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Financial Innovation—A Complex Problem Even in a Simple Framework

Deregulation of financial markets and financial innovations have caused a great deal of discussion on how to implement monetary policy during a period of time when the structure of the economy is rapidly changing. In particular, the decline in M-1's velocity in late 1982 and early 1983 raised questions about what effects innovations and regulatory change were having on M-1's interpretation and performance. This question of what unstable economic relationships mean for monetary policy is not a new issue, of course, but was a key consideration of the "rules-versus-discretionary-policy" debate some 25 years ago. At that time, Jacob Viner argued:[1]

> Even if there are a single end, a single authority, and a single means, but the end is a quantity of some kind which is a function of several variables, all of which are important and are in unstable relation to each other, there will be no fixed rule available which will be both practicable and appropriate to its objective.

The purpose of this article is to show in terms of a very simple model the broad range of problems that innovations and deregulation could cause for monetary policy. The case will be made that the effects of innovations and deregulation on the economy are very difficult to spell out, even if a very simple model of the economy is used. This, of course, makes one wonder what can be said about the effects of innovations on our highly complex economy.

[1]Jacob Viner, "The Necessary and Desirable Range of Discretion to be Allowed to a Monetary Authority", Leland B. Yeager (ed.), *In Search of a Monetary Constitution*, Harvard University Press (1962), page 247.

The framework for illustrating the effects of innovations in this paper is the basic IS-LM model (Table 1). This model, as used here, consists of three equations: (1) an equation that relates consumption and investment expenditures to the level of interest rates, (2) an equation that relates the public's demand for money to income and interest rates, and (3) an equation relating the supply of money to the quantity of reserves provided by the Federal Reserve and the level of interest rates. These three equations, in turn, can be solved so that it is possible to see the effects innovations can have on economic relationships.

Much discussion has already taken place on the question of whether the interest responsiveness of the demand for M-1 has been or will be increasing or decreasing as a result of innovations and deregulation. On the one hand, consumers now have highly liquid, market-rate yielding alternatives to M-1 such as money funds and money market deposit accounts. These could increase the interest elasticity of the demand for M-1 in the sense that it is easier than before for the consumer to manage transactions balances. On the other hand, one component of M-1—Super-NOW accounts—already pays an unregulated rate of interest, and this deregulation could continue in the future. These developments might reduce M-1's interest responsiveness because the yield on M-1 will vary with market rates. Therefore, the net effect of all these changes on M-1's interest elasticity at any point in time remains highly uncertain. Nonetheless, since the interest elasticity of the demand for M-1 is a factor that determines how responsive M-1 will be to changes in the supply of reserves, how it changes over time is important for monetary policy.

In this paper, an attempt is made to go beyond just the

question of what a declining money demand interest elasticity means for the relationship between M-1 and the supply of reserves. It will be argued that the interest responsiveness of expenditures and/or the income elasticity of money demand might also change as a result of innovations, and these changes could also have important implications for the Federal Reserve's ability to control M-1. Hence, it is not possible to say for certain whether the responsiveness of M-1 to changes in the supply of reserves will become greater or smaller on balance as a result of innovations because many, possibly offsetting, changes could be occurring simultaneously. In other words, both the predictability and stability of the relationship between M-1 and the supply of reserves could deteriorate considerably, thereby greatly complicating monetary policy.

Moreover, the Federal Reserve's ability to control its intermediate target—M-1—is not the only problem caused by innovations. For example, the arithmetic of the IS-LM model suggests that a declining money demand interest elasticity, along with changes in the other parameters, could also affect in an unpredictable way the responsiveness of GNP to changes in the supply of reserves and M-1. The primary point is that changes in these elasticities could alter several of the key relationships in the economy and not just the relationship between the supply of reserves and M-1. Moreover, changes in these elasticities mean that income might become more or less sensitive to shocks coming from either the real or monetary side which could also affect the basic decision of whether it would be in theory better to target M-1 or interest rates.[2]

Innovations and the IS-LM Model

The primary problem in illustrating the effects of innovations using the basic IS-LM model shown in Table 1 is that the results are often ambiguous. In presenting the potential effects of innovation below, we begin with the most common view, but then also make the case that the effects of innovations, particularly in the shorter run, could differ from this more conventional view. We then proceed to show that even if the more conventional view is taken, innovations are still difficult to analyze even in the simple IS-LM model because they have the potential for causing changes in many dimensions simultaneously.

In terms of the basic IS-LM model, innovations and deregulation that result in a larger portion of bank assets and liabilities (including M-1 deposits) paying market-related rates of interest could contribute to three changes in the economy.

- *They could reduce the interest elasticity of money demand ("a" in the model) because the return on money will move with market rates.* Background: Even though transactions balances at some point in time will perhaps pay a market-related rate of interest, the gap between the rate on transactions balances and market instruments will still widen as market rates increase because of the reserve requirements on transactions balances. Thus, it could be argued on the one hand that the interest elasticity of money demand for transactions purposes will be reduced but not eliminated. On the other hand, it could also be argued that the public will tend to hold, particularly at low rates of interest, both savings and transactions balances in M-1 but that the savings component will be much more sensitive to changes in rate spreads than has been the case in the past when only transactions balances were held in M-1. On balance, of course, it is not clear what the net effect will be on the M-1 interest elasticity of having transactions deposits bear a market-related rate of interest. Thus far, with the introduction of fixed-rate conventional NOW accounts, the experience seems to have been that the interest elasticity of money demand has been increased not reduced. This is in part because a given change in market rates will produce a larger percentage change in the spread between market rates and NOW accounts than in the spread between market rates and the zero rate on demand deposits. It also appears that money funds and money market deposit accounts have made consumer money demand more responsive to changes in market rates because it is now easier for consumers to earn market rates and manage their cash balances more effectively.[3]

- *They could increase the interest elasticity of expenditures ("c" in the model) because more loans will be on a floating (variable rate) basis.* Background: With fixed rate loans, when rates rise only the prospective borrower is affected, whereas with variable rate loans all borrowers would be affected—hence a greater expenditure elasticity. However, if variable-rate borrowers in some sense expect to pay some average rate, not the initial rate, over some longer period of time, then an increase in floating rates, unless it changes the assumed average, would not affect the expenditures of previous borrowers. Moreover, with floating rates not even the prospective borrower would postpone spending until rates dropped because his borrowing costs will automatically fall as rates decline and he will pay the average rate "just like everyone else". So the effects of variable rates on the expenditures elasticity are not clear on balance. It could also be argued that in a

[2]See, for example, William Poole "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Model", *Quarterly Journal of Economics* (May 1970).

[3]For more on this topic, see Lawrence J. Radecki and John Wenninger, "Shifts in Money Demand: Consumers Versus Business", this *Quarterly Review* (Summer 1983), pages 1-11.

deregulated environment the effects of changes in interest rates will be larger because (1) no sectors of the economy are insulated from rate increases by ceilings on the deposits that are used to fund them, and (2) a given percentage change in rates will be transmitted more quickly through a more competitive economy. Moreover, if the effect of deregulation is to make the general level of interest rates higher and therefore interest costs a higher proportion of total costs, then spending might become more sensitive to a given percentage change in rates.[4] All in all, the effects of innovations and deregulation on the expenditures elasticity is still an open question. Already, we have seen how complicated assessing the effects of changes in the financial system on this parameter can be without even asking such questions as whether the development of markets for financial futures could insulate spending from changes in interest rates.

- *They could possibly increase the income elasticity of money demand ("b" in the model). Since M-1 deposits will earn about the same rate of interest as savings accounts, consumers might place in M-1 as income grows funds that they would otherwise have placed in savings accounts.* Background: Here again, it is difficult to know for certain whether the elasticity will increase or decrease on balance. It would depend upon the degree to which and where transactions and savings accounts are combined and upon the relative income elasticities of transactions and savings deposits. It is entirely possible that consumers also have been combining some savings and transactions balances in other instruments as well, such as money funds or money market deposit accounts. Hence, although the direction of change is unclear, the potential exists for this elasticity also to change.

Even though it is difficult to know for certain what the effects of innovation will be, for the sake of illustration from Table 1 it is assumed that when the transition to a deregulated economy has been completed the interest elasticity of money demand (a) will have declined, the interest elasticity of expenditures (c) will have increased, and the income elasticity of money demand (b) will have increased. Will these three developments (individually and collectively) make income (Y), the interest rate (r), and the narrow money stock (M-1)—the endogenous variables in Table 1—more or less sensitive to exogenous changes in reserves (R), money demand shifts (Z), money supply shifts (K), or changes in autonomous expenditures (X)?[5]

Table 2 provides a partial answer to this question on a case by case basis. Case 1 deals with the interest elasticity of money demand while Case 2 and Case 3, respectively, deal with changes in the interest elasticity of aggregate demand and the income elasticity of money demand. We will first analyze the effects and implications of innovations on the individual elasticities and then turn to what happens on balance as a result of all the changes. The only elasticity in the model that is assumed not to change because of innovations is the interest elasticity of the money supply function (d). It has a positive interest elasticity in this very simple model because banks borrow more reserves from the Federal Reserve as market rates rise. However, since it has been suggested that this elasticity could be reduced, if not effectively made equal to zero, by having the discount rate move with market rates, this proposal will also be briefly examined in the context of this simple model. The effects of reducing d on the multipliers is shown in Case 4, while in Case 5 the combined effects of reducing both the money

[4]For a detailed argument along these lines, see M.A. Akhtar, "Financial Innovations and Their Implications for Monetary Policy: An International Perspective", *Bank for International Settlements Economic Papers*, Number 9 (December 1983).

Table 1

Basic IS-LM Model

(1) $Y = -cr + X$
(2) $M\text{-}1 = -ar + bY + Z$
(3) $M\text{-}1 = R/m + dr + K$

M-1 = narrow money stock
r = the interest rate
Y = income
Z = money demand shift
X = autonomous expenditures
R = nonborrowed reserves
K = money supply shift
m = reserve ratio
a, b, c, d = structural parameters

Reduced Form Multipliers

$$Y = + \frac{c}{m(a+d+bc)}R + \frac{c}{a+d+bc}K - \frac{c}{a+d+bc}Z + \frac{a+d}{a+d+bc}X$$

$$r = - \frac{1}{m(a+d+bc)}R - \frac{1}{a+d+bc}K + \frac{1}{a+d+bc}Z + \frac{b}{a+d+bc}X$$

$$M\text{-}1 = + \frac{a+bc}{m(a+d+bc)}R + \frac{a+bc}{a+d+bc}K + \frac{d}{a+d+bc}Z + \frac{bd}{a+d+bc}X$$

[5]For the ease of illustration, it is assumed that X, R, Z, and K are not correlated with one another. Moreover, in a simple model like this, there is no room for innovations to affect the speed of adjustment of the endogenous variables to exogenous disturbances, or to make a dynamic system stable or unstable over time. Rather, the intent of this article is to show how difficult it is to evaluate the effects of innovations even before more complex models, with perhaps even additional variables included, are incorporated. In this article, innovations are viewed as affecting key parameters or elasticities in the model. Innovations, of course, could also "shift the functions," that is, cause Z, or K to change.

demand and supply elasticities to zero in absolute value are shown.[6]

Case 1

Case 1 shows the effects on the multipliers when the interest elasticity of money demand declines. The results indicate that for the most part the endogenous variables (in 9 of the 12 cases) become more sensitive to changes in the exogenous variables. The important exception, of course, is that the money stock becomes less sensitive to changes in the supply of reserves. But since interest rates become more sensitive, some analysts have been concerned that larger swings in interest rates will be required to control M-1.[7] At the same time, the Federal Reserve's ability to control M-1 is deteriorating in other dimensions as well as the interest elasticity of money demand declines because M-1 is becoming more sensitive to exogenous shifts in the demand for money and autonomous expenditures (bottom row of Case 1). Thus, a given shock could cause a larger deviation of M-1 from target, and the Federal Reserve might need to allow larger deviations of M-1 from target or make larger adjustments to the M-1 target as a result.

However, the "ultimate objective" income becomes more sensitive to changes in the supply of reserves at the same time M-1 becomes less sensitive. Thus, we end up with a situation in which M-1 is less sensitive to changes in the supply of reserves, while income and interest rates are more sensitive. Nevertheless, a given desired path for GNP will still be associated with the same interest rate movements as in the past because the ratio of r to Y does not depend on the money demand interest elasticity for any given level of reserves, but rather only on the interest elasticity of expenditures (Table 1). In a sense, whether monetary policy on balance will be encumbered by a declining money demand interest elasticity depends on how one views the way the Federal Reserve operates. If the view is taken that the Federal Reserve tries to control M-1, while avoiding large swings in interest rates, then a declining money demand interest elasticity is undesirable because correcting a given deviation of money from target will require a larger change in interest rates. If, on the other hand, the view is taken that the Federal Reserve does not care about M-1 for its own sake, but only attempts to control it in order to achieve a GNP objective, then the concern about M-1 control and interest rate stability is less important because the same interest rate movements as in the past will be required to obtain a desired level of GNP. Monetary policy is still complicated by a declining money demand interest

Table 2

Effect of Innovations on Reduced Form Multipliers

In absolute value

Case 1: Reduced Money Demand Interest Elasticity

	R	K	Z	X
Y	Larger	Larger	Larger	Smaller
r	Larger	Larger	Larger	Larger
M-1	Smaller	Smaller	Larger	Larger

Case 2: Increased Expenditures Interest Elasticity

	R	K	Z	X
Y	Larger	Larger	Larger	Smaller
r	Smaller	Smaller	Smaller	Smaller
M-1	Larger	Larger	Smaller	Smaller

Case 3: Increased Money Demand Income Elasticity

	R	K	Z	X
Y	Smaller	Smaller	Smaller	Smaller
r	Smaller	Smaller	Smaller	Larger
M-1	Larger	Larger	Smaller	Larger

Case 4: Reduced Money Supply Interest Elasticity

	R	K	Z	X
Y	Larger	Larger	Larger	Smaller
r	Larger	Larger	Larger	Larger
M-1	Larger	Larger	Smaller	Smaller

Case 5:* Money Demand and Supply Interest Elasticities = 0

	R	K	Z	X
Y	Larger (+1/mb)	Larger (+1/b)	Larger (−1/b)	Smaller (o)
r	Larger (−1/mbc)	Larger (−1/bc)	Larger (+1/bc)	Larger (+1/c)
M-1	Larger (+1/m)	Larger (1)	Smaller (o)	Smaller (o)

*The resulting multipliers are also shown in this case for ease of comparison to those in Table 1.

[6]It is also possible to view the interest elasticity of the supply function declining for other reasons as well. In a more deregulated environment, it could be argued that the quantity of money and credit supplied by banks would not depend upon the interest rate level, but rather on the desired spread between the interest rate on loans and cost of funds. Hence, with regard to the level of rates, the supply of money function interest elasticity would become more, if not completely, inelastic. Since this effect in terms of the level of rates works in the same direction as indexing the discount rate to market rates, it did not seem necessary to create a separate case for it. For more discussion on the subject of the supply of money or credit in a deregulated environment, see Albert Wojnilower, "The Central Role of Credit Crunches in Recent Financial History", *Brooking Papers on Economic Activity II* (1980).

[7]For more on this topic, see Richard G. Davis, "Monetary Targeting in a Zero Balance World", Proceedings of Asilomar Conference on Interest Rate Deregulation and Monetary Policy, sponsored by the Federal Reserve Bank of San Francisco (November 1982).

elasticity, however, because GNP would become more susceptible to monetary disturbances (Table 2).

If disturbances from the monetary side are a source of instability in the economy, then a declining money demand interest elasticity will make income more sensitive to monetary shocks unless the Federal Reserve adjusts its monetary targets when these disturbances occur or uses interest rate targets instead. As a matter of fact, if the result of a declining money demand interest elasticity is to make income more sensitive to monetary shocks than to real sector shocks, then in theory it might be better for the Federal Reserve to target an interest rate rather than the money stock. The results from the top row of Table 2 suggest that a declining money demand interest elasticity reduces the sensitivity of income to real sector disturbances at the same time it increases the sensitivity of income to monetary shocks. So it is entirely possible that interest rate targets might turn out to be better than M-1 targets.[8]

Another question could also be asked: even if it becomes less desirable in some sense for the Federal Reserve to target M-1 as the interest elasticity of money demand declines, is M-1 still a reliable indicator of Y? From Table 1 it can be seen that for a given supply of reserves, the ratio of Y to M-1 equals $c/(a+bc)$. As "a" decreases, therefore, velocity increases and M-1 is not as good a proxy for Y during the transition period to a deregulated economy. In other words, a given change in Y will be associated with a smaller change in M-1 than in the past. This means that changes in the interest elasticity of the demand for M-1 not only can affect the Federal Reserve's ability to control M-1 but also can affect the value of M-1 as an indicator of what is happening in the economy. Moreover, not only will changes in the supply of reserves have different relative effects on M-1 and Y than in the past because of a declining money demand elasticity, but so will changes in the other exogenous variables as well—making velocity quite unpredictable. A declining money demand interest elasticity changes not only the relationships between the exogenous variables and the endogenous variables but also the relative movements in the endogenous variables during the transition to a deregulated financial system. In this case, the ratio of Y to M was altered, raising questions about M-1's value as a target or as an indicator.

Cases 1 and 4 combined—Case 5

The final point to keep in mind from Case 1 is that even if the money demand interest elasticity goes to zero, that does *not* mean that the Federal Reserve loses all control over M-1.[9] As long as there are reserve requirements on M-1 (or a stable "desired demand" for reserves as a function of transactions deposits), there will be a link between M-1 and the supply of reserves. This can be seen most readily from the bottom row of Case 5 in Table 2. Even if the interest elasticity of M-1 demand goes to zero, and even if there was some sort of reform of the discount window so that the money supply function had an effective interest elasticity of zero ($d=o$ in Table 1), all that would do is change the multiplier between reserves and M-1 to $1/m$, where m is the reserve ratio. In other words, we end up with the simplest textbook money supply function (compare the relationships in the bottom row of Case 5 in Table 2 to the bottom row of Table 1).[10]

And in this extreme case, ($a=d=o$), it could be argued that the Federal Reserve's control of M-1 would be greatly improved for basically two reasons. First, money demand shifts and shifts in autonomous expenditures would have no effect on M-1 under these circumstances (last two terms in the bottom row of Case 5 in Table 2 become equal to zero). The effects of these variables would show up as larger movements in interest rates (center row of Case 5). Second, it could also be argued from this extreme case ($a=d=o$) that changes in other parameters (b and c to be discussed later in the context of innovations changing them) no longer would affect the relationship between the supply of reserves and M-1 since this relationship depends now only on the reserve ratio. So in that sense the "money multiplier" would

[8]James Tobin, in a recent lecture, reached much the same conclusion: "Monetarist policy has made the LM curve more vertical in recent years. Structural changes are working in the same direction. Deregulation is allowing deposits to bear market-determined interest rates, which will move up or down with the rates depository institutions can earn on their assets. Thus the demand for deposits, however sensitive to the differential between open market rates and deposit rates, will be much less sensitive to the general level of rates. In short, this reform itself is making the economy's natural LM curve much steeper. If the pre-reform M-r rule was optimal by Poole criteria, it is no longer optimal. The rule should be changed in the accommodative direction—the more so if, as seems likely, the reform also increases the volatility of money demand. This seems likely because, once the two rates are so close, depositors will be less precise and prompt in moving funds between moneys and near-moneys." See James Tobin, "Monetary Policy: Rules, Targets, and Shocks", *Journal of Money, Credit, and Banking*, Volume 15, Number 4 (November 1983), page 514.

John Hicks makes a similar argument: "What I mean by a credit economy is one that contains no money that does not bear interest; so that the key instrument of monetary control must be the rate of interest, or the interest rates. Actual economies, as we have seen, are tending in that direction; so it need not surprise us to find that much can be learned about actual money by considering the pure type". See John Hicks "The Foundations of Monetary Theory", *Money, Interest and Wages—Collected Essays on Economic Theory*, Volume 2, Harvard University Press (1983), page 266.

[9]For the interest elasticity of M-1 demand to become zero, not only would the rate of interest on M-1 balances need to move with market rates, but the Federal Reserve would also need to pay a market rate of return on reserve balances as well. In this article, we are ignoring the currency component of M-1 which does not earn interest.

[10]Case 4 shows just the effects of reducing the money supply interest elasticity (d). With respect to the impacts of the exogenous variables on r and Y, a reduced money supply interest elasticity reinforces the effects of a reduced money demand elasticity. With respect to the effects on M-1, they tend to offset one another (compare Case 4 to Case 1). However, in the extreme case, $a=d=o$, the effects of the money supply elasticity on the M-1 multipliers dominate (see bottom row of Case 5).

be more predictable since innovations that might affect these other parameters would no longer affect the relationship between reserves and M-1.[11]

But again, there are complications that may or may not make this a desirable outcome. Clearly, if one takes the view that (1) controlling M-1 is the only objective the Federal Reserve should have, and (2) the demand for M-1 is becoming highly interest inelastic, then reforming the discount window, which provides interest elasticity in the supply function for M-1, would be an important goal. Obviously, setting d = o by having the discount rate move with market rates, or by making it a "true penalty" rate, would be ways of tightening monetary control in the sense outlined above. But what are some of the other consequences of setting d = o? Income becomes more sensitive to shifts in the supply of and the demand for M-1 (top row of Case 5). At the same time, however, income becomes less sensitive to changes in autonomous expenditures, with the impact equalling zero if both a and d = o (top row of Case 5). Hence, the end result could well be to make income more sensitive to shocks from the monetary side than from the real side. This could argue for interest rate targeting rather than M-1 targeting, assuming that the magnitudes of the disturbances themselves are not also changed. Ironically, the very changes in the structure that might make M-1 highly controllable might also be the ones that alter the relative importance of the disturbance terms from the real and monetary sides in such a way that interest rate targets would be preferable to M-1 targets.[12]

The question could also be asked whether M-1 would have any meaning or could be defined if transactions balances earned a market rate of interest and the Federal Reserve paid a market rate on reserves. Clearly, many so-called "cash management practices" would stop and M-1 would contain liquid investments as well as transactions balances. Banks might also allow limited checking privileges on other accounts as well, and M-1 would lose all the uniqueness currently attributed to it by regulation. Thus, it might not be possible to specify an "LM schedule" in terms of M-1 as has been done in this paper. Under these circumstances, some analysts would argue that the Federal Reserve would have little choice but to use interest rate targets.[13] Hence, while this extreme case serves as an interesting theoretical exercise in some ways, it is not clear that it could ever exist in practice.

Table 3

Effects of Innovations on the Economy

Overall changes in relationships from Table 2

Case* (variable)	Changes in Supply of Reserves (R)	Money Supply Function Shifts (K)	Money Demand Function Shifts (Z)	Changes in Autonomous Expenditures (X)
1(Y)	Larger	Larger	Larger	Smaller
2(Y)	Larger	Larger	Larger	Smaller
3(Y)	Smaller	Smaller	Smaller	Smaller
4(Y)	Larger	Larger	Larger	Smaller
1(r)	Larger	Larger	Larger	Larger
2(r)	Smaller	Smaller	Smaller	Smaller
3(r)	Smaller	Smaller	Smaller	Larger
4(r)	Larger	Larger	Larger	Larger
1(M-1)	Smaller	Smaller	Larger	Larger
2(M-1)	Larger	Larger	Smaller	Smaller
3(M-1)	Larger	Larger	Smaller	Larger
4(M-1)	Larger	Larger	Smaller	Smaller

*Case 1 = Effects of the demand for M-1 becoming less sensitive to changes in interest rates.
Case 2 = Effects of aggregate demand becoming more sensitive to changes in interest rates.
Case 3 = Effects of the demand for M-1 becoming more sensitive to changes in income.
Case 4 = Effects of the supply of M-1 becoming less sensitive to changes in interest rates.

Cases 2 and 3

Next, we turn briefly to the effects of innovations on the remaining elasticities in the model. In Case 2 in Table 2, where the interest elasticity of expenditures increases, and in Case 3 where the income elasticity of money demand increases, the results suggest that the effects, for the most part, would be to reduce the multipliers (Table 2). Here, as was the result in Case 1, the important exception is the relationship between M-1 and the supply of reserves. The money stock becomes *more* sensitive to changes in reserves, while the interest rate becomes *less* sensitive—

[11]Moreover, if a = d = o then the multiplier between autonomous expenditures and income also becomes zero (top row of Case 5). In other words, fiscal policy has no impact on income, while monetary policy, as measured by the supply of reserves, has a larger impact. Hence, the elasticities also matter in some sense for the relative effectiveness of monetary and fiscal policy, which was often raised as an issue in the late 1960s. For a more detailed discussion of this, see Warren L. Smith, "A Neo-Keynesian View of Monetary Policy", *Controlling Monetary Aggregates*, Federal Reserve Bank of Boston (June 1969).

[12]James Tobin recently expressed some similar concerns. "A number of 'reforms' have been proposed to limit variability in the money multipliers connecting the monetary base or unborrowed reserves to intermediate aggregates. These include indexation of the discount rate to market interest rates and payment of a similarly indexed rate on reserves. They are objectionable on the ground that they, like the deregulation of deposit interest, enhance the volatility of interest rates and the vulnerability of business activity to purely financial shocks". See James Tobin, *op. cit.*, page 515.

[13]See John Hicks, *op. cit.*, for a detailed discussion.

the opposite of what happened in Case 1. Moreover, in Case 1 the effect of a declining money demand interest elasticity was to increase the sensitivity of M-1 to money demand shifts and changes in autonomous expenditures. From Cases 2, 3 and 4, however, it can be seen that these effects could be offset or even reversed. (Table 3 contains a different arrangement of the first four cases from Table 2 that is easier to use for some of these overall comparisons.) Hence, whether innovations will reduce the Federal Reserve's ability to control money on balance after all these different elasticities change is an open (perhaps empirical) question.

Moreover, the impacts of innovations in Cases 2 and 3 could offset the effects of a declining money demand interest elasticity in other dimensions as well. For example, in Case 3 an increasing money demand income elasticity would make income less sensitive to shocks coming from the monetary sector. This could offset the added sensitivity of income to monetary disturbances caused by a declining money demand interest elasticity. In turn, this would also affect the question of whether in theory it is better to target M-1 or interest rates.

This is not the only instance in which the results become ambiguous. Nor is it necessary to have changes in all four elasticities for ambiguous results to occur. For example, in Case 1 in Table 3 the direction of change on all 12 multipliers is clear. If Cases 1 and 2 are combined, the effect on only four of the 12 multipliers remains unambiguous; and if Cases 1, 2 and 3 are combined, only the effect on one multiplier is still clear (upper right hand corner of Table 3). In any case, the simple model still shows that innovation increases the uncertainty about what the underlying economic relationships in fact are, making policy much more difficult. And with many relationships in the economy changing at the same time, it is not even possible to say that the Federal Reserve would be better off targeting interest rates instead of M-1.

Table 4 contains a summary of the changes that argue for interest rate targeting versus money supply targeting. In Table 4, the top four rows of Table 3 are reclassified in terms of whether or not the larger or smaller multipliers argue for money supply targeting (MST) or interest rate targeting (IRT). If the result was one that made income more (less) sensitive to shocks from the monetary sector, then the underlying change in the financial structure was classified as one that argued for interest rate targets (money supply targets). On the other hand, if the underlying change made income more (less) sensitive to changes in autonomous expenditures, then the result was classified as favoring money supply targeting (interest rate targeting). In 10 of the 12 instances, the changes corresponding to Cases 1 through 4 would argue for interest rate targets. But that in and of itself does not make a case for interest rate targeting. In terms of looking at the results down all four cases in each cell, two out of the three overall effects are ambiguous since some changes within the individual cell favor interest rate targets, while others favor money supply targets. The only result that is clear-cut is the one on the far right-hand side. All of the changes make income less sensitive to shifts in autonomous expenditures. If the net effect in the other two cells is not to change the sensitivity of income to shocks from the monetary sector from what it had been before, then the results in the far right-hand cell might be interpreted as giving more weight than before to the argument for interest rate targets. However, given all the uncertainties in assessing in which direction these various elasticities will change as a result of innovations, a great deal of caution should be taken in drawing any policy implications from Table 4.

Conclusion

In sum, the analysis presented here essentially takes us back to the point made in the citation from Jacob Viner at the onset of this article. If the relationships between key variables are changing, then it simply is not practical for policy to focus in some mechanical way on any single variable, whether it be M-1, GNP, interest rates, or even reserves themselves. A change in a structural parameter in one equation has the potential for changing the relationships among many (or possibly all the) other variables. From even a very simple model it can be seen that innovations and deregulation can have far-reaching implications for the

Table 4

Effects of Innovations on the M-1 Versus Interest Rate Targeting Question*

Case† (variable)	Changes in Supply of Reserves (R)	Money Supply Function Shifts (K)	Money Demand Function Shifts (Z)	Changes in Autonomous Expenditures (X)
1(Y)	‡	IRT§	IRT	IRT
2(Y)	‡	IRT	IRT	IRT
3(Y)	‡	MST‖	MST	IRT
4(Y)	‡	IRT	IRT	IRT

*Assuming that the ultimate objective is to stabilize income (Y).

†Case 1 = Effects of the demand for M-1 becoming less sensitive to changes in interest rates.
Case 2 = Effects of aggregate demand becoming more sensitive to changes in interest rates.
Case 3 = Effects of the demand for M-1 becoming more sensitive to changes in income.
Case 4 = Effects of the supply of M-1 becoming less sensitive to changes in interest rates.

‡Not applicable.

§A change that favors interest rate targeting.

‖A change that favors money supply targeting.

relationships between key variables, and that makes fixed rules for policy very unattractive regardless in terms of which variable they are formulated.

The main conclusions of this article that remind us of the citation from Jacob Viner are as follows:

- The effects of financial innovations, even in the simplest of models, are next to impossible to sort out. This raises questions about what we can say about the effects of these innovations in terms of the complex economy we have in reality.

- One reason it is difficult to assess the effects of innovations even in simple models is because even for a given parameter—such as the interest elasticity of the demand for M-1—some changes seem to be increasing it, while others seem to be working to reduce it. This is particularly true during the transition phase to a deregulated financial system. Hence, it is difficult to know, for example, whether the net effect will be to increase or reduce the responsiveness of M-1 to changes in the supply of reserves at any point in time.

- But even if it was possible to ascertain that a declining money demand interest elasticity was causing M-1 to become less sensitive to changes in the supply of reserves, that would only be one effect of this declining elasticity. Monetary control could also be complicated by the consideration that M-1 would become more sensitive to shifts in the money demand function and changes in autonomous expenditures.

- Moreover, a declining money demand interest elasticity could also affect how responsive income would be to exogenous shocks such as money demand shifts or changes in autonomous expenditures. This, of course, could affect the fundamental question of whether the Federal Reserve should target M-1 or interest rates if GNP is viewed as its ultimate objective.

- If the demand for M-1 does become interest inelastic as a result of innovations, then reform of the discount window that would make the supply of money function unresponsive to interest rates movements would become attractive to some analysts because the supply function would more closely approximate the simple "money multiplier" model. However, such a change would also affect other relationships in the economy, and it is not clear on balance that it would be a worthwhile reform.

- The problem is further complicated in that the money demand and supply interest elasticities are not the only parameters that might be affected by innovations. Depending upon which other parameters are affected and the direction in which they are changed, the effects on the economy from changes in the money supply and demand elasticities could be offset or enlarged.

- Not only do changes in these elasticities raise questions about what impact changes in supply of reserves will have on M-1, but they also have the potential for affecting the ratio of income to M-1, perhaps reducing the usefulness of M-1 as an indicator of what is happening to income during the transition to a deregulated economy.

John Wenninger

Targeting in a Dynamic Model

Support for monetary targeting is eroding. Many economists and government officials express increasing concern that monetary targeting destabilizes both the financial and real sectors of the economy. Unnecessary volatility in the money supply, interest rates, and the levels of income and employment, they argue, comes from attempting to target money too rigidly. The sharp swings in the economy during the three-year period following the change in the Federal Reserve's operating procedures in October 1979 are cited frequently, although the second oil price shock and the credit control program certainly contributed to the increased volatility. Moreover, they view the much smoother performance of the economy since late 1982 as a telling development. Around that time, the Federal Open Market Committee (FOMC) reduced its emphasis on M-1 relative to the broader monetary aggregates; and in view of rapid institutional change, it adopted a more flexible approach to achieving the objectives for the aggregates.

As support for monetary targeting wanes, the search for an alternative approach to policymaking intensifies. Many agree that the Federal Reserve should have targets or numerical objectives of some kind. Targets communicate to the public the long-run direction of monetary policy and provide Congress with some basis to assess FOMC decisions. Against this background, some economists (among them James Tobin and Robert Gordon) have advocated nominal GNP targeting.[1] They claim adopting this strategy will lead to better achievement of the ultimate objectives of monetary policy.

This paper investigates the properties of both monetary targeting and nominal GNP targeting. The first issue to be covered is whether adhering rigidly to monetary targets does indeed lead to unnecessary volatility in the financial and real sectors of the economy. Perhaps the monetary targets and the ultimate objectives of policy are actually best achieved by attempting less rigid control. Currently, these matters are particularly relevant. With the implementation of contemporaneous reserve requirements and the more normal behavior of M-1's velocity recently, some may feel that this year offers an opportune time to return to tighter monetary targeting.

The second issue is the effectiveness of nominal GNP targeting versus monetary targeting. How well do the two policy strategies stabilize nominal income around desired levels? If GNP targeting can be shown to be more effective, then the strategy advocated by Tobin and Gordon has a firmer foundation.

Throughout the article, the issues are examined by using the most compact model of the economy possible. Nevertheless, the model's framework is kept versatile enough to study the consequences of alternative approaches to monetary policy in a dynamic setting—the primary purpose of this article. But many of the practical and institutional constraints that surround both monetary targeting and nominal GNP targeting are left aside.[2]

The first section shows that a monetary target is best achieved over time by gradually offsetting deviations from

[1]James Tobin, "Monetary Policy: Rules, Targets, and Shocks", *Journal of Money, Credit, and Banking* (November 1983), pages 506-18; and Robert J. Gordon, "Using Monetary Control to Dampen the Business Cycle: A New Set of First Principles", National Bureau of Economic Research Working Paper, Number 1210.

[2]For a discussion of some of the practical problems with monetary targeting and nominal GNP targeting, see the articles by John Wenninger (page 1) and Douglas M. Woodham (page 16) in this issue. Also see Anthony M. Solomon, "Unresolved Issues in Monetary Policy", this *Quarterly Review* (Spring 1984), pages 1-6; and John B. Carlson, "Nominal Income Targeting", Federal Reserve Bank of Cleveland *Economic Commentary* (May 21, 1984).

target. And the second section goes on to show that moderation in pursuing a monetary target will also contribute to lower volatility in interest rates *and* nominal income. But this raises a question about the usefulness of monetary targeting in stabilizing income in the longer run. In the last section, the strategy of reacting to movements in income emerges as more effective than monetary targeting in stabilizing the level of nominal income. This turns out to be the case for this particular model, even when the demand for money is stable and no financial innovation or deregulation is occurring.[3]

The volatility of money and the interest rate under monetary targeting

To begin, consider a simple version of the monetary sector, separate from the rest of the macroeconomy. Two relationships comprise it: the demand for money and a policy formula. The demand for money is based on a transactions motive for holding money. The total volume of money demanded by households and firms is determined primarily by the levels of income and the interest rate. Furthermore, it is assumed that households and firms take some time to adjust their holdings to changes in income and the interest rate. Simple one-period lags are specified in the demand-for-money function to reflect this. (Longer and more complex lag patterns could be used, but at the cost of greatly complicating the mathematics underlying the analysis.) This means that the current values of income and the interest rate and their previous period's values jointly determine the quantity of money demanded. Because the relationship is presumed not to hold exactly, a random disturbance term is included, representing all other factors in the demand for money. The disturbance term satisfies all the usual assumptions. So, the demand for money can be written as:

$$(1)\quad M(t) = a - br(t) - cr(t-1) + dY(t) + eY(t-1) + v(t)$$

where:

M = actual money supply,
r = the interest rate,
Y = nominal income,
v = a random disturbance term, and
t denotes the time period.
(b, c, d, and e > o)

The policy formula attempts to succinctly represent the essence of decision-making while following a strategy of monetary targeting. The formula used here states that in order to achieve the target the interest rate is moved upward when the money supply is above target, and downward when it is below target. The movement in the interest rate is in proportion to the deviation of the actual money supply from the target.[4] The deviation is measured over the interval from the previous FOMC meeting to the present one.[5] The new level of the interest rate is then to be maintained until the time of the next meeting. So, the policy formula can be written as:

$$(2)\quad [r(t) - r(t-1)] = \lambda[M(t-1) - M^*]$$

where:

M^* = the targeted level of the money supply.

The change in the level of the interest rate, $[r(t) - r(t-1)]$, is related to the discrepancy between actual and targeted money, $[M(t-1) - M^*]$, by the coefficient λ. It measures the strength of the response to deviations from target. For example, suppose the FOMC sets the value of λ at 2.00 (and the money supply is measured in billions of dollars). Then the interest rate is moved 2 percentage points for every billion dollars the money supply is away from target.

Implicit in this representation of policymaking is the assumption that the FOMC—with its 12 members, each possessing his or her own views on monetary economics—can reach a consensus on how strong the response to deviations from the monetary target should be. The value of λ reflects this consensus. Now, assuming that the true value of the coefficient b in equation 1 (the short-run response of money demand to the interest rate) is 0.10, the FOMC, by setting λ equal to 2.00, would actually be attempting to correct 20 percent of a deviation from target immediately. Each FOMC member, however, may not estimate the coefficient b to be exactly 0.10. So, each FOMC member could believe that setting λ at 2.00 means that something other than 20 percent immediate correction is being sought.

In general, setting λ equal to (1/b), whatever the value of b is, implies that, in reality, immediate correction of deviations is sought, although individual FOMC members may think differently. A value of λ between zero and (1/b) means that partial correction is attempted in the upcoming period. In other words, the time horizon over which the money supply is to be brought back to target is somewhere

[3]The article by John Wenninger in this issue addresses the problems for monetary policy created by financial innovation and deregulation.

[4]A similar representation of monetary targeting was used by Jared Enzler and Lewis Johnson, "Cycles Resulting from Monetary Targeting", in *New Monetary Control Procedures*, Federal Reserve staff study, Volume 1, Board of Governors of the Federal Reserve System Washington, D.C. (1981), page 3.

[5]The policy formula contains the previous period's, and not the current period's observation on the money supply. The assumption then is that the FOMC reacts to observed, rather than anticipated changes in money at the time of each meeting. The erratic nature of the monetary data, as well as the difficulty of accurately projecting the money stock, suggests that this is a reasonable assumption. If the current period's observation is incorporated instead, many of the results obtained in the analysis are reversed. Furthermore, equation 2 should not be construed as a representation of monetary targeting with a nonborrowed reserve target at the tactics level. In that setting, there is some immediate response to a deviation from target.

beyond the upcoming period; the smaller the value of λ, the longer the horizon.

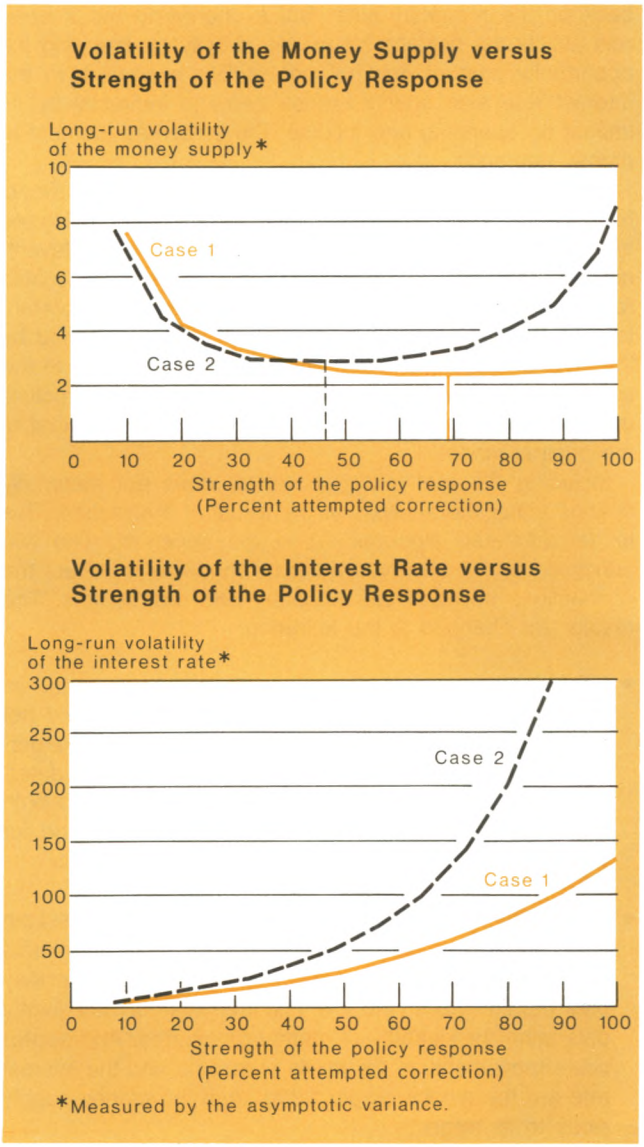
If these two equations are combined, they can be used to derive the long-run volatility (or asymptotic variance) of the money supply about its target, and correspondingly, the interest rate about its level that is consistent with the monetary target.[6] These values, of course, depend on (1) the interest rate elasticity and lag structure of money demand and (2) the particular value selected for the coefficient λ. There will be, though, a value of λ that minimizes the variance of the money supply for a prespecified demand for money. This minimum variance implies that the money supply is being kept, on average, as close to the target as possible.

Rather than presenting at this point the algebraic solution for the value of λ that produces the tightest effective control over money, two specific examples will be drawn. The two examples differ in terms of the speed with which individuals and firms adjust their money holdings to interest rate changes. In the first example, two-thirds of the total adjustment in money holdings to a change in the interest rate occurs immediately; that is, in the same time period that the interest rate changes. (Or, b = 0.10 and c = 0.05 in the money-demand equation 1.) In the second example, the adjustment takes place less rapidly, occurring almost equally in the current and the following period (b = 0.08 and c = 0.07).[7]

The two examples are used to show the relationships between, on the one side, the strength of the policy response, and on the other, the long-run variances of the money supply and the interest rate. The relationships are plotted in the diagram; the strength of the policy response is varied from 0 to 100 percent attempted correction in the upcoming period. In the upper panel of the chart, monetary targeting appears most accurate in the first example when the response is to attempt to eliminate 69 percent of the deviation in the upcoming period; in the second example, 46 percent. Clearly, in neither case is the money supply kept closest on average to target by attempting to eliminate deviations from target entirely in the next period.

In general terms, the presence of lagged interest rate effects on the volume of money demanded explains why attempts to immediately correct deviations from target do not produce the greatest effective control. If the interest rate is moved upward to correct an overshoot in money completely in the upcoming period, the lagged effect of the interest rate change would push the money supply below target in the following period.[8] Thus, attempting to correct deviations too quickly only increases the volatility of the money supply and is ultimately counterproductive. Conversely, attempting to correct deviations from target gradually—in other words, over an appropriately long horizon—can lead to greater success on average in keeping the money supply close to target. In fact, as long as there is partial adjustment in the same period in which the interest rate moves, complete immediate correction will be less than optimal.

The lower panel in the chart shows that the asymptotic variance of the interest rate increases exponentially as the



[6]The use of the asymptotic variance to measure the effectiveness of stabilization policies was developed in E. Phillip Howery, "Stabilization Policy in Linear Stochastic Systems", *Review of Economics and Statistics* (August 1967), pages 404-11.

[7]If b < c, the model exhibits undampened (explosive) cycles.

[8]That is, unless the disturbance term takes on a large positive value in the upcoming period.

strength of the policy response increases.[9] This agrees with the widespread view that in order to smooth the course of the money supply, the interest rate must fluctuate widely. In this situation, uncertainty over the relative size of the current and lagged interest rate effects on the demand for money would lead policymakers to respond conservatively to money supply deviations. To illustrate with the second example, the money supply is kept closest to target by attempting to eliminate 46 percent of the observed deviation in the upcoming period. If this is done, the asymptotic variance of the interest rate is about 48 times the variance of the disturbance term attached to the demand for money. If the policy response is strengthened with the intention of eliminating 64 percent of the observed deviation immediately, interest rate volatility roughly doubles. Conversely, if the policy response is weakened to 32 percent, interest rate volatility drops off to 24 times the variance attached to money demand.

With these figures in mind, suppose it is somewhat uncertain how quickly the public adjusts its money holdings. Policymakers are then unsure as to how quickly to bring money back to target. Obviously, it would be advantageous for them to err on the low side in determining the speed with which the money supply is brought back to target.

The effect of adding the real sector to the model

The model used in the previous section represented just the monetary sector. The real sector was omitted, as mentioned earlier, to keep the mathematics relatively simple. But to understand the basis for nominal GNP targeting and then compare its performance with that of monetary targeting, the real sector must also be part of the model. Incorporating the real sector modifies the two major results regarding monetary targeting. The results now reflect the impact of the monetary sector on the real sector and vice versa, but they are not fundamentally changed.

Let us add to the monetary sector a version of the widely used multiplier-accelerator model. There are two behavioral relationships in this model. First, consumption spending depends solely on income. Second, investment spending responds to the interest rate and to changes in the level of output. Neither relationship is assumed to hold exactly; random disturbance terms are included. Thus, the real sector can be represented as:

$$(3)\quad C(t) = f + gY(t) + u_1(t)$$
$$(4)\quad I(t) = h - jr(t) + k[Y(t-1) - Y(t-2)] + u_2(t)$$

where:

C = nominal consumption,
I = nominal investment, and
u_1 and u_2 are disturbance terms.
$(0 < g \text{ and } k < 1;\ j > 0)$

By combining these two equations with the income identity, we obtain the "IS curve", equation 5:

$$(5)\quad (1-g)Y(t) - kY(t-1) + kY(t-2) = (f+h) - jr(t) + u(t)$$

Adding the real sector expands the model from two equations to three: the demand for money and the policy formula, plus the IS equation. Now the monetary sector affects the real side of the economy, which in turn feeds back on the monetary side. So, a change in the interest rate affects the demand for money directly by changing the opportunity cost of holding money. But a change in the interest rate also affects money demand indirectly by its impact on spending and income, the other key element in money demand.

Note also that the lagged effects present in the model have been increased substantially. Earlier, only the lagged effect of the interest rate on money demand was relevant; now the lagged income effect on money demand is also relevant. Furthermore, the real sector has an important lagged effect: aggregate demand is in part determined by the level of income one and two periods earlier, due to the accelerator mechanism. All together, the dynamic structure of the expanded model is much more complex than that of the original model.

Including the real sector, however, does not materially change either the analysis or the thrust of the results. This is demonstrated algebraically in the appendix. The two principal results, however, must be modified to reflect the connections between the monetary and real sectors. The results are changed to the following:

- Keeping the money supply as close, on average, as possible to target still requires seeking partial, and not complete, correction in the current period. But, the percentage correction that accomplishes this is now determined by the elasticities and the lag structures in both the demand for money and the aggregate demand for goods and services.

- As the strength of the policy response to deviations from target increases, the long-run volatility of both the interest rate *and* income rises exponentially. This is because they play parallel roles: income and the interest rate jointly determine the quantity of money demanded. And appropriate movements in the levels of income and the interest rate are the means employed to keep the money supply close to its target.

[9] This result appears to be the analogue in a stochastic model to the problem of "instrument instability" in a deterministic model, identified first by Holbrook. See Robert S. Holbrook, "Optimal Economic Policy and the Problem of Instrument Instability", *American Economic Review* (March 1972), pages 57-65.

The second result, modified now to reflect the real sector, has important implications. As the policy response is increased until the greatest attainable stability in the money supply is achieved, the volatility of income and the interest rate increases. This means, as it did earlier, that uncertainty over the structure of the economy would make policymakers prefer bringing the money supply back to target too slowly rather than too quickly. But the motive here is concern about unnecessary fluctuations in income and employment, not just fluctuations in interest rates.

Moreover, adopting strict monetary targeting could, in fact, be self-defeating if the intent were to stabilize income. To hit a money supply target, the interest rate and income must be maneuvered so that random disturbances shocking the system have a minimal impact on the money supply. That is, the process of targeting money insulates the money supply from shocks to the economy, with income and the interest rate bearing the brunt of the shocks. Taking this line of thinking one step further, it may be that, in order to stabilize income, policy should respond to deviations of income, not money, from target. The money supply, in other words, should be the "shock absorber" instead of income.

Monetary targeting versus focusing directly on income

Now bearing the larger model in mind, let us compare how well targeting money stabilizes income with how well focusing on income itself stabilizes income. To simulate monetary targeting, the system must contain three equations: the IS curve, the demand for money, and a policy formula oriented to deviations of the money supply from its target. To simulate nominal GNP targeting, the system must consist of the IS curve and a policy formula relating changes in the interest rate to movements in income itself. The interest rate changes can be made relative to the deviation of income (Y) from its target (Y*), which would be represented as:[10]

$$(6a)\ [r(t) - r(t-1)] = \beta[Y(t-1) - Y^*]$$

Or instead, the interest rate changes could be made relative to the observed changes in income, which would mean the formula would be written as:[11]

$$(6b)\ [r(t) - r(t-1)] = \gamma[Y(t-1) - Y(t-2)]$$

To simplify the comparisons between nominal GNP targeting and monetary targeting, consider two cases: first, all disturbances are in the monetary sector; second, all disturbances are in the real sector.[12] In the first case, focusing on income itself must be a superior strategy to monetary targeting. If all shocks originate in the monetary sector, aggregate demand is perfectly stable. Therefore, if policy focuses on income, it will be left undisturbed after coming to rest at the target level. But focusing on the money supply requires movements in the interest rate to keep it on target. These movements in the interest rate will in turn cause income to fluctuate, at times moving far away from the target. Thus, GNP targeting is preferred to monetary targeting.

This finding could have been expected on the basis of Poole's work with a static model.[13] He shows that the money supply is inferior to the interest rate as an intermediate target when the monetary sector (or LM curve) is the source of instability in the economy, not the real sector (IS curve).

In the other polar case, where all disturbances originate in the real sector, a simulation exercise must be conducted to compare the long-run volatility of income under the three policy formulas. Starting from equilibrium, the model was simulated for 250 periods. Under GNP targeting, a search was conducted for the value of the policy parameters (β or γ in equations 6a and 6b) that minimized the variance of income. Under monetary targeting, the search was for the value of the policy parameter (λ in equation 2) that minimized the variance of the money supply, and the corresponding variance of income was noted.

The simulations show, surprisingly, that monetary targeting was less effective, although only slightly less so, than either version of GNP targeting. The fact that monetary targeting is ranked below the other two strategies, even by a slight amount, is decisive. This polar case, in which all shocks originate in the economy's real sector, is where monetary targeting is supposed to be most effective. Moreover, the differences in the ranking of the strategies could probably be substantially widened either by altering the model's structure or by selecting different values for some key parameters. In any event, the two polar cases together indicate that over the entire spectrum a monetary targeting strategy is outperformed by a strategy of concentrating on the economy itself.

[10]National income accounts data are compiled quarterly, whereas the time period in the model is one half of a quarter. So, if the model were made operational, GNP data would have to be interpolated. Considering the volume of data on the real economy released monthly, and the fact that monthly estimates of GNP are made in the private sector, the task could be performed.

[11]The policy formulas are examples of proportional and derivative control in the Phillips framework for stabilization policy. See A. W. Phillips, "Stabilization Policy in a Closed Economy", *Economic Journal* (June 1954), pages 290-323.

[12]Because the policy strategies are evaluated on their ability to stabilize nominal GNP, "supply-side" or "price" shocks are not considered. If the strategies are evaluated in terms of real output and inflation, the aggregate supply of goods and services must be incorporated in the model. See Gordon H. Sellon, Jr. and Ronald L. Teigen, "The Choice of Short-Run Targets for Monetary Policy", Federal Reserve Bank of Kansas City *Economic Review* (April 1981), pages 3-16.

[13]William Poole, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model", *Quarterly Journal of Economics* (May 1970), pages 197-216.

Identifying the source of inefficiency in monetary targeting
Considering the results of the simulations, there must be a source of inefficiency intrinsic to monetary targeting in addition to the one Benjamin Friedman identified. He argued that "the intermediate-target procedure for monetary policy, based on the money stock, is in general an inefficient means of processing the information contained in observations on the money stock."[14] More specifically, monetary targeting implicitly attributes all money supply surprises to the disturbance term in the real sector, which is generally not believed to be true. But in the case of the simulations conducted here, it is true. All disturbances in the simulations are by design in the real sector and monetary targeting is still inefficient.

The extra source of inefficiency apparently lies in the lagged interest rate and income effects in the demand for money. With GNP targeting, the demand for money does not enter into the determination of income. But naturally, with monetary targeting it does, and consequently its presence introduces more lagged effects into the system. Since lagged effects create substantial difficulties in stabilizing any system, monetary targeting turns out to be inefficient relative to GNP targeting even when all disturbances are on the real side. If there are no lagged effects in the demand for money, this particular source of inefficiency in monetary targeting disappears; the inefficiency Friedman identified remains, however.

While the simulations point to GNP targeting's relative efficiency, they conceal a complication. Economists believe that interest rate movements have virtually no impact on aggregate demand in the very short run. The effect first becomes noticeable perhaps three months later. In contrast, interest rate changes do have a discernible impact on money supply growth in the very short run. Thus, policymakers would see their actions having an effect sooner on the money supply than on nominal GNP.

[14]Benjamin M. Friedman, "The Inefficiency of Short-Run Monetary Targets for Monetary Policy", *Brookings Papers on Economic Activity II* (1977), page 318.

Summary

This paper examined the properties of monetary targeting in a compact model of the macroeconomy. The first conclusion is that a monetary target is most effectively achieved by returning the money supply gradually to its target following a deviation. Attempts to bring the money supply back to target too rapidly cause unnecessary volatility in the money supply, interest rates, *and* the level of income. Hence, it is not just concern about volatility in rates that argues for a gradualistic approach, but unnecessary volatility in GNP itself.

The second conclusion is that, in principle, monetary policy could more effectively stabilize nominal income by focusing on the economy directly instead of on a monetary aggregate. Moreover, this is true even when the demand for money is stable and no financial innovation is occurring. This finding lends support to the argument for shifting the focus of monetary policy from the monetary aggregates to the performance of the economy. But, of course, the results of this analysis are limited by the particular model used, which does not incorporate some potentially significant factors, such as expectations. In other words, different models can yield different results. But even more importantly, a comprehensive evaluation of monetary targeting and GNP targeting would also take into account several practical and institutional considerations.

Lawrence J. Radecki

Asymtotic Variance

In the first section of the paper, the monetary sector is separated from the rest of the macroeconomy. Equations 1 and 2 can be solved to obtain the final-form equations for the money supply and the interest rate.

$$(1A)\ M(t) + (\lambda b-1)M(t-1) + \lambda cM(t-2) = (b+c)M^* + v(t) - v(t-1)$$

$$(2A)\ r(t) + (\lambda b-1)r(t-1) + \lambda cr(t-2) = (a-M^*) + \lambda v(t-1)$$

The asymptotic variances of the money supply, s_M^2, and the interest rate, s_r^2, are shown in equations 3A and 4A.

$$(3A)\ s_M^2 = \frac{(1 + \lambda c)\ 2s_v^2}{(1 - \lambda c)\ [(1 + \lambda c)^2 - (\lambda b - 1)^2]}$$

$$(4A)\ s_r^2 = \frac{(1 + \lambda c)\ \lambda^2 s_v^2}{(1 - \lambda c)\ [(1 + \lambda c)^2 - (\lambda b - 1)^2]}$$

In the second section of the paper, the real sector, represented by equation 5, is joined to the monetary sector. Combining this IS curve with equations 1 and 2 yields final-form equations for the money supply, income, and the interest rate, equations 5A, 6A, and 7A, respectively.

$$(5A)\ AM(t) + BM(t-1) + CM(t-2) + DM(t-3) + EM(t-4) = F_M + G_M(t)$$

$$(6A)\ AY(t) + BY(t-1) + CY(t-2) + DY(t-3) + EY(t-4) = F_Y + G_Y(t)$$

$$(7A)\ Ar(t) + Br(t-1) + Cr(t-2) + Dr(t-3) + Er(t-4) = F_r + G_r(t)$$

where:

$$A = 1-g$$
$$B = [(1-g)(\lambda b-1) - k + \lambda dj]$$
$$C = [(1-g)\lambda c - k(\lambda b-1) + k + \lambda ej]$$
$$D = [k(\lambda b-1) - \lambda ck]$$
$$E = \lambda ck$$
$$F_M = \lambda[(1-g)(b+c) + j(d+e)]M^*$$
$$F_Y = \lambda[(b+c)(f+h) - j(a-M^*)]$$
$$F_r = \lambda[(d+e)(f+h) + (1-g)(a-M^*)]$$
$$G_M(t) = dw(t) + (e-d)w(t-1) - ew(t-2) + (1-g)v(t) - (1-g+k)v(t-1) + 2kv(t-2) - kv(t-3)$$
$$G_Y(t) = w(t) - (1-\lambda b)w(t-1) + \lambda cw(t-2) - \lambda jv(t)$$
$$G_r(t) = \lambda dw(t-1) + \lambda ew(t-2) - \lambda(1-g)v(t-1) + \lambda kv(t-2) - \lambda kv(t-3)$$

There are two features of these equations to be noted: all three equations, by necessity, have the same autoregressive structure; and the three equations differ in their composite disturbances.

It is anticipated that, if the expressions for the asymptotic variance were available, essentially the same results would be found for this fourth-order system of three variables as were found for the second-order system of two variables. These results, modified to take account of the addition of the real sector, would be that:

- There is a value of λ between zero and $(1-g)/[b(1-g) + dj]$ that minimizes s_M^2, the asymptotic variance of the money supply. In the expanded system, $[b(1-g) + dj]/(1-g)$ is equal to the contemporaneous impact on the money supply brought about by a fall in the interest rate of one percentage point. It is the combined effect that the interest rate has on the demand for money directly and indirectly, via a change in income. The value $(1-g)/[b(1-g) + dj]$ sets the value of λ corresponding to 100 percent elimination of deviations in the upcoming period.

- As λ increases, the asymptotic variance of both the interest rate *and* income rises exponentially. This is because the parameter λ appears in the composite disturbance terms of these two variables. (See $G_y(t)$ and $G_r(t)$ in equations 6A and 7A.) Thus, the solutions for the asymptotic variance will have λ^2 in the numerator, just as it appeared in the solution for the asymptotic variance of the interest rate in the smaller system, equation 4A.

The last point has an important implication. As the policy response is increased until the greatest attainable stability in the money supply is achieved, the volatility of the other endogenous variables increases at an explosive rate. In other words, as λ is increased until s_M^2 is minimized, s_Y^2 and s_r^2 are growing exponentially.

Potential Output Growth and the Long-Term Inflation Outlook

The rapid growth in real GNP and in domestic demand during this expansion has led to concern about a resurgence in inflation. If the economy continues to expand at a quick pace, some analysts suggest, it may soon run into a capacity constraint. Further increases in the demand for goods and services would then raise the inflation rate, with little or no increase in real output.

Historically, the effect of demand pressures on the inflation rate has been captured well by unemployment rate movements. An important factor in the inflation outlook is the rapidly closing gap between the unemployment rate and the natural rate—the unemployment rate consistent with stable inflation. This gap has proved to be a useful indicator of demand pressures since movements in the gap have had a stable and predictable impact on the rate of inflation.[1] At present, most estimates of the natural rate fall somewhere between 6 and 7 percent; thus, the current unemployment rate is somewhat above the midpoint of this range. Once the unemployment rate reaches the natural rate, if the economy can then be stabilized there, a pickup in inflation may be prevented.

To operate at the natural rate, real GNP needs to grow at what is called its potential or capacity growth rate. Growth in potential output, as discussed below, is fundamentally equal to trend growth in productivity, the labor force, and average weekly hours. As such, it represents the rate of growth in the economy's long-run ability to produce goods and services. If the economy expands at the same rate as potential, there is no systematic pressure on the unemployment rate to rise or fall. Thus, when actual output is growing in line with potential and the unemployment rate is equal to the natural rate, an important source of pressure on the inflation rate is eliminated.

This article examines the behavior of potential output over the past twenty-five years. Growth in potential output from 1974 to 1983 was found to be approximately 3.1 percent, down significantly compared to the years 1960 to 1973. An analysis of likely trends in the determinants of potential output suggests that it could continue to expand approximately three percent a year over the next decade.

Since 1974, however, the link between output growth and changes in the unemployment rate has become more variable. Consequently, deviations in output growth from its potential are no longer as reliable an indicator of movements in the unemployment rate. The inflationary consequences of an expanding economy, therefore, are more uncertain today than before 1974. This greater uncertainty, moreover, suggests caution in moving to a nominal GNP target for monetary policy that some economists have suggested in recent years.

What is potential output?

Generally speaking, potential output measures what the economy can produce at full employment. Throughout the 1960s, the Council of Economic Advisors defined potential output to equal the amount of goods and services the economy could produce with a 4 percent unemployment rate. In the late 1960s and early 1970s, however, it became increasingly clear that while it might be possible for the economy to operate with 4 percent unemployment, it would conflict with another policy goal—price stability.

For most purposes, the relevant measure of potential

[1] See A. Steven Englander and Cornelis A. Los, "The Stability of the Phillips Curve and Its Implications for the 1980s", Federal Reserve Bank of New York Research Paper Number 8303 (February 1983).

output equals the amount of goods and services the economy can produce when operating at the natural rate. Potential output is tied to the natural rate since movements in the unemployment rate away from the natural rate have proved to be an important determinant of whether the inflation rate will rise or fall. Note, however, that even if the economy is growing at its long-run potential rate, in the short run, the unemployment rate need not equal the natural rate.

Some analysts have suggested that a natural rate of capacity utilization also exists and that deviations in capacity from its natural rate serve as a reliable indicator of inflation. But if there is a natural rate of capacity utilization, it, like the natural rate of unemployment, does not appear to have remained constant over the past twenty years. In the mid- to late-1960s, for example, the manufacturing sector reached rates of capacity utilization in the high eighties before consumer prices accelerated. In the mid- to late-1970s, in contrast, inflation accelerated when the manufacturing sector was operating at only about 80 percent of capacity.

Perhaps more importantly, movements in capacity utilization tend to mirror movements in the unemployment rate; the two series have a correlation coefficient close to -0.9. Thus, after accounting for movements in the unemployment rate, movements in capacity may not improve our ability to track inflation. This, however, is an empirical question beyond the scope of this paper.

Measurement of potential output

A number of techniques have been used to measure growth in potential output; two of them are employed in this article. The simplest and most direct method is to ascertain the growth in real GNP that historically has been associated with a stable unemployment rate. The equations estimated for this purpose are presented in Box 1. An alternative approach, which analyzes growth in productivity, average weekly hours, and the labor force, is discussed below. A third approach, not used in this paper, involves estimating a production function for the economy and determining the factor input levels consistent with full employment.[2]

Econometric or statistical approach

Based upon the statistical relationship between movements in real GNP and the unemployment rate, the rate of growth in potential output over the period 1974 to 1983 was found to be 3.1 percent. This rate of expansion, however, was less than the 3.9 percent growth in potential that characterized the period from 1960 to 1973.

The chart illustrates the reduction in capacity growth by plotting the estimated long-run relationship between real GNP growth and changes in the unemployment rate. As can be seen in the chart, the GNP growth rate consistent with a stable unemployment rate decreased beginning in 1974.

The decline in potential output growth meant that after 1973 the economy could no longer expand as fast as in the previous decade and still maintain a stable inflation rate over the longer term. Yet perceptions of potential growth changed slowly. As a result, the growth rates which had been built into people's expectations may have become highly inflationary.

A second, and perhaps more significant new finding in this article is that beginning in the mid-1970s, the link between output growth and the unemployment rate became more uncertain.[3] This implies that the range of likely movements in the unemployment rate associated with any rate of real GNP growth became much wider. For example, the unemployment rate rise in 1975 and drop in 1983 were larger (in absolute terms) than the statistical relationship predicted. In the earlier period, on the other hand, the relationship predicted unemployment rate changes much more accurately. Thus significant movements in the unemployment rate, that do not reflect the underlying strength or weakness of the economy, are now more likely to occur. Over time, these errors will tend to cancel each other out. However, over the course of six months to a year, large movements in the unemployment rate, unrelated to GNP, can occur.

Historically, compensation growth has moved in fairly close tandem with unemployment rate movements. The more tenuous link between GNP growth and the unemployment rate, then, serves to loosen the link between GNP growth and inflation. Thus the inflationary consequences of economic expansion are more uncertain today then before 1974, primarily because unemployment rate movements cannot be predicted as accurately from GNP growth.

The increased variability in the GNP/unemployment rate relationship suggests that a *significant* decline or increase in inflation over the short run may occur even when the economy is expanding at the same rate as its long-run potential. Consequently, successfully implementing economic policies aimed at stabilizing the unemployment and inflation rates may be more difficult. For policy-makers, this means distinguishing what may be only "blips" in the unemployment and inflation rates from movements which truly reflect the economy's underlying strength or weakness.

[2]For recent analyses along this line see, among others, Jeffrey M. Perloff and Michael L. Wachter, "A Production Function-Nonaccelerating Inflation Approach to Potential Output: Is Measured Potential Output Too High?", in Karl Brunner and Allan H. Meltzer, eds., *Three Aspects of Policy and Policymaking: Knowledge, Data, and Institutions,* Carnegie-Rochester Conference Series on Public Policy, Volume 10 (1979), pages 113-163, and John A. Tatom, "Potential Output and the Recent Productivity Decline", Federal Reserve Bank of St. Louis *Review* (January 1982), pages 3-16. A number of objections, however, have been raised about this method. See, for example, the comments on the Perloff and Wachter paper. Estimates of potential output made by Tatom are discussed later in this article.

[3]Not only did the growth rate of potential output change, but the residual standard error rose 75 percent as well.

Box 1: Estimating the Unemployment/Real Output Relationship

The relationship between real GNP growth and unemployment rate changes was estimated using data from 1960-I to 1983-IV. Based upon a number of tests for structural stability, the data were consistent with real GNP having a different impact on the unemployment rate beginning in 1974.*

In light of this, the data were split into two groups—1960-I to 1974-I and 1974-II to 1983-IV. Several models were estimated for each subperiod to identify the relationship between the unemployment rate and real GNP. The best equation for each subperiod was:

1960-I to 1974-I

(A.1) $\hat{DU}_t = .260 - .183\ gnp_t^* - .090\ gnp_{t-1}^* + .312\ DU_{t-1}$
(6.18) (−7.26) (−2.60) (3.17)
$R^2 = .70$ $\hat{\sigma} = .16$ Durbin's-H = −.63

*For details, see Douglas M. Woodham, "The Changing Relationship Between Unemployment and Real GNP in the United States", Federal Reserve Bank of New York Research Paper (forthcoming), revised.

1974-II to 1983-IV

(A.2) $\hat{DU}_t = .329 - .285\ gnp_t^* - .142\ gnp_{t-1}^*$
(6.44) (−7.05) (−3.58)
$R^2 = .73$ $\hat{\sigma} = .28$ DW = 1.71

where DU equals the change in the unemployment rate and gnp* equals $(GNP_t - GNP_{t-1})/GNP_{t-1}$ times 100. Both equations were estimated by ordinary least-squares (t-statistics are in parentheses).

The rate of growth in potential output equals the rate of growth in real GNP associated with a stable unemployment rate. This growth rate can be calculated for the period 1974-II to 1983-IV as follows: set the left hand side of equation (A.2) to zero and find the constant rate of growth in GNP that solves the equation. The solution is .77 percent. This corresponds to 3.1 percent growth when expressed at a compound annual rate.

Growth in potential over the earlier period can be calculated in a similar manner. Besides setting the current value of DU equal to zero, however, the lagged value of the change in the unemployment rate must also be set equal to zero.

Box 2: Decomposing Growth in Potential Output

Movements in real GNP can be decomposed into movements in productivity (P), average hours worked (AHW), the proportion of people employed (1-U), and the labor force (LF) using the equation reported in the section on an alternative approach to measuring potential output. A problem arises, however, in using the conventional measures of P, AHW, (1-U), and LF in this equation since they are not measured on the same basis.* The most widely used measure of productivity equals output per hour produced by *all* employees in the nonfarm business sector while average hours worked is generally reported as the average workweek of *production* workers in the nonfarm sector.

Furthermore, the employment series used to calculate both of these variables is based upon data from the Bureau of Labor Statistics' payroll survey. The unemployment rate and labor force variables, on the other hand, are based upon employment numbers generated from the Bureau of Labor Statistics' household survey. These surveys sometimes give very different estimates of the number of jobs being created in the economy. This was particularly true in 1983.

The fact that P, AHW, (1-U), and LF are measured on different bases can be accounted for by noting that:

$$GNP = \frac{GNP}{NFGNP} * \underbrace{\frac{NFGNP}{HOURS}}_{P} * \underbrace{\frac{HOURS}{PRODHOURS} * \frac{PRODHOURS}{WORKERS}}_{AHW} * \frac{WORKERS}{EMPLOY} * \underbrace{\frac{EMPLOY}{LF}}_{(1-U)} * \underbrace{LF}_{LF}$$

*The approach employed here owes much to Peter K. Clark, "A Kalman Filtering Approach to the Estimation of Potential GNP", unpublished manuscript, Yale University (November 1983).

where:

NFGNP = nonfarm private sector output,
HOURS = total hours of all employees in the nonfarm private sector,
PRODHOURS = total hours of production workers in the nonfarm private sector,
WORKERS = production workers in the nonfarm private sector.
EMPLOY = total employment
LF = civilian labor force.

The first ratio compares real GNP to the value of all goods and services produced in the nonfarm business sector. The second ratio equals the conventional measure of productivity while the third ratio provides a link between productivity and the conventional measure of average hours worked. The fifth ratio links different employment variables from the household and payroll series, while the last two ratios equal, respectively, one minus the civilian unemployment rate and the civilian labor force.

This equation implies that the underlying rate of trend growth in real GNP can be decomposed into the underlying rates of trend growth in the conventional measures of P, AHW, and LF, along with growth in the various "linking" variables. Cyclically adjusted trend growth in P, AHW, and LF are reported in Table 1 along with the sum of the underlying rates of trend growth in the "linking" variables.

An alternative approach to measuring potential output

The estimates of potential growth presented above were derived implicitly from statistical analysis of the relationship between unemployment rate changes and real GNP growth. Another approach is to estimate the growth in potential by measuring trend growth in productivity, average weekly hours, and the labor force. This method both confirms the earlier statistical analysis and provides insight into the fundamental factors that have changed potential output growth.

Underlying the alternative approach is the following identity, relating real GNP growth to the sources of economic growth:

$$GNP = \frac{GNP}{\text{total hours worked}} * \frac{\text{total hours worked}}{\text{employment}} * \frac{\text{employment}}{\text{labor force}} * \text{labor force.}$$

The first ratio measures labor productivity, the second average weekly hours, and the third is equal to one minus the unemployment rate.

This equation implies that GNP growth in any quarter is identically equal to the sum of growth in labor productivity, average weekly hours, the proportion of workers employed, and the labor force. Suppose the unemployment rate were set equal to a pre-specified value, such as the natural rate. Then, the economy's underlying rate of growth—the rate of growth in potential—would equal the sum of the underlying rates of growth in labor productivity, average hours worked, and the labor force. Table 1 presents these growth rates for different time periods.

Calculating trend growth in these variables requires some care. The equation presented above is an identity, and, as such, the product of productivity, average hours worked, etc., has to equal real GNP. This necessitates choosing the input variables carefully since the conventional measures of these variables are calculated using somewhat different bases. Accordingly, compositional changes in employment and output have to be accounted for, as noted in Box 2.

From 1960 to 1973, potential output was expanding at a 3.9 percent annual rate. Most of this growth came from rapid advances in labor productivity. Trend growth in the civilian labor force of 2.0 percent was also an important factor.[4]

[4]The growth accounting framework used here provides a convenient way of summarizing how the sources of economic growth have changed over time. A mistaken impression may arise, however, that an acceleration or deceleration in one source of economic growth will unequivocably lead to a change in potential growth. This is not true since the behavior of each source of growth can affect the evolution of the others. A rapid influx of inexperienced workers, for example, may boost labor force growth; however, it will also tend to depress productivity. The trend behavior of each source of economic growth, then, should not be viewed as being independent of the others.

Taken together, the expansion in productivity and the labor force suggest that potential output was growing at a 4.4 percent annual rate. However, average hours worked by production workers in the nonfarm private sector was falling a cyclically-adjusted 0.5 percent. This lowered the rate of growth in potential output to 3.9 percent.

Beginning in 1974, growth in potential output fell to 3.1 percent. Two disparate factors led to this change: a rise in labor force growth and a slowdown in productivity growth.

First, from 1974 to 1983, cyclically-adjusted trend growth in the civilian labor force rose to 2.5 percent from 2.0 percent. The accelerated growth stemmed from a sharp rise in labor force participation. From 1974 to 1983, labor force participation—the ratio of the civilian labor force to the working age population—expanded at an annual rate of 0.7 percent (adjusted for cyclical variation). This is more than three times the growth rate from 1960 to 1973 (Table 2). The pickup in participation rates was largely the result of more women entering the labor force.

Second, faster growth in the labor force, which by itself would have increased growth in potential, was offset by a decline in the rate of expansion in labor productivity. Several factors contributed to the productivity slowdown. Sharp increases in energy prices, a decline in capital investment relative to employment growth, and a change in the composition of the work force that accompanied the surge in the labor force are some of the more frequently cited factors. A complete explanation for the slowdown, however, has eluded researchers.

Taken together, the productivity slowdown that began in 1974 more than offset the rise in labor force growth over the same period. The result has been a noticeable decline in the economy's capacity to produce goods and services.

Comparison with other studies

The analysis presented above suggests that potential output has been growing about 3.1 percent a year since the mid-1970s, down sharply from 3.9 percent. Statistical analysis also implies that the link between GNP growth and the unemployment rate became weaker after 1973. Both the large size of the estimated drop in potential growth—0.8 percent per year—and the more uncertain link of GNP growth to unemployment after 1974 are results which are new in this paper.

Table 3 shows the growth rates for three potential output series constructed by the Council of Economic Advisors, by John Tatom, and by Peter Clark. Over the period 1960 to 1973, only one series had potential expanding 3.9 percent a year while the other two grew a bit slower. Also, from 1974 to 1983, all three series grew faster than 3.1 percent. Since the three studies used different methods and time periods to calculate potential, it is not surprising that they produced somewhat different point estimates.

While the point estimates may differ, the work presented

Table 1

Decomposition of Growth in Potential Output

Cyclically adjusted trend growth, in percent

Period	Productivity*	Average weekly hours†	Civilian labor force	Compositional changes‡	Rate of growth in potential output
1960-73	2.4	−0.5	2.0	0.0	3.9
1974-83	0.9	−0.5	2.5	0.2	3.1

*Output per hour in the nonfarm private sector.
†Hours worked per week by production workers in the private nonfarm sector.
‡Explained in Box 2.

The trend growth rates were estimated by regressing the natural log of each variable on a constant and time trend. To account for cyclical variation, the current and one lagged value of the unemployment rate were added into each regression. Annualized rates of growth are reported in the Table.

Trend growth in average weekly hours and some of the variables that go into the "compositional change" variable are based on data beginning in 1964.

The productivity, average weekly hours, and civilian labor force trend growth rates are based on *Bureau of Labor Statistics* data.

in this paper, unlike the other studies, suggests that a sharp decline in the economy's capacity to produce goods and services occurred in the mid-1970s.[5] A reasonable lower bound on the decline is 0.5 percentage point, while a 0.8 percentage point fall is an upper limit. The actual decline, which we can never know with certainty, is probably closer to the upper limit than the lower one.

A reduction of this size implies that a significant loss of output can accumulate in a short period of time. For example, suppose the economy were to grow over the next five years at its earlier 3.9 percent potential growth rate, rather than at our current estimate of 3.1 percent per year. Real GNP in 1988 would be $71 billion more—almost 5 percent of real GNP—a very significant difference over a short period of time.

Another finding of this study that was not stressed in earlier work is the more uncertain link between output and unemployment since 1974. The 1979 Annual Report of the Council of Economic Advisors alluded to an apparent decline in the reliability of the relationship between output and employment that began in 1973.[6] The forecasting errors, however, were attributed to an incorrect estimate of growth in potential GNP. The work presented here suggests that even after allowing for a shift in the rate of potential growth, the relationship between real GNP and unemployment became more uncertain.

The outlook for growth in potential

An analysis of likely trends in productivity, average hours worked, and the labor force can be used to project tentatively the rate at which potential output may expand over the next 10 years. Such calculations, although highly speculative, help to illuminate the likely sources of economic growth.

Over the next decade, both the civilian labor force and labor productivity will probably behave very differently compared with the 1970s. However, in contrast to the earlier period, the changes are likely to offset each other, leaving growth in potential output at about 3 percent.

The Bureau of Labor Statistics projects that the civilian labor force will only grow by about 1.2 percent on average from 1985 to 1995, compared with 2.5 percent growth for 1974 to 1983. A decline in the growth rate of both the working age population and labor force participation are responsible for the slowdown.[7]

If trend behavior in productivity and average hours worked were not to change over the next decade, slower labor force growth would push the rate of growth in potential down to approximately 2.0 percent. Trend growth in productivity, however, will probably not remain at the depressed 1974-83 rate of 0.9 percent for a number of reasons.

First, the entry of the baby-boom generation into the labor force and the rise in labor force participation of women increased the number of relatively inexperienced and unskilled workers seeking employment in the 1970s. This change in the composition of the labor force contributed significantly to the productivity slowdown. As these workers gain experience and develop new skills, productivity is likely to advance at a faster rate over the next decade than in the 1970s.

Second, the sharp rebound in business fixed investment in this recovery, if continued, is likely to increase productivity growth. Furthermore, expenditures on "high-tech" capital goods[8] have been growing rapidly since the mid-1970s,

[5]A revised, yet unpublished, potential output series developed by John Tatom suggests that potential output growth fell about 0.7 percentage point in the mid-1970s. The "middle-expansion" trend real GNP series presented in a table in Frank de Leeuw and Thomas M. Holloway, "Cyclical Adjustment of the Federal Budget and Federal Debt", *Survey of Current Business*, Volume 63, Number 12 (December 1983), page 29, also supports the view that a major change in productive capacity occurred around 1974.

[6]See pages 73-4 of the Council's 1979 Report.

[7]These projections are based upon data discussed in Howard N. Fullerton, Jr. and John Tschetter, "The 1995 Labor Force: A Second Look", *Monthly Labor Review* (November 1983), pages 3-10.

[8]In 1976, for example, expenditures on "high-tech" capital goods—scientific and engineering instruments, photographic and communication equipment, and office and store machinery—were equal to 26.5 percent of expenditures on producers' durable equipment. By 1983, the share had risen 80 percent to 47.7 percent.

leading to an ever larger share of total equipment expenditures going to high-tech goods. This change in the composition of expenditures may also help to boost productivity growth.

Finally, energy price growth—regarded by many analysts as a key factor in the productivity slowdown—is expected to be moderate in the 1980s. Indeed, over the past two and a half years energy prices have generally been either declining or showing no change. Thus they are not likely to act as a further drag on productivity growth, barring another round of energy price shocks.

These factors, taken together, suggest that over the next ten years productivity is likely to expand faster than the 0.9 percent trend growth which occurred after the first oil shock. Forecasts of long-term productivity growth of about 2 percent, for example, have been made by a number of economists.[9]

Such a substantial pickup in productivity growth would largely offset the decline in labor force growth projected by the Bureau of Labor Statistics. If these forecasts are correct, then, the rate of growth in potential output over the next decade would essentially remain at approximately 3 percent. The labor force and productivity projections may, of course, prove to be incorrect. However, until there is evidence that these forecasts are wide of the mark, projections of three percent growth in potential seem reasonable. Therefore, both this analysis and the statistical analysis presented earlier suggest that once the unemployment rate is at the natural rate, real growth of approximately 3 percent will help avoid a long-term rise in inflation.

The near-term outlook for unemployment

The alternative approach confirms the potential growth estimate obtained from the statistically-based method. This suggests that the statistically-based method may indeed be helpful in analyzing short-term unemployment rate movements. However, in so doing, one should recall the second implication of the statistical analysis: forecasts of unemployment rate movements based on GNP growth are not as reliable today as they once were. Therefore, the impact of GNP growth on the unemployment rate, and in turn the inflation rate, is much less certain.

As a benchmark for our projections, we use the Blue Chip consensus forecast of June 1984, which calls for fourth quarter to fourth quarter growth of approximately 4.8 percent in 1984 and 2.8 percent in 1985. If these forecasts prove to be correct, further reductions in the unemployment rate are likely in 1984, albeit at a slower pace than in 1983, since real GNP will be growing faster than potential. In 1985, however, the unemployment rate is not likely to decline very much, since the economy will be expanding at approximately the same rate as potential output.

Will the decline in the unemployment rate that may occur in 1984 bring the unemployment rate down to the natural rate? The rates of real output growth needed over various time intervals to reduce the unemployment rate by one or more percentage points are shown in Table 4. Real growth at an annual rate of approximately 7 percent over two years, for example, is associated with a three percentage point decline in the unemployment rate. As a rule of thumb, for every percentage point by which real GNP growth exceeds 3 percent, the unemployment rate declines about 0.4 percentage point over a year.[10]

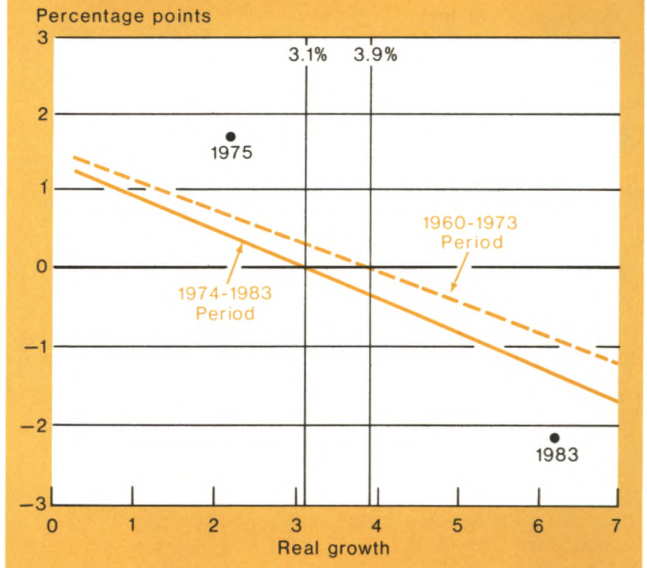
The numbers in Table 4, which are based on the historical relationship between real output and the unemployment rate, imply that the unemployment rate will probably not fall below the natural rate this year. The June unemployment rate, at 7.1 percent, was about 0.6 percentage point above the midpoint of natural rate estimates. Historical relations suggest that a reduction in the unemployment rate of this size

[9]See Chase Econometrics, *U.S. Macroeconomic Long-Term Forecasts* (October 1983), page A.4 and Data Resources, Inc., *U.S. Long-Term Review* (Summer 1983) page 1.9.

[10]In their 1984 Report, the Council of Economic Advisors projected that real GNP would expand on average 4.2 percent from 1984 to 1989. This rate of expansion exceeds the estimate of potential growth presented in this paper by about one percentage point. The Council has the unemployment rate falling on average 0.4 percentage point a year to 5.7 percent in 1989, a drop consistent with our estimate of potential output growth.

Estimated Long-run Relationship Between Changes in the Unemployment Rate and Real GNP Growth

Fourth-quarter to fourth-quarter



would require real GNP growth of approximately 4.6 percent for one year. Growth of this magnitude, while possible, is stronger than most forecasts. The economy, then, may well be operating somewhat above the natural rate at the year-end, although it may approach the natural rate sometime in 1985.

A final note of caution is in order here. The natural rate is not known with certainty. Changes in trend productivity growth or shifts in labor bargaining relationships may alter the natural rate. Thus, it is important to monitor wage and price inflation carefully as we approach the range of estimated natural rates.

Table 2

Decomposition of Growth in the Civilian Labor Force

In percent

Demographic factors	Trend rate of growth 1960-73	1974-83
Civilian labor force	2.0	2.5
Working age population*	1.7	1.7
Labor force participation†	0.2	0.7

*All noninstitutionalized civilians 16 years old and over.

†The ratio of the civilian labor force to the working age population.

The data were obtained from the *Bureau of Labor Statistics*. See Table 1 for an explanation of how the growth rates were calculated. Since the working age population depends upon past fertility rates and life expectancy, rather than the business cycle, the unemployment rate was not included in the working age population regressions.

Table 3

A Comparison of Estimates of Growth in Potential Output

In percent

Period	Council of Economic Advisors	Tatom*	Clark†	This study
1960-73	3.7‡	3.9	3.6	3.9
1974-83	3.3‡	3.4	3.4	3.1
1984-89	4.2(3.1)§	‖	‖	3.1

*See John Tatom, *op. cit.* The growth rates were estimated by regressing the natural log of Tatom's potential output series on a constant and time trend. The growth rate for 1974 to 1983 is based on data ending in 1981-III.

†Revised estimates based on Peter K. Clark, *op. cit.* The growth rates, which are based on annual data, equal the average rate of growth over the stipulated interval. The growth rate for 1974 to 1983 is based on data ending in 1982.

‡1981 *Annual Report of the Council of Economic Advisors*. The growth rates were estimated by regressing the natural log of the Council's potential output series on a constant and time trend. The growth rate for 1974 to 1983 is based on data ending in 1980-IV.

§1984 *Annual Report of the Council of Economic Advisors*. The first number equals the average rate of growth in the Administration's real GNP forecast. See Table 6-11, page 197 in the Council's Report. The number in parentheses refers to the Council's estimate of *trend* GNP growth from 1970 to 1989.

‖Not available.

Conclusions and policy implications

The economy's potential growth rate—the long-run rate compatible with stable inflation—appears to be about three percent. Real GNP growth above three percent would ultimately drive the unemployment rate below its natural rate, eventually reviving inflationary pressures. This rate of growth in potential is lower than the 3.9 percent rate that characterized the 1960s and early 1970s.

Particularly significant is the finding that the link between the unemployment rate and real GNP is more uncertain today. Given any rate of growth in real GNP, the range of likely movements in the unemployment rate is larger now than before 1974.

What does this uncertainty mean for our understanding of inflation and real growth? The relationship between inflation and unemployment has remained fairly tight over the past twenty years. But the weakened link between unemployment and real output, by extension, loosens the link between inflation and output. We therefore face more uncertainty today regarding the inflationary consequences of economic growth than in the 1960s and early 1970s.

Suppose, for example, that the economy is expanding at the same rate as its long-run potential and that the unemployment rate is initially at the natural rate. Shocks to the unemployment rate, unrelated to GNP growth, can cause temporary, yet significant, upticks or declines in inflation. This has been particularly true since 1974.

Notwithstanding these difficulties, the rate of growth in potential GNP is a useful measure of the longer-term ability of the economy to produce goods and services. Sustained growth in excess of 3 percent is likely to induce an overheating of the economy, which would revive inflationary pressures. Thus, despite the greater uncertainty in the unemployment/real output relationship in the post-1973 economy, it is important that policy aim at bringing economic growth toward its long run potential of about 3 percent.

However, arguing that economic policy should be consistent with growth in potential does not imply that we should move all the way to nominal GNP targeting, as some analysts have suggested. In fact, hitting nominal GNP targets presents many of the same problems as hitting monetary targets. Targeting nominal income requires setting goals for both real output growth and price inflation, which add up to nominal GNP growth. Our estimated three percent growth in potential provides a long-term anchor on which

to focus the real growth component. But this estimate would have to be carefully monitored. As we have seen, a shift in the rate of capacity growth—similar in many ways to a shift in money demand—occurred in 1974, but it took a long while before the shift was detected. Such undetected shifts would greatly reduce the benefits from nominal GNP targeting.

Finally, our finding of a weakened link between output and unemployment (and therefore inflation) implies that the economy is now more prone to large, albeit possibly temporary, departures from a nominal income target over a policy-making horizon of, say, a year. Consequently, even if real GNP were to expand along its potential path, a wide range of inflation rates and, thus, deviations from a nominal income target, are possible over a period of several quarters, again posing problems analogous to those associated with interpreting the monetary aggregates.[11] More generally, a given rate of nominal income growth may be difficult to interpret, since its inflation and real growth components may differ greatly from those expected in setting the nominal income target. Such issues raise questions about the practicality of targeting nominal GNP.

Table 4

Relationship Between Unemployment Rate Movements and GNP Growth

	Real Growth (in percent) needed to reduce unemployment rate by:		
Over a period of	1 point	2 points	3 points
1 year	5.5	8.0	10.5
2 years	4.3	5.5	6.8
3 years	3.9	4.7	5.5

These numbers were derived using equation (A.2) reported in Box 1. They were obtained by solving the equation for the constant rate of growth in real output that would reduce the unemployment rate by one, two, or three percentage points over the stipulated time interval. The growth rates are expressed at an annual rate.

[11]Suppose, for example, that the economy is proceeding along its potential path and that the nominal income target is 8 percent (composed of 3 percent real growth and 5 percent inflation). Unexpected movements in the unemployment rate (as large as plus or minus a half a percentage point in any quarter) could yield inflation rates of 4 to 6 percent over the course of a year. If policymakers attempt to offset what may be essentially random movements in inflation, they run some risk of inducing unnecessary fluctuations in the economy.

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Financing the U.S. Current Account Deficit

Over the past two years, the U.S. current account—the broadest measure of a country's international trade in goods and services—has moved into heavy deficit. That deficit is continuing to grow rapidly.

The sharp rise in the deficit—from roughly $10 billion in 1982 to about $40 billion last year, and to an estimated $80-100 billion per year this year and next—has understandably raised many questions about whether and, if so, how deficits of these magnitudes can be financed.

This article has three purposes:

- To review the simple analytics of current account financing that apply to any country;
- To compare the pattern of financing for recent U.S. deficits with past financing patterns of this country and other industrial countries; and
- To suggest how the financing pattern might change under a few plausible scenarios (but not predictions) about the future.

It's worth anticipating a few of the main conclusions:

(1) To ask *whether* a current account deficit can be financed is basically the wrong question. If a current account deficit can't be financed, it can't be incurred in the first place. The real question is under what financial market conditions and with what mix of relative interest rates and exchange rates will the financing be forthcoming.

(2) The United States does have financing options that virtually no other country has because of the dollar's unique international role as the principal currency that foreign official monetary institutions hold in their reserves. But during the past two years, when the current account deficit has been rising rapidly, the United States hasn't been relying on financing of the type ordinarily associated with the dollar's special role—increases in official reserves. Instead, the deficit has primarily been financed through the U.S. banking system, by drawing in essentially private short-term funds from abroad, and by various unrecorded capital inflows.

(3) There is no *necessary* point at which the U.S. current account deficit can no longer be readily financed; in that sense, the present pattern of financing is, at least in principle, sustainable.

(4) But there is ample precedent in practice to support the view that the present financing pattern, with its heavy reliance on foreign acquisition of short-term dollar assets, is obviously vulnerable to shifts in how foreign investors perceive U.S. inflation trends and prospects for movements in dollar exchange rates. Moreover, an important part of the recent financing pattern is foreign-trade-related, an incidental by-product of the rapid surge in U.S. imports. As U.S. import growth slows, this incidental financing must also tend to decelerate.

(5) Even so, an abrupt shift in financing patterns is hardly likely to force the United States to suffer a sudden, sharp cutback of imports—the usual adjustment other countries make in the face of obstacles to financing large current account deficits.

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Methods of Current Account Financing

There are many channels through which current account deficits may be financed. Generally, they are distinguished according to who provides the financing and what type of instrument is involved. Six distinctions are natural:

- between the private sector and government;
- between domestic residents or institutions and foreign residents or institutions;
- between banks and other institutions;
- between short-term instruments and long-term instruments;
- between local currency instruments (*e.g.,* dollars for the United States, yen for Japan) and foreign currency instruments (*e.g.* yen, marks, or Swiss francs for the United States); and
- between changes in existing asset holdings and changes in levels of debt.

A couple of examples illustrate how these distinctions work:

1. A U.S. domestic private sector company sells a factory it owns in France, converts the French francs it gets into dollars and uses the proceeds in its U.S. domestic operations. That transaction will (inadvertently) help finance a U.S. current account deficit.
2. A Latin American government-owned development bank borrows dollars from private commercial banks in London for six months. It lends those dollars to the domestic telephone company to enable it to finance a shipment of switching equipment. That will help the Latin American country finance its current account deficit.

The problem with applying this framework is that it leads to literally dozens of possible combinations, even without bringing in the role of international organizations like the International Monetary Fund (IMF) or the World Bank. What's necessary then is to simplify the analysis in a way which is instructive and which fits well with the data available in published balance-of-payments statistics.

The most useful starting point is to separate private from official capital flows and identify the main components of each. *Private* flows incorporate:

- *Net flows through the banking system.* These flows represent changes in bank assets and liabilities with respect to the rest of the world. To finance a deficit, either external assets must be reduced or liabilities to foreigners must be increased.
- *Net direct investment.* When foreigners bring in funds to establish businesses in domestic markets, acquire existing domestic companies or commercial real estate, or add to their current holdings, the result is inflows which offset part of a current account deficit. Alternatively, domestic companies can reduce their ownership stake in operations abroad, as in the first example above.
- *Other private capital.* This category includes net portfolio investment, that is, the difference between net purchases of domestic stocks and bonds by foreign investors and net purchases (or sales) of foreign securities by domestic investors. It also includes suppliers' credits (usually short-term, but sometimes long-term) to finance foreign trade, other than those trade credits granted by the banking system.[1]

It's illuminating to analyze private capital movements in the following way: Some of these flows are best thought of as *incidental financing,* because they are essentially a by-product of trade decisions by exporters and importers. Normally, those decisions depend on the relative strength of demand in different national markets. So, for example, when U.S. market demand is strong and exporters abroad are eager to bolster sales, because of weak demand elsewhere, sales to the United States can be routinely financed by the exporter or the exporter's bank. The financing is incidental in the sense that without the underlying trade transaction the financing (and the associated capital inflow) wouldn't have happened. In other words, the current account deficit would have been smaller, but the capital account *surplus* would have been smaller, too.

By contrast, most other private capital flows are best thought of as *incentive-driven.* They reflect the more or less continuous management of portfolios by international investors and of balance sheets by domestic companies. That process is highly sensitive to such factors as relative interest rates, exchange rates, stock market trends, property values, and commodity price developments. Flows of funds through the banking system, while primarily involving short-term funds, are also incentive-driven. They often respond to even very slight differences in interest rates between, say, the U.S. domestic money market and the Eurodollar market. Eventually, even incidental financing flows become incentive-driven as exporters abroad shift their focus from generating new sales to managing the revenues that they earn from those sales.

The second broad category, *official* flows of funds, is made up of two important elements. First is the change in official reserves. Drawing down official reserves is an important source of current account financing in many countries for short periods of time. The other main element is the change in official borrowing abroad. The borrowing—by the central government, the central bank, or certain

[1]Borrowing abroad by domestic nonfinancial companies to raise funds to use at home is tricky to categorize. Sometimes it appears in direct investment, and sometimes in the "other" category, depending on the specifics of the transaction.

public sector enterprises—can be from private commercial banks, from other governments, or from international organizations like the IMF or World Bank.

The concepts of incidental and incentive-driven financing are often applicable to official, as well as private, financing flows. To the extent that public sector enterprises (a public power company is a good example) are able to finance imports by suppliers' credits from the foreign exporter, incidental financing of the current account occurs. As for incentive-driven flows, public sector enterprises can choose to seek funding abroad because it appears to be cheaper than domestic borrowing. When the decision to borrow abroad is arrived at by the same sort of financial analysis as a private firm might go through, the resulting capital inflow can be described as incentive-driven.

But most official financing is *policy-related*. It is undertaken to avoid the exchange rate and interest rate consequences that would arise if the current account deficit financing had to be left to the private sector. Policy-related financing mechanisms take a variety of forms. They range from discretionary exchange market intervention (and, therefore, discretionary use of reserves), to government directives telling public sector enterprises to borrow abroad regardless of the economic costs or risks, all the way to structural adjustment programs with the IMF providing official balance-of-payments credits to the country. At one time or another, virtually all countries, including the United States, have undertaken foreign exchange operations that directly or indirectly provided current account financing.

To conclude this discussion of the analytics of current account financing, it's important to be aware of the major impediments to applying these basic concepts to the real world. In principle, all capital account items must sum up to a surplus that exactly equals the current account deficit. In reality, data collection is incomplete, partly because of actions taken to avoid official reporting requirements. The difference between the reported current account balance and the reported capital account balance is labeled *errors and omissions*.[2] For the United States, it has been a large,

[2]Some analysts feel that a sizable portion of U.S. errors and omissions reflects unreported current earnings on international trade in services and unreported interest and dividends. Federal Reserve Bank of New York economists feel that they reflect mainly unrecorded capital flows for two reasons:

First, comparing data for the countries *paying* for international services with relevant data for the United States and other industrial countries suggests that the under-reporting problem is considerably greater for the other industrial countries than for the United States.

Second, U.S. errors and omissions tend to follow a pattern: They show large and growing inflows when relatively well-reported banking system transactions show a net outflow and when relatively less well-reported direct and securities investments are increasing. By contrast, when the well-reported banking flows turn around, while less well-reported direct and securities investments diminish, errors and omissions usually diminish too.

The conclusion: errors and omissions behave like capital flows.

Table 1

Decomposition of the U.S. Balance of Payments

In billions of dollars; seasonally adjusted annual rates (+ is an inflow; − is an outflow)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984-I
Balance on current account	**1.9**	**18.1**	**4.2**	**−14.5**	**−15.4**	**−1.0**	**1.9**	**6.3**	**−9.2**	**−41.6**	**−19.4**
Net private capital	−11.4	−20.8	−15.1	−18.2	−14.3	18.4	−5.2	−2.1	16.9	42.4	24.9
Net bank	−3.5	−12.9	−10.4	−4.7	−17.5	6.4	−36.1	−42.0	−45.1	23.7	9.4
Net direct investment	−4.3	−11.6	−7.6	−8.2	−8.2	−13.3	−2.3	13.5	19.6	6.4	−1.3
Other private capital net	−2.2	−2.2	−7.7	−3.3	−1.2	−0.1	8.2	4.1	9.6	3.0	3.2
Errors and omissions	−1.5	5.9	10.5	−2.0	12.5	25.4	24.9	22.2	32.9	9.3	13.5
Net official	9.4	2.7	10.9	32.7	29.8	−18.5	2.2	−5.3	−7.8	−0.9	−5.5
Industrial countries	*	*	*	28.5	28.9	−21.0	−6.1	−12.5	−5.3	11.1	−1.3
Other	*	*	*	4.2	0.9	2.5	8.3	7.2	−2.5	−12.0	−4.2
U.S. assets	−1.1	−4.3	−6.8	−4.1	−3.9	−4.9	−13.3	−10.3	−11.1	−6.2	−2.6
Industrial countries	*	*	*	−0.2	−5.5	0.2	−7.0	−1.0	1.2	1.0	−0.4
Other	*	*	*	−3.9	1.6	−5.1	−6.3	−9.3	−12.3	−7.2	−2.2
U.S. liabilities	10.5	7.0	17.7	36.8	33.7	−13.7	15.5	5.0	3.3	5.3	−2.9
Industrial countries	*	*	*	28.8	34.3	−21.1	0.9	−11.5	−6.5	10.1	−0.9
Opec	*	*	*	6.4	−1.1	5.5	12.8	13.1	7.3	−8.6	−2.5
Other	*	*	*	1.5	0.1	1.9	1.8	3.4	2.5	3.8	0.5
SDR allocations	0	0	0	0	0	1.1	1.2	1.1	0	0	0

*Not available.

Source: U.S. Department of Commerce.

and highly variable, component of the balance-of-payments statistics. In this article, errors and omissions are treated as unrecorded private and official capital flows because they appear to fluctuate over time more like capital flows than like current account transactions. But admittedly, by their very nature errors and omissions cannot be specified with certainty.

How have U.S. current account deficits been financed?

Past financing patterns

In only one other time period besides the present did the United States have a substantial current account deficit: 1977 and 1978, when the deficits added up to about $30 billion. The statistics show (Table 1) that those deficits were financed very differently from the current ones. In 1977 and 1978, the balancing item was a very substantial inflow reflecting net official transactions: purchases of dollars through foreign exchange market intervention by the central banks of the main industrial countries. The official inflow also reflected actions the U.S. authorities took to support the dollar.

In contrast, net private capital movements were entirely adverse in every single category during 1977-78: Banking transactions yielded an outflow of over $20 billion. Net direct investment produced an outflow of over $16 billion. Securities transactions of various types yielded an outflow of nearly $5 billion. The only inflows came from unrecorded net positive errors and omissions. That is, not only did the United States *not* finance its current account through private capital inflows, but it even had to finance private capital outflows. For 1982 to the present, the pattern is completely different.

Recent current account financing patterns

The United States began to run a current account deficit in 1982. Unfortunately, for that year, the sources of offsetting financing cannot be identified. The $9.2 billion current account deficit, together with large net official capital outflows and an enormous $45 billion outflow through the banking system, was essentially offset by huge unrecorded capital flows. To be sure, sizable private capital inflows were identifiable. Foreigners bought, on balance, substantial quantities of stocks and bonds; foreign companies made substantial direct investments. But far greater amounts of flows went unrecorded. In other words, errors and omissions, amounting to $33 billion, financed the current account deficit and a lot besides.

Last year, the financing pattern of the enlarged $41.6 billion current account deficit was very different. Flows into the U.S. stock and bond market continued. Moderate amounts of net inward direct investment also continued. But by far the most important element was a new one: a massive switch in the direction of banking transactions between the Eurodollar market and the domestic money markets. That swing—from a $45 billion outflow through the banking system in 1982 to $24 billion inflow in 1983—accounted for more than half the total financing of the 1983 deficit. In other words, the banking sector provided far more of an increase in financing than the increase in the current account deficit alone required. This turnaround is all the more impressive considering that there had been net outflows through the banking system for every year but one over the past decade, resulting in a cumulative outflow of nearly $170 billion since 1974.

First quarter 1984 statistics are also available. The current account deficit of $19.4 billion was again financed importantly by net bank inflows amounting to $9.4 billion. Reported securities transactions yielded a net inflow of $3.3 billion. By contrast, official capital movements produced a net outflow of $5.5 billion; net direct investment swung to a $1.3 billion outflow. The balancing item, errors and omissions, turned out to be an inflow of $13.5 billion.[3]

What components of bank assets and liabilities have changed to produce this large-scale swing?

Banks make international financial transactions for their own portfolios and, as fiduciaries, for their customers. For instance, U.S. money market mutual funds invest in the Eurodollar market and hold the physical instruments with a U.S. bank. Changes in these holdings are reported by the custodian bank as part of the balance-of-payments data collected by the U.S. Treasury. The largest part of the movement between 1982 and 1983 came through changes to the banks' own portfolios. New claims on foreigners (mainly new loans to foreign enterprises, governments, and banks) dropped precipitously at a time when the buildup of foreign deposits in U.S. banks remained fairly strong.

Some background on these asset-liability developments might be helpful. Banks located in the United States (and that includes U.S. agencies, branches, and subsidiaries of foreign banks, too) build up their external assets in three ways. First, they lend money to their own branches abroad, who in turn lend the money to foreign banks, companies, and governments. Second, U.S. banks also build up claims on unaffiliated banks abroad when, for example, a New York bank lends funds to a German bank subsidiary in Luxembourg—a typical transaction in the Eurodollar market. Finally, banks lend money from their domestic offices, including their recently established International Banking Facilities (IBFs), to foreign customers. All of these transactions represent capital outflows. By contrast, banks build up their external liabilities by taking deposits from banks and other foreigners. That buildup represents a capital inflow.

In 1982, banks located in the United States increased

[3]That's for the time being. Some of the as yet unrecorded inflows may reflect borrowing abroad by U.S. companies from non-U.S. banks and it is conceivable that data on these transactions will be reported, at least in part, in due course.

Table 2

Net Private Bank Flows

In billions of dollars (+ is an inflow; − is an outflow)

Flows	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984-I
Net bank	−3.5	−12.9	−10.4	−4.7	−17.5	6.4	−36.1	−42.0	−45.1	23.7	9.4
Net dollar	−4.6	−12.4	−10.4	−4.0	−18.1	5.8	−35.9	−39.9	−43.7	23.6	14.9
Net own dollar	−4.7	−12.2	−10.4	−4.1	−16.8	14.0	−30.6	−34.9	−40.4	16.9	14.9
Own dollar claims	−17.4	−13.1	−20.1	−10.2	−33.4	−18.4	−38.6	−74.3	−104.1	−32.0	4.1
1) On banks	−11.9	−10.2	−16.7	−8.8	−23.4	−6.3	−26.9	−51.6	−77.3	−18.1	2.1
2) On other foreigners	−5.5	−2.9	−3.4	−1.4	−10.0	−12.1	−11.8	−22.7	−26.8	−13.9	2.0
Own dollar liabilities	12.7	0.9	9.7	6.1	16.6	32.4	8.1	39.4	63.7	48.9	10.8
1) To banks	10.6	−0.7	7.1	4.5	15.3	30.7	7.2	33.8	45.1	35.5	8.2
2) To other foreigners	2.1	1.6	2.6	1.5	1.3	1.7	0.9	5.5	18.6	13.3	2.6
Net custody dollar claim	0	−0.2	0	0.1	−1.3	−8.2	−5.3	−5.0	−3.3	6.7	0
Net foreign currency	−0.4	−0.4	−0.2	−0.4	−0.2	0.5	−0.3	−1.0	−1.1	−0.5	−0.2
Residual	1.5	−0.1	0.2	−0.3	0.8	0	0.1	−1.1	−0.3	0.6	−5.4

Source: U.S. Treasury and U.S. Department of Commerce. Figures prior to April 1978 are FRBNY staff estimates based on data with different categories than shown here.

their claims on foreigners by more than $100 billion. Around half of this was an increase in claims on unaffiliated banks, principally those operating in the Eurodollar market. On the other side of the balance sheet, banks' external liabilities to foreigners increased by a substantial $64 billion. Nevertheless, the net changes in bank assets and liabilities produced a capital outflow of some $40 billion.

In 1983, the pattern was quite different. The increase in bank liabilities to foreign customers slowed a little, to just under $50 billion. But new claims on foreigners shrank across the board, especially new claims on unaffiliated banks, which fell to virtually zero. Overall, these movements produced a capital *inflow* of $17 billion last year.

A large shift in banks' custody accounts reinforced the shift in their own portfolios. Transactions for customers produced a net outflow of around $3 billion in 1982 but a net *inflow* of nearly $7 billion in 1983. Most of that swing represented a reduction of custody claims (for example, a reduction in Eurodollar CDs held in custody by banks located in the United States on behalf of money market funds).

What caused the turnaround in banking flows?

Mainly, the pace of economic recovery in the United States—and the associated demand for public and private sector credit—made U.S. credit markets taut relative to the Eurodollar market. So, relatively ample liquidity in the Eurodollar market offered the U.S. banking system a comparatively inexpensive source of short-term funding to support domestic credit expansion. The key incentive for this was that interest rates within the United States, notably on instruments such as negotiable CDs, have tended to move upward compared to rates in the Eurodollar market. The direction of banking system flows corresponds fairly closely to this interest rate relationship.

Therefore, the question of why the banking flows shifted so much becomes one of why the Eurodollar market became so liquid. That answer is more complex.

To begin with, part of the ample liquidity stems from world exporters (to a great extent, *Asian* exporters) depositing large amounts of dollars earned from the spiraling U.S. trade deficit. This activity constitutes incidental financing of the current account deficit, as discussed earlier.

But incidental financing is a short-term phenomenon. The true question is why exporters have decided to *stay* in dollars rather than convert export earnings into local currency or into other major currencies. The answer is that they perceived a strong incentive to remain in dollar investments, albeit of short-term maturities. Relative interest rates on dollar-denominated assets remained attractive, both in nominal and in real terms throughout 1983 and into this year. That relative yield advantage has been a clear motivation for remaining in short-term dollar assets.

Yet, clearly, there was a reluctance to invest earnings in longer-term U.S. securities or equities. Views on the course of dollar exchange rates conflicted. Predictions were frequently made that dollar exchange rates would decline as a result of burgeoning U.S. current account deficits. But as time went on, and these predictions failed to be realized, expectations about dollar exchange rates came to be increasingly influenced by factors other than current account considerations. In short, the placement of dollar earnings in short-term deposits reflected a positive attitude toward short-term yields and dollar exchange

rates prospects but a more "wait-and-see" attitude toward longer-term developments.

Another major reason why the Eurodollar market remained so liquid was that the pace of economic expansion in Europe lagged behind that of the United States. Accordingly, credit demands were weaker there than here. In fact, as expansion got underway in countries such as Germany, some companies tended to use improved cash flows to repay short-term debt rather than to borrow. This not only relieved pressure on their own domestic credit markets but on the Eurocurrency markets as well.

Current account deficit financing in other industrial countries

The contrast between the two U.S. experiences shows how different current account financing can be. It depends intimately on the attitudes and expectations of private investors and private companies. To put the U.S. experience into perspective, it is also useful to compare it with that of other major industrial countries. Here, perhaps the most interesting distinction—apart from private versus official flows—is between how much of a country's current account financing is in its own currency and how much is in other currencies.

With that distinction in mind, the clearest lesson from experience is that the United States has been singularly able to finance its current account deficits in its own currency, drawing in either private or official capital flows. In fact, in the case of the United States, what foreign currency-denominated movements there have been generally have been outflows—net direct investment abroad and acquisition of foreign currency-denominated securities. Foreign currency-denominated inflows have been rare, most notably the issues of what have become known as Carter bonds during the dollar support program of 1978-79.

Going through recent episodes in other countries, it's apparent that both Germany and Japan, the two countries whose currencies are widely held in official foreign exchange reserves, have been able to finance current account deficits partly in local currency—but not to the extent the United States has (Table 3). France has been able to finance a moderate portion of its current account deficits in French francs, but on a much smaller relative scale than Germany and Japan. On the far side of the spectrum, countries like Italy and Denmark, which have gone through prolonged periods of current account deficit and whose currencies are not held in international reserves, have mainly financed their current account deficits in foreign currencies. (That is true for nearly all nonindustrial countries, too.)

The other feature differing considerably among countries is the role of each country's banking system in financing current account deficits (Table 4).

In the United States, half the time inflows through the banks have offset current account deficits; for the other half, outflows through the banks have magnified the financing requirement. For the other major industrial countries, banks have usually, but not always, generated net inflows. In almost half the cases of large deficits, banking inflows have accounted for an important share of current account financing. There's no way of knowing what portion was incentive-driven or what part was in response to government measures or other encouragement. But it's worth noting that in several cases (the U.K. in 1973, Italy in 1976 and 1980, and France in 1980) banking inflows mitigated the need for official financing. By comparison, when banking flows swelled financing requirements in these other countries, as in the United States during 1978, official financing often needed to be substantial.

Outlook for continuing inflows

What's unique about the current account financing pattern of the United States is that no other country in memory has managed to finance deficits on the order of 2 to 3 percent of GNP on a continuing basis—and in its own currency. There are certainly many cases of large deficits that have been financed, even for extended periods. But those were financed in foreign currencies, so the exchange risk was borne by the deficit country itself, not by the foreign saver. In the case of the U.S. financing pattern, however, the exchange risk is mainly being absorbed by foreign investors.

Therefore, the willingness to keep taking additional foreign exchange risk is the key for the future current account financing pattern. And that directly relates to expectations about the dollar. The size of the impending current account deficit is by now pretty well known, with only some modest disagreements among various experts on its precise magnitude. The continuation of a deficit on an order of $80-100 billion would not occasion any surprise in the markets.

What would be a source of surprise? A number of potential shocks could have a serious impact on confidence:

- First, a sudden rise in U.S. inflation to well above current rates;
- Second, a major adverse reassessment by foreign investors of the medium to longer-term consequences of the likely course of U.S. fiscal and monetary policies;
- Third, a sharp improvement in investment opportunities outside the United States, that is, a relative rise in the real rate of return on foreign currency assets; and
- Fourth, some major relaxation of political and economic uncertainties in several regions of the world, since those tensions have contributed to shifts of capital to the United States for safety motives.

Any of these factors could easily discourage foreign

investments in dollar assets. But the dynamics of the subsequent outcome are paradoxical. That's because an abrupt deterioration of *intended* capital movements almost certainly would be associated, *ex post*, with the same magnitude or larger—but certainly not smaller—*actual* capital flows into the United States.

The reason is that in the very short term the current account deficit is more or less fixed. It responds to current and lagged income growth in the U.S. and abroad as well as to past exchange rates and price trends. So, there is very little scope for adjustment in the size of the current account deficit over the course of a few weeks or even a few months. It takes a number of quarters for even a relatively substantial depreciation of a currency to pay off in a meaningful improvement in a current account deficit. And what's worse, to the extent that some trade is denominated in foreign currencies (which it is, to a limited extent, for U.S. imports) there would be a small adverse valuation effect. This would make the current account deficit even larger right away, were the dollar to go down and raise the cost of buying foreign currency.

Therefore, in the short term, the current account is as large as or larger than it was before the erosion in foreign investment intentions. This means that to compensate actual capital inflows must be as large as or larger than before. And on the assumption that there is no substantial change in official flows, for instance through a stepped-up pace of foreign exchange intervention, those inflows would have to come from the private sector.[4]

Table 3

Current Account Deficits 1975-82: Shares Financed by Domestic Currency Flows

Country	75 percent or more	25 percent to 75 percent	less than 25 percent
United States	1977	*	*
	1978	*	*
	1982	*	*
Germany	1979	1980	*
	*	1981	*
Japan	1975	*	1979
	1980	*	*
United Kingdom	*	1975	1976
France	1980	1976	1981
	1977	*	1982
Italy	*	1975	1976
	*	*	1980
	*	*	1981
	*	*	1982
Denmark	*	1975	1976-82

*Not applicable.

Source: Estimated from International Monetary Fund, *Balance of Payments Statistics Yearbook*, Volume 34, Part I (1983).

How is the capital inflow sustained even in the face of a hypothesized sharp decline in foreign investment intentions? The answer is that exchange rates, and interest rate differentials, and profit opportunities more generally between the U.S. and abroad must move in such a way as to make new investors willing to step in (and uncertain investors willing to stay in) to a greater extent than existing investors in dollar assets are moving out. Normally, that can only happen if the movements in exchange rates and/or interest rate differentials are substantial. Enough of a fall in the currency is needed to convince at least some investors that the sharp movement was overdone and that the next movement in the dollar could only be upward. Therefore, they would be willing to acquire dollar assets that other foreigners are selling and that are being generated by the ongoing trade deficit.

Alternatively, the exchange rate movement may be relatively small but then the shift in interest rate differentials would have to be relatively large. An intended shift, for example, from Eurodollar deposits to Euro-Deutsche mark deposits, reflecting the change in investor perceptions, if substantial enough in size, could lead to a downward movement in Euro-Deutsche mark deposit rates and an upward movement in Eurodollar rates. If the monetary authorities do not take steps to inhibit the effects of those movements on domestic money markets and, therefore, domestic interest rates in Germany and the United States, the movement in interest rate differentials would be able to counter the shift in investment intentions and reinstate favorable incentives for other investors to move back into dollar assets.

In sum, the exchange rate must move enough to give at least some international investors reason to believe that the next movement will be upward; or interest rate differentials and profit opportunities must move enough to reinstate incentives for purchasing and holding dollar assets; or some combination of both must happen.

The problem is how much, empirically, those movements have to be. A further question is whether the resulting configuration of interest rates and exchange rates is likely to become part of a chain of subsequent rate adjustments—a kind of ratchet effect or cascading of rates. The best example of that scenario is when the sharp downward movement in the exchange rate leads to a new and far more pessimistic view of the inflation potential, touching off speculation in commodity, real estate, and other asset markets. The inflationary consequences of that activity could perpetuate the erosion of confidence and require further sharp interest rate or exchange rate adjustments

[4]Any other assumption would be unfair because it would change the character of the analysis.

Table 4

Financing of Large Current Account Deficits in Major Foreign Industrial Countries

		Current Account Deficit		Sources of Finance as Percent of Total Financing			
Country	Year	$ billions	As % of GNP	Banks	Public sector borrowing	Official reserve assets (net)	Other
France	1974	−3.5	−1.3	9.6	17.5	1.7	71.2
	1976	−3.4	−1.0	−40.0	7.2	84.4	48.4
	1980	−4.2	−0.6	86.2	15.4	−157.1	155.5
	1981	−4.8	−0.8*	116.9	34.5	79.1	−130.5
	1982	−12.1	−2.2*	−21.3	30.0	30.2	61.1
Germany	1979	−6.2	−0.8	192.9	20.0	57.3	−170.2
	1980	−16.0	−2.0	−33.8	111.5	64.8	−42.5
	1981	−5.7	−0.8	−67.7	161.8	48.6	−42.7
Italy	1973	−2.5	−1.6	2.2†	40.0	−16.5	74.3
	1974	−8.1	−4.7	9.3†	45.2	13.5	32.0
	1976	−2.9	−1.5	109.0†	18.7	−64.9	37.2
	1980	−9.8	−2.5	81.5†	37.2	−9.5	−9.2
	1981	−8.6	−2.5	−17.0†	56.9	4.9	55.2
	1982	−5.8	−1.7	−39.8†	37.8	80.5	21.5
United Kingdom	1973	−2.4	−1.3	138.6	5.5	−22.5	−21.6
	1974	−7.7	−3.9	24.8	52.6	−3.3	25.9
	1975	−3.5	−1.5	24.7	13.9	41.8	19.6
Japan	1974	−4.7	−1.0	167.8	21.4	−26.3	−62.9
	1979	−8.8	−0.9	−3.9	11.0	151.2	−58.3
	1980	−10.8	−1.0	119.3	60.8	−47.0	−33.1

*Percent of GDP. GNP estimates not yet available.
†Short-term only.
Sources: Estimated from IMF *Balance of Payment Statistics* and *International Financial Statistics*.

later on in order to attract the necessary capital inflow.

To conclude, the U.S. current account deficit—and the likelihood it will continue indefinitely—raises a valid concern about future private-sector financing. In principal, the pattern can be sustained, so long as sufficient interest rate, exchange rate, and profit incentives, along with an essential underpinning of market confidence, are maintained. But this is uncharted territory. No other country has financed such a large deficit in the private capital markets for so long in its own currency. All old capital inflows have to be retained; there is no room for any net diversification out of the dollar by existing holders. And new capital inflows of $80-100 billion a year must be attracted for some time to come. The challenge of securing such financing is imposing.

Roger M. Kubarych

Did Financial Markets in 1983 Point to Recession?

In the second half of 1983, the financial sector sent conflicting signals of the economy's future course. M-1 growth slowed sharply, suggesting that the economy would also slow substantially, if not fall into recession. But interest rates were only modestly higher than in January 1983, indicating little change in financial market conditions. Because real GNP expanded vigorously over the first two quarters of 1984, considerable interest has developed in why M-1 pointed in the wrong direction and, more generally, in how reliable M-1 is as an indicator of turning points in the business cycle.

In this paper, we review how in the past money and interest rates have both provided fairly clear signs of recession, when their behavior is evaluated properly. We show, according to a criterion developed by William Poole, that the deceleration in M-1 last year—before and after the data revisions—was not as large as those associated with past recessions.[1] By year-end, however, it had become sufficiently large to suggest the high likelihood of an imminent economic downturn. We also show that, in contrast, the rise in interest rates in 1983 was far less steep than usual before past recessions.

Why did the money supply give a false signal? Before each of the past four downturns, the deceleration in M-1 was connected to rising interest rates, according to a well-established money demand equation. For 1983, the slowdown in M-1 can be explained in two ways, neither of which should have caused concern about the economy. First, slower money growth reflected the response of money demand to the leveling off of interest rates after their rapid decline in the second half of 1982. Alternatively, it reflected a downward shift in money demand.

Last year's experience underscores a point often made: exclusive reliance on M-1 for policy purposes is too narrow a focus. Our results imply that, at the very least, movements in interest rates should be examined to corroborate that slower money supply growth points to an imminent recession. More generally, we believe that it is useful to look at many economic variables, financial and nonfinancial, in the framework of a model when forecasting the economy.

Monetary slowdowns and recessions

Growth of the narrowly defined money supply, M-1, moderated considerably in the second half of 1983. Over the last two quarters of 1983 M-1 rose at a 7.2 percent annual rate, compared with its 12.4 percent annualized advance over the first two quarters. The slowdown was even more pronounced according to data reported during the course of 1983, which did not incorporate subsequent benchmark revisions and updated seasonal adjustment factors. Prior to these revisions, M-1 growth was measured to be 13.3 percent in the first half of the year and 5.5 percent in the second half, the sharpest deceleration in the post-war period. But even after the revisions, the 5.2 percentage point drop was among the steepest decelerations.

Although last year's slowdown was exceptional, concerns

[1] William Poole, "The Relationship of Monetary Decelerations to Business Cycle Peaks: Another Look at the Evidence", *The Journal of Finance* (June 1975), pages 697-712.

about the economy may not have been warranted. As is well-known, monthly and quarterly changes in M-1 are quite "noisy", and frequently have little to do with the overall economy. For example, 1962 and 1973 saw sharp one-quarter decelerations of about three percentage points. Only the later slowdown was soon followed by recession.

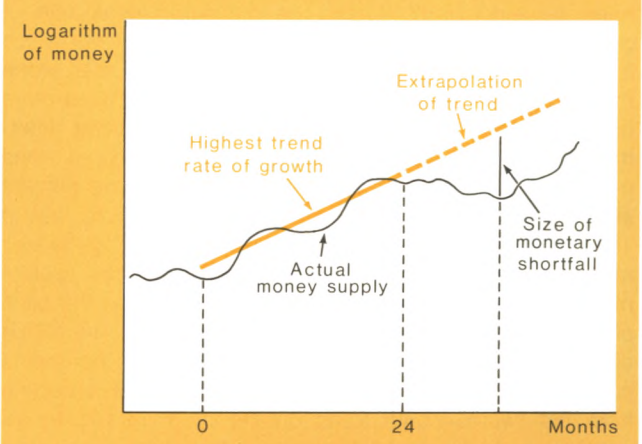
Moreover, evaluating movements in the monetary aggregates without some well-defined criterion or rule is highly discretionary and can be done to "fit" a particular "story". Indeed, choosing two intervals to compute first the acceleration and then the deceleration in M-1 can become quite arbitrary, as the experience of 1979-80 illustrates. The two-quarter growth rate of M-1 spiked in the third quarter of 1979. When the subsequent deceleration (which occurred just prior to the 1980 recession) is measured from that spike, it is comparable to those observed before earlier economic downturns. But when the deceleration is measured from any of the other quarters of 1979, it is only modest. So, we need an objective way to determine the significance of a monetary slowdown.

Such an approach was developed by William Poole. He compared the level of M-1 with the extrapolated value of its most recent highest trend, as measured over a predetermined interval. In particular, for each month in the 1914 to 1972 period he calculated the trend in M-1 over the previous twenty-four months. Then, after determining the highest trend between two successive cyclical troughs, he computed the shortfall in M-1 from that trend, extrapolated twelve months beyond the cyclical peak (chart). Using this calculation, Poole found that with few exceptions M-1 fell below trend by at least 3 to 4 percent around a peak in the business cycle. He also judged the finding to be valid for M-2. He concluded that "...an NBER [National Bureau of Economic Research] business cycle peak will be identified within plus or minus 5 months of the month of significant deceleration."[2] As we will discuss later, this means that the condition may not be met until *after* the onset of recession.

We apply Poole's technique to the past four recessions to see whether the pattern he observed has continued. Of course, recent financial innovation and deregulation might have altered the relationship between monetary decelerations and turning points in terms of either size or timing. Still, the results are generally consistent. Specifically, significant monetary slowdowns occurred around the cyclical peaks in 1973 and 1980. This was not quite the case, however, in 1981 (Table 1, right-hand column). But this may be because the 1981-82 recession followed the 1980 recession so closely and depressed the estimated twenty-four month trend. Estimating the trend over a twelve-month

[2]William Poole, page 712. Further work with this approach was done by Bryon Higgins, "Money Growth and Business Cycles", Federal Reserve Bank of Kansas City *Monthly Review* (April 1979).

Illustration of Poole's Procedure for Identifying Significant Monetary Decelerations



Note: The logarithm of the money supply is plotted on the vertical axis. This means that the distance between the extrapolation of the trend and the actual money supply measures the size of the shortfall as a percentage of the trend level.

Table 1

Monetary Decelerations in the Vicinity of Recessions

In percent

Peak in the business cycle†	Greatest Shortfall in M-1 Relative to Its Peak Established Trend*	
	Trend measured over 12 Months	Trend measured over 24 months
December 1969	7.6 (1/71)	5.4 (12/70)‡
November 1973	9.2 (4/75)	6.2 (4/75)§
January 1980	4.5 (5/80)	4.1 (5/80)//
July 1981	6.8 (7/82)	1.7 (7/82)
1983 Deceleration		
As of 12/83, original data	4.5	1.7
As of 12/83, revised data	3.7	¶
As of 3/84, revised data	5.0	¶

*Dates in parentheses refer to the month in which the greatest shortfall occurred.
†As classified by the National Bureau of Economic Research.
‡Became significant in December 1969 according to Poole's three percent rule.
§Became significant in July 1974 according to Poole's three percent rule.
//Became significant in April 1980 according to Poole's three percent rule.
¶Cannot be computed; the peak trend rate has not yet been reached.

interval removes the effect of the 1980 recession and reveals a marked deceleration in M-1 during 1981 (Table 1, left-hand column).[3]

How should a shortfall in M-1 relative to a twelve-month trend be evaluated? Surely, the measured peak rate of growth tends to be more rapid as the time span over which it is calculated shrinks. Thus, it is not surprising that, when money growth tapers off, the deceleration looks even more dramatic relative to a shorter trend. But Poole never determined how great the shortfall from a twelve-month trend must be to have the same significance as a three percent shortfall from a twenty-four month trend. But note that in 1967 there was a 2.7 percent decline from the twenty-four month trend and a 4.5 percent decline from the twelve-month trend; that year the economy was either on the brink of recession, or went into a very mild recession. (The NBER did not identify 1967 as a recession.) Using the borderline case of 1967 as a benchmark, we project that a decline from the twelve-month trend on the order of five to six percent would be as significant as a three percent decline from the twenty-four month trend.

Poole's technique helps put the 1983 deceleration into perspective. According to the initially reported data, the highest twenty-four month trend occurred between October 1981 and October 1983 and stood at an annual rate of 9.7 percent, substantially faster than the 5.5 percent rate in the second half of last year. By the end of 1983, M-1 was 1.7 percent below the extrapolated level of the trend, just over halfway to meeting Poole's criterion for significant deceleration. By this test, forecasts of a 1984 recession based on the M-1 deceleration were premature.[4] And after the data revisions, the peak trend growth was rising into early 1984, and therefore, no shortfall could even be measured.

But looking at the 1983 deceleration relative to the twelve-month trend may be more meaningful, for a similar reason as in 1981. Specifically, measuring the trend over a shorter interval reduces the influence of a nearby recession; in this instance, the 1981-82 recession. Before the data revisions, the highest twelve-month trend was 12.8 percent, spanning July 1982 to July 1983. The shortfall from this trend registered 4.5 percent in December. The data revisions lessened the decline to 3.7 percent in December; but by March 1984, it registered 5.0 percent. In terms of the twelve-month trend, then, the M-1 shortfall seemed to approach, but not reach, a significant decline of five to six percent.

[3]The shortfall from both the twelve and twenty-four month trends would be greater if an adjustment was made to offset the effects of the introduction of NOW accounts nationwide in 1981.

Table 2

The Extent of the Monetary Deceleration at the Time of the Onset of the Recession

In percent

Peak in the business cycle*	Shortfall in M-1 Relative to Its Peak Established Trend: Trend measured over 12 months	Trend measured over 24 months
December 1969	4.6	3.5
November 1973	2.9	1.4
January 1980	1.1	0.9
July 1981	2.0	0.0
1967 Deceleration		
As of 1/67	4.5	2.7
1983 Deceleration		
As of 12/83, original data	4.5	1.7
As of 12/83 revised data	3.7	†
As of 3/84, revised data	5.0	†

*As classified by the National Bureau of Economic Research.
†Cannot be computed; the peak trend rate is rising as of March.

M-1 as a leading indicator

Poole's approach confirms that monetary decelerations and recessions in the past were closely linked. His results, however, do not substantiate the leading indicator properties of M-1.[5] In fact, his findings dispute claims that M-1 is a useful forecasting tool. As Poole shows for the 1914-72 period, decelerations in M-1 typically become significant somewhere inside of six months before *or after* the cyclical peak. In fact, for the nine cyclical peaks he covered, the decelerations become significant before the turning point four times, and after the turning point five times. For none of the three recessions since Poole's study did the decelerations become signficant until after the economy had already turned downward.

To further investigate M-1's leading indicator properties, we measure the size of the shortfalls at the time of each of the past four cyclical peaks. In 1973 and 1980, the decline from the twenty-four month trend was around 1 percent to 1½ percent in the month when the economy turned downward; and in 1981, no decline occurred (Table 2). Even though the slowdowns were much greater relative to the twelve-month trend, they do not approach the magnitude of the 1967 slowdown, which was associated with a near recession. In sum, relying on M-1 (relative to its highest prior twelve-month or twenty-four month trend) as a leading indicator may be quite risky.

[4]The introduction of the Money Market Deposit account in December 1982 distorted the growth of M-2 and M-3 in early 1983. Hence, the broader aggregates could not be used to confirm or dispute the information contained in M-1.

[5]The growth rate of M-1 is classified a leading indicator by the Department of Commerce, but it is not a component of the composite index of leading indicators.

Nevertheless, the pattern in M-1 growth prior to the onset of the past four recessions offers a way to evaluate the most recent experience. The deceleration in 1983 (according to the initially reported data) was larger than most that occurred before past recessions. Even using the revised data, the shortfall relative to the twelve-month trend (as of December 1983 or March 1984) looks large.

Because the deceleration in M-1 did not meet Poole's criterion, deciding whether it implied a recession had to be based on judgement (or some test other than Poole's). It was possible that a subsequent boost in M-1 could very well offset the shortfall and prevent this criterion from ever becoming satisfied. When forecasting the economy, however, the risk of giving a false alarm must be weighed against the risk of waiting too late to sound a warning. In this light, if M-1 was the *only* indicator, the slowdown in M-1 growth certainly looked ominous and probably justified forecasting an economic downturn during the first half of 1984.[6] In restrospect, even if the revised M-1 data had been known last year, the deceleration relative to the twelve-month trend was so sharp that it might have raised concern. In any case, especially because the deceleration's size was not decisive, corroborating evidence from other sources should have been sought. As we will show, other developments in financial markets did not support forecasting an impending recession.

Interest rates and the onset of recessions

Besides the volume of money, an important piece of financial data is the level of interest rates. In judging whether developments in financial markets indicate a near-term recession, it seems eminently reasonable to pay attention to interest rates as well as the money supply, particularly when their signals differ, as in 1983.[7] In essence, a price variable as well as a quantity variable should be considered.

To evaluate last year's rise in rates, we begin by calculating the percent (or relative) change in the nominal commercial paper rate over the last four quarters of each expansion in the postwar period. The rise in the paper rate before past recessions has not been of uniform magnitude, tending to be greater since the late 1960s (Table 3, column 1). Specifically, the commercial paper rate rose two to four times more steeply in the later period. Over the last three quarters of 1983, it climbed about 10 percent. While this is close to some of the increases in the 1950s, that decade may not provide a good standard for evaluating the recent rise.

Financial deregulation and innovation, as well as wider swings in inflation, would certainly seem to be important considerations in analyzing interest rate behavior.[8] The raising and eventual elimination of the ceiling on CD rates, the growth of the Eurodollar market, and the greater diversity of bank liabilities, all reduced the role of credit rationing at times when financial conditions tightened. Consequently, sharper movements in interest rates were needed to restrain the demand for goods and services. But it is also possible that aggregate demand reacted more quickly and strongly to a given percent rise in interest rates when rates reached high levels.[9] Nevertheless, most analyses suggest that the interest elasticity of demand has not yet increased to a significant extent. For our purposes, the upshot is that the behavior of short-term rates since the late 1960s is probably more relevant than that of earlier periods in evaluating the recent rise in interest rates. Using this comparison, then,

Table 3

Behavior of Interest Rates over Four Quarters Before Recession

Start of recession	Percent change in nominal commercial paper rate	Percentage point change in real commercial paper rate*	Percent change in real cost of capital
1949-I	38.1	†	11.3
1953-III	12.9	0.6	2.4
1957-IV	17.9	1.0	3.5
1960-III	13.1	0.8	3.8
1970-I	44.6	2.2	11.7
1974-I	68.5	0.8	16.6
1980-II	43.5	3.3	13.8
1981-IV	72.0	7.5	14.6
1983 (I-IV)	10.0	0.5	−4.7

*Figures are the average of four estimates of the change in the 120-day real commercial paper rate. Each estimate of the real rate subtracts a different proxy for inflation expectations from the nominal commercial paper rate. These proxies are the change in the fixed weight GNP deflator in the contemporaneous quarter (before 1960 the implicit GNP deflator was used), the change in the fixed weight GNP deflator over the previous four quarters, University of Michigan survey data on price expectations over the subsequent twelve months, and the Livingston survey data on price expectations over the subsequent three months.
†Not available.

[6]To determine whether this was so within a framework based on statistical theory, the technique developed by Neftçi could be applied. See Salih N. Neftçi, "Optimal Prediction of Cyclical Downturns", *Journal of Economic Dynamics and Control* (1982), pages 225-41.

[7]The Federal funds rate is classified as a leading indicator of business cycle peaks; the Treasury bill rate a coincident indicator of peaks. The commercial paper rate is not classified.

[8]See Richard G. Davis, "Credit Market Restraints and the Functioning of Monetary Policy", *Federal Reserve Bank of New York Research Paper Number 8015* (September 1980); Donald D. Hester, "Innovations and Monetary Control", *Brookings Papers on Economic Activity I* (1981); Albert M. Wojnilower, "The Central Role of Credit Crunches in Recent Financial History", *Brookings Papers on Economic Activity II* (1980).

[9]See M. Akbar Akhtar, *Financial Innovations and Their Implications for Monetary Policy: An International Perspective*, Bank for International Settlements Economic Papers Number 9 (December 1983).

the ten percent advance of the nominal commercial paper rate in 1983 was clearly quite small, and indeed, almost trivial.

Real interest rates

From our estimates, real short-term rates also did not rise enough last year to suggest an imminent recession. Real rates, of course, are unobservable; their proper measurement has long been debated without ever being settled. For this reason, we present an average of several different estimated changes in the real commercial paper rate for each pre-recession period. But because these estimates are occasionally negative, or positive and close to zero, we cannot always calculate in a meaningful way the percent change. Consequently, we examine their *percentage point* (or absolute) changes over the four quarters before each recession.

In comparison to these changes, the rise in the real paper rate in 1983 was relatively small (Table 3, column 2). We estimate that this rate climbed by less than one percentage point last year, from between 3 1/2 and 4 1/2 percent in the first quarter of 1983 to between 4 and 5 percent in the fourth quarter of 1983. Among the recent experiences, only the modest advance in 1973 approached this increase. That period, however, involved a jump in oil prices and restrictive fiscal policy; it may not be an appropriate episode to compare with 1983. The increases in the real paper rate before the other recessions since the late 1960s were between four and fifteen times greater than the rise in 1983. Overall, it would seem reasonable to conclude that, from an historical perspective, the behavior of short-term interest rates—nominal and real—in 1983 did not point to a near-term recession.

The same was true of real long-term rates. Long-term rates can be measured by the real cost of capital, a weighted average of the corporate bond rate adjusted for inflation expectations and the dividend-price ratio.[10] The real cost of capital fell during most of 1983; by the fourth quarter it stood about five percent below its level of three quarters earlier (Table 3, column 3). But it had climbed sharply before each recession since 1969. Thus, real long-term rates confirmed the information in short-term rates: financial markets were not appreciably tighter in the second half of last year.

Still another sign of stable financial conditions came from domestic nonfinancial sector debt, the credit aggregate first monitored by the Federal Reserve in 1983. Its growth was virtually the same in the two halves of the year, 10.6 percent versus 10.5 percent, at annual rates.

[10]See Patrick J. Corcoran and Leonard G. Sahling, "The Cost of Capital: How High Is It?", this *Quarterly Review* (Summer 1982), page 23; Patrick J. Corcoran, "The Cost of Capital: An Update", this *Quarterly Review* (Autumn 1983), page 23.

Money demand: the connection between money, interest rates and the economy

There is good reason to doubt the import of a slowdown in M-1 growth when nominal interest rates are fairly constant. M-1 and interest rates, in principle, are not independent. Specifically, the demand for money represents a direct connection between short-term interest rates and the money supply. When interest rates rise, the quantity of money demanded tends to fall, everything else held constant, because alternatives to holding money become more attractive. The coincidence of rising interest rates and slower M-1 growth around the onset of past recessions most likely reflected in part this connection. Individually, they indicated the same fundamental change toward tighter financial markets.

We demonstrate the link between decelerations in M-1 and rises in interest rates by simulating the demand for money—represented by a well-established, widely-used equation of the transactions demand for money—over the intervals before the past four recessions.[11] This is done with and without the actual increase in interest rates; all other determinants of money demand follow their historical paths. The difference between the two sets of simulations brings out the role interest rates played in the observed slowdowns of M-1 growth.

The simulations indicate that, before the 1970 and 1974 recessions, the rise in short-term rates contributed substantially to the decelerations in M-1 growth (Table 4). For example, just before the 1974 recession the rate of increase

[11]This equation was analyzed extensively by Stephen M. Goldfeld, "The Demand for Money Revisited", in *Brookings Papers on Economic Activity III* (1973), pages 576-638.

Table 4

The Effect of Rising Interest Rates on the Growth of M-1 before the 1970 and 1974 Recessions

In percent

		Growth Rates of M-1		
Period	Actual	Simulated with actual interest rates	Simulated with constant interest rates	Actual over previous four quarters
1969-I to 1970-I.....	3.0	3.6	6.4	8.3
1973-I to 1974-I.....	5.4	6.3	8.2	8.5
1979-II to 1980-II.....	4.3	7.4	8.5	7.7
1980-IV to 1981-IV...	5.1	9.3	10.7	7.4

Source: Federal Reserve Bank of New York staff estimates.

in M-1 would have been 1.9 percentage points faster had interest rates not risen in 1973. Thus, the deceleration in M-1 growth from 8.5 percent (over the four quarters ending 1973-I) to 5.4 percent (over the four quarters ending 1974-I) can be explained mostly as a consequence of the run-up in rates. Either the money supply or interest rates then would have provided a correct reading on changing developments in the financial markets in 1973.

Unfortunately, similar demonstrations for the 1980 and 1981-82 recessions are not so clear-cut; the demand-for-money equation tracks the actual money stock poorly over the 1980-82 period. The effects of financial innovation, deregulation of bank deposits, the credit control program, and volatility throughout the economy combine to undermine the equation's performance. But none of these developments severs the interest rate/money demand connection; if interest rates had not risen prior to these later recessions, money growth would have been faster. Allowing for the overprediction of money growth in 1980-82, we can compare the simulated growth rates of M-1 with actual and constant interest rates. Around the onset of the 1980 recession, a third of the monetary deceleration can be attributed to rising interest rates; before the 1981 recession, over a half.

Let us now turn our attention to 1983. First, let us assume that the response of money demand to changes in interest rates (and its other determinants) has a mean lag of three to six months, the typical estimate obtained in econometric studies covering the past ten years or so.[12] In other words, one half of the adjustment in the quantity of money demanded by firms and households as a result of a change in interest rates takes place in three to six months.

Combining this estimate with the observed pattern in short-term rates since mid-1982 produces an explanation for M-1 growth in 1983. Short-term rates fell sharply during the third and fourth quarters of 1982, into January of 1983. Taking the time lag into account, more rapid money growth could be expected to begin in the fourth quarter of 1982 and continue into the second quarter of 1983. Then money growth should have slackened as the effect of falling interest rates wore off. The modest rise in rates over the remainder of 1983 would also have tended to depress M-1 growth.

[12]See Flint Brayton, Terry Farr, and Richard Porter, "Alternative Money Demand Specifications and Recent Growth in M-1", Washington, D.C.: Board of Governors of the Federal Reserve System, Division of Research and Statistics, Econometric and Computer Applications Section (May 1983); John P. Judd and Rose McElhattan, "The Behavior of Money and The Economy in 1982-83", Federal Reserve Bank of San Francisco *Economic Review* (Summer 1983).

If interest rates in 1982-83 cannot satisfactorily explain the behavior of the money supply, the alternative is, naturally, that the large swing in M-1 growth was due to shifts in the demand for money. In particular, extraordinary factors (for example, precautionary demands for liquidity on the part of households) may have shifted money demand upward in the first half of last year and downward in the second half. But such a *downward* shift—a fall in the demand for liquidity—would not seem likely to harm economic activity. Under either explanation, then, behavior of M-1 last year did not represent a fundamental market development with adverse implications for the economy.

Conclusion

The failure of M-1 to correctly signal the economy's direction in the first half of 1984 can be related to unresolved issues in monetary policy. Of course, the extent to which monetary authorities should focus on the money supply in formulating policy has been debated for many years. The most avid proponents of the money supply argue that it should be the sole input to policy deliberations. Other analysts argue that taking account of additional economic indicators, besides the money supply, would generally lead to better policy decisions. Some Federal Open Market Committee members have acknowledged in their public remarks the usefulness of targeting monetary aggregates, but at the same time stressed that they need a broader and more flexible approach to policy making.

Our analysis lends support to the view that monetary policy should be formulated in a broad framework. The episode we examined demonstrates that focusing exclusively on just one variable, M-1 in this instance, can be misleading. Moreover, it is probably not the only such occasion in the recent past. We believe, for example, that the growth of M-1 in 1975-77 seriously understated the expansionary forces building in the economy, which contributed to the acceleration of inflation in 1978 and 1979.

But note that there are also occasions when forecasts based on a wide range of variables will not be better than a projection based exclusively on M-1. There are several reasons why an economic forecast can be far from the mark, only some of which could have been foreseen. Also note that the behavior of the monetary aggregates may provide information on the economy's course and should not be ignored. Nevertheless, we believe that, in general, weighing the import of various economic indicators will substantially reduce the risk of errors such as forecasting recession in early 1984.

Carl J. Palash and Lawrence J. Radecki

Recent Trends in the U.S. Foreign Exchange Market

The U.S. foreign exchange market continued to expand in the early 1980s, although not nearly as rapidly as in previous years. The Federal Reserve Bank of New York's latest survey of foreign exchange turnover shows that trading volume increased to $33.5 billion per day in April 1983, a rise of 43 percent from the $23.4 billion recorded in March 1980. By contrast, during the previous three years the volume of foreign exchange transactions multiplied nearly fivefold, from about $5 billion per day in April 1977.

Slower growth is not surprising, considering how rapidly the market expanded in the late 1970s. Most of the changes that helped synchronize U.S. market practices with those in other major financial centers, and sharply boosted activity, had been completed by 1980. Also, the recent increase in turnover is measured from a much higher base level than was true for the 1977-80 period.[1]

Developments in the early 1980s had varying effects on the foreign exchange activity of major classes of market participants. On the one hand, financial deregulation in the United States fostered a sharp increase in foreign exchange trading by nonbank financial institutions looking for additional income or ways to complement traditional lines of business. Meanwhile, Japan, one of the world's major financial centers, relaxed its foreign exchange controls, as had the United Kingdom about a year earlier. Together, these changes created greater potential for capital flows through the diversification of international portfolios and generated increased demand for foreign exchange services.

But some developments limited activity. The worldwide recession and global debt crisis slowed or actually reduced world trade volumes and probably depressed corporate foreign exchange transactions related to trade and foreign earnings flows. In addition, following major changes in foreign exchange accounting rules, many U.S. multinational companies felt less need to hedge accounting exposure. This, too, diminished corporate activity in the exchanges.

The rapidly changing situation affected not only banks' customers but also the banks themselves. The world debt crisis, new regulatory requirements, heightened competition, and pressure on earnings all led bank management to reassess foreign exchange operations. As a result, many institutions altered their approach to the market.

This article, based on in-depth conversations with market participants and the Federal Reserve Bank of New York's 1983 survey of foreign exchange activity in the United States, examines how major segments of the U.S. foreign exchange market reacted. The first section looks at nonbank institutions, both financial and nonfinancial. The second examines commercial banks and their behavior. Third, the various changes in currency shares are discussed. The final section considers how various aspects of market concentration have changed.

[1]Seasonal factors also may have played a role. In the United States both April 1983 and March 1980 had 21 business days. But several financial centers overseas were closed for the Good Friday and Easter Monday holidays during April, probably reducing transactions from what they otherwise might have been, even though the New York market was open on those days. Turnover in April 1983 was also diminished because European countries moved to daylight-saving time in late March, about one month ahead of the United States. This decreased by one hour for most business days in April the time when European and U.S. foreign exchange markets were open simultaneously. In addition, turnover in April 1983 may have been reduced because market participants normally advance some transactions from April into March in order to adjust balance sheets prior to the quarter-end.

The Foreign Exchange Activity of Nonbank Institutions

Nonbank institutions more than doubled their total purchases and sales of foreign currency, to $83.8 billion in April 1983 from $35.4 billion in March 1980 (Table 1). (This excludes arbitrage members of the International Monetary Market (IMM).) In March 1980, activity by nonfinancial entities was about four times that of financial institutions. But by early 1983 trading volume by the two groups was roughly equal. Overall activity (spot, swaps, and outright forwards) by nonfinancial institutions rose nearly 47 percent from $28 billion to $41.1 billion. Growth in transactions by nonbank financial entities was far more rapid, rising nearly sixfold to $42.6 billion from $7.4 billion.

Financial institutions

Especially noteworthy is the surge in activity by nonbank financial institutions, a category including securities and brokerage firms, commodities houses, and insurance companies. As deregulation of the U.S. financial system diminished differences among various financial industries, nonbank financial institutions moved to establish a presence in areas once dominated by banks. In particular, many committed themselves to a more active role in foreign exchange.

Many nonbank financial institutions also benefited when the United Kingdom and Japan eased foreign exchange restrictions on capital flows in 1979 and 1980, respectively. In many commercial banks, trade-related transactions tend to generate a large portion of customer business. But certain nonbank financial entities with a long-standing involvement in the securities business naturally benefited when international investors had greater opportunity to diversify their portfolios by investing abroad.

While generalizing is difficult because firms emphasize different areas, many nonbank financial institutions have become involved in one or more of the following activities:

- Providing foreign exchange services to portfolio investors and borrowers in the United States and abroad. Package deals, which accommodate customers' foreign exchange needs stemming from underlying securities transactions, have become increasingly prevalent.[2]

- Meeting corporate foreign exchange needs related to takeovers and acquisitions of foreign entities.

- Using long-term foreign currency swaps to bring together borrowers and/or investors with different currency interests.[3]

- Arbitraging to profit from price discrepancies that occur between the interbank market and the IMM, where foreign currency futures are traded.[4]

- Positioning in size on the IMM to speculate on currency

Table 1

Summary of Foreign Exchange Transactions by Nonbank Institutions

In billions of U.S. dollars

Type of Transaction	March 1980 90 banks	April 1983 119 banks
Spot		
Nonfinancial institutions	10.8	22.2
Financial institutions	4.3	21.4
Subtotal	15.1	43.6
Swaps		
Nonfinancial institutions	6.7	10.1
Financial institutions	2.0	17.5
Subtotal	8.7	27.6
Outright Forwards		
Nonfinancial institutions	10.5	8.8
Financial institutions	1.1	3.7
International Monetary Market	6.3	3.3
Subtotal	17.8	15.8
Total Transactions		
Nonfinancial institutions	28.0	41.1
Financial institutions	7.4	42.6
International Monetary Market	6.3	3.3
Grand Total (Excluding International Monetary Market)	35.4	83.8
Grand Total (Including International Monetary Market)	41.6	87.0

Source: Federal Reserve Bank of New York's Foreign Exchange Turnover Surveys (March 1980 and April 1983).

Because of rounding, figures may not add to totals.

[2]For example, fully-hedged commercial paper programs are available to foreign borrowers who wish to raise funds in the U.S. market, but avoid exchange rate risk. A foreign company thus can obtain financing in its home currency while fixing in home-currency terms future principal and interest payments. Not all borrowers and investors choose to obtain foreign exchange cover immediately. Instead they hope to lower effective borrowing costs or augment investment returns through subsequent favorable exchange rate movements.

[3]Suppose, for example, that a U.S. investment bank has arranged for a dollar-denominated private placement by a Japanese financial institution with a U.S. financial entity. A long-term dollar/yen swap would provide the Japanese institution with yen funds, while also hedging the dollar-denominated principal payment. Interest payments also could be hedged. Meanwhile, the U.S. institution has a dollar-denominated asset.

[4]Arbitrage entails a comparison of futures prices with outright forward prices for the same maturity in the interbank market, or with the spot or "cash" rate for that currency. Profits are made by buying a currency where it is relatively "cheap" and selling where it is relatively "dear".

movements, both for customers and for their own accounts.[5]

- Positioning in the foreign exchange swap market. Swap positions are based on expectations about interest rate movements between two currencies. There is interest rate risk but no exchange rate risk since the same amount of foreign currency has simultaneously been bought and sold.

- Offering foreign exchange options contracts to customers.

Several nonbank financial institutions have actually established full-fledged trading operations with professional dealing staffs to support their increased commitment to foreign exchange. Some occasionally make markets but normally do not quote rates consistently or maintain reciprocal trading relationships with commercial banks. They conduct their foreign exchange transactions through banks, brokers, and sometimes the IMM.

Nonfinancial Institutions

Two factors largely explain the more moderate growth of foreign exchange activity by nonfinancial institutions. First, in the early 1980s the world economy and trade were depressed. Second, foreign exchange accounting procedures governing corporations' international business changed significantly.

In December 1981, the Financial Accounting Standards Board adopted a set of new rules (FASB 52), replacing those in effect since early 1976. One of the most important changes, from the corporate viewpoint, was that balance sheet translation gains or losses produced by exchange rate changes were to be reflected in a separate component of stockholders' equity, rather than in current earnings, as before.[6] Following this, many U.S. corporations felt less compelled to protect themselves against wide swings in earnings by hedging balance sheet exposure with outright forward contracts.[7] Instead, senior management focused more intensely on transaction and/or economic exposure, accelerating a trend which was already emerging.[8]

At the same time corporations appear to have become increasingly sophisticated in foreign exchange risk management and hedging strategies. In response to volatile exchange rates, some firms modified their trading techniques. Rather than using an outright forward, they now frequently engage in a spot transaction, followed by a swap. The end result is the same, but in a fast-moving market a spot price often can be obtained more quickly from banks than an outright forward price. The spot contract is done promptly to eliminate exchange rate risk. The swap can be done more leisurely because swap rates normally are less volatile than spot rates. Indeed, commercial banks normally use this technique to offset outright forward transactions done for customers.

Beyond this, some large multinational companies have established their own trading operations to manage their foreign exchange exposures more aggressively and profitably. Such firms frequently trade actively on an intraday and day-to-day basis, and at times position aggressively to benefit from favorable short-term movements in exchange rates. This can lead to a heavy volume of both spot and swap transactions, with the latter used to roll over positions coming due. Some corporations reportedly will even quote prices on occasion, although probably only when they have a natural interest in doing the business.

The turnover survey reflects these changes. Outright forward transactions by nonfinancial institutions declined 16 percent to $8.8 billion in April 1983 from $10.5 billion in March 1980. Meanwhile, their spot activity more than doubled to $22.2 billion from $10.8 billion, and swap transactions rose about 50 percent to $10.1 billion from $6.7 billion.

The impact of changing conditions on commercial banks and their response

The international debt crisis and growing list of problem loans at home, especially in the energy sector, led to mounting concern within commercial banks over creditworthiness. Also, the Federal Reserve's new requirement that large U.S. banks maintain primary capital at a level equivalent to at least 5 percent of total assets focused attention on the adequacy of bank capital. Meanwhile, heightened competition and rising costs prompted more emphasis on improving earnings from foreign exchange operations.

For these reasons bank management began to reassess the risks and costs of active interbank trading and positioning, and to adopt a more cautious attitude toward increasing the size of balance sheets. Consequently, many major trading banks have made important changes in their approach to the foreign exchange market. Banks now are generally more conscious of costs, and more attentive to

[5]For example, commodities houses that manage investment funds for clients have shifted a portion of their portfolios into foreign exchange and applied the same charting techniques and technical analysis used for years to trade commodities. Some participants also apply the techniques of spread trading to foreign currencies, hoping to take advantage of distortions in historical price relationships between two currencies, or between a currency and some other financial instrument or commodity. If, for example, the price of Swiss franc futures rises relative to that of German mark futures, above a level that normally has prevailed, a spread trader might purchase mark futures and sell Swiss franc futures, speculating that the price ratio will move back into line.

[6]Translation gains or losses stem from an exposed position on the balance sheet, that is, from a mismatch between those foreign-currency-denominated assets and liabilities which must be translated into U.S. dollars at exchange rates prevailing on the date of the balance sheet.

[7]For a more detailed description of how U.S. companies have reacted to FASB 52, see the author's "FASB 52: Corporate Response and Related Exchange Market Effects", this *Quarterly Review* (Winter 1983-84), page 69.

[8]See Patricia A. Revey, "Evolution and Growth of the United States Foreign Exchange Market", this *Quarterly Review* (Autumn 1981), pages 32-44.

risk-return characteristics of foreign exchange activities and indeed their entire spectrum of products and services. They have increasingly considered how foreign exchange activities affect the size, risk characteristics, and maturity and currency structure of the balance sheet, as well as the potential role of exchange operations in overall asset-liability management.

Reassessment of risks and rewards in foreign exchange trading

Around the turn of the decade, many large trading banks adopted a high-volume style of "in-and-out" spot trading.[9] Positions were put on and unwound in hours and minutes rather than days or weeks, as traders pursued earnings over a relatively short time period. Banks did this to reduce exchange rate exposure risks to more acceptable levels in an environment where exchange rates were highly variable and difficult to predict, making long-term positioning risky. Some banks have continued this strategy. But others, amid growing concern over creditworthiness and the size of balance sheets, became increasingly unwilling to incur the risk accompanying the large credit lines needed to support heavy intraday trading.[10]

In addition, profit opportunities diminished progressively as more and more banks adopted a similar trading style. With banks trading increasingly on signals provided by technical models and with advances in communication reducing the information lag, traders often found themselves reacting at the same time and in a similar way.

Other factors also eroded banks' earnings from foreign exchange operations. Competition was intensifying for corporate business, which was expanding more slowly than before. Banks were competing more aggressively, through both narrower spreads on bid/offer quotes and expanded corporate advisory services. And beyond this, new institutions continued to enter the market. The number of domestic banking institutions in the latest turnover survey increased by 11 to 59 between March 1980 and April 1983. The number of foreign banks in the United States included in the survey climbed from 42 to 60.[11] In addition, nonbank financial institutions were providing more foreign exchange services.

Meanwhile, the cost of running a foreign exchange operation was growing rapidly. Rising costs can be traced to several factors, including the banks' high-volume approach to trading. Rapid "in-and-out" trading required costly back office support systems, particularly computer time, and a bigger clerical staff as banks struggled to process, efficiently and accurately, a large number of transactions. Moreover, this trading strategy put a premium on quick access to timely information about a wide variety of financial data as well as fast-breaking economic, political, and social developments throughout the world. Therefore, many banks acquired expensive new information services and communications facilities.

Heightened competitive conditions also raised costs. Scrambling for customer business, many banks had established or expanded their corporate advisory services around the turn of the decade to increase, or at least maintain, market shares. In addition, the proliferation of trading in the late seventies, along with continued entry of new institutions, spread trading talent thin and pushed salaries of professional dealers rapidly higher. Meanwhile, rents and utility charges were also rising.

Table 2

Foreign Exchange Turnover in the Interbank Market

In billions of U.S. dollars

Type of Transaction	March 1980 90 banks	April 1983 119 banks
Spot		
Direct with banks in U.S.	62.4	93.8
Direct with banks abroad	75.5	81.1
Through brokers	162.5	224.2
Subtotal	300.4	399.2
Swaps		
Direct with banks in U.S.	*	22.5
Direct with banks abroad	*	51.7
Through brokers	*	130.2
Subtotal	137.8	204.4
Outright Forwards		
Direct with banks in U.S.	*	3.1
Direct with banks abroad	*	3.7
Through brokers	*	4.6
Subtotal	11.6	11.4
Total Transactions		
Direct with banks in U.S.	*	119.4
Direct with banks abroad	*	136.5
Through brokers	*	359.1
Grand Total	449.7	615.0

*Not available.

Source: Federal Reserve Bank of New York's Foreign Exchange Turnover Surveys (March 1980 and April 1983).

Because of rounding, figures may not add to totals.

[9]For a more complete description of this development, see Patricia A. Revey, *op. cit.*

[10]Along with the risk of outright losses from failure of counterparties to meet contract terms, heavy intraday trading increases the risk of potential payment errors.

[11]The Federal Reserve believes its survey includes banks that account for the bulk of foreign exchange transactions in the United States.

Changes in approach to positioning and spot foreign exchange trading

Pressure on earnings and risk considerations led some active trading banks to question the wisdom of conducting rapid "in-and-out" transactions to benefit from short-term movements in exchange rates. Now banks are generally less willing to do volume for its own sake, and have reduced active short-term position-taking. A few banks have begun emphasizing a more strategic approach, positioning on longer-term exchange rate expectations. Many have reassessed their role in making markets and chosen a lower, more conservative profile in the interbank market. Banks are less inclined to deal directly and quote two-way prices, particularly for certain currencies or at certain times of the day, and are less enthusiastic about maintaining a consistent posture with respect to reciprocity. Reflecting a more defensive attitude, banks have carefully reviewed credit lines and in some cases cut them back.[12]

Consequently, relationships between trading banks have become increasingly strained. This process has tended to feed on itself, with growing complaints about lack of liquidity, deteriorating trading conditions, and the difficulty of getting business done in the New York afternoon after European centers have closed.

The greater reluctance to pursue rapid intraday spot trading and deal directly is reflected to some degree in the April 1983 survey. Table 2 shows that the share of spot transactions in total interbank activity slipped nearly 2 percentage points to 64.9 percent between March 1980 and April 1983. Meanwhile, the portion of interbank spot turnover accounted for by direct transactions between U.S. banks and between U.S. banks and banks abroad, declined to 43.8 percent from 45.9 percent.[13] Although the changes are modest, these trends seem to have continued since the survey.

Banks less enthusiastic about direct dealing have had greater recourse to foreign exchange brokers. The proportion of interbank spot transactions done through brokers increased to 56.2 percent in April 1983, from 54.1 percent three years before. While fees can be considerable, some banks feel that dealing through brokers is cost-effective because it reduces the size and expense of a full-time professional dealing staff. Using brokers also enables business to be done when banks shrink back from dealing directly. And a bank can control its positions better, since there is no obligation to reciprocate. Brokers generally handle standard amounts in each currency (typically $3 or $5 million equivalent) and discourage smaller, odd-sized deals, so the average size per deal tends to be larger.[14]

Increased emphasis on other areas of trading

Major banks have also turned more to some other areas of trading thought to improve profits on a cost- and/or risk-adjusted basis. These include:

- *Foreign exchange futures.* Many banks are, or are considering becoming, more heavily involved in trading on the IMM, either through their own subsidiary or through brokers there, to profit from relatively riskless arbitrage opportunities. Some are actively quoting prices to other market participants who also are arbitraging between the futures and interbank markets (Box 1).

- *Foreign currency swaps.* The use of swaps as part of banks' normal funding and lending activities has increased. A bank needing dollar financing to fund dollar loans, for example, can borrow dollars directly or borrow one of several foreign currencies and swap the proceeds into dollars if that is cheaper. The bank has no exchange rate risk, and matches a dollar asset with a dollar liability. Bank management has encouraged closer communication between Eurocurrency traders and foreign exchange swap dealers to facilitate this activity.

- *Foreign exchange swap positioning.* This is regarded as more conservative than spot positioning since interest rate differentials typically do not move as rapidly or as much as spot exchange rates. Accordingly, less time and effort is required to monitor swap positions. Many major banks now give more attention to swap trading and, in some cases, make swaps a trader's sole responsibility. Only a few years ago, a single trader often was responsible for both spot and swap transactions. The turnover statistics show a moderate increase in the relative importance of swap transactions in interbank trading to 33.2 percent in April 1983 from 30.6 percent in March 1980.

- *Cross-currency trading.*[15] In part, these transactions accommodate customer demands. Additionally, some banks may now see cross-currency positioning as less risky than positioning directly in the dollar, since most cross rates have been less volatile and more predictable than dollar rates in recent years. Some banks also engage in cross-currency positioning to protect themselves against unfavorable movements in dollar

[12]The large turnover in chief dealers over the last year or two may in part reflect the banks' changing attitudes.

[13]Swap and outright forward transactions done directly by banks with other banks were not separately classified in the March 1980 survey, so the only comparison possible is for spot turnover.

[14]The average deal size was greater for transactions reported by brokers than for those reported by banking institutions for every currency but the German mark.

[15]In a cross-currency transaction a foreign currency is purchased or sold directly against another foreign currency rather than against the dollar.

exchange rates. This is especially true when a position in a widely traded currency, like the German mark, can be used to hedge a position in a currency for which cover is more difficult to arrange.[16] Cross-currency activity, reported for the first time in the latest survey, totalled $1.5 billion. This probably understates such transactions since some banks had problems isolating them from their records. Moreover, cross-currency positioning reportedly picked up in late 1983 and early 1984, with substantial interest shown in sterling/mark, mark/yen, and sterling/yen.

[16] If a bank filled a customer order to buy Dutch guilders against dollars, it might prefer to cover its resulting long-dollar, short-guilder position. But this could be difficult since the dollar-guilder market in New York is often thin, especially in the late afternoon. Thus, the bank might purchase German marks against dollars, effectively leaving it with a long-mark, short-guilder position. Should the dollar decline, losses on the dollar-guilder position would be compensated for by gains on the dollar-mark contract, as long as the mark-guilder cross rate remained stable.

Development and marketing of new products

Heightened competitive conditions, along with the desire to enhance earnings, encouraged many large U.S. trading

Box 1: The Changing Role of the Foreign Currency Futures Market

Trading of foreign currency futures, the bulk of which occurs on the IMM in Chicago, has grown rapidly in recent years. In fact, between March 1980 and April 1983 average daily turnover in the major foreign currencies there grew over twice as rapidly as adjusted total turnover, from $1.1 billion to $2.3 billion equivalent. By April 1983, turnover on the IMM had reached nearly 10 percent of adjusted total turnover, up from 6.7 percent three years earlier. Growth in trading of Swiss franc and Japanese yen futures was particularly dramatic, leading to an IMM to total turnover ratio of nearly 25 percent and 12 percent, respectively.

Commercial banks have contributed significantly to this expansion. In addition to their arbitrage activities, many banks now regard the IMM as another source of liquidity for the foreign exchange market. It enables them to conduct business and alter trading positions when the interbank market is inactive and thin. Moreover, closer contact with the IMM provides important information. Many participants in the futures market rely on the same charting techniques and technical analysis to predict exchange rate movements. The widespread use of this approach can generate similar behavior which in turn sometimes causes sharp, short-term price movements that spill over into the interbank market. Since banks see the IMM as a potential force in moving exchange rates, especially when the interbank market is thin, they have felt compelled to adopt a more active presence there. This helps them keep abreast of developments and make judgements about their own position-taking. For April 1983, banking institutions reported that foreign exchange futures contracts with organized exchanges totalled almost $2 billion.

More active trading by banks and other institutions has had several related consequences. The futures market has become more closely integrated with the interbank market in foreign exchange. Arbitrage opportunities have therefore diminished and exchange rates in the two markets have remained in line to a greater extent and more consistently than before. Consequently, the role of the IMM's "Class B" members, a special class of clearing member authorized to do only arbitrage transactions, has shrunk. Between March 1980 and April 1983, their activity dropped by nearly one-half, from $6.3 billion to $3.3 billion. The share of commercial banks' total customer business accounted for by arbitrage members dwindled from 15 percent to only 4 percent.

Comparison of Growth in Turnover on the IMM and in Total Turnover

Daily averages in millions of dollars equivalent

	March 1980			April 1983		
Currency	IMM turnover	Total turnover*	IMM/total (percent)	IMM turnover	Total turnover*	IMM/total (percent)
German mark	193	5,375	3.6	347	8,004	4.3
Swiss franc	179	1,826	9.8	793	3,239	24.5
Japanese yen	67	1,742	3.8	639	5,434	11.8
Sterling	288	4,230	6.8	241	4,395	5.5
Canadian dollar	326	2,535	12.9	248	2,246	11.0
Total	1,053	15,708	6.7	2,268	23,318	9.7

*Adjusted for double-counting of interbank transactions.

Source: IMM turnover based on International Monetary Market, *IMM Foreign Exchange Daily Information Bulletin*, various issues. Adjusted total turnover based on Federal Reserve Bank of New York's Foreign Exchange Turnover Surveys (March 1980 and April 1983).

banks to develop new products to attract more customer business. This is especially evident in two areas—long-dated foreign currency transactions and foreign exchange options.

Some banks have extended the maturity dates for which they will do foreign exchange swaps and outright forwards, often at the behest of their customers who are naturally interested in such arrangements. Many sophisticated multinational companies and other entities now routinely scour the world's capital markets to locate relatively inexpensive funds and minimize overall financing costs. Long-dated swaps, some reportedly extending well beyond ten years, facilitate the search since with them a company can transfer medium- and long-term borrowings from one currency to another on a fully hedged basis. The opportunity to hedge through *long-dated transactions* is also welcomed by large institutional investors who hold foreign assets to diversify risks internationally and improve overall performance.

Long-dated transactions are riskier for banks than shorter-term ones, owing both to the time element and the greater difficulty of offsetting such deals.[17] But clearly, institutions actively marketing these services believe the income earned adequately compensates for the additional risk. Not all banks reason this way, however. Some arrange long-term deals only at a customer's request, while others will get involved only if they can offset the transaction with another bank or customer. The market for long-term foreign exchange transactions reportedly is still small relative to total turnover. Nonetheless, it is growing and could become more important as banks gain experience in pricing and in dealing with the risks.

Recently some banks began to offer custom-made *foreign exchange options* contracts to their customers.[18] Over-the-counter options, as these sometimes are called, and foreign exchange options traded on organized exchanges in the United States are relatively new but could assume an important role in the market.[19]

Foreign exchange options can be useful in managing foreign exchange risk. For a fixed fee (the premium), the customer essentially purchases an insurance policy, and transfers the risk of adverse exchange rate movements onto the bank writing the option contract. Options limit the customer's downside risk, but leave open the potential for theoretically unlimited upside gains.

Banks writing foreign exchange options contracts take on significant risk. They do not know their ultimate exposure until the holder exercises the option. Accordingly, much time and effort must be spent monitoring the relationship between the contract's strike price and the spot price in the interbank market.[20]

Banks tend to build into the premium price the heavy risk of writing foreign exchange options contracts. So, although corporations have expressed considerable interest, the actual volume of business so far seems to have been fairly limited.

Currency Shares

The main shift in currency shares was a dramatic rise in the Japanese yen's relative importance, largely offset by declines in sterling and the Canadian dollar. The chart shows that the Japanese yen became the second most actively traded currency, accounting for 22.0 percent of total turnover. Three years earlier the yen was fourth, with a 10.2 percent share. Trading in German marks remained the most active, accounting for 32.5 percent of all transactions, very close to March 1980's figure of 31.7 percent.

The doubling of the yen's share largely reflects Japan's relaxation, in December 1980, of foreign exchange restrictions on capital transactions.[21] The new law increased foreign access to Japanese markets and liberalized transactions abroad by Japanese residents.

By most accounts, two-way capital flows between residents of Japan and the rest of the world have risen sharply in recent years, with an accompanying increase in foreign exchange transactions.[22] Although gross data for all capital flows in and out of Japan are not readily available, their magnitude is suggested by total transactions related to foreign portfolio investments by Japanese residents, and portfolio investments in Japan by nonresidents. Since 1980, such purchases and sales of stocks and bonds have more than doubled to $171.8 billion in 1983 from $72.6 billion.[23] Over the same period, Japan's share of world trade also grew from 7.1 percent to 8.1 percent.[24]

[17]The long-term swap market is less liquid than both the spot and short-term swap markets.

[18]An options contract provides the right—but not the obligation—to purchase (call) or sell (put) an agreed-upon amount of foreign currency at a specified price (strike price) on or before the maturity date of the contract.

[19]Trading in sterling options contracts began on the Philadelphia Stock Exchange on December 10, 1982, and over the next two months the exchange added options contracts in Japanese yen, Swiss francs, German marks, and Canadian dollars. Also, option contracts on German mark futures began trading on the IMM early this year.

[20]Banks have devised computer programs to help manage these exposures. Ratioed hedging techniques often are used. They call for covering a certain fraction of the option in the interbank spot market, depending on the gap between the strike price and spot rate. Some banks also try to offset options contracts on the IMM or in Philadelphia, although this is relatively new since no options contracts with organized exchanges were reported in the turnover survey. Moreover, it can be difficult, as these options markets are still rather thin.

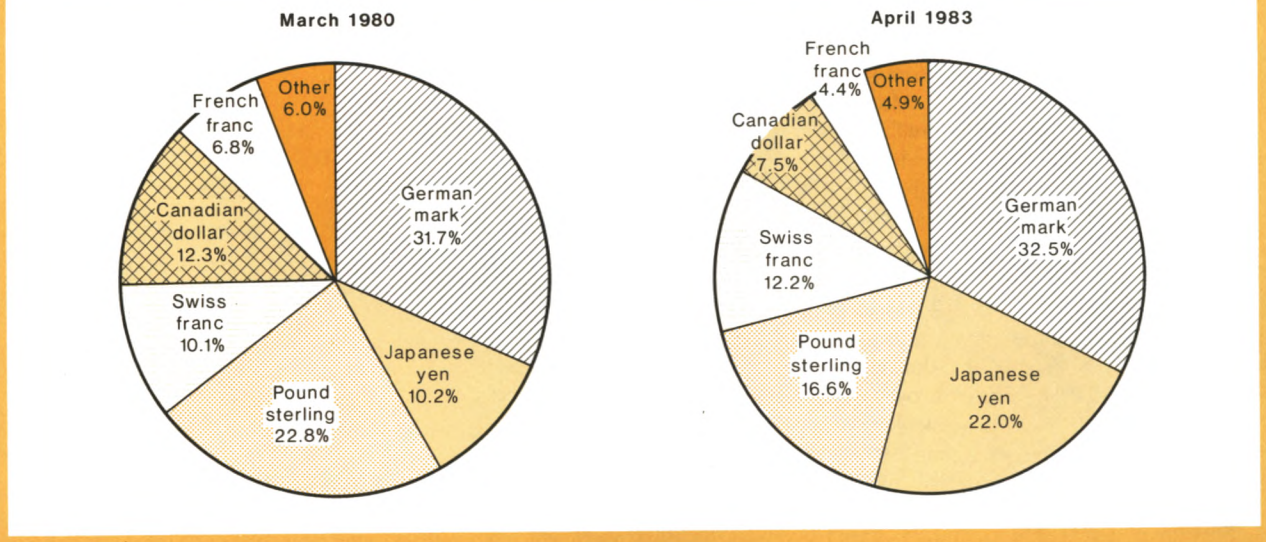
[21]The new Foreign Exchange law ratified and accelerated moves toward relaxation that had been gradually occurring since the early 1970s. See *Japan Economic Institute Report*, "Capital Market Liberalization in Japan", Number 10A (March 9, 1984).

[22]The growth in capital transactions also may help explain why swaps account for a larger proportion of yen turnover than is true for other key currencies. Swaps are frequently used to fund investment and lending activities.

[23]Based on data provided by the Japanese authorities.

[24]International Monetary Fund, *International Financial Statistics* (June 1984).

Distribution of Foreign Exchange Turnover by Currency



Because of rounding, figures do not add to 100 percent.

Source: Data based on Federal Reserve Bank of New York's Foreign Exchange Turnover Surveys (March 1980 and April 1983).

With activity in the yen picking up, many banks began placing more emphasis on trading the currency, replacing junior traders with more senior, experienced personnel who were given larger position limits and generated a larger volume of transactions. The recent agreement between Japan and the United States to further open Japanese financial markets and make the yen more of an international currency is likely to increase the yen's share of overall turnover even more.

Concentration in the Foreign Exchange Market

Changing conditions in the foreign exchanges had varying effects on concentration, depending on which aspect is examined. The following discussion looks at concentration from several perspectives.

- *The overall market.* Measured by the share of total turnover accounted for by the ten most active trading banks, overall concentration changed little. It rose slightly to 39.9 percent in April 1983 from 39.2 percent in March 1980.

- *Individual currency markets.* Of the major foreign currencies, only trading in the German mark became less concentrated, as the share of the ten most active banks declined from 47.4 percent to 41.1 percent. Concentration in the pound sterling, Japanese yen, and Swiss franc markets rose. Meanwhile, trading in the less active currencies became less concentrated; even so, these markets remained more concentrated than most of those in the major currencies.

- *Total turnover accounted for by foreign banks.* Foreign banks in the United States continued to enjoy a significant presence in the U.S. foreign exchange market. Indeed, in April 1983, they comprised fully one-half of the turnover survey's bank respondents, compared with 46.7 percent in March 1980; they also accounted for 43.5 percent of total turnover, up from 39 percent three years earlier.

- *Home-currency trading accounted for by foreign banks.* Foreign banks accounted for an important share of activity in their home-currencies in April 1983, ranging from 16 percent for trading in sterling to 45 percent for the French franc (Table 3A). The market share of home-currency trading of foreign banks from Canada, Japan, and Switzerland rose appreciably from March 1980; but the share of German mark trading accounted for by banks from Germany declined.

- *Foreign banks' specialization in home-currencies.*

Box 2: Comparison of Foreign Exchange Turnover in Selected Markets

Comparing foreign exchange activity in different markets is limited by the lack of published data. However, turnover statistics on the Tokyo, Canadian, and Singapore markets allow activity in those markets to be compared with that in the U.S. market. The Table shows foreign exchange turnover in April 1983 for the United States, Tokyo, Canada, and Singapore. The data are adjusted to eliminate double-counting of interbank transactions within, but not between, markets.

*Tokyo**

Total adjusted turnover of $249 billion in the Tokyo market was less than half of adjusted turnover in the U.S. market of $544 billion during April 1983. However, yen turnover in Tokyo ($229 billion) was twice as large as in the United States ($114 billion), accounting for about 92 percent of total activity, compared with about 21 percent in the United States. As in Canada and Singapore, virtually all foreign exchange trading is conducted against the U.S. dollar. Banks' transactions through brokers accounted for about 49 percent of interbank activity in Tokyo, somewhat lower than the 57 percent in the United States. Unlike brokers in the United States, brokers in Japan currently are not allowed to arrange transactions between domestic banks and banks abroad.† Customer transactions comprised 26 percent of total Tokyo turnover, considerably more than the 16 percent in the United States.

Canada

The volume of foreign exchange transactions in Canada totalled $102 billion in April 1983, about 19 percent of adjusted total turnover in the United States. In the Canadian market, activity in the Canadian dollar was nearly two-thirds larger than in the U.S. market, accounting for about 76 percent of total turnover there, compared with about 8.5 percent in the United States. In addition, a larger share of interbank transactions by Canadian banks was done through brokers (68 percent) than was true for U.S. banks (57 percent). Customer business accounted for 26 percent of total turnover in Canada, compared with 16 percent in the United States.

Singapore

Total adjusted foreign exchange turnover in Singapore amounted to $123 billion in April 1983, about 23 percent of activity in the U.S. market. The share of overall activity accounted for by the Singapore dollar was about 18 percent. The portion of interbank turnover conducted through brokers is not known, since these transactions are included in the figures showing direct transactions. Customer transactions accounted for 4 percent of all activity in the Singapore market, significantly less than in the United States, Tokyo, and Canada. However, the relative importance of customer business in Singapore is probably understated, since transactions by Singapore banks with nonbanks outside Singapore are included in transactions done with banks abroad.

*Foreign exchange trading also takes place in Osaka, where activity is estimated to be about 2 percent of that in Tokyo.

†This will change soon. Beginning August 1, 1984 for nonyen transactions and early next year for yen transactions, brokers in Japan may accept bids and offers from banks abroad.

Foreign Exchange Turnover in Selected Markets for April 1983*

In billions of U.S. dollars

	United States			Tokyo		Canada		Singapore
Transactions	Total turnover	Turnover in Japanese Yen	Turnover in Canadian Dollars	Total turnover	Turnover in Japanese Yen	Total turnover	Turnover in Canadian Dollars	Total turnover	Turnover in Singapore Dollars
Interbank	456	95	36	183	167	75	52	118	18
Direct with domestic banks	60	14	3	—	—	3	3	27†	11†
Direct with banks abroad	136	25	12	92	84	21	14	91†‡	7†‡
Through brokers	260	56	21	90§	82§	51	35	—	—
Customer	87	19	11	65	62	27	26	5	4
Total	544	114	47	249	229	102	78	123	22

*Data adjusted to eliminate double-counting of interbank transactions.

†Includes transactions done through brokers.

‡Includes transactions with banks and nonbanks outside Singapore.

§Includes only transactions involving two domestic banks. Brokers in Japan currently are not permitted to arrange transactions with banks abroad.

Source: Data based on foreign exchange turnover surveys conducted by the Federal Reserve Bank of New York, Bank of Canada, and Monetary Authority of Singapore. Data on the Tokyo market are estimates based on information provided by the Japanese authorities and other market participants. Adjustments to eliminate double-counting in Singapore's and Japan's data were done by the Federal Reserve Bank of New York.

Because of rounding, figures may not add to totals.

Table 3A

Market Share of Home-Currency Trading of Foreign Banks in the United States

In percent

Country of origin	March 1980 Number of banks	March 1980 Market share	April 1983 Number of banks	April 1983 Market share
Germany	8	24.2	11	19.5
United Kingdom	4	16.5	5	15.6
Canada	5	14.4	5	24.3
Japan	9	27.0	13	31.4
Switzerland	3	20.8	4	28.5
France	6	46.7	9	45.2

Table 3B

Relative Importance of Home-Currency Trading in Total Activity of Foreign Banks in the United States

In percent

Country of Origin	March 1980 Number of Banks	March 1980 Share of Activity	April 1983 Number of Banks	April 1983 Share of Activity
Germany	8	89.9	11	85.6
United Kingdom	4	52.8	5	37.8
Canada	5	46.5	5	38.1
Japan	9	69.8	13	86.6
Switzerland	3	51.9	4	49.7
France	6	42.2	9	34.4

Source: Data based on Federal Reserve Bank of New York's Foreign Exchange Turnover Surveys (March 1980 and April 1983).

Home-currency transactions comprised a large share of the total activity of foreign banks, extending from about 34 percent for French banks to 86 percent for German and Japanese banks. But except for Japanese banks, the relative importance of home-currency trading in total activity declined, in some cases substantially, from three years before (Table 3B).

Conclusion

Overall, growth in foreign exchange turnover in the United States slowed significantly in the early 1980s, compared with its rapid pace in the late 1970s. But this was not true for all major classes of market participants, whose experiences differed widely.

- Nonbank financial institutions greatly expanded their foreign exchange activities. Deregulation of the U.S. financial system encouraged them to become more active in meeting customers' foreign exchange needs previously handled by commercial banks. In addition, firms in the securities industry naturally benefited when the United Kingdom and Japan eased controls on capital movements, since that increased opportunities to diversify portfolios internationally and led to greater demand for foreign exchange services.

- Activity of nonbank nonfinancial institutions grew much more moderately. Global recession and the debt payment crisis depressed world trade volumes and thus the need for foreign exchange transactions. At the same time, new foreign exchange accounting rules prompted many U.S. multinational corporations to reduce, or end altogether, certain foreign exchange activities designed to hedge balance sheet exposures.

- Heightened competition, rising costs, and concern over creditworthiness and the size of balance sheets led many commercial banks to reassess their foreign exchange activities. Some became more reluctant to pursue a high-volume, rapid "in-and-out" trading style, to deal directly, or to make markets. To improve earnings, many placed increased emphasis on other areas of trading and began offering new products to attract customer business.

Assessing prospects for future growth in foreign exchange transactions is difficult. All things considered, a recurrence of the explosive growth in the late seventies seems unlikely. More probable is that the more moderate pace of recent years will continue. As economic recovery spreads, world trade volumes should pick up; creating a greater need for foreign exchange transactions. In addition, ample scope for greater diversification of investment portfolios, together with planned further reductions of restrictions on capital movements in and out of Japan, suggest that foreign exchange activity related to capital flows will continue to expand.

Less clear, however, is whether the change in corporate balance sheet hedging practices is permanent. To some extent, companies are still sorting out the full implications of the new foreign exchange accounting rules. The answer may depend on the course of the U.S. dollar. Should the dollar continue to strengthen, many firms would experience balance sheet translation losses. At some point the impact of cumulative losses on equity might prompt them to renew balance sheet hedging, to forestall a negative reaction by analysts and stockholders. Likewise, the decision by some major trading banks to step back from the high-volume approach to foreign exchange trading may also be mercurial.

Michael D. Andrews

Nuclear Power Plant Construction: Paying the Bill

Over the next few years U.S. electric utilities will be asking for revenue increases to pay the cost of building some 50 nuclear power plants which are currently under construction (Table 1). Eighty-five billion dollars has been spent on these projects so far and, according to data provided by the utilities, an additional $45 billion will be needed to complete them. These revenue requests will, if granted, result in electricity rate hikes of unprecedented magnitude: a total increase in utilities' revenues of roughly $25 billion, or about 20 percent of 1982 levels would eventually be required. If requested rate increases are severely limited by the regulators, the financial condition of many of the utilities with nuclear construction projects would be further impaired.

Because of the way most states regulate electric utility rates, the cost of constructing these plants has not yet been reflected in the electricity bills of customers. Instead, funds have been borrowed and raised through stock offerings. Only after the plants begin producing commercial power do customers begin to reimburse the utilities in cash for the costs incurred in building the plants, along with a competitive return on stockholders' investment. In addition, typical regulatory practice heavily loads the cost to consumers of new generating facilities in the first few years that the plant is in operation. In many affected areas all of this could mean jumps in customers' electricity bills upwards of 50 percent as soon as the plants begin commercial operation.

The sudden rate hikes that accompany the opening of nuclear plants (a phenomenon often called "rate shock") are likely to be especially unpopular, not only because of the unusually large size of the hikes, but also because in most cases neither more electrical power nor additional generating capacity is needed right now. In fact, in all but a few specific regions, such as New England, the United States has an excess of electrical-generating capacity.

Although at present it may look as if many new nuclear plants were poor investments, it is not certain that the construction of those plants that are eventually completed will appear to have been a bad idea in retrospect ten or twenty years from now. Demand for electrical power has recently started to escalate as economic growth rates have risen, and the replacement of imported petroleum and acid rain-generating coal as power plant fuels could produce substantial political, environmental, and economic benefits.

For the present, though, several utilities face serious difficulties. There has already been a huge default in the case of the Washington Public Power Supply System (WPPSS). And currently, a number of investor-owned utilities—the Long Island Lighting Company (Lilco), Public Service of New Hampshire, Consumers Power of Michigan, and Public Service of Indiana, among others—have serious financial problems.

The purpose of this article is to describe and measure the nationwide scope of a problem that has generally been discussed on a case by case basis, without sufficient regard to the interrelation of the issues involved.

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The origins: demand growth declines while project costs escalate

Industry standards typically call for electrical utilities to maintain maximum generating capacity between 15 and 22 percent above projected peak load demand. If we take 18

percent as the average requirement, in the early 1970s, when most of the nuclear plants currently under construction were planned, there was no slack capacity in the aggregate by this standard (Chart 1). At the same time, fossil fuel prices were also increasing at unprecedented rates; real crude oil prices quadrupled between 1970 and 1980 and anthracite coal prices roughly doubled.[1] Under the circumstances nuclear power looked like a good bet to all but a few observers. Government agencies actively encouraged utilities to invest in nuclear plants, and opposition was not widespread.

In the mid 1970s, the growth in demand for electricity slowed markedly (Chart 1). In fact, some industry projections 10 years ago overstated the need for capacity in 1983 by nearly 50 percent.[2] As a result, the new capacity brought on line during the 1970s has allayed immediate concerns with most utilities' ability to meet peak load demand. Moreover, fossil fuel prices have stabilized; real anthracite coal prices actually decreased by about six percent between 1980 and 1982.[3]

In addition, the 1979 incident at Three Mile Island raised concerns with the safety of nuclear plant operations. The regulations issued by the Nuclear Regulatory Commission to address the safety issue have contributed substantially to increasing both the cost of plant construction and the time needed to complete the projects.

Finally, over the past several years, the cost of capital to utilities has risen markedly. This not only increased the direct construction cost of the plants, but also exacerbated the cost consequences of delay.

As a result of all of these changes, building nuclear generating plants has apparently not turned out to be as good an investment as originally expected. In fact, current estimates of the completion costs of plants now under construction are as much as ten times as high as the levels originally forecasted when the projects were initiated. Faced with cost escalations of this magnitude, U.S. utilities have cancelled 33 of the 39 new nuclear plants ordered since 1974. No new nuclear plants have been ordered since 1978.[4]

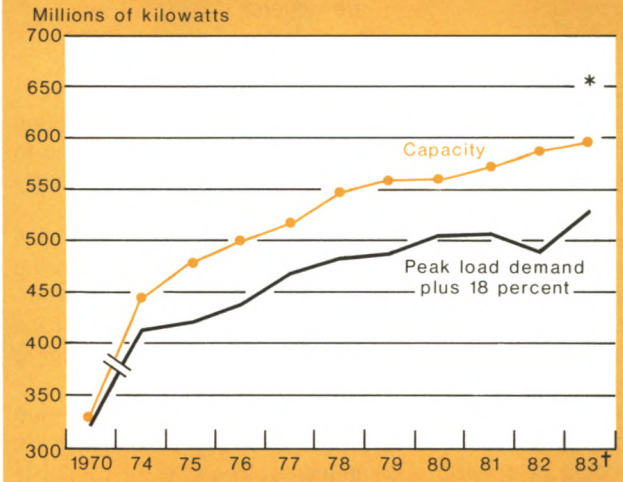
Market structure and rate regulation

The organization of the electrical utility industry is unique in several respects, and its particular market structure will exert a major influence on the ultimate impact of current nuclear construction projects. While utilities in most parts of the country are privately owned, the industry is subject to far-reaching government influence, particularly on the state level. State governments have granted particular utilities the exclusive right to serve specific geographical areas. In return for this distribution monopoly, however, state governments retain the right to approve or disapprove utilities' proposed electricity rates. Another important characteristic of the organization of the electrical utility industry is its extensive vertical integration. A few utilities do not sell power directly to final consumers but only to other utilities; and a few firms act only as retailers of power produced by others. But for the most part utilities produce at their own plants most or all of the power they sell directly to final consumers. The issues raised by nuclear plant construction and the range of possible resolutions are, in large part, determined by this combination of distribution monopoly, rate regulation, and vertical integration.

In most states electrical rates are set by governmental bodies called public service commissions or public utilities boards. These regulatory agencies typically allow rates high enough to meet the costs utilities incur in purchasing fuel and in operating and maintaining their generating plants and transmission facilities. In addition, utilities are allowed to

Chart 1

United States Electrical Generating Capacity and Summer Peak Load Demand plus 18 Percent



*Capacity if all nuclear plants under construction were on line.

†Preliminary.

Source: Edison Electric Institute.

[1] U.S. Department of Energy, Energy Information Administration, *Annual Energy Review.*

[2] For example, the National Electric Reliability Council estimate of electricity demand in 1983 made in 1974 was about 750 million kilowatts, compared with the actual 450 million.

[3] *Annual Energy Review, op. cit*

[4] The Atomic Industrial Forum, "Historical Profile of U.S. Nuclear Power Development" (January 1984).

Accounting for Construction Work in Progress

In most states utilities may not begin to pass the cost of plant construction onto customers before commercial operation begins. In the terminology used by utilities and their regulators, the value of construction work in progress (CWIP) is not typically included in the "rate base"—the aggregate value of the plants whose cost utilities are allowed to recover from their customers. Some states do allow utilities to begin recovering a part of the value of CWIP before plants open, but most do not.

The exclusion of CWIP from the rate base creates a financing problem for utilities, especially given how long it takes to build large generating facilities. Most investors would be unwilling to advance funds to a utility for building a plant in the expectation of not receiving any return for a period of up to ten years. Therefore, to aid power companies in raising construction funds, most regulatory commissions allow utilities to include on their income statements a special item called "Allowance for Funds Used During Construction" (AFUDC). Regulators and accountants allow utilities to report a noncash income item equal to the interest paid that year on debt incurred to build the plant and a competitive return on stockholders' equity in the plant.

The utility does not actually receive cash income in that amount, but with AFUDC included in its financial statement the firm is considered creditworthy enough to continue raising money in capital markets. In other words, by allowing utilities to report AFUDC income, regulators are in effect providing some assurance to potential investors that the utility will eventually be able to recover the funds spent on the construction project with a return retroactive to when the funds were raised.

Under ordinary circumstances, once the plant is completed the utility is allowed to begin recovering from its ratepayers the entire cost of building the plant, includjng both direct expenditures and all accumulated funds used during construction.

Another common regulatory practice is to base rate decisions on the book value of the firm's assets. Over time, therefore, as the book value of a plant is depreciated, the revenue return allowed on each asset declines. Therefore, as any plant ages, the amount consumers must pay as a return on capital investment declines. This means that a large proportion of the total investment in any new plant is charged to the consumers in the first few years of operation. Inflation magnifies the effect of this "front loading" in real terms. First, inflation raises interest rates in general and therefore the rate of return utilities are permitted to earn. Second, with inflation, the real value of the payment stream (which is fixed in nominal terms) is depressed by greater amounts each year.

For all of these reasons, a large part of the impact of an expensive new plant's completion is felt by consumers all at once when the plant goes into service. Given how long it has taken to build those nuclear plants currently under construction and how high capital costs have been over the last ten years, the practices of deferring rate hikes until commercial operation commences and of "front loading" the capital costs has resulted in the potential for huge additions to utilities' rate bases and consequent "rate shock."

collect enough from their customers to service any bonded debt incurred to build plant or purchase equipment and to pay stockholders a competitive rate of return on their equity in the company.

A crucial feature of public utility regulation is that utilities are typically not allowed to recover from their customers the cost of building new plants until those plants begin generating electricity for sale (box). This regulatory practice leads to sudden, large rate hikes for utilities bringing expensive projects into commercial operation.

It is very difficult to predict accurately the utility revenue increase or electricity rate hike which will accompany the opening of specific nuclear plants. The cost of capital is different to different utilities, and different regulators allow different returns on stockholders' equity. Some of the plants may never be completed. In the states that allow utilities to begin recovering the cost of new plants before commercial operation, part of the required revenue increase may already have been implemented. Many relevant figures may change by the time the plants finally go into service.[5] Finally, regulators, legislatures or the courts may not allow the utilities to recover the full costs of construction on any one of a number of grounds.

These qualifications notwithstanding, the rough estimates in Table 2 provide a consistent basis for aggregation and comparison across utilities and regions. The required revenue increases in the *first year* of operation (Table 2, column 4) represent the sum of the following costs:[6]

[5]For example, the Department of Energy forecasts 5.4 percent growth of electricity sales in 1984. See Energy Information Administration, *Short Term Energy Outlook* (June 1984). Demand growth raises the revenue increases required (as more operation and fuel costs are incurred) but lowers the required rate hikes per kilowatt hour (as fixed costs are spread over more kilowatt hours).

[6]Table 2 reports revenue increases only for the 60 investor-owned utilities with shares of one or more nuclear plants under construction. These utilities collectively own about two-thirds of the aggregate nuclear capacity under construction. The rest is owned by private cooperatives and governmental agencies.

- operations, maintenance, and fuel costs of two cents per kilowatt hour produced, assuming the plant operates 65 percent of the hours in a year,

- capital costs of an amount sufficient to service a mortgage with initial principal equal to the cost of the plant at completion over 30 years at 14 percent interest, and

- annual charges of 6 percent of the cost of the plant at completion to account for depreciation and taxes.[7]

This estimate of additional revenue requirements is expressed as a percentage of the utility's revenues for 1983 electric utility operations. It is important to emphasize that these estimates are for the first year of operation only. A large share of the utility revenues associated with a specific plant is computed as a proportion of the capital value of the facility. As the plant is depreciated, this portion of revenues will decline.

There are a few utilities with nuclear construction work in progress which will not require very large rate increases to meet their share of the obligations incurred in building a plant. However, the (weighted) average percentage revenue increase of some 35 percent for these utilities is more than twice as large as the average 15 percent increase in nominal revenues experienced by all U.S. electrical utilities between 1970 and 1980.[8] And in some cases, the required increase is extremely large, exceeding 50 percent for 14 utilities.

The revenue increases associated with completion of nuclear plants will probably be mitigated by the relatively low operations, maintenance, and fuel costs at nuclear plants. Much of the new nuclear capacity that comes on line will initially be used to replace older oil and coal fired plants. Operations and maintenance costs for the older plants, especially the oil fired ones, are much higher than for nuclear plants. Therefore, as nuclear capacity replaces oil and coal fired capacity, the average variable cost of producing electricity will probably decrease.

The fifth column of Table 2 reports the net increases of revenue required, assuming all of the electricity produced by each nuclear plant replaces power produced currently at the utility's average 1983 costs for operations, maintenance, and fuel. In the cases of the utilities with the highest variable cost of production—generally in the oil-burning northeast—the eventual savings could be substantial. In fact, the savings could be even greater than those shown in Table 2, because these estimates are based on average production costs for all plants, but utilities can be expected to replace their highest variable cost facilities first.

It should also be noted that the expected percentage *revenue* increases listed in Table 2 will not translate directly into electricity *rate* increases. How much rates per kilowatt hour do increase will depend on how many kilowatt hours are sold. The demand for electricity could very well increase substantially over the next few years, along with the growth of GNP. A few years' real growth of 3 percent would wipe out most of the present excess capacity if no additional plants are completed.[9] To the extent that each utility increases the sale of electrical energy, part of the revenue increase would be covered by these sales.

In another way, however, a given initial rate increase might understate the long term economic and financial impact of nuclear plant completion. The experience of the 1970s suggests that consumers will respond to the likely initial electricity rate increases by conserving electricity and by increasing their own production of electricity. (Under current federal law, in fact, utilities are required to purchase excess electricity produced by their customers.) Reductions in nuclear utilities' sales would lead to further rate hikes, to provide enough revenues to meet fixed costs.

Aggregate and regional economic effects

For the national economy, the impact of the rate increases expected upon completion of nuclear construction work in progress would generally be moderate. A $25 billion shift from utilities' customers to investors in nuclear utilities would probably not have substantial macroeconomic consequences, but such a transfer might have significant distributional effects. The average price of electricity per kilowatt hour nationwide would increase substantially. Thus, electricity-intensive industries with large investments in fixed plants, such as ferro-alloy and aluminum smelting and petrochemicals, would suffer the most.

In specific regions of the country the effects on economic development may be greater. While 23 states are not seriously affected directly, in 13 others revenue increases could exceed one percent of state personal income (Chart 2). By this standard, the most severe problems appear to be concentrated in northern New England and in the Ohio and Mississippi Valleys. Some regions which could be affected by large rate increases are not shaded in Chart 2 because the local nuclear plants are being constructed by government-owned utilities or public authorities (notably the Pacific Northwest).

There are, of course, differences in the impact of nuclear plants within states (Table 2, columns 6 and 7). In New York

[7]The results are mildly sensitive to these assumptions. Allowing the total rate of return to vary from 18 percent to 22 percent, and allowing the operating factor to vary from 55 percent to 70 percent yielded estimates of total revenue increases ranging from $20 billion to $25 billion. The results reported in the table lie in the middle of that range.

[8]U.S. Federal Power Commission (1970); U.S. Energy Information Administration, Statistics of Privately Owned Electric Utilities (1980).

[9]In Chart 1, for example, the excess reserves according to the 18 percent standard was about 13 percent in 1983.

State, for example, Long Island has a severe problem while New York City is unlikely to be directly affected.

The regulatory response

Under normal circumstances action on rate increases by public utilities boards is fairly routine. Utilities document the need for a rate increase, consumer advocates present their arguments, and the board members vote to award the utility an increase they see justified by the economic and financial circumstances.

However, any request for an unusually large rate increase would ordinarily be subject to special scrutiny by regulators and extensive judicial review. And in the cases of nuclear plants, because of the controversies surrounding nuclear power and because the capacity is not immediately needed, the attention paid to the regulatory proceedings will be especially intense. The rules under which these regulatory agencies operate provide some grounds for extraordinary actions by public service commissions.

First, many states do not allow utilities to recover the cost of constructing plants that are abandoned before completion. For example, Washington State utilities entered into contracts with the Washington Public Power Supply System to pay for the construction of WPPSS power plants whether they operate or not. But the courts voided these contracts, ruling that the utilities had no right to commit themselves to pay for power never received. Firms with expensive construction work in progress in states that do not allow recovery of investment in incomplete projects have substantial incentive to finish their projects, even if the electricity is not presently needed or when the completed plant would not be an economical generating facility.

Table 1

U.S. Nuclear Plant Construction Projects as of January 1, 1984
(All estimates are as of March 31, 1984 unless otherwise noted.)

Plant	Capacity (megawatts)	Estimated Final Cost (thousands)	Percent Complete	Status/Estimated Date of Commercial Operation	Principal Owner
Beaver Valley 2	852	3,076,208	78	1986	Ohio Edison
Bellefonte 1	1,235	{5,575,000	77	1989	TVA
Bellefonte 2	1,235		57	1991	TVA
Braidwood 1	1,120	2,077,600	70	1986	Commonwealth Edison
Braidwood 2	1,120	1,465,500	54	1987	Commonwealth Edison
Byron 1	1,120	2,200,000	93	1985	Commonwealth Edison
Byron 2	1,120	1,535,700	67	1986	Commonwealth Edison
Callaway 1	1,188	2,850,000	99	Low power license	Union Electric Co.
Carroll County 1	1,120	*	0	On order	Commonwealth Edison
Carroll County 2	1,120	*	0	On order	Commonwealth Edison
Catawba 1	1,145	1,800,000	99	1985	North Carolina Elec. Membership Corp.
Catawba 2	1,145	2,100,000	72	1987	North Carolina Municipal Power Agency
Clinton 1	950	2,867,982	83	1986	Illinois Power Co.
Comanche Peak 1†	1,150	1,945,000	97	1985	Texas Utilities
Comanche Peak 2†	1,150	1,945,000	65	1986	Texas Utilities
Diablo Canyon 2	1,106	2,219,500	96	1985	Pacific G&E
Fermi 2	1,093	3,071,258	98	1984	Detroit Edison
Grand Gulf†	1,250	3,000,000	100	1984	Middle South
Hartsville A-1‡	1,205	{6,735,000	44	Indefinitely suspended	TVA
Hartsville A-2‡	1,205			Indefinitely suspended	TVA
Hope Creek	1,067	3,780,000	85	1986	Public Service E&G
Limerick 1	1,065	2,657,000	94	1985	Philadelphia Elect.
Limerick 2	1,065	3,766,000	31	1990	Philadelphia Elect.
Marble Hill 1	1,130	3,009,156	56	Indefinitely suspended	P.S. Indiana
Marble Hill 2	1,130	2,061,482	35	Indefinitely suspended	P.S. Indiana
Midland 1†	492	{4,430,000		Cancelled	Consumers Power
Midland 2†	818		84	Indefinitely suspended	Consumers Power
Millstone 3	1,159	3,538,500	84	1986	Conn. Light & Power
Nine Mile Point 2	1,080	5,100,000	75	1986	Niagara Mohawk
Palo Verde 1	1,304	1,905,694	99	1985	Arizona Public Service

Even when plants are completed, rate increases sufficient to pay back all costs of construction may not be automatic. Some states, such as New York and Ohio, allow utilities to recover only those costs of construction which were "prudently" incurred. Under this regulatory provision the state public service commission has the right to conduct detailed investigations into the history of each construction project and to judge whether any "mistakes" that might have been made could reasonably have been foreseen and avoided by the utility's management. For example,[10] under this principle the staff of the New York State Public Service Commission has concluded that up to $1.6 billion of the $4.1 billion cost of constructing the Shoreham nuclear facility had been imprudently incurred. The Commission itself has not ruled on the staff's recommendation, but if it accepts this finding Lilco could have to absorb a business loss of that magnitude.

In fact, regulatory law offers a number of mechanisms for opponents to challenge almost any utility's case for almost any rate increase. In some states, for example, the public service commission may deny rate increases to utilities to pay for plants whose capacity is not needed to meet demand. And some public service commissions, those of New York and Connecticut, for example, have placed limits on the total construction costs for specific plants which will be reimbursed through rate increases.

Consumers cannot be certain of being able to find legal grounds for avoiding any rate increase; utilities have recourse to the courts for protection from arbitrary actions

[10]State of New York, Department of Public Service, *Investigation of the Shoreham Nuclear Power Station: Executive Summary Testimony* (February 1984).

Table 1

U.S. Nuclear Plant Construction Projects as of January 1, 1984 *(continued)*
(All estimates are as of March 31, 1984 unless otherwise noted.)

Plant	Capacity (megawatts)	Estimated Final Cost (thousands)	Percent Complete	Status/Estimated Date of Commercial Operation	Principal Owner
Palo Verde 2	1,304	1,330,563	99	1986	Arizona Public Service
Palo Verde 3	1,304	1,463,743	88	1987	Arizona Public Service
Perry 1	1,205	2,651,300	94	Indefinitely suspended	Cleveland Elec. Illum.
Perry 2	1,205	2,461,700	44	1988	Cleveland Elec. Illum.
River Bend 1	934	2,473,643	86	1985	Gulf States Utilities
River Bend 2	934			Cancelled	Gulf States Utilities
Seabrook 1†	1,198	2,539,900	89	Indefinitely suspended	P.S. New Hampshire
Seabrook 2†	1,198	2,709,100	29	1987	P.S. New Hampshire
Shearon Harris 1	915	2,830,298	85	1986	Carolina P&L
Shoreham	854	4,100,000	99		Long Isl. Lighting
South Texas Proj. 1†	1,250	7,411,006	50	1987	Houston L&P
South Texas Proj. 2†	1,250		18		Houston L&P
Susquehanna 2	1,011	2,159,000	99	Low power license	Pennsylvania P&L
Vogtle 1	1,100	3,722,379	65	1987	Georgia Power
Vogtle 2	1,100	1,475,671	22	1988	Georgia Power
Waterford 3	1,151	2,649,200	100	1984	Middle South
Watts Bar 1	1,165	3,505,000	97	1985	TVA
Watts Bar 2	1,165		63	1986	TVA
Wolf Creek†	1,150	2,900,000	91	1985	Kansas G&E
WPPSS 1‡	1,266	3,460,209	60	Indefinitely suspended	WPPSS
WPPSS 3‡	1,242	3,809,203	50	Indefinitely suspended	WPPSS
Yellow Creek 1‡	1,285	3,875,000	33	Indefinitely suspended	TVA
Yellow Creek 2‡	1,285		33	Indefinitely suspended	TVA
Zimmer 1	810	3,100,000	85	Converted to coal	Cincinnati G&E
Total for all plants	59,286	135,338,495			

*Not available.
†1983 Estimates.
‡1982 Estimates.
Source: Federal Energy Regulatory Commission, individual utilities, and the Atomic Industrial Forum.

by state regulators. However, rate increases to pay for very expensive and apparently unneeded capacity cannot be considered automatic. Most of the large rate increases associated with the completion of nuclear plants currently under construction will probably come under very contentious challenge before regulatory commissions, in state legislatures and executive chambers and before state and federal courts.

Financial consequences and capital market responses

Any possibility that previously expected rate increases may be slow in coming or may not come at all threatens the financial health of some of the utilities with nuclear construction work in progress. It is difficult to say exactly how much of a loss any given utility could bear because the tax treatment of such write-offs complicates matters considerably. However, if a utility has less than 100 percent of its owners' equity invested in a nuclear project, then the senior creditors of the firm, if not necessarily the stockholders, would probably be protected, even if the full book value of the nuclear project had to be written off as a loss. When the book value of nuclear construction work in progress

Table 2

Investor Owned Utilities with Nuclear Construction Work in Progress*

Utility	Plant Completion Cost (millions)	Expenditures Remaining (percent)	Nuclear Exposure (percent)†	First Year Required Revenue Increase (percent)	Revenue Increase, Net Operating Savings (percent)	Current Revenues per Kwh (cents)	First Year Net Revenue Increase per Capita (dollars)‡	First Year Net Revenue Increase % Personal Income (percent)‡
Arizona Public Service Co.	1.368	4	84	46	25	6.8	200	1.9
Atlantic City Electric Co.	189	15	26	9	5	8.8	24	0.2
Bangor Hydro-Electric Co.	115	42	96	35	22	6.4	149	1.8
Canal Electric Co. (MA, RI)	184	42	196	27	19	5.0	10	0.1
Carolina Power & Light Co. (NC, SC)	2.372	15	68	34	28	5.3	144	1.8
Central Hudson Gas &,Electric Corp. (NY)	459	25	70	25	19	7.8	91	0.9
Central Maine Power Co.	403	36	62	22	16	5.9	103	1.2
Central Power & Light Co. (TX)	1.868	66	90	47	33	6.7	432	4.3
Central Vermont Public Service Corp.	144	31	71	25	17	5.9	63	0.7
Cincinnati Gas & Electric Co.	1.442	15	59	39	33	5.6	172	1.6
Cleveland Electric Illuminating Co.	2.344	28	55	49	32	7.2	268	2.3
Columbus & Southern Ohio Electric Co.	787	15	71	27	23	5.3	124	1.3
Commonwealth Edison Co. (IL)	7.279	27	95	47	15	7.6	271	2.2
Connecticut Light & Power Co.	2.071	19	75	37	22	8.2	160	1.2
Consumers Power Co. (MI)	4.430	16	97	69	57	5.8	222	2.0
The Dayton Power and Light Co.	871	15	58	30	24	6.5	178	1.8
Detroit Edison Co.	2.457	2	70	26	19	6.6	116	1.0
Duke Power Co. (NC, SC)	975	16	49	11	9	4.5	101	1.0
Duquesne Light Co. (PA)	1.127	28	56	35	23	7.3	159	1.4
El Paso Electric Co.	743	4	164	73	23	8.1	457	6.0
Fitchburg Gas and Electric Light Co. (MA)	47	42	88	41	17	8.4	6	0.1
Georgia Power Co.	2.376	48	59	22	17	5.1	129	1.4
Gulf States Utilities Co. (TX, LA)	1.732	14	102	31	26	4.8	299	2.8
Houston Lighting & Power Co.	2.283	66	37	15	11	6.4	174	1.3
Illinois Power Co.	2.294	17	119	69	57	5.3	304	3.1
Interstate Power Co. (IA, IL)	§	100	0	13	−2	5.3	87	0.9
Iowa-Illinois Gas and Electric Co.	§	100	8	16	−2	5.7	62	0.6
Kansas City Power & Light Co. (KS, MO)	1.363	9	105	56	39	6.3	232	2.0
Kansas Gas and Electric Co.	1.363	9	116	79	60	5.4	540	4.7
Long Island Lighting Co.	5.018	5	143	78	49	10.9	251	1.9
Maine Public Service Co.	79	42	129	60	43	5.7	218	2.8
Middle South Utilities, Inc. (MS, LA, AR)	5.349	0	146	49	40	4.6	266	2.9
Montaup Electric Co. (MA, RI)	294	30	137	32	23	5.5	37	0.4
New England Power Co. (MA)	951	30	92	24	18	5.5	66	0.7

exceeds 100 percent of equity, both stockholders and bondholders would be exposed to losses. Based on data for 1983 there are 14 utilities whose total investment in nuclear construction projects exceeds their stockholders' equity (Table 2, column 3).

No one knows exactly what would happen in the event that a privately-owned utility sought court protection from its creditors. Surely the legal proceedings would be lengthy, complex, and costly. It is highly unlikely, however, that delivery of electrical power to consumers in the bankrupt utility's service area would be disrupted, at least in the short run.

The uncertainty lies in the short- and long-term financial impacts of a utility's recourse to the courts for protection, and especially its eventual effect on electricity rates. If the utility loses access to short-term capital markets, and if cash flows are insufficient to meet current expenses, the company could make operating decisions that would lead to a deterioration in the quality of service. In the longer run, investors might eventually be willing to lend money to the utility or its reorganized successor, but only at a very high rate of return. It is unclear how large the capital markets' penalty would be, but any higher cost of capital to the utility would

Table 2

Investor Owned Utilities with Nuclear Construction Work in Progress* *(continued)*

Utility	Plant Completion Cost (millions)	Expenditures Remaining (percent)	Nuclear Exposure (percent)†	First Year Required Revenue Increase (percent)	Revenue Increase, Net Operating Savings (percent)	Current Revenues per Kwh (cents)	First Year Net Revenue Increase per Capita (dollars)‡	First Year Net Revenue Increase: % Personal Income (percent)‡
New York State Electric & Gas Corp.	918	25	34	26	22	6.4	40	0.4
Niagara Mohawk Power Corp. (NY)	2.091	25	43	23	20	5.9	101	1.0
Ohio Edison Co.	2.823	27	85	52	37	6.4	227	2.3
Pacific Gas and Electric Co. (CA)	2.220	4	55	15	9	6.5	33	0.3
Pacific Power & Light Co. (OR, CA, ID, WY, MT, WA)	388	100	0	11	10	3.5	33	0.3
Pennsylvania Power & Light Co.	1.943	1	62	40	31	5.4	125	1.1
Pennsylvania Power Co.	266	31	67	35	27	5.6	36	0.3
Philadelphia Electric Co.	6.423	43	96	73	48	7.6	416	3.6
Portland General Electric Co. (OR)	388	100	23	16	15	4.1	66	0.6
Public Service Co. of New Hampshire	1.968	41	119	107	61	7.3	539	5.5
Public Service Electric & Gas Co. (NJ)	3.591	15	69	33	21	8.4	134	1.1
Public Service Co. of Indiana, Inc.	4.209	53	0	121	98	4.9	615	6.8
Public Service Co. of New Mexico	479	4	53	36	23	6.4	225	2.5
Puget Sound Power & Light Co. (WA)	194	100	30	9	8	3.5	20	0.2
Rochester Gas & Electric Corp.	714	25	56	35	28	6.9	159	1.4
Southern California Edison Co.	743	4	51	5	2	7.5	18	0.1
Texas Utilities Co.	3.417	19	80	26	18	5.6	97	0.8
The Toledo Edison Co.	1.630	28	103	81	56	6.9	557	5.4
Union Electric Co. (MO)	2.850	2	114	60	50	4.6	361	3.2
United Illuminating Co. (CT)	1.049	39	119	59	20	9.7	168	1.2
Washington Water Power Co.	194	100	24	21	22	2.4	75	0.8
Western Massachusetts Electric Co.	439	17	96	41	26	7.7	132	1.4
Totals or Averages	93.709	24	74	35	29	6.0	143	1.3

*Information as of December 31, 1983.

†Exposure is measured as value of construction work in progress on nuclear projects as a percentage of the proprietors' capital in each utility.

‡Population and income figures are the totals for the counties served, in part or in whole, by each utility. These figures understate the actual per-capita cost and cost as a percentage of personal income because in many cases utilities serve only part of a single county. The understatement is probably greatest for the utilities in the New England states.

§The Carroll County Facility is on order, but construction has not yet begun.

Source: Federal Energy Regulatory Commission, Census Bureau, Atomic Industrial Forum and individual utilities.

be translated into higher electricity rates.

The consequences of several electrical utilities experiencing difficulties at the same time would be felt in the financial system as a whole; the aggregate investment at risk is substantial. If we take those utilities with more than 100 percent of their proprietors' capital invested in a nuclear project to be most severely at risk, then the nuclear investment most threatened is about $21.5 billion.

Capital markets have already taken note of this situation. Over the past six months the common stocks of utilities with nuclear projects underway did significantly worse than the average for the industry. In fact, regression analysis of utility stock price changes between November 1, 1983 and June 1, 1984 for a sample of utilities with and without nuclear construction projects shows an additional decrease in the aggregate market value of a company's common stock of between 10 and 15 cents for every dollar the firm has spent on nuclear construction work in progress.[11] In other words, the stock market may have essentially "written off" this proportion of the value of nuclear construction work in progress between November 1983 and June 1984, either in anticipation of rate hike denials or in response to the added uncertainty of the return to their investment. It remains to be seen whether capital markets are correct in their current assessment that, on average, state public service commissions will disallow 10 to 15 percent of the rate increases necessary to recover from ratepayers the utilities' investment with a competitive return.

Conclusions

At present, it looks as if the construction of many nuclear power plants in the United States could turn out to be a poor investment. The capacity and power produced by these plants is, for the most part, not needed immediately. Moreover, current fossil fuel prices and the huge capital costs incurred in building these plants make most of them very expensive sources of electricity. But given the market structure and regulatory environment unique to the electric utility industry some or all of the costs of these plants can be passed onto electricity users.

A competitive return on utilities' entire investment in nuclear plants could only be guaranteed in some parts of the country by requiring consumers to pay more for electricity than the cost of production at available alternative sources. There are places served by utilities with nuclear construction work in progress which could, in the short run, acquire both electrical energy and firm peak load capacity at much less than the capital plus operating costs of a newly completed nuclear plant. In other places moderate additions to transmission capacity would facilitate sufficient imports from neighboring regions of the United States or from Canada.

This does not mean, however, that construction of any given nuclear plant should be abandoned. Once built, nuclear plants have relatively low marginal operating costs, so abandonment of most projects that are close to completion is probably not cost beneficial. Furthermore, completion of nuclear plants now provides some insurance against increases in fossil fuel prices and against possible "brownouts" caused by unexpectedly rapid increases in the demand for electricity.

Ordinarily, an acceptable reconciliation of the interests of investors and ratepayers could probably be reached through routine regulatory processes or through litigation. However, the regulatory system for electrical utilities we have in place was not designed to contain or manage controversies with stakes running into billions of dollars. Consequently, the controversy inevitably takes on a political dimension. The relative losers in the regulatory process, whoever they are, will almost certainly make an arguable claim that the outcome is unfair or inefficient. There will be calls for special legislation or regulatory reform aimed at reducing or reallocating the burden imposed by new nuclear plants.

There have already been some proposals for passing part of the burden onto state or federal taxpayers. For example, it has been suggested that state authorities purchase some plants. However, substantial new borrowing by state power authorities could increase the cost of capital for other state operations.

Under some proposals the federal government might purchase the plants and retain them as a "strategic energy reserve" against the possibility of an interruption in oil supplies. The federal government would face lower capital costs than the investor-owned utilities, because it pays a much lower risk premium than a private firm. But the debt service payments associated with the purchase of the plants would make it harder to reduce the federal budget deficit.

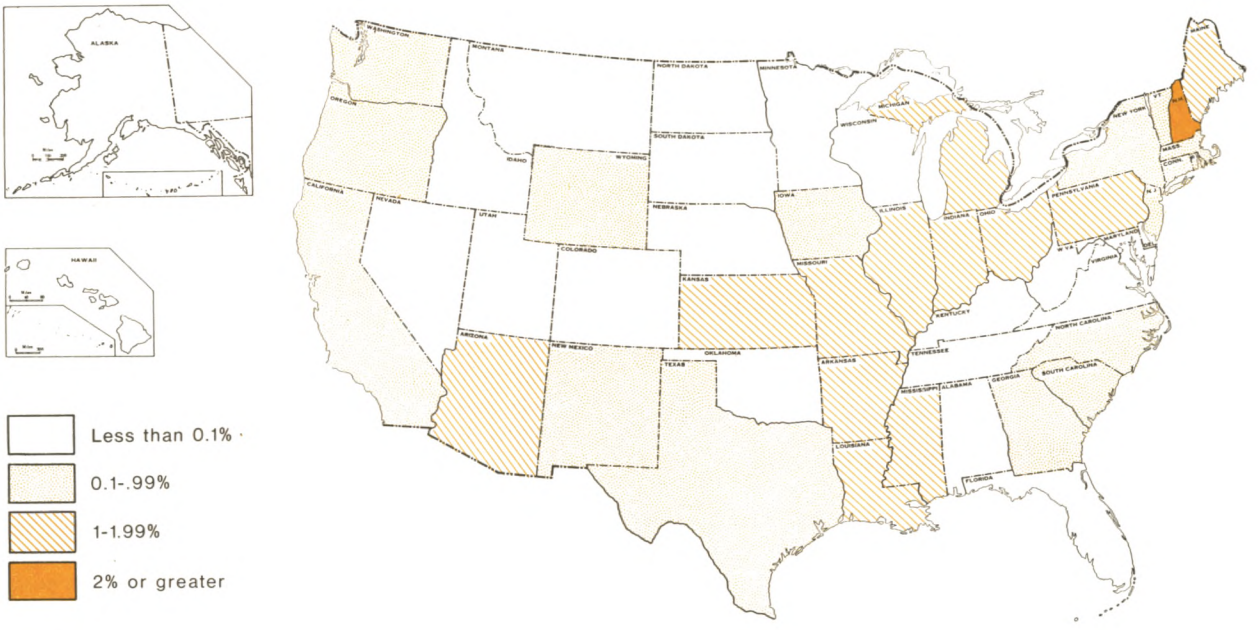
Regulatory reform of various types might reduce the cost marginally or make it easier to bear. Under current regulatory practice the immediate effect of plant completion is to increase electricity rates markedly. Over time, however, the cost of individual plants to consumers in terms of rates per kilowatt hour will probably decline for two reasons. First, as consumption of energy increases with general economic growth, the fixed cost of the plant is spread over more kilowatt hours generated. Second, as the book value of the plant depreciates, the amounts customers must pay to stockholders as a return on the owners' equity in the facility declines.

Therefore, a part of the rate shock associated with plant completion is an artifact of the effective "front loading" of the cost of plants in the first few years of operation. But

[11] The finding that each dollar invested in nuclear projects reduces the total market value of a company's common shares by between 10 and 15 cents is sustained even when the four utilities with the most widely publicized difficulties, Lilco, Public Service of New Hampshire, Public Service of Indiana, and Consumers Power, are omitted from the sample.

Chart 2

Expected Required Net Revenue Increase: Percent of State Personal Income



Sources: Federal Energy Regulatory Commission, Individual Utilities, and Federal Reserve Bank of New York calculations.

"front loading" is not the only way of compensating utilities' investors for the funds they have provided. It might make more sense to spread out the costs and savings over the life of the plant. Alternative regulatory schemes might "phase in" the lifetime cost of the plant over a long period, possibly commencing before commercial operation, while maintaining the same net present value as the current system.

There are other regulatory reforms, which while not directly related to nuclear facilities financing, have an impact on this problem. A number of proposals have been offered in recent years aimed at enhancing the competitiveness of the electrical utility industry. For example, one proposal aims to promote competition among wholesale producers of electricity by separating production and distribution. Other proposals would make utilities' rate structures more complex by encouraging wider use of differentials by time of day and for different service qualities. It is expected that rate structures more closely based on costs would create an incentive for more efficient use of energy and capacity and reduce the overall cost of electricity.

Unfortunately, in the current environment of uncertainty regarding the return on investments in nuclear plants it would be very difficult to implement any reform. Capital markets are likely to interpret any changes in the rules of the game as an attempt to pass the cost of nuclear plants back to stock and bondholders. Further disenchantment with electric utilities on the part of capital markets would make electricity even more expensive, and defeat the intent of reform over the long run. Therefore, the challenge is to minimize the burden to be borne, to find and implement a just allocation of the burden, and to do both in a way that maintains investor confidence.

Aaron S. Gurwitz and Daniel E. Chall

In Brief
Economic Capsules

Collateralized Mortgage Obligations: Do They Reduce Cash Flow Uncertainty?

The collateralized mortgage obligation (CMO) has become a very popular instrument in the secondary mortgage market: over $9.5 billion of these securities have been issued since the first offering in June 1983. Like standard mortgage pay-through securities, the cash flow generated by the CMO mortgage collateral pool is used to provide for interest and principal repayment. However, the conventional wisdom is that the CMO structure creates two advantages over the standard pay-through bond.

First, CMOs offer a wider variety of expected maturity dates and thus may appeal to a broader spectrum of investors. Second, they "offer a more predictable principal repayment schedule."[1] If both propositions were true (and there were no alternative means in the market to accomplish the same ends), one would expect the CMO to lower mortgage rates by making mortgages more marketable in the secondary market.

But the second proposition is not necessarily true. Although the CMO structure does lead to a more diverse selection of expected maturity dates, our research indicates that the timing of the cash flows cannot be more predictable for all CMO investors.[2] In fact, we show that under a variety of conceivable circumstances the timing of the payment stream for many CMO investors will be considerably less certain than with a standard pay-through bond. Furthermore, under some scenarios, *all* CMO investors may receive less predictable cash flows.

Uncertainty about the timing of payments on any mortgage or pay-through security (including CMOs) arises from the borrower's option to prepay the mortgage at any time (usually with little or no penalty).[3] With a pay-through bond, these prepayments would be passed onto the holder of the security, effectively reducing the instrument's duration—a measure of its average life. Investors generally view this duration uncertainty as a disadvantage, since it could leave them vulnerable to some unexpected interest rate risk.[4]

While all investors in a standard pay-through security receive a pro rata share of *each* of the payments, CMO investors get a pro rata share of only a specific *segment* of the total mortgage payments. By design, the CMO mortgage pool is divided into two or more maturity classes. Initial principal payments (both prepayments and regular repayments) from the total pool are paid to investors in the shortest maturity class only, until their entire principal has been repaid. Principal repayments to investors in any subsequent class are made only when all of the shorter maturity classes are fully paid off.

Therefore, while all investors in standard pay-through securities share the same randomly timed payment stream, CMO investors can choose among classes with different expected cash flow patterns, ranging from very short to very long periods. However, the variability around those expected

The authors would like to express their appreciation to Amy Barber for her assistance in the calculation of the figures in this article.

[1] *Real Estate Finance Today*, "Lack of Consensus May Delay CMO Guidelines" (May 1984), page 9.

[2] For a proof of this assertion, see Arturo Estrella and Andrew Silver, "The Collateralized Mortgage Obligation: A Statistical Analysis of Its Cash Flows", Federal Reserve Bank of New York Working Paper, forthcoming.

[3] We are abstracting here from any other payment uncertainty, such as default risk.

[4] Interest rate risk is the risk that net worth may decline due to a change in interest rates. To avoid this, investors may in principle adjust their portfolios so that the ratio of the duration of liabilities to the duration of assets equals the ratio of assets to liabilities. However, when the duration of an asset is uncertain, as in the case of a mortgage with a prepayment option, it is not possible to adjust so precisely. For a further explanation of duration and interest rate risk, see Richard W. McEnally, "Duration as a Practical Tool for Bond Management", *Journal of Portfolio Management* (Summer 1977), pages 53-57.

Duration Statistics for a Simulated Collateralized Mortgage Obligation

Security	Prepayment rates* FHA Mean†	FHA Variance‡	Flat Mean†	Flat Variance‡	Increasing Mean†	Increasing Variance‡	Decreasing Mean†	Decreasing Variance‡
Mortgage pool	5.73	.038	5.51	.043	6.50	.020	4.71	.051
CMO class								
1	2.47	.084	2.02	.092	3.83	.150	1.44	.037
2	4.64	.137	4.37	.172	6.16	.057	3.08	.129
3	6.28	.102	6.11	.098	7.08	.017	4.82	.156
4	7.40	.020	7.24	.027	7.57	.004	6.50	.102
5	7.87	.001	7.84	.002	7.88	.000	7.73	.009

*One of our prepayment assumptions represents the actual FHA experience from 1970 to 1983. See Thomas N. Herzog and Dominick C. Stasulli, "Survivorship and Decrement Tables for HUD/FHA Home Mortgage Insurance Programs as of December 31, 1983"; U.S. Department of Housing and Urban Development (March 1984). A second schedule assumes a flat expected prepayment rate of 6 percent (of the remaining outstanding mortgages) per year over the 30 year period—the average of all the annual FHA rates. Finally, two sets of more strongly tilted rates are used. One increases linearly from 1.1 percent in the first year to 10.9 percent in the twenty-ninth, and the second decreases linearly from 10.9 percent to 1.1 percent. Once again, the average rate is 6 percent in both cases.

†In years.

‡In years squared.

patterns depends on the variability of the repayments in which the investors share. The investor in a CMO class shares the cash flow from just a portion of the mortgage pool, a portion segmented by the timing of payments. One would thus expect that the repayment period for a CMO class probably would be less spread out than for a standard pay-through security. This would tend to reduce the variability of the payments and is probably behind the conventional conclusion that CMOs provide a more predictable repayment schedule.

Another factor, however, tends to increase the variability. Prepayments which come in at unexpected times have a much larger impact on the duration of a CMO class than of a standard pool. This is because in a standard pool, deviations from expectations are averaged over the entire pool, while CMO deviations are averaged over only a segment of the pool.

So it is not clear, *a priori,* whether the duration of the repayment schedule would tend to be more predictable with a CMO class than with a conventional pay-through security. The answer depends on the relative magnitudes of the two opposing factors described above, which in turn depend on the probability distribution of the timing of the prepayments. What is clear, however, is that not all of the CMO classes can have more predictable cash flows. At best, the uncertainty can be shuffled from class to class.[5] At worst, the uncertainty for all classes is greater than that for the pool.

To illustrate these points, we examined the effects of uncertain prepayments on the duration for a variety of possible distributions. Prepayment experience will vary with interest rates; generally, higher interest rates lead to slower prepayment rates. Thus, the exact distribution may vary if the CMO is offered at different points in the interest rate cycle.

We measure the uncertainty regarding cash flow timing by the variance of the duration, which quantifies the dispersion around the expected duration.[6] The method of Monte Carlo simulations was used to estimate the means and variances of the duration for a standard pay-through security and CMO classes based on the same underlying mortgages. In each simulation, the basic pool consisted of 100 independent 14 percent 30-year mortgages, and the CMO was assumed to have five classes (each with the same initial principal).

The mean and variance of the duration for each distribution are presented in the table for the mortgage pool and for each of the five CMO classes. The results indicate that:

[5]To shift the uncertainty, issuers could direct all or part of the initial prepayments to classes other than that with shortest stated maturity. Alterations of the conventional CMOs along these lines have not yet become commonplace in the market, although at least one variant was offered in early 1984, in a private placement. (See Bondweek, "Lepercq Structures CMOs to Protect Short-term Investors" [March 19, 1984], page 1.) As with conventional CMOs, however, any alteration would leave at least one class of investors with greater uncertainty than with a standard pay-through security. For a proof of this assertion and an example of an alternative structure, see Arturo Estrella and Andrew Silver, *op. cit.*

[6]Instead of looking at the deviations from the mean duration, one can look at the dispersion around any "desired" duration. This amounts to attributing a specific form to investors' preferences regarding duration. In our basic simulation (five CMO classes, FHA prepayment rates), the pool was preferable to all CMO classes for some of the desired durations. See Arturo Estrella and Andrew Silver, *op. cit.*

- the claim that the CMO provides a wider *selection* of expected durations is correct, but
- the claim that duration is more *predictable* for the CMO classes is incorrect in most cases.[7]

CMO classes, then, offer a variety of combinations of expected durations and variances. For some investors, certain classes may provide both a more appealing expected duration and more payment timing certainty than a standard pay-through bond. Other investors, however, may find that a CMO class offers more desirable expected cash flow timing only at the expense of higher variability. Thus the total cost of issuing a CMO instead of a standard pay-through security can be lower only if the premium relinquished by the group which benefits from the CMO exceeds the premium required by the group which is made worse off.

[7]There are conceivable situations in which *all* of the classes would have a higher variance than the pool. For example, with two CMO classes, an interest rate of eight percent and annual prepayment rates decreasing linearly from 7.4 percent to 4.6 percent, the class variances are .130 and .107, while the pool variance is .098.

Arturo Estrella and Andrew Silver

Trade Impact of Recent Actions on Unfair Trade Suits

In recent years U.S. industries have filed record numbers of petitions for import relief under the antidumping (AD) and countervailing duty (CVD) laws—and the pace is picking up (Table 1). Some observers regard this as a worrisome development. And it is true that suits charging unfair trade practices are often merely the opening move by companies and industries in a broader campaign for relief from imports. The steel industry, for example, accounts for half of the AD and CVD suits filed since 1980, and those actions were clearly just one element of a multifaceted effort to gain protection.

Nevertheless, a close inspection of the data indicates that apart from steel, the recent escalation in trade suits has so far had only a limited impact on U.S. imports. From January 1980 to April 1984 the value of all nonsteel imports covered under successful suits amounted to only $1.3 billion, less than 1 percent of total nonsteel, nonoil imports in 1979, the base year (Table 2). Suits involving some $3.4 billion of imports were denied, including a negative determination on a case involving $2.6 billion of lumber imports from Canada. Therefore, the degree of protection actually emanating from AD and CVD suits is not very large even when the suits that were unsuccessful are factored in. That conclusion is true both in the aggregate and for individual trading partners.

The problem of protectionism is still of concern. But the true source of that concern has to do with nontariff barriers to trade including various orderly marketing arrangements and voluntary quota arrangements which do inhibit trade to an important degree. Recent petitions for import relief under AD and CVD laws have not been a major source of protectionist pressure.

Paul Glotzer and Leonard Sahling

Table 1

Countervailing Duty and Antidumping Cases, 1980-84

In number of cases

Year initiated	Total cases	Nonsteel	Steel
1980	55	23	32
1981	27	19	8
1982	113	45	68
1983	66	42	24
1984*	39	20	19
Total	300	149	151

*Through April 30, 1984.

Source: United States Office of the Trade Representative, *Trade Action Monitoring System* (June 1984).

Table 2

Value of Nonsteel, Nonpetroleum Imports Covered by Countervailing Duty and Antidumping Suits, 1980-84

In thousands of 1979 dollars, customs value

	Newly Initiated Investigations			
Year initiated	Affirmative	Negative	Pending	Total
1980	550,303	75,243	0	625,546
1981	164,284	159,959	0	324,243
1982	470,339	3,090,260	2,917	3,563,516
1983	83,320	23,810	39,233	146,363
1984*	0	29,683	375,797	405,480
Total	1,268,246	3,378,955	417,947	5,065,148

*Through April 30, 1984; figures not annualized.

Source: Trade Policy Staff Committee, *TRADENET* database and United States Office of the Trade Representative, *Trade Action Monitoring System* (June 1984).

Fiscal Stimulus in the Current Recovery

In view of the recent budget measures passed by the U.S. Congress, will the reduced, but nevertheless still large, federal budget deficits continue to have a stimulative effect on the economy? Our analysis suggests that unusually strong fiscal thrust should persist through 1984 and 1985, even with the recent "downpayment" package included in the Deficit Reduction Act of 1984.[1]

In its latest forecast, the Congressional Budget Office estimated that prior to the Deficit Reduction Act, the federal deficit would have been around $195 billion in 1985. This would represent about 5.0 percent of GNP, down from a peak of 6.1 percent in 1983. With the $13 billion downpayment package, though, the deficit should fall to roughly 4.6 percent of GNP in 1985. And, if Congress cuts defense spending, the ratio could be even lower.

On the surface, this may seem to indicate that the stimulatory effect of fiscal policy will decline from 1983 to 1985. In measuring fiscal stimulus, however, it is important to separate business cycle effects from discretionary policy. For example, the federal deficit usually falls during an economic upturn whether or not new policies are enacted, as higher growth brings about an increase in federal tax receipts and a drop in unemployment benefits. For this reason, we focus on the ratio of the high-employment deficit to potential GNP.[2]

[1]The Deficit Reduction Act of 1984 includes nearly $11 billion in higher revenues and about $2 billion in lower nondefense outlays in fiscal 1985. It does not include reductions in defense outlays.

The Effect of Federal Policy Changes Since 1981 on Budget Deficits*

In billions of dollars, by fiscal year

Legislative changes	1982	1983	1984	1985
Tax reductions†	−40	−73	−93	−106
Defense spending increases	−1	−17	−25	−36
Nondefense spending cuts	39	46	48	61
Effect of legislative actions on interest costs	‡	−2	−9	−18
Total changes	−2	−47	−79	−99

*The figures for 1982-84 are Congressional Budget Office (CBO) estimates. The 1985 figures are CBO estimates adjusted by the authors to include the revenue and outlay provisions contained in the Deficit Reduction Act of 1984. A negative figure indicates that the legislative change contributed to the federal budget deficit. The aggregate changes are in net terms and are the difference from the CBO baseline in each year.

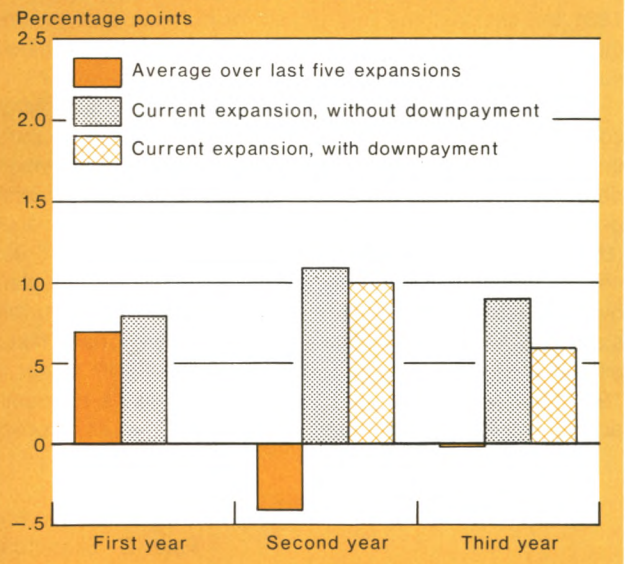
†The effects of changes in social security tax rates and maximum taxable income legislated prior to the 1983 Social Security Amendments are not included.

‡Less than $500 million.

Source: *Baseline Budget Projections for Fiscal Years 1985-1989*, Congressional Budget Office (February 1984).

Change in the Ratio of the High-employment Deficit to Potential GNP in Expansion

Percentage point change in yearly average



A positive number indicates an increase in the ratio of the high-employment deficit to potential GNP; a negative number indicates a decrease.

The high-employment deficit and potential GNP estimates for 1984 and 1985 were calculated by the authors in two steps. First, adjustments were made to the Bureau of Economic Analysis' (BEA) estimates for different assumptions regarding interest rates, potential GNP, and profit and income shares. Second, the proposed spending and tax changes in the Administration's Fiscal Year 1985 Budget, embodied in the BEA's estimates, were omitted in the "without downpayment" scenario and were replaced with the revenue and outlay provisions in the Deficit Reduction Act of 1984 in the "with downpayment" scenario.

Sources: The high-employment deficit and potential GNP estimates through 1983 are calculated by the BEA. For recent estimates, see Joseph C. Wakefield and Richard C. Ziemer, "Federal Fiscal Programs", Survey of Current Business (February 1984), pages 9-19.

[2]The high-employment deficit is calculated under the assumption that the economy is at full employment, which, in recent years, is defined as 6 percent unemployment. This measure is derived by adjusting many components of outlays and receipts; *e.g.*, unemployment insurance benefits and individual and corporate income taxes, to reflect the impacts of differences between actual and potential levels of economic activity.

The high-employment deficit as a share of potential GNP rose from 0.6 percent in 1981-I to 3.3 percent in 1984-I. Even with the downpayment, it will average 4.4 percent in 1985. Legislative changes since 1981 are mostly responsible for the increasing high-employment deficit. In particular, the 1981 tax cut package, the growth of defense outlays, and the indexing of the individual income tax in 1985 contribute substantially to the increase (table).

As a result, fiscal thrust in this expansion is quite large compared with that in past economic upturns. To be sure, the nearly one percentage point rise in the high-employment deficit to potential GNP ratio in 1983 is similar to what generally occurred in the first year of earlier recoveries (chart). But the consecutive increases in 1984 and 1985 contrast markedly with the typical declining or neutral pattern over the second and third years of expansion. The current stance of fiscal policy, then, may be an important factor behind the unusually strong growth in real GNP so far in 1984. Our results also indicate that next year's economic activity should still be buoyed by the impetus of fiscal policy.

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Outlook for State and Local Government Holdings of U.S. Treasury Securities

In 1982 and 1983, state and local governments financed a significant portion of the Federal deficit, as they increased their holdings of Treasury securities by $17.2 and $39.6 billion, respectively.[1] Most of the investments in these two years appear to have come from the unused proceeds of municipal security issues. Those issues were extremely high, particularly in 1983, as a result of the strength in the bond market and the rush to beat the deadlines for issuing bearer bonds and single-family mortgage revenue bonds. Most experts in the municipal markets expect levels of issuance to be substantially lower in the coming months. By contrast, only a part of the 1983 acquisitions of U.S. Treasury obligations can be explained by the budget surplus at the state and local government levels.

The ability of state and local governments to invest the proceeds of tax-exempt securities, whether in Treasury instruments or in anything else, is restricted by guidelines established by the U.S. Treasury. In general, the Treasury has ruled that if the proceeds of a municipal bond are invested at a materially higher yield than the interest paid on the bond, the interest on the municipal bond will not be exempted from Federal income taxes. Therefore, to retain the bond's tax-exempt status, the yield earned on the unused proceeds of the bond may be at most slightly higher than the cost of funds.

In practice, however, several exceptions to the rule drastically lessen the constraints on how state and local governments may invest the proceeds of bond issues for temporary periods of time. The trouble is that once the temporary time period lapses the investments must be liquidated. The guidelines are strict enough to make it likely that state and local governments will be required to disinvest the unused proceeds of past bond issues in the near future. In fact, net purchases of Treasury securities have already fallen to $2 billion in the first quarter of 1984, compared with an average quarterly rate of $10 billion in 1983.

These are the key elements of the guidelines:
(1) When the securities are issued to raise "new money," the unused proceeds on most general obligation and revenue bonds can be invested without yield restriction for a "temporary period" of up to three years if at least 85 percent of the proceeds are spent within three years.
(2) When the securities are issued to refund outstanding issues, the restriction-free "temporary period" is generally two years, provided that the principal and debt service of the original bond are repaid at the end of this "temporary period."

Because the time limit based on the heavy issuance of municipal securities in the 1982-83 period is coming up and because the special factors which operated to create that period of heavy issuance have vanished, the likelihood is that state and local holdings of Treasury securities will be run off, with new acquisitions sharply limited.[2] Therefore, this substantial source of Treasury financing will be much less important in the near future.

[1]This analysis deals only with state and local governments *per se*, and not their pension funds, which independently buy Treasury obligations, along with other securities.

[2]The authorization to issue tax-exempt single-family mortgage revenue bonds, which expired at the end of 1983, was reinstated by the recently passed Deficit Reduction Act of 1984. This may increase somewhat the issuance of new tax-exempt securities, and hence municipalities' purchases of Treasury securities, relative to the first quarter of 1984.

Eric M. P. Tang

Impact of IRAs on Saving: An Update

In an earlier *Quarterly Review* article, we argued that the expansion of the Individual Retirement Arrangement (IRA) program by the Economic Recovery Tax Act of 1981 (ERTA) would probably not produce much *new* saving by households—the main intent of the law.[1] Instead, it seemed likely to result in large-scale reshuffling of *existing* assets to take advantage of the tax break. Although the amount of new saving generated by IRAs cannot be measured directly, we cited indirect evidence suggesting that most of the individuals newly eligible to open IRAs probably were in middle-to-high-income brackets and therefore had many assets that could be used to fund such investments.

Preliminary data on 1982 tax returns have recently become available, so it is now possible to see which individuals did in fact make most of the new IRA contributions. Because publicity surrounding the passage of ERTA may have helped boost contributions in 1981, we compare IRA contributions in 1982 with those in 1980 to get a sense of the legislation's full impact.

Most of the new IRA contributors belong to the upper-middle and high-income groups. The number of tax returns with income in excess of $20,000 (the top 40 percent of all returns) showing IRA contributions climbed by about eight million between 1980 and 1982 (table). For those with lower income, the gain was less than two million returns.

The distribution of IRA contributions bears out the larger role of higher-income individuals in the expanded program. Individuals in the top 20 percent of the income distribution were responsible for about two-thirds of the $25 billion increase between 1980 and 1982. About 90 percent of this overall gain came from the highest two income groups. It is not known whether these people boosted their saving to fund IRAs. But, as we showed in our earlier article, these individuals already had many assets, and therefore probably switched from these other assets into IRAs. Chances are slim that they saved significantly more specifically in response to the availability of IRAs.

Most of the IRA contributions, then, may not constitute new private saving, but they have reduced tax revenue. We estimate that the tax loss from IRA contributions in 1982 may have been about $9 billion.

[1] See Robin C. DeMagistris and Carl J. Palash, "Impact of IRAs on Saving", this *Quarterly Review* (Winter 1982-83), pages 24-32.

Distribution of IRA Tax Returns and Contributions by Income Group
In recent years*

Income group† (annual income in dollars)	Tax returns with IRA contributions (thousands of returns) 1980	1981	1982	IRA contributions (millions of dollars) 1980	1981	1982
less than 6,000	16.4	42.9	147.5	13.3	37.2	296.3
above 6,000 and less than 11,000	99.2	180.2	503.6	78.0	150.3	786.7
above 11,000 and less than 20,000	310.9	419.7	1,348.7	321.7	489.0	2,388.5
above 20,000 and less than 30,000	643.8	857.7	2,978.7	799.0	1,122.9	6,068.5
30,000 and more	1,494.1	1,914.8	7,119.5	2,218.9	2,950.8	18,876.1
Total	2,564.4	3,415.1	12,098.0	3,430.9	4,750.2	28,416.0

*Columns may not add to totals because of rounding.

†Each income group represents 20 percent of all tax returns filed. The annual income cutoffs of the income groups are approximate.

Source: Internal Revenue Service, *Statistics of Income: Individual Tax Returns* (1980-1982). The data for 1982 are preliminary.

Robin C. DeMagistris and Carl J. Palash

February-April 1984 Interim Report
(This report was released to the Congress and to the press on June 8, 1984.)

Treasury and Federal Reserve Foreign Exchange Operations

The dollar declined modestly on balance over the three months ended in April. It dropped through the first five weeks of the period but later rose against the major foreign currencies to offset much of its earlier move.

The dollar's fall early in the period occurred amid indications that the incentives for capital flows might be shifting away from dollar-denominated assets. News of strengthening foreign industrial activity and orders, especially in Germany, generated expectations of rising earnings abroad where inflation remained low. Thus the climate for growth and investment abroad was improving. At the same time, the U.S. economy showed unexpected buoyancy well into 1984 and market participants came to focus on the risks for the dollar of a potential overheating of the domestic economy. Following the President's State of the Union address and budget message, participants in the financial markets increasingly questioned the implications of growing U.S. fiscal deficits. Market participants also questioned the financing of the U.S. current account deficit, especially after public officials expressed concern about extended dependence on foreign capital inflows and the vulnerability of the dollar to a potential shift in investor sentiment.

Against this background, reports circulated in February that some internationally oriented investors were already reducing the share of dollar-denominated assets in their portfolios in favor of the German mark and other foreign currencies. Earlier in the year, when U.S. stock prices faltered while stock markets in Germany and Japan were experiencing net inflows and rising to set new records, talk spread that investors had made substantial net sales of U.S. equities. Doubts were voiced whether the dollar's exchange rate could be sustained without a sharp rise in U.S. interest yields. Although U.S. interest rates rose modestly in February in response to strong credit demand, market participants were uncertain how the Federal Reserve would respond if the demand for credit continued to mount. Under these circumstances, the increases in interest rates already underway were viewed in the market more as a sign of pressure against the dollar than as a source of support.

In this context, the belief spread that the dollar had begun a long-awaited and potentially sustained decline, encouraging a pronounced shift of both professional positions and commercial leads and lags in favor of foreign currencies. These shifts added to the momentum of the dollar's decline throughout February and early March, which by the first week in March brought the dollar down 13 percent compared with its high in early January against the German mark, and about 7 percent lower in terms of a trade-weighted average.

After early March, the dollar's fall came to an abrupt halt, and dollar exchange rates rose more or less steadily until the end of the period under review. Reports of progress in efforts by Congress and the Administration to agree on a "down payment" package of budget cuts lent some support to the dollar. Also, as U.S. market interest rates climbed during March and April, observers concluded that the increases were unlikely to be resisted by the monetary authorities inasmuch as they reflected a continuing buildup

A report presented by Sam Y. Cross, Executive Vice President in charge of the Foreign Group at the Federal Reserve Bank of New York and Manager of Foreign Operations for the System Open Market Account. Patricia H. Kuwayama, Manager, was primarily responsible for the preparation of the report.

of credit demands generated by the strong domestic expansion. By the time the Federal Reserve announced a one-half percentage point rise in its discount rate to 9 percent, effective April 9, market participants had become convinced that the U.S. authorities were prepared to accept yet higher rates.

Meanwhile, yields in foreign centers remained steady. With little or no acceleration in U.S. price indexes, real interest differentials were perceived to be widening in favor of the United States and these perceptions were a factor underpinning the dollar in the exchanges. Concerns over the financing of U.S. current account deficits receded and the announcement of two more record monthly deficits in U.S. international trade received little notice in the exchange markets.

In addition, the dollar was supported by labor conflicts in several countries in Europe which received increasing attention during April and brought into question the immediate outlook for continued economic recovery there. In particular the prospect of strikes in Germany, resulting from a major union's call for shorter hours and higher pay, raised new worries about the investment climate there and contributed to a weakening of German stock prices. Talk of shifting out of U.S. assets subsided and inflows to U.S. equities resumed.

As the dollar rose in April, its movement gained momentum from professional positioning based on technical models and a reversal of commercial leads and lags. It closed the period under review only 3 to 3 1/2 percent lower against EMS currencies and the Japanese yen. In terms of the Swiss franc, the dollar's value was little changed compared to end-January; against the pound sterling and Canadian dollar it closed somewhat higher on balance. The dollar's average decline in trade-weighted terms came to about 2 percent for the three months as a whole.

The U.S. authorities did not intervene in the exchange markets during the period under review and extended no new credits through foreign exchange swap arrangements. The Bank of Jamaica repaid on March 2 the $10 million it had drawn against the U.S. Treasury temporary swap facility on December 29, 1983, and this facility then expired.

On March 30 the U.S. Treasury announced that it would participate in an arrangement to support the efforts of the Government of Argentina to put into place an economic adjustment program backed by the International Monetary Fund (IMF). The Treasury's participation consisted of agreeing to extend temporary swap credits of up to $300 million to Argentina when agreement on an economic adjustment program is reached between Argentina and the IMF. Argentina would repay any such drawings on the

Table 1

Federal Reserve Reciprocal Currency Arrangements

In millions of dollars

Institution	Amount of facility April 30, 1983	Amount of facility April 30, 1984
Austrian National Bank	250	250
National Bank of Belgium	1,000	1,000
Bank of Canada	2,000	2,000
National Bank of Denmark	250	250
Bank of England	3,000	3,000
Bank of France	2,000	2,000
German Federal Bank	6,000	6,000
Bank of Italy	3,000	3,000
Bank of Japan	5,000	5,000
Bank of Mexico:		
Regular facility	700	700
Special facility	325	*
Netherlands Bank	500	500
Bank of Norway	250	250
Bank of Sweden	300	300
Swiss National Bank	4,000	4,000
Bank for International Settlements:		
Swiss francs-dollars	600	600
Other authorized European currencies-dollars	1,250	1,250
Total	30,425	30,100

*Facility, which became effective August 30, 1982, expired on August 23, 1983.

Treasury using proceeds of IMF drawings. This undertaking was part of a $500 million financing package that was used to pay certain interest arrears. The $500 million package consisted of: $300 million credits extended to Argentina by the governments of Mexico, Venezuela, Brazil and Colombia, to be repaid upon Argentina's drawing from the U.S. Treasury; $100 million additional credits extended by certain of Argentina's commercial bank creditors and $100 million provided from Argentina's resources.

In the period from February through April, the Federal Reserve and the Exchange Stabilization Fund (ESF) of the Treasury realized no profits or losses from exchange transactions. As of April 30, cumulative bookkeeping, or valuation, losses on outstanding foreign currency balances were $860.6 million for the Federal Reserve and $586.1 million for the ESF. (Valuation gains and losses represent the increase or decrease in the dollar value of outstanding currency assets and liabilities, using end-of-period exchange rates as compared with rates of acquisition.) These valuation losses reflect the fact that the dollar has appreciated since the foreign currencies were acquired.

The Federal Reserve and the Treasury invest foreign currency balances acquired in the market as a result of their foreign exchange operations in a variety of instruments that yield market-related rates of return and that have a high degree of quality and liquidity. Under the authority provided by the Monetary Control Act of 1980, the Federal Reserve had invested $1,528.0 million of its foreign currency resources in securities issued by foreign governments as of April 30. In addition, the Treasury held the equivalent of $1,852.4 million in such securities as of end-April.

Table 2

Net Profits (+) or Losses (−) on United States Treasury and Federal Reserve Current Foreign Exchange Operations

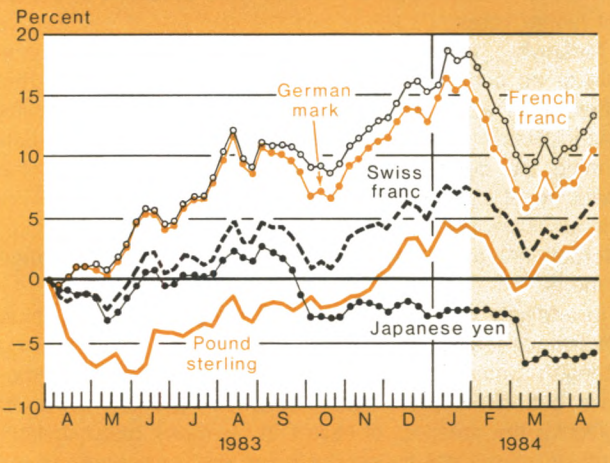
In millions of dollars

Period	Federal Reserve	United States Treasury: Exchange Stabilization Fund	United States Treasury: General Account
February 1 through April 30, 1984	–0–	–0–	–0–
Valuation profits and losses on outstanding assets and liabilities as of April 30, 1984	−860.6	−586.1	–0–

Data are on a value-date basis.

Chart 1

The Dollar against Selected Foreign Currencies

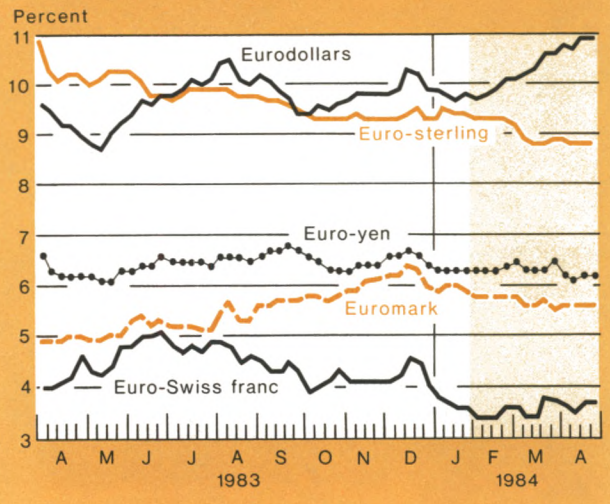


Percentage change of weekly average bid rates for dollars from the average rate for the week of March 26-31, 1983. Figures calculated from New York noon quotations.

Chart 2

Selected Interest Rates

Three-month maturities *



*Weekly averages of daily rates.

NEW PUBLICATION

A table—*Depository Institutions and Their Regulators*—is now available from the Federal Reserve Bank of New York. The grid-like form shows the responsibilities that national and state regulators have in ten areas—from branching to consumer protection—for a variety of depository institutions. The table contains footnotes summarizing laws and rulings affecting the activities of regulators and depository institutions. It is intended to provide easy reference for bankers and advanced students of banking.

Single copies of the 11½" x 22½" foldout table can be obtained free. Quantities for classroom use are also available free when ordered from a university address. Write to the Public Information Department, 33 Liberty Street, New York, N.Y. 10045.

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