

# 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.<sup>1</sup>

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.

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

<sup>1</sup>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.

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.<sup>2</sup>

### 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 de-regulation 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.<sup>3</sup>

- 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

<sup>2</sup>See, for example, William Poole "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Model", *Quarterly Journal of Economics* (May 1970)

<sup>3</sup>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.<sup>4</sup> 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

<sup>4</sup>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).

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)?<sup>5</sup>

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

Table 1

**Basic IS-LM Model**

(1) $Y = -cr + X$	M-1 = narrow money stock
(2) $M-1 = -ar + bY + Z$	r = the interest rate
(3) $M-1 = R/m + dr + K$	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**

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

<sup>5</sup>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.<sup>6</sup>

### 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.<sup>7</sup> 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

<sup>6</sup>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 Wojniower, "The Central Role of Credit Crunches in Recent Financial History", *Brookings Papers on Economic Activity II* (1980).

<sup>7</sup>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).

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

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.<sup>8</sup>

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.<sup>9</sup> 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 ( $d=0$  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).<sup>10</sup>

And in this extreme case, ( $a=d=0$ ), 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 ( $a=d=0$ ) 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

<sup>8</sup>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.

<sup>9</sup>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.

<sup>10</sup>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,  $a=d=0$ , 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 <sup>11</sup>

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  $d=0$  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  $d=0$ ? 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  $d=0$  (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 <sup>12</sup>

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

<sup>11</sup>Moreover, if  $a=d=0$  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).

<sup>12</sup>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.

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

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 <sup>13</sup>. 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.

**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—

<sup>13</sup>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.

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