor expansions. However, even after one has taken account of annexations, population losses are still much more prevalent in northern areas.

Unemployment rates, like the other indicators, show a significant number of large cities faring better than the country as a whole. In 1977, 21 of the 58 cities had unemployment rates below the national average. In some cases, the difference was substantial: Minneapolis and St. Paul, Houston, Dallas, Nashville-Davidson

and Austin all had unemployment rates below 5 percent. Of course, most cities did not do so well. Almost two-thirds of them had unemployment rates above the national average and 13 were in excess of 9 percent. Newark, the most disadvantaged city according to this indicator, had an unemployment rate more than twice the Nation's and almost four times that of the lowest city, Nashville-Davidson.

As with both income and population growth, unemployment rates follow a distinct regional pattern. However, this pattern is rather different from that shown by the other indicators. Cities in the Northeast still appear more distressed than those in any other part of the country — all seven have unemployment rates above the national average and two, Newark and Buffalo, have the highest unemployment rates of all 58 cities. The South again fares comparatively well although, as before, there is considerable diversity. The median unemployment rate in the South is the lowest of the four regions; at the same time, several southern cities have unusually high rates. What is different is the performance of cities in the North Central region and the West. In the West, which is prosperous according to income and population indicators, not a single city has an unemployment rate below the Nation's average. In the North Central region, on the other hand, half of the cities have unemployment rates below the national average and those cities with above average rates are still generally below cities in the Northeast and West.

Table 2 summarizes the regional pattern displayed by the income, population, and unemployment indicators. For each indicator and each region the table shows the number of cities faring better than the Nation as a whole, the number doing worse and, in the case of population, the number with negative growth. The final columns show how many cities are distressed according to all seven measures, five or more measures, and two or less — distressed being defined as doing worse than the national average in terms of the various income and unemployment measures and having negative population growth.

The weak condition of cities in the Northeast dominates the table. Five of seven cities performed more poorly than the country as a whole by all measures of economic well-being; all seven more poorly according to at least five. Thus cities of the Northeast are simultaneously poor, declining in population, and lacking sufficient employment opportunities for those residents who remain. In contrast, not a single city in either the South or West is distressed according to all seven indicators. This is not to say that no cities in these regions have problems. Six southern cities and three in the West fare poorly according to at least five indicators; however, in general the sense of economic distress is much less pervasive than in the Northeast. In the West most cities have per capita incomes above the national average, and a relatively low proportion of their residents are below the poverty level. In the South, low unemployment rates and rapid income growth are common. In both regions a substantial number of cities have experienced large population increases. The North Central region tends to be more like the Northeast. It is the only region other than the Northeast where some cities fare poorly according to all seven indicators. Population declines have been widespread and, in some cases, very large. However, there are important differences: income levels are relatively high and unemployment rates are low. This apparent prosperity coupled with declining populations may mean the population losses are not economically motivated. Alternatively, employment opportunities may be declining but migration has been an effective mechanism in maintaining income levels and holding down unemployment rates. In the Northeast the coin-

TABLE 2
The Economic Health of Large Cities:
Regional Summary
(number of cities)

	Per Capita Income–1974		*Percent Growth in Per Capita Income 1969–74*		*Percent of Families Below Poverty Level 1969*		*Percent of Families Rec. Public Assistance*	
	Above U.S.	*Below U.S.*	*Above U.S.*	*Below U.S.*	*Below U.S.*	*Above U.S.*	*Below U.S.*	*Above U.S.*
Northeast	1	6	0	7	1	6	0	7
North Central	9*	5*	5	10	11	4	4	11
South	9	13	15	7	6*	15*	7	15
West	12	2	5	9	12	2	4	10

	Percent Growth in Actual Population 1960–70			*Percent Growth in Actual Population 1970–75*			*Unemployment Rate*		*Distressed by:*		
	Above U.S.	*Below U.S.*	*Nega-tive*	*Above U.S.*	*Below U.S.*	*Nega-tive*	*Below U.S.*	*Above U.S.*	*All 7 Ind.*	*5 or more Ind.*	*2 or less Ind.*
Northeast	0	7	6	0	7	7	0	7	5	7	0
North Central	4	11	9	1	14	14	8	7	3	6	4
South	10	12	5	9	13	10	13	9	0	6	8
West	8	6	3	6	8	7	0*	13*	0	3	4

* One city same as U.S.
NOTE: "Distressed" means faring worse than the United States as a whole according to the unemployment and income measures and having negative population growth.
SOURCE: Table 1.

cidence of declining populations, low incomes, and high unemployment suggest a much more serious deterioration in the cities' economic bases.

In summary, the "city problem" can be characterized as follows:

1. as a group, large cities have been troubled by decreasing populations. This has been a problem for some time.
2. large cities are more likely than not to have high unemployment rates.
3. large cities as a group, are *not* particularly poor, in the sense of having low per capita incomes and high proportions of their residents below the poverty level. However, *some* large cities are substantially poorer than the country as a whole.
4. large cities tend to have relatively large dependent populations.
5. those large cities which are both poor, losing population, and suffering high unemployment rates are located disproportionately in the Northeast.

Cities in a Regional and Metropolitan Context

When compared with national averages cities in the Northeast and to a lesser extent the North Central region seem to have the most severe problems. This is especially true when distress is measured by a deterioration in economic well-being over time. The Northeast and North Central states, as regions, have also experienced serious economic problems since at least 1970. This suggests substantial interdependence between the problems of cities and broader economic trends in both of these regions. Table 3 presents information on pertinent economic characteristics of cities compared with their surrounding suburban areas and regionwide averages.

The importance of a region's economic health to that of its cities can be seen most clearly for income growth, population growth, and unemployment rates. The Northeast region has had the slowest rate of growth in per capita incomes and population. From 1970 to 1975, population grew by only 0.8 percent in the Northeast — less than one-tenth the rate in either the South or the West. Moreover, since cities everywhere tend to grow more slowly than their surrounding areas — unless there are annexations — the meager growth in the Northeast inevitably means population declines in many of its cities. On the other hand, the strong growth in the South and West has meant that most cities there were at least able to hold onto their absolute level of population even though their metropolitan share was diminishing.

Similarly, differences in income growth among the cities in the four regions are consistent with differences among the regions themselves. Cities in the Northeast have the slowest rates of income growth; those in the South the most rapid. However, per capita income in the Northeast as a whole grew only 39.8 percent from 1969 to 1974 — substantially less than the 54.3 percent growth in the South.

The regional influence is perhaps most apparent in unemployment rates. Unemployment rates are highest in the Northeast and West; lowest in the South and North Central regions. This pattern is reflected in the unemployment rates of the cities in the various regions. Cities in the West, while they appear relatively prosperous according to other indicators, have unemployment rates in excess of the national average. Cities in the North Central region, despite other problems, have generally low levels of unemployment. In both the Northeast and the South unemployment rates are more consistent with other indicators of city health — high in the Northeast and usually low

TABLE 3
Comparison of Cities and Suburbs by Region

	Percent of Families Below Poverty Level 1969	*Percent of Families on Public Assistance*	*Percent Change Population 1970–75*	*Per Capita Personal Income 1974*	*Percent of Population Nonwhite 1969*	*Unemployment Rate 1977*
United States	10.7%	5.3%	4.8%	$4571	12.5%	7.0%
Northeast	7.6	5.4	0.8	4802	9.6	8.5
Median City	11.2	9.4	–9.8	4330	21.3	9.7
Median Suburb	4.4	3.0	3.0	5210	3.6	7.3
North Central	8.3	3.8	1.9	4670	8.7	6.0
Median City	8.8	6.2	–8.0	4680	18.4	6.9
Median Suburb	4.8	1.9	6.8	4924	2.0	4.7
South	16.2	6.0	8.4	4137	19.7	6.4
Median City	13.5	6.4	0.0	4472	24.9	6.3
Median Suburb	9.0	3.0	12.2	4358	8.5	5.1
West	8.9	6.6	8.6	4900	9.8	7.8
Median City	9.3	7.0	–0.2	5050	11.1	8.0
Median Suburb	7.0	5.0	16.2	5161	4.6	7.5

SOURCE: Appendix Table A1.

in the South. However, in all four regions the city unemployment experience follows that of the larger area.

While the influence of broad regional economic trends partly explains the distressed condition of many cities in the Northeast and to a lesser degree North Central region, it certainly is not the whole explanation. A careful look at some of the other data in Table 3 indicates that the relationship between city problems and the economic well-being of their regions is a considerably more complex issue. For example, Table 3 indicates that in terms of money income the cities that are most distressed are located in relatively well-off regions. The Northeast had a per capita income in 1974 5 percent above the national average and the proportion of its population below the poverty level is lower than in any other part of the country. The region also had the greatest proportion of distressed cities. The North Central states which had the second greatest proportion of distressed cities also had a per capita income above the national average and the second lowest share of population below the poverty level. It should be noted that both of these measures consider well-being in terms of money income and do not make any adjustment for differences in the cost of living. The Northeast by most measures is the most costly part of the country and prices are also high in the North Central states.

However, the most striking difference between cities in different regions does not have to do with how closely they are or are not tied to area-wide economic conditions, but rather with their relationship to their surrounding suburban areas. In the Northeast, and to a lesser degree North Central states, cities tend to be much

more dissimilar to their surrounding suburbs in terms of economic well-being than is the case in either the South or the West. In 1974 the median per capita income of northeast cities was 17 percent below that of surrounding suburbs, while in the South and the West city and suburban per capita incomes were roughly the same. The median northeast city also had a significantly higher share of its population (11 percent) below the poverty level than the median suburban area (4 percent). In the South and West the shares of the population below the poverty level in the cities and suburbs are much more similar.

The greater disparity between city and suburban income in the Northeast is reflected in the proportion of the population receiving public assistance. In the Northeast and the North Central states more than three times as high a share of the population was on public assistance in central cities as in their surrounding communities. In the South the city's share was twice as high as that of suburban areas; and in the West the difference was about 50 percent.

These figures indicate that in the Northeast, and to a lesser degree the North Central states, there tends to be more economic segregation between cities and suburbs than in the South and West. This is also true racially. In all parts of the country a substantially higher proportion of the population in cities is minority than in suburbs. However, in the West and the South minorities make up about three times as great a share of city population as in suburbs; in the Northeast and North Central regions the city-suburb ratio is at least twice that.

Boston in the Northeast and Cleveland in the North Central states are interesting examples of wide differences in economic characteristics of cities and suburbs. Boston's per capita income in 1974 was 23 percent below the average of its suburbs and also close to three times as great a share of its population was below the poverty level. In Cleveland central city per capita income was 31 percent less than in surrounding suburbs and more than four times as great a share of its population was below the poverty level as in the surrounding area. Differences in city and suburban racial composition are especially dramatic for these two cities. In Boston 18 percent of the population is nonwhite contrasted to less than 2 percent in its surrounding suburbs; the comparable figures for Cleveland are 39 percent and 4 percent. Boston and Cleveland are also both fairly small central cities in much larger metropolitan areas; Boston's population comprises only 23 percent of its metropolitan area and Cleveland's 36 percent.

San Diego, on the other hand, is an example of a relatively new city in the West that is quite well off compared to its surrounding area. San Diego's per capita income in 1974 was 7.5 percent greater than its suburbs' although a slightly greater share of its population was below the poverty level — 9 percent vs. 8 percent. San Diego's population is 11 percent nonwhite contrasted with 4 percent in its surrounding suburbs.

Memphis is an example of a southern city that has annexed much of its suburban area and as a result has more favorable economic characteristics than the surrounding communities which remained independent. Memphis's per capita income is about one-fifth greater than its surrounding cities and towns. The suburban ring around Memphis also has a higher proportion of its population, 22 percent, below the poverty level than the central city, 16 percent, and in fact higher than any of the other suburban areas examined. Reflecting its ability to annex its surrounding area, Memphis comprises most of the metropolitan area's population, 81 percent. Thirty-nine percent of Memphis's population is minority, very similar to the share of suburban population — 32 percent.

The picture that emerges from all of this is that the most distressed cities are not only

located in the most slowly growing regions but have also been somewhat isolated from what economic gains there have been. Although the economic problems of the Northeast and North Central states have certainly affected them, cities in these regions are also much poorer relative to their suburbs than central cities in other parts of the country. The question is what factors have contributed to the substantial differences between cities and suburbs in these regions and why the pattern has not been repeated in the South and West.

The Role of Annexations

Two factors distinguish the cities of the Northeast and, to a lesser extent, the North Central region from those in the South and West. The first is age. Most of the cities in the first two regions developed as major population centers before the advent of the automobile. In 1920 four of the ten most populous cities were located in the Northeast, four in the North Central region, and only one in each of the South and West.[2] All seven of the cities in the Northeast ranked among the country's 25 largest cities. Six of the seven, the exception being New York City, had larger populations in 1920 than they do today (1975).

The second distinguishing characteristic, which applies particularly to cities in the Northeast, is that their geographic boundaries have not changed over the years. Only two of the seven northeastern cities, Pittsburgh and Rochester, have expanded their land area by more than 10 percent since 1920 and in both cases most of the change came in the 1930s. No major annexations or consolidations have occurred in the Northeast since 1940 (Chart 1). In the South only 2 of the 22 sample cities, Baltimore and Washington, did *not* expand their land area by more than 10 percent since 1920; only three did not since 1940. The situation in the West has been similar and even in the North Central region almost three-quarters of the cities have increased their land areas by more than 10 percent since 1920, half since 1940.

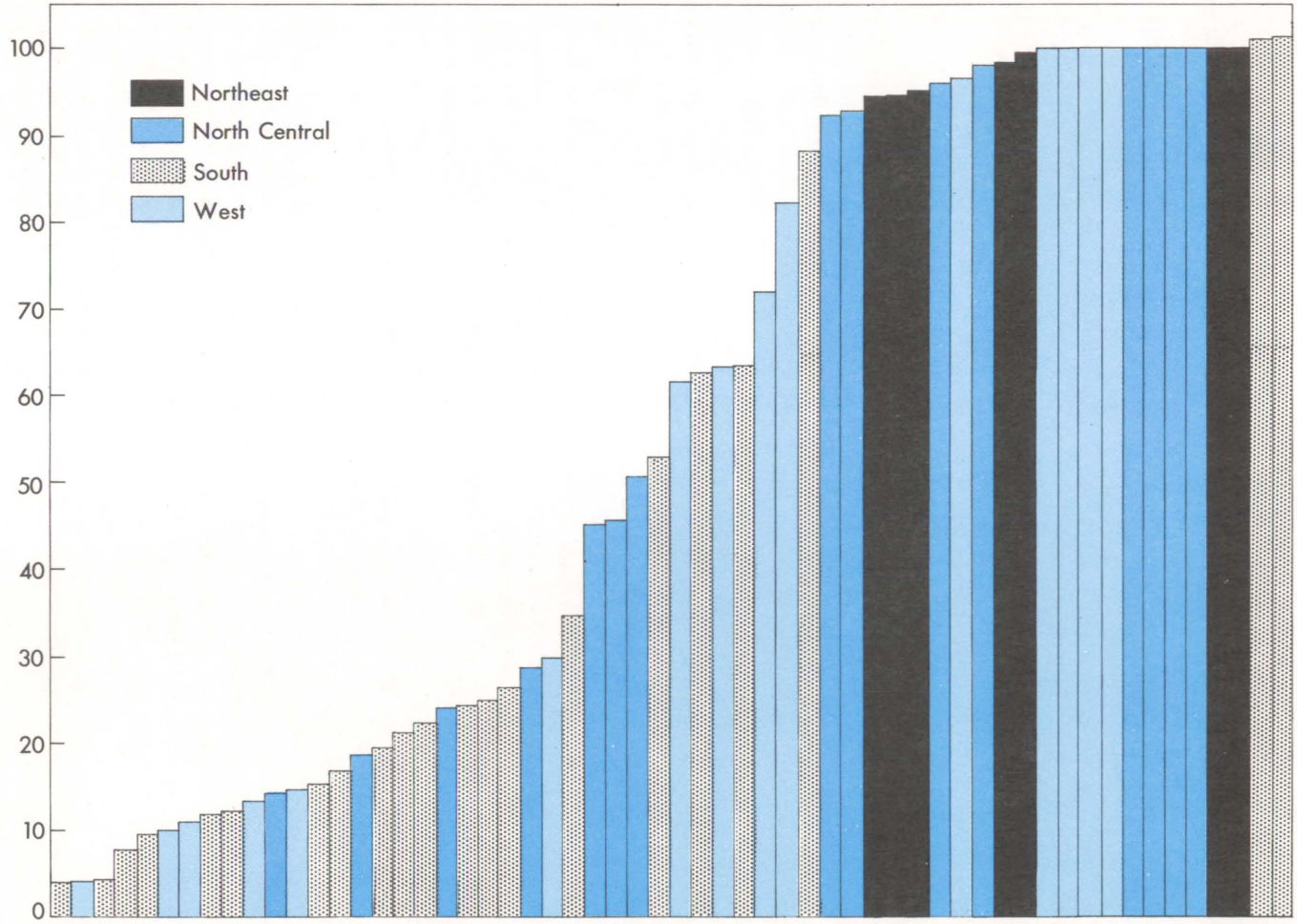
Because the cities of the Northeast developed so early and because their boundaries have not changed, their physical structures — their roads and sewer systems, their industrial capital, their residential structures — reflect preferences and technologies of many years ago. Roads built for horsedrawn vehicles are narrow for today's traffic. Much of the usable land area is occupied by apartments rather than single-family homes, by multistory factories and warehouses rather than by spacious single-level plants. More important still, most usable land area is occupied and has been throughout most of this century. As the automobile made it possible for people and goods to travel further, those individuals and industries whose preferences and needs required greater land area moved away from the built-up areas. In the Northeast this meant moving out of the city. The surrounding areas were often incorporated communities, fiercely independent with their own boundaries. Perhaps the most extreme case is Boston where most of the surrounding suburbs have had charters since before 1700.

Elsewhere the situation was very different. In a few cases, Honolulu and to some extent Los Angeles, early city boundaries were large enough to accommodate the need for space. More commonly, city boundaries have moved out with the population. In essence, movement from the original central city has simply meant movement from one part of a legally defined entity to another less densely populated area. Some of these expansions have been dramatic. As Chart 1 shows, the land areas of Houston and Dallas today are roughly six times what they

[2] New York (1), Philadelphia (3), Boston (7), Pittsburgh (9) in the Northeast; Chicago (2), Detroit (4), Cleveland (5), St. Louis (6) in the North Central; Baltimore (8) in the South and Los Angeles (10) in the West.

Chart 1

THE EFFECT OF ANNEXATIONS: LAND AREA IN 1940 AS A PERCENT OF 1970



were in 1940; those of Jacksonville and Phoenix, almost 25 times as great.

This ability to annex or consolidate with surrounding areas is a key factor explaining the sharp differences in population growth between northeastern cities and those of the South and West. Since 1940 cities everywhere have seen movement out from the central core to suburban areas. Most of the cities of the South and West and some of those in the North Central have been able to capture much of this movement by consolidating with the growing areas. Across much of the country the old central core and its surrounding suburbs are within the same legal and administrative boundaries. In the Northeast there is only the core.

The cumulative effect of these differences is reflected in the small size of the cities in the Northeast relative to their surrounding metropolitan areas. Despite New York City, which in 1970 accounted for 68 percent of the population of its metropolitan area, the median city in the Northeast had a population only one-third that of its standard metropolitan area (Appendix Table A2). In contrast, the median southern city accounts for just under 60 percent of its metropolitan area. For the long run this means that growth in the metropolitan area is much more likely to translate into city growth in the South and for that matter, the North Central and West, than it is in the Northeast. It also means that cities in the first areas may be inherently somewhat more attractive to potential residents. Through expansions cities have acquired a more diversified infrastructure, consisting not only of the older buildings in a high density core but also modern structures in more lightly used surrounding areas developed to serve an automobile age. Again, cities of the Northeast have only a core.

The ability to annex or consolidate with surrounding areas not only accounts for many of the differences in population growth among cities in different regions and between cities and suburbs in the same region but also contributes to differences in income levels between city and suburban residents. In general the more affluent have moved to suburban locations. In the Northeast this has meant that the more well-to-do have left the cities; in other regions the city has been able to retain these higher-income residents by expanding its boundaries to encompass them. In so doing the growing cities have been able to retain unimpaired tax bases, while the cities of the Northeast have lost not only population but also a disproportionate share of their wealth. Both indicative of this loss and contributing to it is the age of the housing stock in the various regions. In all of the cities in the Northeast 60 percent or more of the housing stock was built before 1940 (Appendix Table A3). In the South and the West only two cities were in this position. To a large extent this simply reflects the fact that northeastern cities have not grown, but it is also a problem in and of itself. An older housing stock generally means less wealth and, on the whole, is viewed as less desirable by those with the means to choose their location. Thus while older housing is a symptom of population decline, it also exacerbates the problem. Moreover, to the extent that housing is indicative of the stock of industrial capital, the problem is still more severe, for it means fewer and less attractive opportunities for employment.

The greater ability of cities in the South and West to annex or consolidate can be attributed to several factors: their greater fiscal and, in some cases, economic strength, the lack of a well-defined sense of community in the annexed areas, and state laws governing annexations. If a city has a strong fiscal base and tax rates are lower than or comparable to those in surrounding areas, communities may consider it

advantageous to consolidate or be annexed. Economies of scale in the provision of local services such as sewage and waste disposal may enable small towns or lightly populated areas to enjoy a much higher level of services as part of a larger entity than they would on their own, without a corresponding increase in tax rates. Also, if suburban areas have developed primarily as outgrowths of the city, they may feel a sense of identity with the larger area, and if there is no financial penalty, may view consolidation as merely confirming in law what already was true in fact. On the other hand, if communities have had a tradition of independence and of managing their own affairs, they may resist submerging their identities in those of the larger community. This is certainly the case in Boston where most of the surrounding towns have been incorporated since before 1700. Finally, state laws regarding annexation differ. In general, it appears that more power is given to the city as one goes further south. In New York, for example, annexations can only be initiated by a petition from the area to be annexed. If the surrounding communities do not wish to join with the larger area, then there can be no annexation. In Florida, on the other hand, annexations can be initiated by either the city or the area to be annexed. If proposed by the city, a referendum must be passed by a majority of voters in each area in separate elections. However, even if the referendum fails to pass, the legislature can authorize an annexation by special law. In Texas, "home-rule" cities — those with populations over 5,000 and a city charter — can annex adjacent land whether or not the residents approve.

Thus, annexations can occur either because both parties perceive union to be mutually advantageous, or where only the city desires annexation, state law is favorable to annexation. The two alternatives are linked. The ability to annex helps a city to maintain the integrity of its tax base and thus is likely to make that city a more attractive partner in any consolidation than it would otherwise be.

Conclusions

This article has shown that cities as a group are not markedly worse off than other parts of the country according to a set of common economic indicators. However, some cities clearly are in severe distress and these cities are concentrated disproportionately, although not exclusively, in the Northeast.

The problems faced by the cities of the Northeast — as well as Detroit, Cleveland, Cincinnati, and St. Louis in the North Central region; Baltimore, New Orleans, Louisville, and Birmingham in the South; and Oakland in the West — have both a purely economic and a fiscal component. On the one hand, these cities suffer from insufficient employment opportunities. Although people are leaving these cities in substantial numbers, jobs — at least the jobs that the remaining city residents can fill — have been leaving at an even faster rate. This lack of employment opportunities is reflected in the cities' high unemployment rates, their low and — except in the South — slowly growing incomes and the large proportions of their populations receiving public assistance.

At the same time these cities are faced with a fiscal problem. Low incomes mean that it is more difficult for residents of these cities to finance a given level of local services than residents of other, more prosperous cities. Moreover, because these cities have experienced large population losses, their public infrastructure is larger than their present needs. The costs of supporting this infrastructure must be borne by those who remain; so that not only are residents of these cities likely to have more difficulty pay-

ing for a given level of services, but also the level of services which they must support is likely to be higher than that in other cities.

The fiscal problems of northeastern cities may be easier to deal with than their economic difficulties. As discussed earlier, the Northeast is not a poor region and its suburbs have higher income levels than those in any other region. Thus, the resources to pay for city services are available within most metropolitan areas and states in the Northeast — they are simply not located within the cities themselves. Consequently, if one is concerned about the fiscal difficulties of cities in the Northeast, the first place to look for assistance would be the cities' own metropolitan areas and states. They have the necessary income and, presumably, would derive the greatest benefit from increasing the cities' fiscal health.

As discussed earlier, annexation is the way in which many cities in the South and West have maintained their fiscal integrity. Businesses and people leaving the central city for the suburbs cannot escape the city's taxing jurisdiction. It might well be that without the power of annexation the large southern and western cities would have more of the fiscal problems of those in the Northeast. However, since state laws in the Northeast often deny cities the ability to augment their tax base by annexing their comparatively well-off neighbors, state governments in that region rather than the Federal Treasury must bear much of the responsibility for providing additional fiscal assistance. Cities are creatures of the state so our form of government prescribes this remedy; economic reality also indicates that it is the most sensible approach.

Annexation is not, however, the only way in which a city's fiscal position can be strengthened. The creation of metropolitan districts to perform certain functions accomplishes the same thing as annexation — a broader sharing of the tax burden — for those particular functions while allowing cities and suburbs to provide independently those services for which local input is judged to be most critical. Alternatively, the state can take responsibility for the funding and administration of various programs previously handled at the local level. The state can also leave the administration to the local government, but at the same time provide substantial aid so that these programs will not impose an undue burden on the local community.

In the Northeast, state aid is fairly extensive. As Table A4 of the Appendix shows, in FY76 the median city in the Northeast received almost 30 percent of its revenues from state aid; "revenue from own sources" accounted for roughly 50 percent of the total.[3] Elsewhere state aid usually accounted for only 12 percent of city revenues; local sources about 65 percent. However, the Northeast has made much less use of special districts, which potentially can tap the wealth of suburban areas, than have other regions. In general, the level of expenditures for which the city is responsible is substantially greater in the Northeast than is usually the case elsewhere. To some extent, this may reflect more ambitious public undertakings in the Northeast; but most of the difference relates to how fiscal responsibility is allocated among the various levels of government. Among the Northeastern cities, median per capita expenditures in FY76 were $678 — in the North Central region $306; in the South $256 and in the West $286. Consequently, even though cities in the Northeast usually get more state aid, they still must pay for a much higher level of expenditures. Whether through conscious policy or merely historic accident, it would appear that the Northeast states have not taken as much responsibility for the welfare of their cities as have other regions.

[3] U.S. Department of Commerce, *City Government Finances in 1975–76.*

However, the economic problems of the Northeast's cities are likely to be much more difficult to resolve. One reason is that these economic problems extend beyond city borders. The entire Northeast appears to be undergoing a period of slow growth. As mentioned previously, the population increase from 1970–75 for the entire region was only .8 percent. Unemployment rates have been high throughout the 1970s,[4] and income levels have grown more slowly than in any other part of the country.[5] This means that cities in the Northeast cannot hope to ride to economic prosperity on the coattails of the surrounding areas. Cities everywhere have, in the absence of annexations, grown more slowly than their surrounding suburbs. However, in the Northeast the suburbs themselves are barely growing and unemployment rates are above the national average. While the reasons for population and business migration are many and the role of taxes is unclear, the Northeast cannot lightly run the risk of accelerating the outward movement by increasing the taxes on its higher income and more mobile sectors in order to finance extensive urban redevelopment. Thus, the starting point for any solution to the problems of the Northeast cities is to bolster the economic health of the entire region.

[4] L.E. Browne, "Regional Unemployment Rates — Why Are They So Different?" *New England Economic Review*, July/August 1978.

[5] The West also has slowly growing income levels and high unemployment rates. However, these high unemployment rates are largely the result of the very extensive migration into the region. Rapid in-migration may also explain the comparatively slow per capita income growth, as competition for jobs holds down wage increases.

TABLE A1
Comparison of Cities and Suburbs by Region
(background for Table 3)

	Per Capita Money Income 1974 ($)		*Percent of Families Below Poverty Level 1969*		*Percent of Families On Public Assist. 1969*		*Percent of Population Nonwhite 1970*		*Population Growth 1970–75 Percent Change*		*Unemployment Rate 1977*	
	City	*Suburbs*	*City*	*Suburbs*	*City*	*Suburbs*	*City*	*Suburbs*	*City*	*Suburbs*	*City*	*Suburbs*
Northeast												
New York	$4940	$6412	11.5%	4.3%	9.7%	2.9%	23.4%	6.4%	-5.2%	3.0%	10.0%	7.3%
Philadelphia	4330	5210	11.2	4.6	8.6	2.9	34.4	7.1	-6.8	4.0	9.7	8.0
Boston	4157	5390	11.7	4.4	13.8	4.5	18.2	1.6	-0.6	-0.9	9.6	7.3
Pittsburgh	4426	4739	11.1	6.1	9.4	3.7	20.7	3..6	-11.7	-1.0	8.2	6.2
Buffalo	3928	4712	11.2	4.5	9.3	3.0	21.3	2.3	-12.1	3.8	12.0	7.9
Newark	3348	6112	18.4	3.8	18.5	3.0	56.0	10.1	-11.0	-1.2	15.9	7.6
Rochester	4335	5280	8.9	3.4	6.7	1.7	17.6	1.7	-9.8	5.5	8.7	6.3
North Central												
Chicago	4689	5977	10.6	3.3	7.4	1.4	34.4	4.1	-8.0	8.4	7.4	4.6
Detroit	4463	6075	11.3	3.8	8.3	2.4	44.5	4.0	-11.6	4.8	9.9	6.8
Indianapolis	4843	4827	7.1	5.3	2.9	1.6	18.4	1.0	-4.0	15.8	6.1	4.8
Milwaukee	4680	5620	8.1	3.2	5.9	1.6	15.6	0.6	-7.1	6.7	5.1	3.5
Cleveland	3925	5721	13.4	3.2	8.6	1.5	39.0	3.8	-14.9	1.1	8.7	4.4
Columbus	4333	4875	9.8	4.4	6.2	1.7	19.0	2.1	-0.7	10.9	6.4	5.2
St. Louis	4006	4925	14.3	5.9	10.0	3.1	41.3	7.5	-15.6	3.0	7.8	6.3
Kansas City	4736	5234	8.9	5.5	4.4	2.8	22.8	5.7	-6.7	4.4	6.9	4.5
Cincinnati	4517	4689	12.8	5.8	8.3	2.5	28.1	3.1	-8.8	4.9	7.3	4.6
Minneapolis	5161	(1)	7.2	(1)	7.6	(1)	6.4	(1)	-12.9	(1)	4.9	(1)
Omaha	4887	4412	7.2	6.2	4.8	2.7	10.6	1.7	6.9	3.1	5.3	4.8
Toledo	4571	4896	7.7	5.1	5.5	2.6	14.3	1.7	-4.2	9.1	7.6	6.6
St. Paul	4931	(1)	6.4	(1)	5.9	(1)	4.6	(1)	-9.7	(1)	4.6	(1)
Wichita	4951	4455	8.2	7.4	3.3	1.6	11.1	1.6	-4.3	7.1	5.0	4.5
Akron	4614	4923	8.8	4.2	6.2	2.0	17.8	1.8	-8.4	2.7	7.4	6.1
Minneapolis-St. Paul		5275		3.0		2.2		0.7		9.4		3.8
South												
Houston	5110	5048	10.7	8.3	3.4	3.6	26.6	9.2	7.6	21.5	4.6	3.9
Baltimore	4330	5442	14.0	4.2	10.1	1.8	47.0	6.5	-6.0	11.2	8.7	5.0
Dallas	5285	(1)	10.1	6.8	4.6	2.9	25.8	5..8	-3.7	21.5	4.6	(1)
San Antonio	4795	4795	17.5	11.3	7.3	2.9	8.6	5.9	18.2	-14.3	7.1	6.2
Washington, D.C.	5659	6634	12.7	3.7	6.4	1.2	72.3	9.0	-5.9	6.9	9.7	3.6e
Memphis	4383	3697	15.7	21.5	7.3	7.8	39.2	32.1	5.9	-13.0	6.2	7.1
Jacksonville	4615	3881	14.1	(2)	6.0	(2)	22.9	(2)	6.2	(2)	6.6	6.0
New Orleans	4029	4358	21.6	9.6	11.4	4.8	45.5	12.8	-5.6	17.9	7.7	7.4
Nashville-Davidson	4606	4256	10.4	15.0	3.8	4.3	19.9	8.5	-0.2	23.7	4.3	5.0

Atlanta	4527	5322	15.9	5.3	9.0	2.7	51.6	6.4	-12.3	20.8	9.6	6.2
El Paso	3479	2869	16.8	23.5	3.3	3.8	3.3	8.8	19.9	2.7	11.6	13.5
Oklahoma City	4731	4305	11.0	7.8	6.4	3.3	16.0	4.0	–	13.2	5.0	4.2
Miami	4416	5713	10.6	9.0	12.9	4.4	23.4	12.6	9.0	15.1	10.2	8.3
Ft. Worth	4527	(1)	10.3	5.6	4.6	2.4	20.6	1.6	-8.9	15.6	6.1	(1)
Louisville	4302	4805	13.0	5.3	8.1	2.3	24.0	3.4	-6.9	7.5	5.5	5.1
Tulsa	5173	3777	9.0	11.6	5.5	6.9	13.4	7.8	–	14.5	5.0	5.0
Austin	4379	4063	11.0	9.8	3.9	3.0	12.8	6.6	19.4	40.0	4.7	3.5
Baton Rouge	4187	3408	6.1	12.2	6.6	5.4	28.2	30.0	77.1	-85.6	6.3	8.6
Norfolk	4233	(1)	16.1	(1)	6.2	(1)	30.2	(1)	-6.8	(1)	6.1	(1)
Charlotte	4926	(1)	11.2	8.1	4.5	2.2	30.6	13.1	16.8	-8.1	5.0	(1)
Tampa	4362	(1)	14.9	(1)	6.3	(1)	20.0	(1)	0.7	(1)	8.4	(1)
Birmingham	4023	4557	17.4	14.2	6.9	5.7	42.2	20.9	-8.3	9.9	7.9	6.1
Dallas-Ft. Worth		4812										4.2
Norfolk-Portsmouth				9.8		2.4		14.6		21.5		
Norfolk-Portsmouth-Virginia Beach		3824										5.6
Charlotte-Gastonia		4324										4.3(3)
Tampa-St. Petersburg		4829		8.7		2.7		4.7		36.4		8.0
West												
Los Angeles	5277	(1)	9.9	(1)	9.9	(1)	22.8	(1)	-3.2	(1)	9.0	(1)
San Diego	5016	4666	9.3	7.9	6.6	5.4	11.1	4.4	11.0	22.7	9.1	8.3
Honolulu*	5065	(2)	7.2	(2)	3.7	(2)	66.1	(2)	11.9	(2)	7.3	(2)
Phoenix	4942	4933	8.8	9.0	4.0	3.1	6.7	3.6	14.3	43.7	7.4	7.6
San Francisco	5990	(1)	9.2	(1)	9.9	(1)	28.6	(1)	-7.1	(1)	8.3	(1)
San Jose	4972	6174	6.7	5.0	8.0	5.5	6.4	5.2	24.7	-0.2	7.7	6.3
Seattle	5800	(1)	6.0	(1)	5.8	(1)	12.6	(1)	-8.3	(1)	8.4	(1)
Denver	5585	(1)	9.4	4.9	7.4	3.0	11.0	1.5	-5.8	27.6	7.0	(1)
Long Beach	5652	(1)	8.2	(1)	7.7	(1)	8.2	(1)	-6.4	(1)	8.0	(1)
Oakland	5034	(1)	13.9	(1)	12.2	(1)	40.9	(1)	-8.6	(1)	10.1	(1)
Portland	5192	5126	8.1	6.1	5.5	3.7	7.8	1.3	-6.8	14.7	7.2	6.4
Tucson	4385	5161	10.5	11.7	3.4	4.6	5.2	9.9	12.5	66.3	7.8	7.3
Albuquerque	4544	2019	11.1	20.2	4.6	7.1	4.3	6.1	14.3	17.6	7.9	9.1
Sacramento	4765	4852	10.5	7.7	13.3	7.1	18.5	4.6	2.8	12.5	9.3	8.5
Los Angeles-Long Beach		5252		7.0		7.2		9.2		1.5		7.2
San Francisco-Oakland		6065		5.4		5.9		9.0		5.6		7.1
Seattle-Everett		5236		4.5		3.9		2.0		3.7		8.1
Denver-Boulder		5316										5.3

e = estimated
* City and County of Honolulu.
(1) SMSA has more than one city listed in the title. Suburbs are assumed to exclude all cities appearing in the title.
(2) Central city and SMSA boundaries are the same.
(3) Suburbs include Gastonia.
NOTE: Suburban data on percent below the poverty level, percent on public assistance, percent nonwhite and population growth 1970–75 are based on the SMSA definitions in the *Census of Population 1970*. Suburban data for income and unemployment rates are based on 1975 definitions. Also if the SMSA definition in 1975 has additional cities appearing in the title, these extra cities are excluded from the suburbs for unemployment and income, even if they were treated as suburbs for the poverty, welfare, race and growth variables. Denver-Boulder is an example.
SOURCE: Same as Table 1. Data on percent nonwhite is from the *Census of Population 1970*, state volumes, Table 23.

TABLE A2
City Population as a Percent of SMSA Population, 1970

Northeast		North Central	
New York	68.2%	Chicago	48.2%
Philadelphia	40.5	Detroit	36.0
Boston	23.3	Cleveland	36.4
Pittsburgh	21.7	Indianapolis	67.1
Buffalo	34.3	Milwaukee	51.1
Newark	20.6	Columbus	58.9
Rochester	33.6	St. Louis	26.3
		Kansas City	40.4
South		Cincinnati	32.7
Houston	62.1	Minneapolis	24.0
Baltimore	43.7	Omaha	64.3
Dallas	54.3	Toledo	55.4
San Antonio	75.7	St. Paul	17.1
Washington, D.C.	26.4	Wichita	71.0
Memphis	81.0	Akron	40.6
Jacksonville	100.0	Minneapolis-St. Paul	41.0
New Orleans	56.8		
Nashville-Davidson	82.8	West	
Atlanta	35.8	Los Angeles	40.0
El Paso	89.7	San Diego	51.3
Oklahoma City	57.2	Honolulu*	100.0
Miami	26.4	Phoenix	60.1
Ft. Worth	51.6	San Francisco	23.0
Louisville	43.7	San Jose	41.9
Tulsa	69.5	Seattle	37.3
Austin	85.2	Denver	41.9
Baton Rouge	58.2	Long Beach	5.1
Norfolk	45.3	Oakland	11.6
Charlotte	58.9	Portland	37.9
Tampa	27.4	Tuscon	74.8
Birmingham	40.7	Albuquerque	77.2
Norfolk-Portsmouth	61.6	Sacramento	31.8
Tampa-St. Petersburgh	48.8	Los Angeles-Long Beach	45.2
		San Francisco-Oakland	34.6
		Seattle-Everett	41.1

* City and County of Honolulu.
SOURCE: *1970 Census of Population, United States Summary*, Tables 31 and 32.

TABLE A3
Percent of City Housing Stock Built Before 1940

Northeast		North Central	
New York	62.1%	Chicago	66.6%
Philadelphia	69.5	Detroit	61.8
Boston	77.2	Cleveland	73.4
Pittsburgh	74.4	Indianapolis	39.7
Buffalo	85.7	Milwaukee	55.0
Newark	68.4	Columbus	39.0
Rochester	79.5	St. Louis	73.8
		Kansas City	51.2
South		Cincinnati	59.3
Houston	17.3	Minneapolis	68.1
Baltimore	60.0	Omaha	46.1
Dallas	18.1	Toledo	56.8
San Antonio	25.8	St. Paul	62.4
Washington, D.C.	47.0	Wichita	29.0
Memphis	23.0	Akron	57.0
Jacksonville	20.9		
New Orleans	35.7	West	
Nashville-Davidson	24.8	Los Angeles	32.2
Atlanta	30.3	San Diego	21.7
El Paso	22.7	Honolulu*	16.0
Oklahoma City	29.1	Phoenix	11.2
Miami	29.9	San Francisco	66.9
Ft. Worth	26.7	San Jose	13.9
Louisville	53.2	Seattle	47.6
Tulsa	25.9	Denver	41.0
Austin	17.0	Long Beach	31.6
Baton Rouge	20.7	Oakland	53.3
Norfolk	30.6	Portland	57.2
Charlotte	19.3	Tucson	13.1
Tampa	28.6	Albuquerque	12.6
Birmingham	42.7	Sacramento	27.7

* City and County of Honolulu.
SOURCE: U.S. Bureau of the Census, *Census of Housing 1970, Housing Characteristics for States, Cities and Counties*, state volumes, Table 43.

TABLE A4
City Expenditures Per Capita and Revenue Sources by Region FY76

	Expenditures Per Capita	Percent of General Revenues from: Own Sources	State Sources
Northeast			
New York	$1625	49.8%	43.1%
Philadelphia	482	61.4	14.8
Boston	1024	57.8	23.9
Pittsburgh	256	58.4	13.0
Buffalo	678	33.8	39.0
Newark	949	40.4	54.3
Rochester	610	51.4	29.4
Median	678	51.4	29.4
South			
Houston	196	81.4	1.3
Baltimore	911	34.7	50.4
Dallas	200	81.2	1.7
San Antonio	161	69.4	3.9
Washington, D.C.	1879	51.0	
Memphis	402	37.3	31.8
Jacksonville	300	61.8	19.8
New Orleans	337	57.6	15.1
Nashville-Davidson	498	66.9	21.0
Atlanta	344	73.7	11.4
El Paso	128	76.2	1.3
Oklahoma City	212	69.2	6.3
Miami	218	70.9	17.4
Ft. Worth	183	67.7	2.3
Louisville	329	59.1	10.8
Tulsa	219	62.3	4.8
Austin	265	70.7	1.8
Baton Rouge	233	68.9	12.7
Norfolk	606	49.6	33.4
Charlotte	251	57.0	12.4
Tampa	257	53.4	11.8
Birmingham	256	71.9	5.4
Median	256	67.3	11.4
North Central			
Chicago	306	71.0	11.6
Detroit	416	54.7	15.1
Indianapolis	307	52.3	27.4
Milwaukee	267	48.7	36.9
Cleveland	348	73.1	9.4
Columbus	256	69.1	11.6
St. Louis	426	71.5	11.6
Kansas City	354	74.7	4.5
Cincinnati	843	56.7	18.3
Minneapolis	310	60.6	23.5
Omaha	193	57.5	10.5
Toledo	266	66.5	11.2
St. Paul	306	62.5	19.8
Wichita	240	66.4	10.8
Akron	237	70.1	7.4
Median	306	62.5	11.6
West			
Los Angeles	282	73.8	11.2
San Diego	212	61.5	14.3
Phoenix	227	56.1	22.4
San Francisco	850	56.7	25.7
San Jose	180	67.3	14.0
Seattle	345	68.9	11.4
Denver	577	67.1	18.5
Long Beach	420	76.3	11.0
Oakland	364	69.7	11.7
Honolulu	291	64.8	4.6
Portland	307	63.2	10.1
Tucson	265	58.7	20.9
Albuquerque	269	42.9	28.7
Sacramento	267	73.7	18.6
Median	286	66.0	12.8

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *City Government Finances in 1975-76*, GF76, No. 4.

Liquidity Creation by Euro-banks: 1973–1978

By Jane Sneddon Little*

Introduction

The financial world continues to be greatly concerned about the inflationary impact of the Euro-currency market.[1] Among students of this market, however, there is a growing consensus that Euro-banks create very little additional money or other assets for the spending (i.e., nonbank) public. Accordingly, interest has shifted to the question of whether the Euro-banks exert an expansionary impact by making the economically active public more liquid according to maturity criteria. Euro-banks might exert such an influence by providing nonbanks with short-term assets and, on balance, relatively longer term debts. Previous research on this matter suggests that in 1973 the Euro-banks were creating very little net liquidity for their nonbank customers, purportedly much less than that created by U.S. commercial banks. This article explores recent trends and concludes, by contrast, that Euro-banks are currently creating much more net liquidity in terms of maturity transformation for the nonbanks than had hitherto been indicated. The article also compares Euro-bank liquidity creation with that of U.S. commercial banks and suggests some possible reasons for and consequences of the change in Euro-bank behavior.

Euro-banks and Money Creation

Euro-banks are frequently considered to be "engines of inflation" since the fear that they can create money or other financial assets beyond what would otherwise be available to the spending public remains widespread. A recent news article cites an investment banker as saying, for instance, that "you can theoretically increase credit creation in the Eurocurrency markets forever."[2] Similarly, a Yale University professor is quoted as believing that "the Euro-markets are contributing to the explosive growth of world liquidity, which could be dangerously inflationary if uncontrolled."[3]

By contrast, most students of the Euro-dollar increasingly agree that Euro-banks do not create additional money or financial assets for non-

*Economist, Federal Reserve Bank of Boston. The author is grateful for the assistance of Judy Liss, who was largely responsible for developing the remaining maturity estimates for U.S. bank assets and liabilities.

[1] The *Euro-currency market* is the market for balances deposited in banks outside of the home country of the currency used for denomination. In other words, the Euro-dollar market is the market for dollar balances deposited in banks outside of the United States. *Euro-banks* are the banks which accept and relend Euro-currency deposits.

[2] "Stateless Money," *Business Week*, August 21, 1978, p. 85.

[3] *Ibid.*, p. 85.

banks to any significant extent. As part of this belief, they suggest that the Euro-currency multiplier remains close to one. The concept of a Euro-currency multiplier is, of course, related to the familiar commercial bank deposit multiplier. According to this multiplier analysis, commercial bank lending operations will multiply an initial quantity of primary deposits or reserves into a larger final quantity of deposits because as the primary deposits are lent out to nonbank borrowers, some of the proceeds eventually are redeposited with Euro-banks.

This commercial bank multiplier model (which assumes that commercial banks can increase their deposits and loans without affecting relative interest rates and that their customers will hold a fixed proportion of their assets in the form of bank deposits) cannot be applied to Euro-banks without significant modifications, however. This lack of direct applicability stems from the fact that Euro-banks operate in an unregulated, highly competitive market where each sizable transaction clearly does change relative interest rates. Moreover, in part because Euro-dollar deposits do not serve as a means of payment, depositors do not hold a set share of their assets in this form. For these reasons, if European depositors decide to transfer funds from banks in the United States to the Euro-dollar market because of the advantages of holding these balances in local European banks, the shift in primary deposits would bring about a relative decline in Euro-dollar interest rates that might induce some funds to flow in the reverse direction, from the Euro-dollar market to the United States. As a consequence, the final increase in Euro-dollar deposits might be less than the inflow of primary deposits. In other words, the multiplier might be even lower than one.

On the other hand, Euro-dollar deposits are assets with relatively low effective reserve requirements. Because Euro-banks hold their (minimal) reserves as deposits with U.S. commercial banks which in turn make loans on the basis of these foreign bank deposits, the sterile reserves behind Euro-dollar deposits are very low. If, for example, a Euro-bank holds 2 percent of its Euro-dollar deposits in demand deposits with a large U.S. commercial bank, and the U.S. bank holds 16.25 percent of those deposits as reserves and uses the balance to extend loans, only .325 percent (.02 x .1625) of the Euro-dollar deposits would be sterilized as reserves with a Federal Reserve bank. The fractional reserve aspects of the Euro-currency banking system would thus tend to produce a multiplier well above one and would at least partially offset the leakages induced by relative interest rate changes. Several recent studies which incorporate both the changes in relative interest rates and the reduction in required reserves caused by a transfer of funds to the Euro-dollar market suggest that the Euro-dollar multiplier is in the vicinity of one.[4] The most specific of these studies states that between 1968 and 1972 the Euro-dollar multiplier was 1.4 at the maximum.[5]

Do Euro-banks Create Liquidity for Nonbanks?

Since Euro-banks appear to create little additional money or other financial assets for

[4] See, for instance, John Hewson and Eisuke Sakakibara, "The Euro-dollar Deposit Multiplier: A Portfolio Approach," *IMF Staff Papers*, XXI (July 1974), 307–328; Jürg Niehans and John Hewson, "The Euro-dollar Market and Monetary Theory," *Journal of Money, Credit and Banking*, VIII (February 1976), 1–27; Andrew D. Crockett, "The Euro-Currency Market: An Attempt to Clarify Some Basic Issues," *IMF Staff Papers*, XXIII (July 1976), 375–386, and John Hewson and Eisuke Sakakibara, "A General Equilibrium Approach to the Eurodollar Market," *Journal of Money, Credit and Banking*, VIII (August 1976), 297–323.

[5] Hewson and Sakakibara, "The Euro-dollar Deposit Multiplier" (1974), 325.

nonbanks, Euro-market analysts have begun to ask whether Euro-banks exert an expansionary impact by making the spending public more liquid according to maturity criteria, than they otherwise would be. Euro-banks might change the liquidity of the nonbank public — without varying the volume of loans available — by modifying the maturity structure of their assets and liabilities. For example, if Euro-banks accept one-month deposits from the nonbank public and extend loans to them also payable in one month, the net liquidity of the nonbank sector taken as a whole will not have increased at all. If, on the other hand, the Euro-banks extend the maturity of their claims and make six-month loans on the basis of one-month deposits, the net liquidity of the nonbanks will have increased. Similarly, if the Euro-banks reduce the maturity of their liabilities and make one-month loans on the basis of one-week deposits, this maturity transformation will also have increased the net liquidity of the nonbanks.

In order to measure the contribution to the net liquidity of nonbanks made by this type of maturity transformation, the volume of various bank assets and liabilities can be weighted by their maturity with the shortest terms being considered closest to money and thus being assigned the highest weights. While the specific weights are of crucial importance and could be subject to considerable debate, this paper will arbitrarily adopt the weights used in previous work on this subject in order to facilitate comparison over time.[6] (The appropriateness of these weights will be discussed later on pages 70–71.) The amount of maturity transformation performed can then be indicated by summing the banks' maturity-weighted liabilities to nonbanks and subtracting the sum of the banks' maturity-weighted claims on nonbanks. A positive number indicates that the banks are borrowing short to lend long. The bigger the number, the greater is the amount of positive maturity transformation occurring.

Such positive maturity transformation undoubtedly has a somewhat expansionary impact on the economy, because it gives the spending public greater freedom of action. To illustrate, a person granted a $100,000 loan payable in one week will probably use it differently from a person granted a loan of the same amount repayable in instalments over 15 years. Similarly, a depositor with an account which is accessible in a day or a week will be able to react to unforeseen opportunities or crises differently from a depositor holding a two-year deposit. Generally, positive maturity transformation permits investors to commit themselves to risky endeavors or to undertake high income-generating projects which take a long time to bear fruit. Indeed, positive maturity transformation allows some transactions to occur which would be impossible in its absence.

Do Euro-banks perform such positive maturity transformation to any significant extent? Previous research on Euro-bank liquidity creation by Jürg Niehans and John Hewson suggests that in September 1973 Euro-banks were creating very little net liquidity for nonbanks. Using data compiled by the Bank of England on the remaining maturity of Eurocurrency claims and liabilities at all U.K. Euro-banks, Niehans and Hewson applied the weights shown in Table 1 to the proportion[7] of nonbank

[6] Niehans and Hewson, "The Euro-dollar Market and Monetary Theory," 11.

[7] Niehans and Hewson applied their weights to the share of assets or liabilities in each category because U.S. Euro-bank claims on nonbanks are generally greater than their liabilities to nonbanks. The difference may be matched by net borrowing from other banks or net conversions of funds out of sterling. In using these shares, the authors were willing to assume that the liabilities to nonbanks which the London banks incurred indirectly through other banks had the same maturity structure as those they incurred directly. Data on Asia-dollar and other Euro-banks not available to Niehans and Hewson and data on U.S. banks developed for this paper suggest that Niehans and Hewson were reasonably safe in making their assumption.

TABLE 1
Liquidity Weights for Selected Maturities

Maturity	*Liquidity Weight*
Less than 8 days	.9
8 days – <1 month	.8
1 month – <3 months	.7
3 months – <6 months	.6
6 months – <1 year	.4
1 year – <3 years	.2
3 years and over	.1

[1] Money would have a liquidity weight of one.
SOURCE: Niehans and Hewson, "The Euro-Dollar Market and Monetary Theory," 11.

assets and liabilities in each maturity category. Taking the difference between the weighted sum of liabilities to nonbanks and the weighted sum of claims on nonbanks, the authors then arrived at a measure of Euro-bank net liquidity creation (or maturity transformation) for nonbanks. From this calculation, they concluded that in September 1973 the moneyness of Euro-bank liabilities exceeded the moneyness of Euro-bank assets by 16 percent. For every dollar deposited with the Euro-banks, thus, Euro-bank transactions resulted in the same impact on economic activity as an increase of 16¢ in the money supply (M_1), according to the weighting scheme shown in Table 1. In other words, since the Euro-banks were only creating about 16¢ in net liquidity for the nonbanks for every dollar deposited with them, Euro-bank liquidity creation was less than one-sixth of Euro-bank deposit creation. In the absence of comparable data for national banking systems, Niehans and Hewson added, the amount of liquidity creation in the Euro-banking system is probably much lower than in the U.S. banking system.[8]

Analysis of the data since 1973 suggests that Euro-banks are currently creating much more net liquidity for nonbanks than they were at that time. As shown in Table 2, applying the same methods just described indicates that Euro-bank liquidity creation has increased since 1973, particularly in 1974 and 1975. During the last two years covered by the data, U.K. Euro-banks have been creating about 40¢ in net liquidity for nonbanks for every dollar deposited with them. The high point of 41.3¢ was reached in November 1976. Since then the figure has fallen slightly to 37.8¢ in May 1978.

This change from 1973 to the present represents some shortening of maturities on the liability side of the balance sheet but primarily a lengthening on the asset side. For instance, the share of deposits with a remaining maturity of less than three months rose from 68 percent in September 1973 to 78 percent in November 1977. The share of assets with a remaining maturity of more than one year almost doubled, however, from 30 percent in 1973 to 59 percent in November 1977.

Are these data for the U.K. Euro-banks typical of all Euro-banks? The Bank of England provides a breakdown of its maturity analysis by

TABLE 2
Net Liquidity Creation by U.K. Euro-banks vis-à-vis Nonbanks, 1973–1978

	(Cents per $1 of Deposits)
1973, September	16.5
1974, May	24.3
November	31.1
1975, May	37.3
November	37.0
1976, May	37.6
November	41.3
1977, May	40.9
November	38.7
1978, May	37.8

SOURCE: Based on data from the *Bank of England Quarterly Bulletin*, selected issues, March 1974–September 1978.

[8] Niehans and Hewson, "The Euro-dollar Market and Monetary Theory," 12–13.

TABLE 3
Net Liquidity Creation by U.K. Euro-banks vis-à-vis Nonbanks by Nationality of Bank, 1973 and 1977

	(Cents per $1 of Deposits)	
	September 1973	*November 1977*
British	11.4	45.6
American	15.0	40.8
Japanese	28.9	36.3
Other Overseas	7.6	26.4
Consortium	28.3	49.8

SOURCE: Based on data from the *Bank of England Quarterly Bulletin.*

nationality of parent bank, and, as Table 3 shows, the amount of maturity transformation performed varied considerably by nationality in 1973 with the relatively small Japanese and consortium bank operations appearing at the high end of the range, and the "other overseas" banks appearing at the low end. Similar figures for 1977 show less variation by nationality, although the British and consortium banks were performing more maturity transformation than the U.S., Japanese and particularly the "other overseas" banks. Moreover, the trend towards increased maturity transformation is evident across the board, affecting all nationality groups.

Furthermore, other fragments of data support the same general conclusion that the U.K. figures are broadly and increasingly representative of the trends at all Euro-banks. For instance, data on the maturity of all (as opposed to nonbank) assets and liabilities at Singapore's Asia Currency Unit banks indicates that in 1973 the ACU banks, like their U.K. counterparts, were matching the maturities of their deposits and loans fairly closely, as Table 4 shows. While the ACU banks were doing more business with terms of 3 to 12 months, the U.K. banks were doing more business with terms of under three months and over one year. On balance, in 1973 the U.K. banks were engaging in slightly more maturity transformation than the ACU banks, for the U.K. banks were creating about 5¢ in liquidity for all of their customers for every dollar deposited with them while the ACU banks were creating 2¢.[9] By 1976, when the maturity structures of their assets and liabilities were more similar than in 1973, both sets of banks were creating 9¢ in net liquidity for every dollar deposited with them. Seemingly, thus, the trend toward increased maturity transformation is widespread in the Euro-currency market.

Another fragment of data which suggests that Euro-banks of all nationalities may now have broadly similar maturity structures is that Bank for International Settlements data on the external claims of banks in the Group of 10 Countries, Denmark, Ireland, and Switzerland and their offshore affiliates show that in late 1976 81 percent of the (largely Euro-currency) external claims of this large group of banks was made for one year or less. The comparable figure for the Euro-currency claims of U.K. and ACU banks was 76 percent and 83 percent respectively.

Comparison with Liquidity Creation at Commercial Banks in the United States

How does the amount of maturity transformation (liquidity creation) performed by Euro-banks compare with that performed by commercial banks in the United States? Unfortunately, comprehensive maturity data comparable to those collected by the Bank of England for Euro-banks are not available for banks in the United States (nor are such data available, incidentally, for the domestic currency transactions of U.K.

[9] Part of these differences may reflect the fact that the ACU data for 1973 give original maturities while the U.K. data are for outstanding maturities. In 1976 both ACU and UK data reflect outstanding maturities.

TABLE 4
Total Net Liquidity Creation by U.K. and Singapore Euro-banks,* 1973 and 1976

	U.K. Euro-banks			*Singapore ACU Banks*	
	Liabilities	*Claims*	*Weight*	*Liabilities*	*Claims*
	(percent)	(percent)		(percent)	(percent)
1973					
Sight – 3 months	65	59	.80	49	45
3 months – 12 months	30	29	.50	48	50
Over 1 year	6	13	.15	4	5
Net Liquidity Creation (Cents per $1 of deposits)	5			2	
1976					
Sight – 3 months	68	54	.80	78	61
3 months – 12 months	25	22	.50	20	22
Over 1 year	7	24	.15	2	17
Net Liquidity Creation (Cents per $1 of deposits)	9			9	

*The UK and ACU data are not exactly comparable. The ACU data for 1973 are for original maturity while all other data are for outstanding maturity. The 1973 figures are for September for the U.K. and for December for the ACUs while the 1976 figures are for September for the ACUs and November for the U.K. Finally, the U.K. and Singapore sources divide the maturity categories differently by 1 day.

SOURCE: Based on data from the *Bank of England Quarterly Bulletin* and from the Monetary Authority of Singapore, *Quarterly Bulletin* cited in Zoran Hodjera, "The Asian Currency Market: Singapore as a Regional Financial Center," International Monetary Fund, *Staff Papers*, XXV (June 1978), Table 3, 232–33.

banks). Therefore, in order to make a comparison with U.K. Euro-banks, it is necessary to estimate from incomplete data the outstanding maturities of various types of nonbank assets and liabilities at U.S. commercial banks.

These data differ considerably from one asset or liability to another in form and detail. For instance, the Federal Reserve System conducts periodic surveys of the maturity of time deposits at U.S. banks. Similarly, detailed maturity information is available for commercial bank holdings of U.S. Treasury securities and commercial and industrial loans, two large classes of assets. As for other types of assets, outstanding maturity figures can only be estimated from published data of various degrees of detail. In the case of instalment loans to individuals, for instance, estimates of the average original maturity can be based on published outstanding and repayment figures. From the original maturity and extension figures in turn, it is then possible to estimate the remaining maturity structure of the loans on the banks' books in December 1973 and 1977. Similarly, in the case of real estate loans rough maturity estimates can be made from HUD data on gross flows of mortgage lending and from Federal Home Loan Bank Board surveys of maturities and interest rates.[10] Despite the many assumptions involved,

[10] For a detailed description of the methods and sources used in developing these estimates of the outstanding maturity structure of the nonbank assets and liabilities of commercial banks in the United States, see Judy Liss and Jane Little, "Estimating the Maturity Structure of U. S. Bank Assets & Liabilities vis-à-vis Nonbanks: a Technical Supplement to Liquidity Creation by Euro-banks" available upon request from the Research Department, Federal Reserve Bank of Boston.

TABLE 5
Net Liquidity Creation by Commercial Banks in the United States vis-à-vis Nonbanks, 1973 and 1977

	December 1973		*December 1977*	
	Liabilities	*Assets*	*Liabilities*	*Assets*
	(percent)	*(percent)*	*(percent)*	*(percent)*
Less than 8 days	67.1	5.3	67.2	5.4
8 days – < 1 month	6.5	8.6	5.3	7.2
1 month – < 3 months	8.7	17.5	6.9	16.3
3 months – < 6 months	6.3	10.4	7.4	10.3
6 months – < 1 year	4.7	10.6	3.9	10.5
1 year – < 3 years	4.2	16.6	6.0	16.7
Over 3 years	2.5	31.0	3.3	33.8
Net Liquidity Creation (Cents per $1 in deposits)	37.6		37.9	

SOURCE: Based primarily on data from the Board of Governors of the Federal Reserve System, the Federal Home Loan Bank Board, and the U.S. Department of Housing and Urban Development. For details, see the Technical Supplement.

the aggregate estimates shown in Table 5 are probably satisfactory for the purpose at hand, i.e., obtaining an approximate measure of the amount of maturity transformation performed by commercial banks in the United States and an indication of any trend which may have developed between 1973 and 1977.

When the same liquidity weights used for U.K. Euro-banks are applied to the U.S. estimates, it appears that U.S. commercial banks are creating just slightly less than 40¢ in net liquidity for the nonbanks for every dollar deposited with them. In addition the amount of maturity transformation performed by banks in the United States does not seem to have increased significantly between December 1973 and December 1977. In other words Euro-banks seem to have become very similar to U.S. commercial banks in the amount of net liquidity they create for the spending public.

Because Euro-banks are in most respects more closely comparable with the biggest U.S. banks than with the bulk of small U.S. institutions, it also seems appropriate to estimate the amount of net liquidity created for nonbanks by a group of the largest U.S. banks.[11] Primarily because their assets tend to have shorter maturities, the large U.S. banks create less net liquidity for nonbanks (per dollar of deposits) than do all U.S. commercial banks according to the weighting system used previously and the data available. In December 1977 large U.S. banks were creating 35¢ in net liquidity for nonbanks for every dollar deposited with them. For 1973 the comparable figure was also 36¢. Although the difference between the amount of net liquidity created by the large U.S. commercial banks and the Euro-banks suggests some distinction in the types of business they handle, the gap is not major — especially in view of the uncertainties involved in developing the U.S. estimates. Euro-banks currently appear to create approximately the same amount of net liquidity for nonbanks as U.S. commercial

[11] Changes in the FDIC categories between 1973 and 1977 necessitated the use of two different groups of large banks. In 1973 the group was composed of 172 banks with deposits over $500 million. In 1977 the group included 141 banks with assets over $1 billion.

banks — whether all or large U.S. banks are used in the comparison.

However, a few caveats about the difficulty of making such comparisons for two somewhat different types of institutions are in order. For instance, Euro-banks hold a very large proportion (90 percent according to Niehans and Hewson)[12] of their claims on nonbanks as floating rate loans which are rolled over every six months, at which time the rate is set at a given percent above the lender's cost of funds. Because Bank of England data reflect the commitment rather than the roll-over period,[13] the calculations performed above may exaggerate the amount of net liquidity created by the Euro-banks. Moreover, since banks in the United States make a smaller share of their loans on a floating rate basis, comparisons between U.S. banks and Euro-banks may be distorted. Nevertheless, a five-year floating rate loan rolled over every six months clearly provides the borrower with more liquidity, despite the possible rate changes, than does a six-month loan which may or may not be renewed; thus, for our current purposes, the reported commitment period seems more relevant than the roll-over period. In addition, although banks in the United States make a lower share of their loans on a roll-over basis, over half of short-term commercial and industrial loans, 40 percent of long-term C&I loans and 35 percent of construction and land development loans were recently made with floating rates. Thus, the distinction between U.S. and Euro-bank practice is somewhat muted.

Another distinction between U.S. and Euro-bank practice is that in contrast to U.S. commercial banks, Euro-banks almost never issue demand deposits. If U.S. bank demand deposits are given a weight of one (since they are indeed money) rather than the .9 previously assigned to liabilities of less than eight days, however, the amount of net liquidity created by U.S. banks only rises from 38¢ to 41¢ for each dollar deposited with them in December 1977. (Again, the fundamental question of appropriate weights will be discussed on pages 70–71.) Even after roll-over loans and U.S. demand deposits are taken into account, therefore, it still appears that the amount of Euro-bank liquidity creation now approaches that provided by U.S. commercial banks.

Possible Reasons for the Increase in Euro-bank Liquidity Creation

Why have the Euro-banks increased the amount of maturity transformation they perform? Several developments may have contributed to this outcome. Theoretically, first of all, an increase in the spread between long-term and short-term rates would tend to foster maturity transformation by making it potentially more profitable to accept the risk of borrowing short to lend long. As Table 6 shows, changes in the spread between December 1973 and December 1975 may partly account for the increase in Euro-bank liquidity creation at that time. In fact, in late 1973 Euro-dollar interest rates were extremely high, and the usual rate structure was inverted so that long-term rates were lower than short-term rates. This situation may have occurred because borrowers were loathe to commit themselves to extraordinarily high rates for an extended period. The period from December 1973 to December 1975 was also the time when the oil-exporting countries began to accumulate massive holdings of Euro-currency deposits. With their natural preference

[12] Niehans and Hewson, "The Euro-dollar Market and Monetary Theory," 13.

[13] While Bank of England data on the maturity of assets reflect the ultimate maturity date, "roll-over" deposits are reported according to their earliest repayment date. The data thus show the "worst possible" situation for the bank. To the extent possible, U.S. figures were estimated according to the same principles.

TABLE 6
Spread between Long-Term and Short-Term Euro-dollar Deposit Rates,* December 1972 – June 1978

	(percent per annum)	
	12 months minus 6 months	*12 months minus 3 months*
December 1972	.19	.50
December 1973	–.57	–.57
December 1974	–.44	–.44
December 1975	.56	1.38
December 1976	.18	.56
December 1977	.17	.48
June 1978	0	.50

*Prime banks' bid rates in London at or near end of month.

SOURCE: Morgan Guaranty Trust Company of New York, *World Financial Markets*, "Euro-dollar Deposit Rates," January 1977 and July 1978.

for liquidity reinforced by this inversion, no wonder the oil-exporting countries were concentrating their funds in short-term holdings. Naturally, however, as some large banks faced growing difficulties in accepting very large deposits from a handful of depositors at very short term, the rate structure gradually righted itself as short-term rates fell,[14] and the spread became positive again. Since late 1975, by contrast, liquidity creation by Euro-banks has declined only slightly despite somewhat discouraging changes in the maturity spread.

Another development which would theoretically encourage banks to give up maturity matching and undertake maturity transformation is a decrease in the variability of Euro-currency interest rates. Such a decrease in the variability of monthly Euro-dollar rates[15] did occur between 1973 and 1977 (except during 1974). In addition, and more importantly perhaps, the widespread use of floating rate loans further removes the risk of interest rate changes from the lender and places it with the borrower. Apparently borrowers have been willing to accept this risk as part of the price they must pay for obtaining a commitment[16] of funds for a longer maturity. Charles Kindleberger sees the acceptance of floating rate loans as one of many examples of corporations "which want assurance of financing for a given quantity over a fixed period of time, and which are prepared to ignore the interest rate as a second-order consideration, quantity dominating price."[17] Indeed, such evolutionary changes as the development of the floating rate loan are probably more important in explaining the increase in maturity transformation than are changes in the rate structure or variability of interest rates. Other evolutionary changes contributing might be the accumulation of experience and a change in the type of financing conducted. In the early days of the market a large share of nonbank Euro-lending was devoted to trade finance. More recently, project financing and balance-of-payments loans have come to dominate.

Consequences of Increased Maturity Transformation in the Euro-Currency Market

What are the consequences of the increased maturity transformation provided by the Euro-banks? Undoubtedly, the primary consequence is that some borrowers are able to obtain funds for a given maturity at a lower cost than they otherwise would. As a result, some investments occur which would otherwise not have been eco-

[14] As Norman Fieleke had suggested they would in "Oil and International Payments," *New England Economic Review*, November/December 1974, p. 35.

[15] As measured by the standard deviation of prime banks' bid rates.

[16] Borrowers generally gain the probability but not the certainty of having funds for the entire commitment period since many contracts contain clauses breaking the commitment if market crises or exchange controls make it difficult for the bank to obtain funds.

[17] C. P. Kindleberger, "Quantity and Price, Especially in Financial Markets," *Quarterly Review of Economics and Business*, XV (Summer 1975), 12.

nomically feasible. Euro-banks are thus performing a valuable and traditional function of financial intermediaries (a function also performed by commercial banks and savings and loan associations here in the United States) and are contributing to the increased efficiency of the world's financial system.

A doubling in the amount of net liquidity created by Euro-banks may appear startling, however. Is such a development dangerously inflationary? Unfortunately, little research has been conducted on the relationship between the amount of maturity transformation performed and the rate of increase in prices. In the absence of such research, however, a couple of simple examples may serve to persuade us that no fixed or significant relationship between the two exists, and that the increased amount of maturity transformation performed by Euro-banks is not dangerously inflationary.

In the first place, let us imagine a commercial bank which accepts only demand deposits (weighted .9 by our system or, more accurately, 1) and makes only six-month to one-year loans (weighted .4). It thus creates 50–60¢ in net liquidity for every dollar deposited with it. Now let us compare with that commercial bank another intermediary which accepts 89-day deposits (weighted .7) and makes three-year loans (weighted .1). This intermediary, creating 60¢ for every dollar deposited with it is providing as much or more "net liquidity" for nonbanks as the commercial bank. Surely, however, the economic impacts of the deposit-creating and lending activities of the two institutions are not the same, since the depositors at the commercial bank retain their current spending power while the depositors at the other institution do not. While the distinction between commercial banks, which do accept time deposits, and Euro-banks, which do accept overnight and call deposits, is not as clearcut as that between the two institutions in the example, it remains true that Euro-bank depositors do not hold money and do not retain their current spending power. The degree of maturity transformation performed by U.S. commercial and Euro-banks may be similar, thus, but the impact of their activities on the economy is not necessarily the same.

Moreover, as another example, consider that if a commercial bank, which once accepted demand deposits (weighted 1) and made 29-day loans (weighted .8), began to make loans of just under six months (weighted .6), the amount of maturity transformation performed by this bank would also have doubled — just as is the case with the Euro-banks. This change might indicate that the maturity spread had widened or, by contrast, that the bank was willing to accept slightly more risk at a given lending rate. It also might suggest that the type of activity being financed had changed; however, it is hard to imagine that such a change could have a significant impact on the amount of inflation in the economy. In other words, while measuring the amount of maturity transformation performed by Euro-banks may yield useful information about the riskiness of their position, the type of activity they are performing etc., it is not a fruitful way of summarizing their impact on the economy as a whole.

Summary

In contrast to earlier research on this question, this article concludes that Euro-banks are performing considerable maturity transformation. By one system of measurement, between the end of 1973 and mid–1978, the amount of net liquidity created by Euro-banks for the spending public has more than doubled and is now comparable to that created by U.S. commercial banks. Because the degree of maturity transformation is unlikely to have a fixed or important relationship with the pace of price increases,

however, this doubling in the amount of "net liquidity" created by Euro-banks should not be viewed as dangerous but as a constructive response to the needs of the economy for increased liquidity. An analysis of the amount of maturity transformation performed by Euro-banks is not a fruitful way of measuring their impact on world inflation. The multiplier model modified to include interest rate leakages remains the most promising approach to that question.

A Technical Supplement giving a detailed description of the methods and sources used in developing the estimates of the outstanding maturity structure of the nonbank assets and liabilities of the commercial banks in the United States has been written by Judy Liss and Jane Little. It is available on request to the Research Department of the Federal Reserve Bank, Boston, Mass. 02106.

THE FEDERAL RESERVE BANK OF BOSTON
CONFERENCE SERIES

No. 1	Controlling Monetary Aggregates	June 1969
No. 2	The International Adjustment Mechanism	October 1969
No. 3	Financing State and Local Governments in the Seventies	June 1970
No. 4	Housing and Monetary Policy	October 1970
No. 5	Consumer Spending and Monetary Policy: The Linkages	June 1971
No. 6	Canadian–United States Financial Relationships	September 1971
No. 7	Financing and Public Schools	January 1972
No. 8	Policies for a More Competitive Financial System	June 1972
No. 9	Controlling Monetary Aggregates II: The Implementation	September 1972
No. 10	Issues in Federal Debt Management	June 1973
No. 11	Credit Allocation Techniques and Monetary Policy	September 1973
No. 12	International Aspects of Stabilization Policies	June 1974
No. 13	The Economics of a National Electronic Funds Transfer System	October 1974
No. 14	New Mortgage Designs for an Inflationary Environment	January 1975
No. 15	New England and the Energy Crisis	October 1975
No. 16	Funding Pensions: Issues and Implications for Financial Markets	October 1976
No. 17	Minority Business Development	November 1976
No. 18	Key Issues in International Banking	October 1977
No. 19	After the Phillips Curve: Persistence of High Inflation and High Unemployment	June 1978

Federal Reserve Bank of Boston
600 Atlantic Avenue
Boston, Massachusetts 02106

In this issue...