

# *Review*

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## In This Issue . . .

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In the first article of this *Review*, “Why Does Velocity Matter?” Daniel L. Thornton examines the role that income velocity plays in monetary policy decisions and evaluates the problems that arise when monetary policymakers attempt to offset short-run fluctuations in velocity in order to stabilize the short-run growth of nominal income.

Thornton explains that policymakers must be aware of the important difference between changes in the *level* of velocity and changes in its *growth rate* when choosing policy options. He discusses a number of factors that can produce either temporary or permanent changes in both these measures of velocity. He points out the difficulty in predicting such changes and the potential danger facing policymakers if they respond too quickly to them.

In “Business Cycles and the Eighth District,” G. J. Santoni compares the economic performance of the Eighth Federal Reserve District with that of the nation since 1970 to assess whether economic conditions in the District typically follow those of the nation or whether there is a unique pattern to local economic fluctuations.

Santoni examines quarterly growth rates of personal income, total employment, total value of residential and commercial construction, housing starts, mortgage loans, as well as the level of the unemployment rate for both the United States and the District. He focuses separately on periods of economic expansion and contraction to determine whether significant cyclical differences exist.

Santoni points out that, because indicators of District economic activity are more volatile than those for the nation, differences — even fairly large ones — between District and national economic indicators are to be expected and, indeed, have been observed from time to time. These differences have little substantive meaning, however; they are due largely to “chance” occurrences. Overall, the data reveal that the District’s economic performance essentially has matched that of the nation’s over the past 14 years.

In the third article, “Government Loan and Guarantee Programs,” Joel Fried examines the economic effects of government direct loans and loan guarantee programs. He concludes that, although both government direct loans and loan guarantees tend to increase aggregate demand, direct loans have a more stimulatory effect. Therefore, replacing loan guarantees with direct loans will increase interest rates on government securities, lower interest rates to all other borrowers and generate a higher demand price for capital.





# Why Does Velocity Matter?

DANIEL L. THORNTON

**T**HE significant decline in the income velocity of money during 1982 and in the first quarter of 1983 has engendered confusion and controversy.<sup>1</sup> Amid this controversy, little attention has been paid to the more fundamental role velocity plays in macroeconomics and, hence, about its potential and actual importance in the conduct of monetary policy. This article sets forth the concept of income velocity and illustrates the potential effects of a change in velocity for monetary policy.

## INCOME VELOCITY: A BRIEF OVERVIEW

Irving Fisher's famous "equation of exchange" primarily was responsible for the prominent role of income velocity in macroeconomic analysis.<sup>2</sup> In its most rudimentary form, the equation of exchange can be written as the identity given by equation 1 in table 1. Here,  $M$  and  $Y$  denote the nominal money stock (however defined) and nominal GNP, respectively, and  $V$  represents income velocity, the average number of times each unit of nominal money is used to support nominal GNP. Nominal GNP, in turn, can be represented by the average level of prices,  $P$ , times real

GNP,  $X$ . In this form, the equation of exchange is an accounting identity equating the nominal money stock multiplied by the number of times each unit turns over to nominal output, that is,  $V = Y/M$ . In this form, the equation is of little practical use since there is one equation and four unknown quantities,  $M$ ,  $V$ ,  $P$  and  $X$ .

## Making the Equation of Exchange Useful

Fisher argued, however, that the level of velocity is determined by a number of social and economic factors.<sup>3</sup> He argued further that these factors tend to be relatively stable so that velocity could be treated as a constant,  $\bar{V}$ .<sup>4</sup> Under this assumption, equation 1 ceases to be an identity and becomes Fisher's useful equation of exchange (equation 2, table 1).<sup>5</sup> If  $V$  is constant and  $M$  is controlled exogenously by the monetary authority, nominal GNP can be determined — indeed, con-

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<sup>1</sup>The decline in velocity was a persistent concern of the Federal Open Market Committee (FOMC) in the conduct of monetary policy during 1982 and contributed to the Committee's decision to suspend the use of  $M1$  as an intermediate policy target in October 1982. See Daniel L. Thornton, "The FOMC in 1982: Deemphasizing  $M1$ ," this *Review* (June/July 1983), pp. 26–35.

<sup>2</sup>Irving Fisher (assisted by Harry G. Brown): *The Publishing Power of Money: Its Determination and Relation to Credit, Interest and Crises* (MacMillan, 1911).

<sup>3</sup>Money was viewed primarily as a medium of exchange necessitated by the lack of synchronization between the sale of one good and the purchase of another. Thus, the proportion of income held (on average) in the form of money balances was determined by institutional factors that determined the pattern of payments and receipts. A discussion of this can be found in most macroeconomics textbooks.

<sup>4</sup>Actually, the classical economists never considered  $V$  to be a constant in the sense of unchangeable. Indeed, they recognized the effects of interest rates and price expectations on velocity; however, they generally believed that such factors would be relatively unimportant over the long run. For a good discussion of these issues, see Laurence Harris, *Monetary Theory* (McGraw-Hill, 1981), chapter 6.

<sup>5</sup>Although they stem from different theoretical approaches, Fisher's equation of exchange is similar to the "Cambridge cash balance equation" of Marshall and Pigou. See Alfred Marshall, *Money, Credit and Commerce* (MacMillan, 1923); and A. C. Pigou, "The Value of Money," *Quarterly Journal of Economics* (November 1917), pp. 38–65.



Table 1

### Various Forms of the Equation of Exchange

- (1)  $MV = PX$
- (2)  $M\bar{V} = Y$
- (3)  $M\bar{V} = P\bar{X}$
- (4)  $\dot{M} + \dot{\bar{V}} = \dot{Y} = \dot{P} + \dot{\bar{X}}$
- (5)  $\dot{P} = \dot{M} + (\dot{\bar{V}} - \dot{\bar{X}})$

trolled — through monetary policy.<sup>6</sup> That is, for any  $\bar{V}$ , the monetary authority can obtain any  $Y$  it desires simply by setting  $M$  at the appropriate level. If a primary goal of policy is to stabilize nominal income growth, a constant velocity would give the monetary authority the means to achieve this goal by controlling money growth.<sup>7</sup> Of course, it is impossible from this relationship to determine the separate effects of changes in  $M$  on real output and prices.

### The Quantity Theory of Money

If real output is determined independently of the stock of nominal money in the long run, selecting the money stock is tantamount to determining the price level. This is essentially the position of the classical economists, who argued that the amount of real output is determined by the “real” side of the market (e.g., factors of production, technology and relative prices). In the most elementary form of the equation, output is fixed at the full-employment level,  $\bar{X}$ . With this added assumption, Fisher’s equation of exchange becomes the so-called crude quantity theory of money, given by equation 3 of table 1. With  $V$  and  $X$  constant, there is a direct, proportional link between money and the price

<sup>6</sup>Money is assumed to be largely exogenous. Both classical and neoclassical writers acknowledged the feedback of prices to money. Modern writers like Friedman and Schwartz consider money to be “for all practical purposes” exogenous in the sense that it can be controlled by the monetary authority. See Milton Friedman and Anna J. Schwartz, *Monetary Statistics of the United States* (National Bureau of Economic Research, 1970), p. 124.

<sup>7</sup>The goals of economic policy as set forth in the Full-Employment Act of 1946 are (1) full employment, (2) price level stability, (3) equilibrium in the balance of payments and (4) a high rate of economic growth. The first two of these are reiterated in the Humphrey-Hawkins Act. Since  $Y = P \cdot X$ , the first two objectives amount to stabilizing nominal GNP.

Table 2

### Growth Rates of Real Output and Velocity: II/1954–IV/1981

Country	$\dot{M}$	$\dot{P}$	$\dot{V}$	$\dot{X}$
United States	4.5%	4.5%	3.4%	3.4%
Germany <sup>1</sup>	7.9	4.4	0.5	3.7
Japan <sup>2</sup>	15.3	5.6	-0.5	8.2
United Kingdom <sup>3</sup>	8.8	10.3	4.0	2.1
Canada	6.9	5.2	3.4	4.6

<sup>1</sup>Data covers period II/1960–IV/1981.

<sup>2</sup>Data covers period II/1957–IV/1981.

<sup>3</sup>Data covers period III/1963–IV/1981.

level: if the money stock doubles, the price level will double.<sup>8</sup>

This version of the quantity theory, while appealing because of its simplicity, is of limited use because real output is not constant at the full-employment level; instead it varies over business cycles.

Thus, a more sophisticated quantity theory of money is a long-run (secular) theory of the relationship between money and prices. Under this more general theory, changes in the money stock may result in changes in real output or prices (or both) in the short run, but result primarily in price level changes in the long run (i.e., over business cycles).<sup>9</sup> Within this expanded framework, the quantity theory conclusion of the close correspondence of money growth and price level movements holds in the long run.

### Velocity Is Not a Numerical Constant

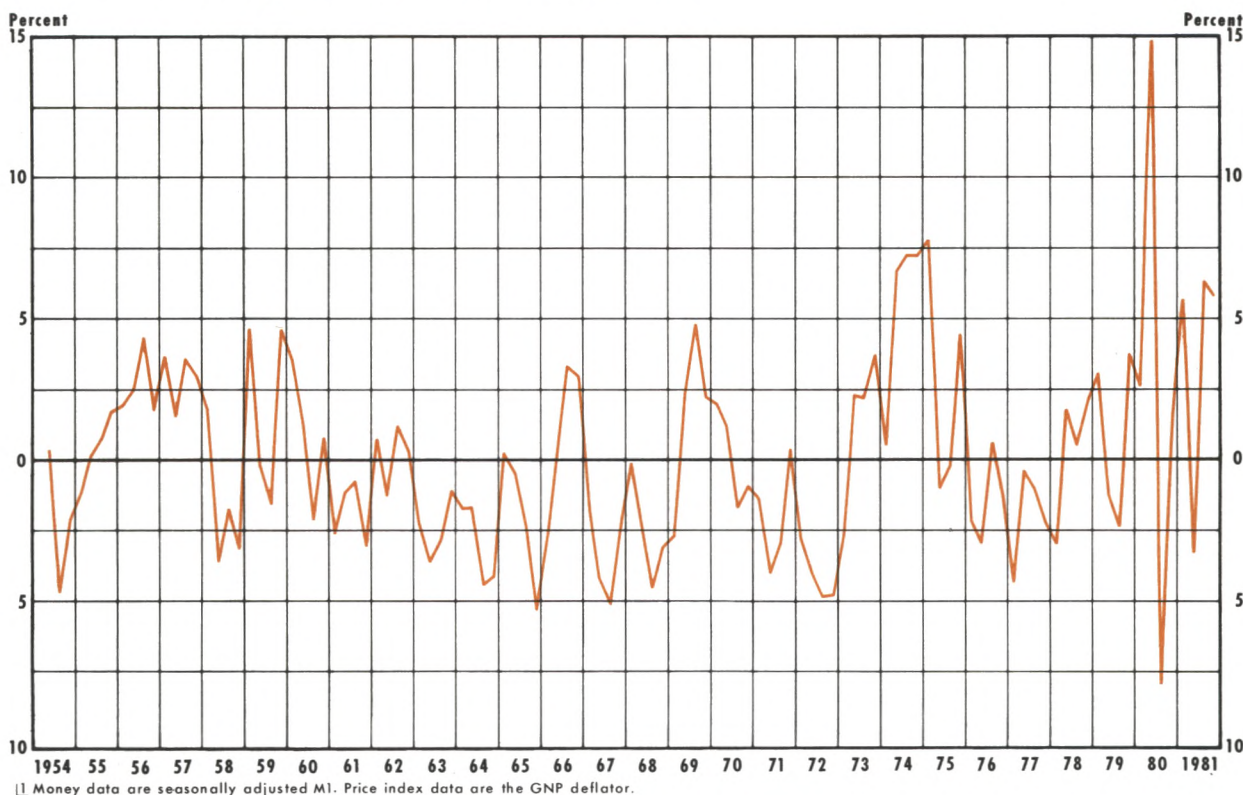
Frequently, velocity is treated erroneously as a numerical constant; however, this restriction is both unnecessary and incorrect. Equation 1 can be written in the useful growth rate form as equation 4 of table 1. The dots over the variables denote compounded annual growth rates. Velocity need not be constant for

<sup>8</sup>This is the “neutrality of money.” Also, there was the closely related “classical dichotomy” between money and output. For a discussion of these points, see Harris, *Monetary Theory*, chapters 4 and 6; and Don Patinkin, *Money, Interest and Prices* (Harper and Row, 1965), chapter 8.

<sup>9</sup>Furthermore, full employment does not necessarily mean zero unemployment, but is merely a level consistent with stable prices given the structural characteristics of the labor and output markets, including market imperfections. See Milton Friedman, “The Role of Monetary Policy,” *American Economic Review* (March 1968), pp. 1–17, for his concept of the natural rate of unemployment.



Chart 1

Rate of Price Change minus Rate of Money Growth <sup>1</sup>

nominal GNP to be controlled through monetary policy; all that is required is that its growth rate be relatively stable. Equation 4 can be rewritten as equation 5 to show that the rate of increase in prices (inflation) is related to money growth. Thus, in the long run, the relative growth rates between money and prices reflect the relative difference between the growth rates of velocity and real output. The slower velocity growth is relative to real output growth, the faster the growth in nominal money can be consistent with stable prices or a low rate of inflation.

If  $\dot{V}$  and  $\dot{X}$  are approximately equal on average, then the rate of inflation will equal approximately the growth rate of money. Basically, this situation has existed in the United States for roughly the past three decades. The average quarter-to-quarter compounded annual rates of growth of M1 velocity and real output from II/1954 to IV/1981 were both 3.4 percent. As a result of the equality between  $\dot{V}$  and  $\dot{X}$ ,  $\dot{M1}$  and  $\dot{P}$  were equal over this period. Both the implicit price deflators for GNP and M1 increased at an average compounded annual rate of 4.5 percent over this same period. In the

short run, however,  $\dot{X}$  and  $\dot{V}$  deviate from each other; thus, so do  $\dot{M1}$  and  $\dot{P}$ . This is illustrated in chart 1, which shows the difference between  $\dot{P}$  and  $\dot{M1}$  for the period.

This long-run, near-equality between  $\dot{P}$  and  $\dot{M1}$ , however, does not hold for all countries. This is shown in table 2, which shows the average growth of  $\dot{V}$ ,  $\dot{X}$ ,  $\dot{P}$  and  $\dot{M1}$  for five countries, including the United States.

## VELOCITY AND MONETARY POLICY

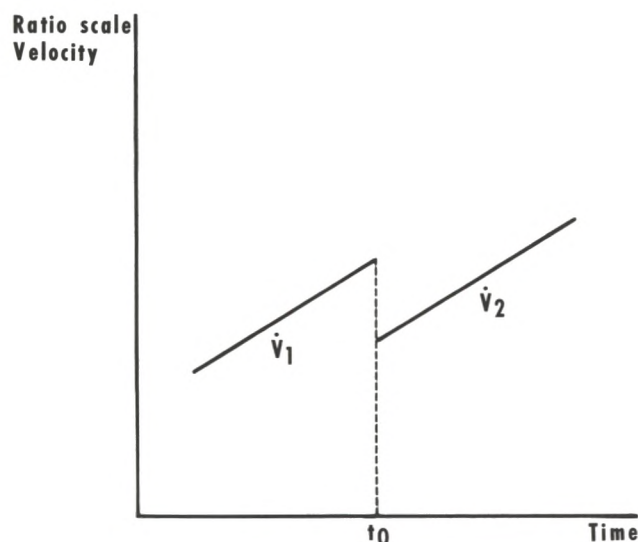
If one goal of monetary policy is to stabilize nominal GNP growth, policymakers must incorporate velocity considerations into their decisions. There are, however, a variety of ways in which velocity can change. These complicate the analysis of velocity movements for policy decisions.

### *Permanent Vs. Temporary Changes*

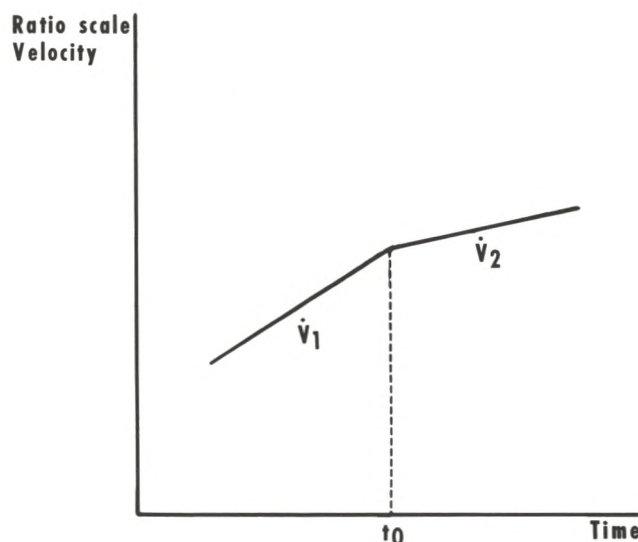
If a change in velocity is known and is permanent, the appropriate policy response is a compensatory

Figure 1

Level shift in velocity at  $t_0$  with no change in growth rate



Decrease in the growth rate of velocity at  $t_0$



change in money to offset the effects of a velocity change on  $Y$ .<sup>10</sup>

If a change is temporary, however, policymakers may decide not to respond to the change because their response may increase rather than reduce the instability of nominal income. For example, suppose that policymakers observe a decline in velocity that they anticipate will reverse itself in the course of a quarter or two. If policymakers want to neutralize the effect of this temporary change on nominal income, they will increase the rate of money growth to keep nominal income growth on course, then reduce money growth later when the velocity change reverses.

Because policymakers are generally uncertain about the timing and extent of such a shift, they may be too aggressive for too long, producing larger swings in nominal income growth than would have occurred otherwise. Such instability need not result inevitably from policy responses to temporary changes in velocity; nevertheless, the danger is there. Thus, if policymakers suspect that the velocity change they observe is temporary, they may choose to ignore it.<sup>11</sup>

<sup>10</sup>This statement and much of the discussion that follows assumes a long-run neutrality of money; that is, changes in the growth rate of money have no lasting effect on the growth rate of real output. If money is not neutral in the long run, both the policy prescriptions and the effects of a failure to respond to velocity changes would differ accordingly.

<sup>11</sup>For example, at its meeting of November 16, 1982, the Federal Open Market Committee anticipated that M1 might grow due to a

### Level Vs. Growth Rate Shifts

Policymakers also must distinguish between changes in the levels of velocity and changes in its growth rate; the policy response will be different in the two cases. To illustrate this, consider the cases depicted in figure 1.<sup>12</sup> In both,  $\dot{V}_1$  and  $\dot{V}_2$  represent the growth rate of velocity before and after the hypothetical change at time  $t_0$ .

In the case of a permanent decline in the *level* of velocity that leaves the growth rates unaffected ( $\dot{V}_1 = \dot{V}_2$ ), a policy response that accelerated the growth of money temporarily until the higher desired level is obtained and then returned money growth to its previous rate would produce an unvarying rate of growth in GNP. In the second case ( $\dot{V}_2 < \dot{V}_1$ ), a compensatory and permanent increase in the growth rate of money at time  $t_0$  is necessary to maintain the growth rate of GNP.

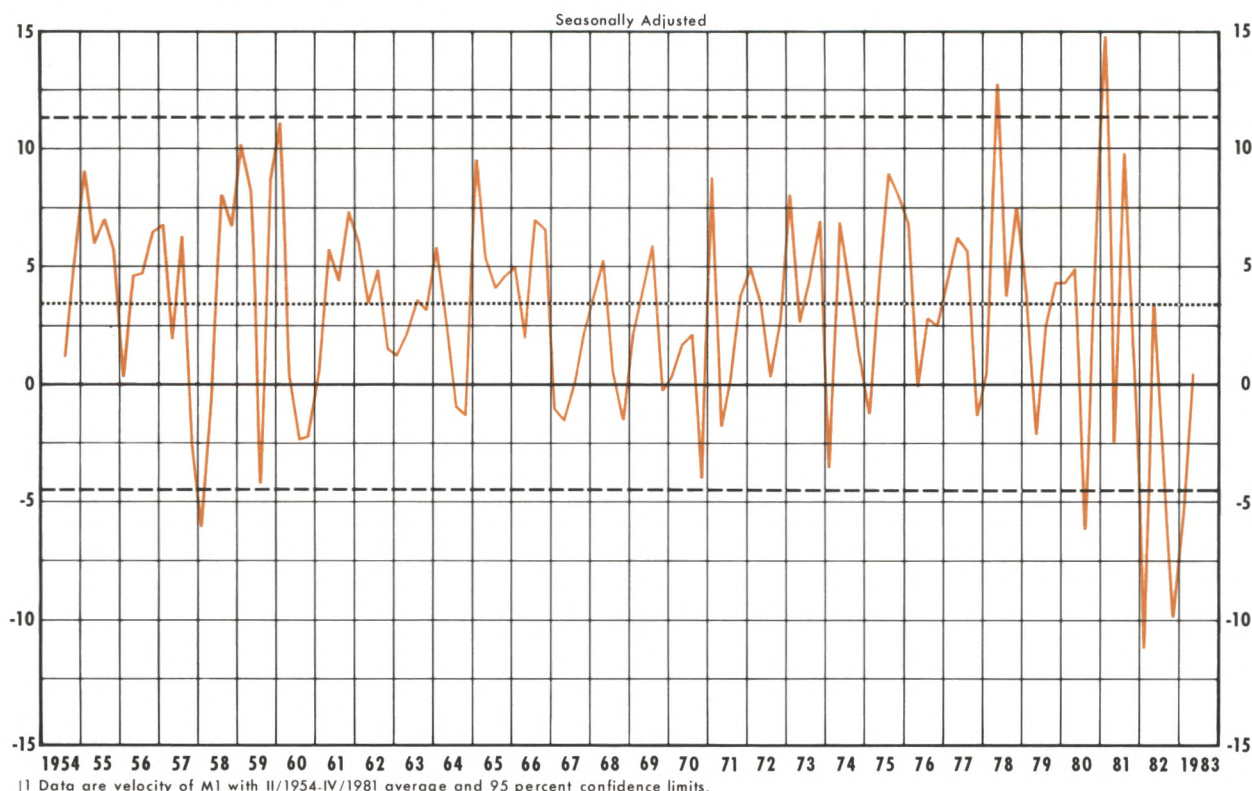
If policymakers failed to respond to the velocity changes depicted in figure 1, the consequences would

temporary buildup of balances in M1 components for eventual placement in the new money market deposit accounts (MMDAs), which would become effective on December 14, 1982. Thus, the Committee anticipated a short-run decline in velocity resulting from this potential buildup. See "Record of Policy Actions of the FOMC," *Federal Reserve Bulletin* (January 1983), p. 19.

<sup>12</sup>A ratio scale for the natural log of velocity is presented in figure 1 so that the growth rates can be represented by the slopes of straight lines.



Chart 2

Rate of Velocity Change and its Average <sup>11</sup>

<sup>11</sup> Data are velocity of M1 with II/1954-IV/1981 average and 95 percent confidence limits.

be different in the two cases. In the first (level-shift) case, there would be a *temporary* reduction in the rate of change of prices or real output, or both. In the long run, however, velocity would return to its former growth rate and, hence, so would the growth of nominal output. In the second case, the growth rate of prices would be lowered *permanently*; in addition, the growth rate of real output may be lowered temporarily if the monetary authority failed to adjust the growth rate of money in response to a permanent decline in velocity growth.

## THE VARIABILITY OF VELOCITY

The timing of the policy response to the velocity change, of course, is very important. Unfortunately, it is difficult to determine whether there has been a significant change in velocity, let alone to foresee such a change. Furthermore, it is difficult to differentiate between level and growth rate shifts, and to differentiate between temporary and permanent changes.

In order to see why this might be the case, consider the historical movements in the growth rate of M1

velocity presented in chart 2. This chart shows the quarter-to-quarter growth rate of M1 velocity, a horizontal line showing the average growth rate of M1 velocity for the period II/1954-IV/1981, and dashed lines representing plus or minus two standard deviations of the quarter-to-quarter growth rate of velocity from its mean over this period.<sup>13</sup>

It is obvious that the quarter-to-quarter growth rate of velocity is highly variable. Nevertheless, it falls outside the range of plus or minus two standard deviations in four of the 111 quarters from II/1954-IV/1981. More recently, there have been three occasions during the last six quarters when the growth rate of velocity has fallen outside of this range. A priori, it is difficult to determine whether these apparent shifts are simply temporary movements in the growth rate associated with a permanent change in the level of velocity, a permanent change in the growth rate, or a temporary change in the growth rate associated with a temporary change in the level. Indeed, it is difficult to know

<sup>13</sup>If  $\dot{V}$  is normally distributed, then approximately 95 percent of its observed values should fall within  $\pm 2$  standard deviations.



whether these changes represent a significant change in velocity. It could be that other factors that affect velocity may have caused it to change. Thus, in order to determine whether a policy response is called for, it is necessary to examine the factors that determine velocity.

## FACTORS THAT AFFECT VELOCITY

There are a number of factors that can cause velocity to change.<sup>14</sup> Since increased velocity is simply the ratio of nominal GNP to the stock of money, any factor that causes the stock of money to change relative to nominal output, or vice versa, can produce a change in the level of velocity. Likewise, any factor that causes the growth rate of money to change relative to the growth rate of nominal GNP, or vice versa, will cause the growth rate of velocity to change. Furthermore, since the growth rate of velocity is defined as the percentage change in the *level* of velocity per unit of time, factors that affect the level of velocity affect the growth rate if they likewise change through time. Thus, the following discussion will be carried out in terms of the level of velocity, unless otherwise stated.

Many of the factors that affect velocity can be analyzed easily by recognizing that velocity changes whenever people alter their holdings of money relative to their income. Factors that cause people to hold less money relative to their income increase velocity, while factors that cause people to increase their money holdings reduce it. For example, if two households have the same income and monthly expenditure patterns but one receives its income once a month while the other receives it twice a month, the latter, all other things constant, will hold less money on average than the one that receives income once a month. Thus, changes in the pattern of receipts and expenditures can produce changes in society's holdings of money relative to income.

### *Economizing on Money Balances*

Other factors that cause individuals to economize on their holdings of money relative to income increase velocity. For example, the increased use of credit cards could reduce individuals' desires to hold money bal-

ances and, thus, increase velocity. In particular, these and other lines of credit may lessen individuals' desires to hold money as a contingency against uncertainty.<sup>15</sup>

Two of the most commonly cited factors that can cause changes in velocity are changes in real interest rates and expectations of inflation. Increases in the real interest rate tend to cause individuals to hold less money relative to their real income. The same generally will be true of an increase in the expected rate of inflation. Higher expected inflation will cause individuals to economize on their money holdings, raising velocity.

### *Financial Innovations*

Financial innovations also can produce velocity changes. In general, innovations that reduce the implicit or explicit cost, or both, of transferring funds from non-transaction to transaction forms (perhaps by giving transaction characteristics to assets not included in M1) tend to increase the velocity of M1. Therefore, innovations such as money market deposit accounts and money market mutual funds would increase the velocity of M1 to the extent that they lower these costs.

In contrast, innovations that lower the cost of holding M1 relative to non-M1 assets tend to reduce the velocity of M1. This could be the case with automatic transfer of savings, negotiable order of withdrawal (NOW), and Super-NOW accounts.<sup>16</sup> Such innovations, however, may produce a temporary decline in velocity that lasts only until individuals realign their portfolios.

### *Cyclical Factors*

Finally, there are a number of factors that can cause velocity to change with cyclical movements in real income (see appendix). They suggest that velocity tends to rise during periods of rising real income and fall during periods of declining real income.

Furthermore, there is considerable evidence that a change in money growth affects nominal income with a

<sup>14</sup>For discussions of some of these, see John A. Tatom, "Was the 1982 Velocity Decline Unusual?" this *Review* (August/September 1983), pp. 5-15; and William T. Gavin, "Velocity and Monetary Targets," *Economic Commentary*, Federal Reserve Bank of Cleveland (June 6, 1983).

<sup>15</sup>For a more detailed discussion, see Mack Ott, "Money, Credit and Velocity," this *Review* (May 1982), pp. 21-34. To date, however, there is little empirical support for this proposition about credit cards.

<sup>16</sup>John A. Tatom, "Recent Financial Innovations: Have They Distorted the Meaning of M1?" this *Review* (April 1982), pp. 23-35; and John A. Tatom, "Money Market Deposit Accounts, Super-NOWs and Monetary Policy," this *Review* (March 1983), pp. 5-16.



lag that is distributed over several quarters. Thus, an acceleration in money growth will produce a temporary decline in velocity as nominal output temporarily grows at a slower rate than does money. Thus, a decline in velocity associated with a recession can be exacerbated if the monetary authority expands money rapidly in order to stimulate a sluggish economy.

### *Permanent Vs. Temporary Effects*

While all the factors mentioned above can affect velocity, they need not produce a lasting effect on its level or on its growth rate. For example, it is commonly recognized that, in a noninflationary environment, interest rates tend to be procyclical — rising during the expansion phase of the business cycle and declining during the contraction phase. Although the level of velocity and its growth rate can be affected by movements in interest rates, neither need change permanently; they, like such cyclical movements in interest rates, simply will average out over the course of a business cycle.

Also, financial innovations can have a permanent effect on the level of velocity but, perhaps, only a temporary effect on its growth rate. An innovation that lowers the cost of holding M1 relative to non-M1 assets induces a shift out of non-M1 into M1 assets, permanently lowering M1 velocity but reducing the growth rate only temporarily. Once the portfolios are realigned, the growth rate of velocity simply may resume its previous path.<sup>17</sup> Nevertheless, financial innovations can affect the extent to which velocity responds to changes in some of the other factors mentioned above.<sup>18</sup>

### *Forecasting Velocity Changes*

Indeed, several economists have suggested recently that the seemingly unusual changes in velocity shown in chart 2 can be accounted for by cyclical movements in velocity and by changes in the inflation rate and interest rates.<sup>19</sup> This section does not attempt to evalu-

ate these claims. Instead, the purpose here is to show that even when these factors are accounted for, it is difficult to forecast short-run changes in velocity.

To illustrate this point, the in-sample standard deviation of a model of velocity growth which recently appeared in this *Review* will be used as an estimate of the true one-quarter-ahead forecast error. The in-sample standard deviation is used to be conservative, and this model was selected because it incorporates many of the factors discussed above and because it performs well in forecasting velocity growth.<sup>20</sup> The in-sample standard deviation is about 2.0 percentage points. Thus, after accounting for factors that significantly influence velocity growth, the approximate 95 percent confidence interval for the forecast of velocity growth,  $\hat{V}_f$ , will be  $\hat{V}_f \pm 2(2.0)$  or  $\hat{V}_f \pm 4$ .<sup>21</sup> This implies a fairly large margin for error. For example, if the forecast for velocity growth is 5 percent, then, loosely interpreted, actual velocity growth can be expected to be between 1 and 9 percent with high probability. This sizable margin for error demonstrates that the monetary authority will generally find it difficult to stabilize nominal output growth in the short run by offsetting short-run changes in velocity.<sup>22</sup>

Furthermore, the sizable error makes it difficult to determine whether a significant change in velocity has taken place. It takes a fairly large change in velocity growth to be significant enough to be considered unusual. Of course, the problems of discriminating between permanent and temporary shifts and between level and growth rate changes remain.

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Demand or Inflation?" Federal Reserve Bank of San Francisco *Economic Review* (Spring 1983), pp. 12–19; and Milton Friedman, "Why a Surge of Inflation is Likely Next Year," *Wall Street Journal*, September 1, 1983. Though these economists generally agree on the factors affecting velocity, they disagree on the relative importance of the factors cited.

<sup>20</sup>The Tatom model has a smaller root-mean-squared error than the best univariate time series model recently reported by Hein and Veugelers, as well as a model which explains velocity growth with movements in real interest rates and the expected rate of inflation alone. See Tatom, "Was the 1982 Velocity Decline Unusual?"; and Scott E. Hein and Paul T. W. M. Veugelers, "Velocity Growth Predictability: A Time Series Perspective," this *Review* (October 1983), pp. 34–43.

<sup>21</sup>That is, approximately 95 percent of the intervals so constructed in one quarter would contain the value of velocity in the next. This simplified interpretation of the forecast interval tends to understate the margin of forecast error. See Robert S. Pindyck and Daniel L. Rubinfeld, *Econometric Models and Economic Forecasts* (McGraw-Hill, 1976), chapter 6.

<sup>22</sup>This result implies that recent suggestions that the Federal Reserve use nominal GNP as an intermediate target are ill-advised.

<sup>17</sup>For example, if individuals held expectations of inflation over a long period of time because of, say, excessive money growth, they might attempt to realign their portfolios continually in order to economize on money holdings and, as a result, the growth rate of velocity would be positive over this period.

<sup>18</sup>The availability of more and better substitutes for a commodity tends to increase its own and cross elasticities of demand. Thus, financial innovations affect velocity to the extent that they alter velocity's response to the above factors.

<sup>19</sup>See Tatom, "Was the 1982 Velocity Decline Unusual?"; John P. Judd, "The Recent Decline in Velocity: Instability of Money



## SUMMARY AND CONCLUSIONS

This article outlines the meaning of income velocity and reviews its important role as the link between money growth and nominal GNP growth. It demonstrates the problems that the monetary authority faces if it attempts to offset short-run (quarter-to-quarter)

changes in velocity growth. Indeed, it appears that, even if a conservative estimate of the one-quarter-ahead forecast standard deviation is used, the forecast errors are large for policy purposes. Thus, while it might seem desirable for the monetary authority to respond to permanent changes in the level or growth rate of velocity, it is difficult to predict such changes, or to verify them quickly *ex post*.

## Appendix: Cyclical Factors That Affect Velocity

The purpose of this appendix is to illustrate four factors that can produce movements in velocity associated with cyclical swings in GNP.

### Measured Vs. Theoretical Velocity

Velocity as it is usually measured may differ from its theoretical counterpart. As a result, not all changes in measured velocity indicate true changes in velocity. To illustrate this, consider the common specification of the demand for nominal money,

$$(A.1) \quad M^d = f(P, \dot{P}^e, r, r^e, Y_p, Z),$$

where

- $P$  = the current price level
- $\dot{P}^e$  = the expected future price level
- $r$  = the current real interest rate
- $r^e$  = the expected future real interest rate
- $Y_p$  = current nominal permanent income
- $Z$  = all other factors that affect money demand.<sup>1</sup>

It is usually assumed that individuals do not suffer from a money illusion (i.e., equation A.1 is homogenous of degree one in  $P$  and  $Y_p$ ) so that equation A.1 can be written as

$$(A.2) \quad M^d/P = f(\dot{P}^e, r, r^e, Y_p/P, Z)$$

or

$$(A.3) \quad m^d = f(\dot{P}^e, r, r^e, y_p, Z),$$

where  $m^d$  denotes the demand for *real* money balances and  $y_p$  denotes real permanent income. Now assume that A.3 is homogenous of degree  $s$  in real permanent income so that A.3 can be written as

$$(A.4) \quad m^d/(y_p)^s = f(\dot{P}^e, r, r^e, Z).$$

Further assume that  $s = 1$ , so that the theoretical measure of velocity,  $V^*$ , is

$$V^* = Y_p/M = 1/f(\dot{P}^e, r, r^e, Z).$$

Thus, if velocity is measured as  $Y/M$ , changes in measured velocity can occur that do not reflect changes in  $V^*$ . Of course, estimates of  $Y_p$  could be used to get a better estimate of  $V^*$ ; however, this problem will continue to the extent that there are estimation errors. Moreover, the most commonly watched measure of velocity is  $Y/M$ .

### Economies of Scale

Another problem arises when  $s \neq 1$ . It is sometimes argued that the elasticity of the demand for real money balances with respect to real permanent income is less than one. If this is the case, the percentage change in real money balances will be less than the percentage change in real income. An increase in real income will result in a less than proportionate increase in the holding of real money and, hence, an increase in velocity. Thus, if there are cyclical movements in permanent income, velocity would rise during the expansion phase of the cycle and fall during the contraction phase. This would occur even if permanent income

<sup>1</sup>See Milton Friedman, "The Quantity Theory of Money: A Restatement," in *Studies in the Quantity Theory of Money* (University of Chicago Press, 1956).



were measured precisely. This factor also could account for a secular rise in velocity as real output expands. For example, if real output is growing at a 4 percent rate and the real income elasticity of the demand for real money is about one-half, then velocity would grow secularly at about a 2 percent rate.

### *Short-Run Adjustments of Money Demand*

Another factor that can account for cyclical movements in velocity is the possibility of short-run adjustments of money demand. A change in one of the factors in  $f(\cdot)$  alters an individual's demand for real money while leaving his actual holdings of real money unchanged. As a result, the individual must adjust actual money holdings to his new desired holdings. Such an adjustment is costly, so the adjustment may progress (perhaps slowly) over time. Theoretically, the speed at which this portfolio adjustment takes place depends on the cost of moving to the new equilibrium relative to the cost of being out of equilibrium: the higher the former cost relative to the latter, the slower the speed of adjustment.<sup>2</sup> If these adjustment costs are small, the adjustment will be rapid; however, most empirical estimates suggest a very slow adjustment.<sup>3</sup> In any event, if money demand does not adjust immediately,

<sup>2</sup>See Zvi Griliches, "Distributed Lags: A Survey," *Econometrica* (January 1967), pp. 16–49.

<sup>3</sup>For a discussion of this problem and some estimates of the speed of adjustment, see Daniel L. Thornton, "Maximum Likelihood Estimates of A Partial Adjustment-Adaptive Expectations Model of the Demand for Money," *Review of Economics and Statistics* (May 1982), pp. 225–29.

an increase in real income can produce a smaller increase in the demand for money in the short run and, hence, a short-run increase in velocity. As the demand for money adjusts towards the new equilibrium, velocity will approach the level implied in A.4.

The above analysis rests in a disequilibrium between actual and desired money holdings. If such disequilibria exist, they also could be caused by real-side shocks, such as natural disasters, oil price shocks and the like.

### *Lags in the Effect of Money on Nominal Income*

Another possibility is a lag effect from money to income.<sup>4</sup> That is, changes in the current money stock produce changes in nominal income with a lag that is distributed over several quarters. If this is the case, a change in the current money stock produces a less than proportional change in current nominal income and, hence, an initial decline in velocity. Thus, periods of relatively rapid money growth tend to be associated initially with declining velocity, while periods of relatively slow money growth tend to be associated initially with rising velocity. Taking this factor and previously mentioned factors into consideration, it could be argued that the decline in velocity during 1982 was precipitated by the decline in real economic activity and exacerbated by the rapid growth of M1 beginning III/1982.

<sup>4</sup>If money were exogenous, then this lag would only result from a lagged response of money demand, such as that discussed above. In this instance, this and the previous factor would be identical.



# Business Cycles and the Eighth District

G. J. SANTONI

**Q**UESTIONS frequently arise regarding the longer-run economic performance of a particular geographic region relative to the nation as a whole. Recently, for example, attention has been focused on the rapid growth of the "Sun Belt" states and the economic decline of the industrial centers in the Northeast. Fundamental economic forces, of course, are always at work and over long time periods can have substantial effects on the economic growth of a particular region.<sup>1</sup>

Alternatively, questions about the relative performance of a particular region may focus on shorter-run issues. Economic conditions in the Eighth Federal Reserve District, for example, have drawn considerable attention during the recent recession. Various commentators have pointed out that the recession was particularly severe, resulting in a decline in District economic activity relative to the nation. This differential effect apparently has been most noticeable in the markets for consumer goods, labor, transportation and residential housing.<sup>2</sup> In addition, some observers have claimed that the recession caused the growth rates of District personal income and tax revenues to decline relative to national averages.<sup>3</sup>

If the relatively poor economic performance of the District during the recent recession was a capricious event, it would be useless to worry about. The observed discrepancy may have been a mere statistical artifact that has no lasting importance. A similar situation may never arise again and it would be unprofitable to alter present plans (which, presumably, are based on *expected* future circumstances) to take account of an event that is not expected to recur.

The purpose of this article is to assess whether economic conditions in the Eighth District typically follow those of the nation or whether there is a consistently different pattern to local economic fluctuations when compared with national trends. If, as some commentators have suggested, there are important differences between business conditions in the Eighth District and those in the rest of the country, it would be of interest to determine what the reasons for such disparate behavior might be and what, if anything, can be done about them.

## THE EIGHTH DISTRICT'S RELATIVE PERFORMANCE DURING THE 1980s

Table 1 presents the average growth rate of personal income, total employment, the total dollar value of residential and commercial construction, housing starts, mortgage loans and the level of the unemployment rate in the United States and the District during the recent recession (the third quarter of 1981 to the fourth quarter of 1982) and the previous expansion (the third quarter of 1980 to the second quarter of 1981).<sup>4</sup>

<sup>4</sup>The Eighth Federal Reserve District includes Arkansas, parts of Missouri, Illinois, Indiana, Mississippi, Kentucky and Tennessee. Since data by county are not available in a convenient form and since the bulk of the economic activity in the District is accounted for by the states of Arkansas, Kentucky, Missouri and Tennessee, table 1 and subsequent tables include data for these states only.

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<sup>1</sup>See, for example, Mancur Olson, "The South Will Fall Again: The South as Leader and Laggard in Economic Growth," *Southern Economic Journal* (April 1983), pp. 917-32; Mancur Olson, *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities* (Yale University Press, 1982); and R. Alton Gilbert, "Employment Growth in St. Louis," this *Review* (August 1973), pp. 9-15.

<sup>2</sup>See, for example, "Memphis Falls Behind on Buying-Power List," *Memphis Commercial Appeal*, September 2, 1983; "River Shipping In Troubled Waters," *St. Louis Post-Dispatch*, July 25, 1983; "Market For Homes Is Termed Healthy," *Memphis Commercial Appeal*, September 4, 1983; Bill Kester, "St. Louis Economy Lags U.S. Economic Recovery," *St. Louis Post-Dispatch*, September 7, 1983.

<sup>3</sup>"Kentuckians Earn Less Than National Average," *Louisville Courier Journal*, September 6, 1983; and "State In Financial Bind, Consultant Says," *Louisville Courier Journal*, July 29, 1983.



**Table 1**  
**Growth Rates and Levels of Selected Economic Indicators**

	Average		
	District	U.S.	Difference
<b>Recent Recession II/1981–IV/1982</b>			
Growth rates			
Personal income	5.86%	6.81%	–0.95%
Total employment	–1.61	–0.63	–0.98
Total building	–1.03	4.09	–5.12
Housing starts	4.66	–1.76	6.43
Mortgage loans	–1.61	–2.09	0.48
Level			
Unemployment rate	9.64	8.86	.78
<b>Previous Expansion II/1980–II/1981</b>			
Growth rates			
Personal income	9.64%	10.49%	–0.85%
Total employment	–0.43	0.80	–1.23
Total building	43.70	24.27	19.43
Housing starts	–15.88	–7.90	–7.98
Mortgage loans	3.74	5.60	–1.86
Level			
Unemployment rate	8.10	7.44	0.66

Some of the differences appear, at first blush, to be substantial. The personal income of District residents grew at an average rate that was roughly 1 percent below the national growth rate during both the recession and the previous expansion. This was true, as well, for the growth rate in total employment. The unemployment rate in the District was about three-fourths of a percent higher. The growth rate in the total dollar value of residential and commercial construction (total building) was 5.12 percent lower than the national average during the contraction. With the exception of housing starts and mortgage loans during the recession and total building during the expansion, economic growth in the District was depressed relative to the national average during both the recent contraction and prior expansion.

Because these differences are based on relatively few observations, they can be misleading. A more

reliable inference can be drawn by examining the economic performance of the District relative to the nation over a number of business cycles. If the results are similar to those of table 1, we can be more confident that the experience of 1981–82 was not freakish.

## ECONOMIC ACTIVITY IN THE EIGHTH DISTRICT RELATIVE TO THE NATION

### *The Period 1970–83*

Chart 1 plots the quarterly growth rates of personal income, total employment, total building, housing starts, mortgage loans and the level of unemployment for the Eighth District and the United States from the first quarter of 1970 through the first quarter of 1983. The shaded areas represent periods of recession, while the horizontal lines indicate the averages for the entire period.

One interesting feature of this chart is that the averages of the various growth rates for the District appear to correspond closely to their respective national averages. Statistical testing confirms this observation, as the data in table 2 demonstrate. Although the differences between the average growth rates fluctuate between –1.47 and 0.23, depending upon the specific indicator selected, none is statistically significant.

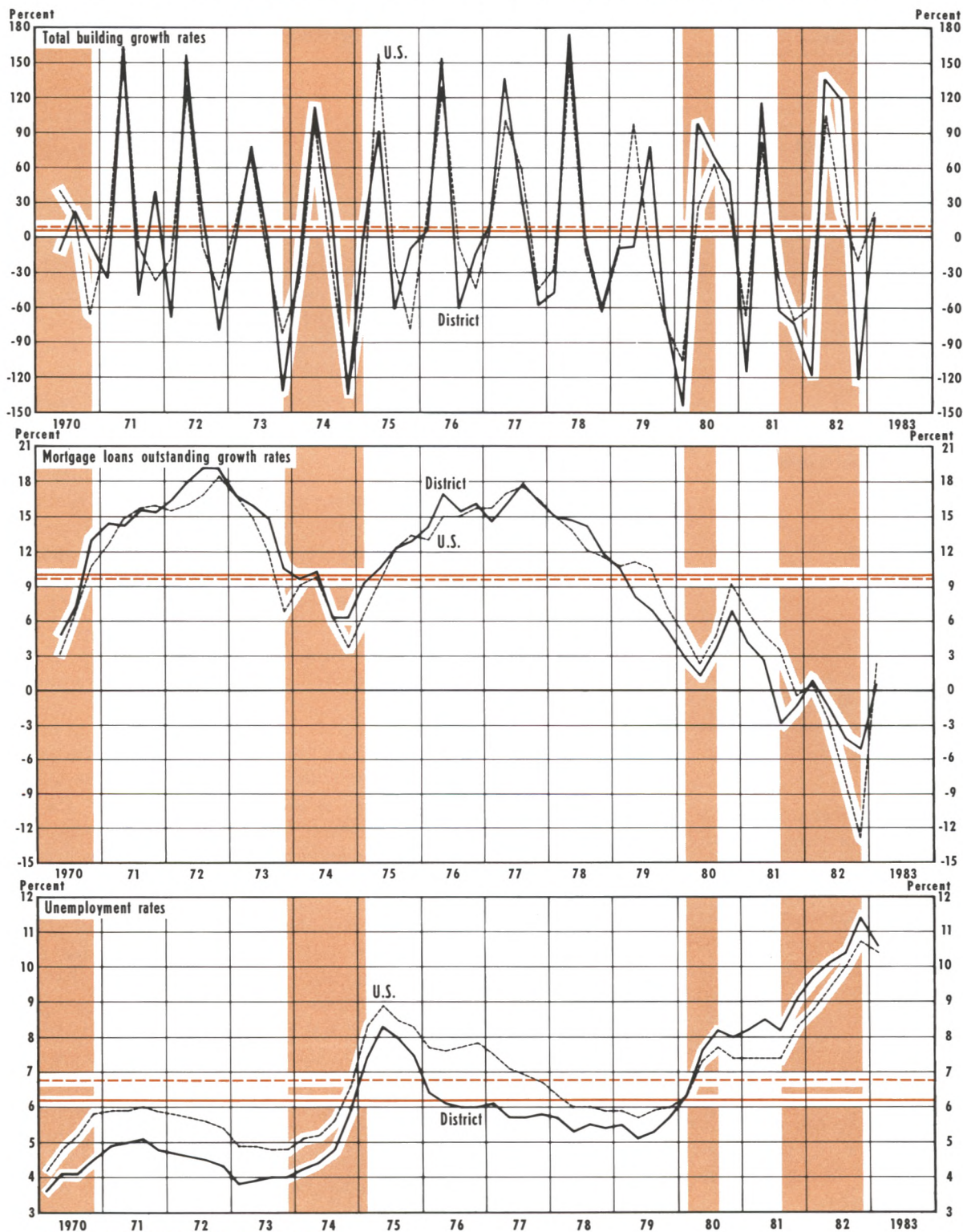
The average level of the unemployment rate, however, is an exception to the general observation regarding the growth rates. On average, the District's unemployment rate is about 0.5 percent below the national average and this difference is statistically significant. In terms of the level of unemployment, the District, on average, has outperformed the nation.

The data in table 2 also help explain the differences between District and national indicators when the sample is small as in table 1. Notice that the variances of the growth rates and unemployment rate generally are higher for the District than they are for the nation (see table 2). Moreover, District variances for the growth rates of personal income, total employment, total building and the level of unemployment are significantly higher in a statistical sense. This means that these District indicators of economic activity are more volatile than the national indicators. If, as seems to be the case, the true averages of the respective indicators do not differ between the District and the nation, it is likely that for small samples there will *appear* to be substantial differences between District and national



Chart 1

## Selected Economic Indicators in the United States and the Eighth Federal Reserve District





## Selected Economic Indicators in the United States and the Eighth Federal Reserve District

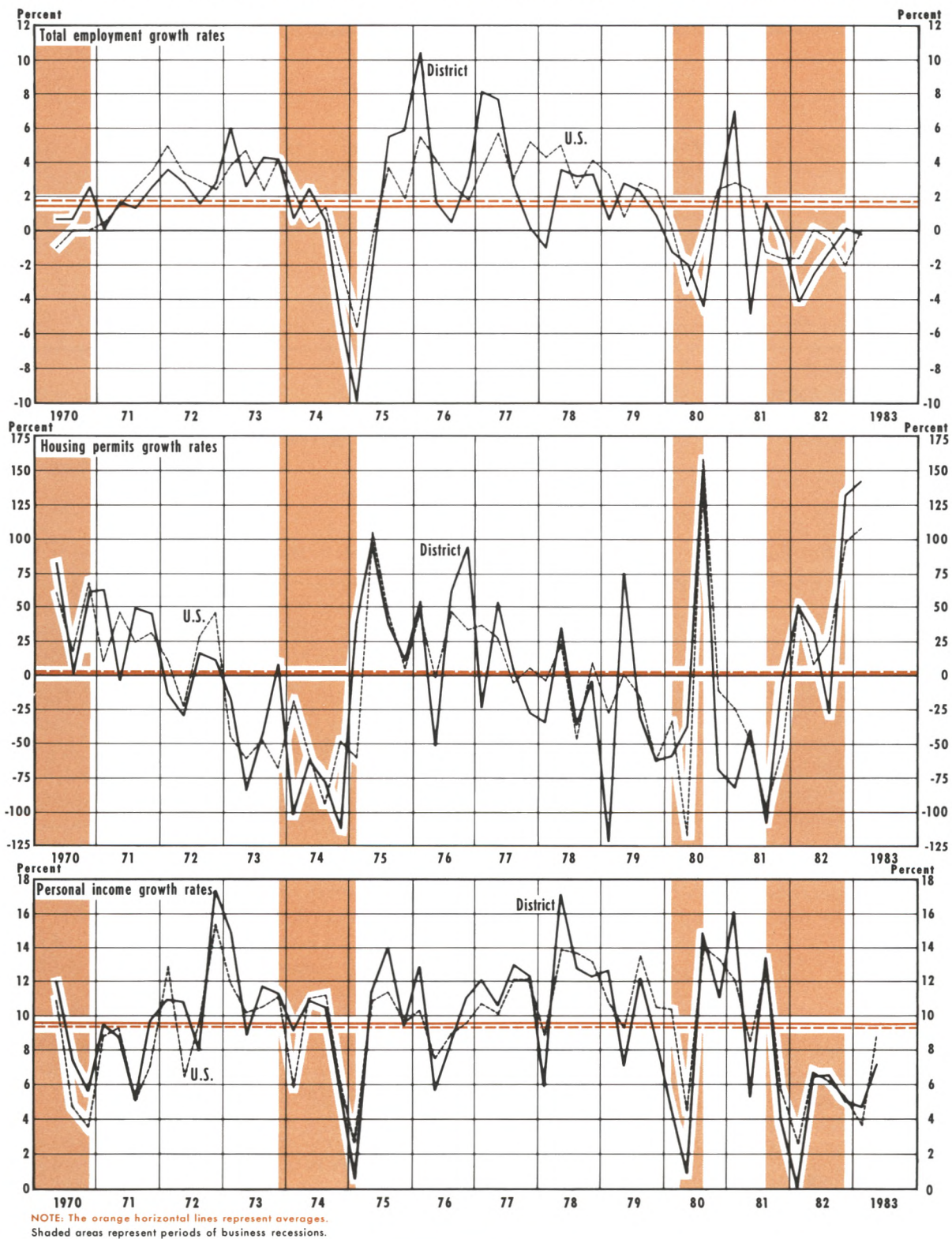




Table 2

**Summary Statistics for Selected Economic Indicators: I/1970–I/1983**

	Average				Variance		
	District	U.S.	Difference <sup>1</sup>	t-stat	District	U.S.	Ratio <sup>2</sup>
<b>Growth rates</b>							
Personal income	9.45%	9.37%	0.08%	.27	16.24	10.43	1.56**
Total employment	1.45	1.76	−0.31	.88	12.82	5.95	2.15**
Total building	6.23	7.68	−1.45	.22	7213.10	4723.81	1.53**
Housing starts	0.77	2.24	−1.47	.25	4338.85	3058.09	1.42
Mortgage loans	9.92	9.69	0.23	.78	43.96	42.25	1.01
<b>Level</b>							
Unemployment rate	6.18	6.74	−0.56	5.29*	3.96	2.31	1.71**

\*Significantly different than zero at the 5 percent level.

\*\*Significantly greater than one at the 5 percent level.

<sup>1</sup>For the purposes of the statistical test, the difference is the average of paired differences between the District and U.S. growth rates at each point in time. As a result, the numbers in this column may not correspond exactly to the differences between the average growth rates in the first two columns.

<sup>2</sup>The numbers in this column are the ratios of the larger to smaller variance.

averages. The smaller the sample period, the greater the probability that sizable, albeit meaningless, differences will arise.

These results suggest that the economic performance of the Eighth District, when measured by the growth rates of various indicators as well as the level of the unemployment rate, is somewhat more erratic than that of the nation. At any point in time, the deviations of District indicators from their averages are likely to be greater than deviations of national indicators from their averages. On the other hand, the averages of the growth rates across time for the nation and District are virtually identical indicating that, over the longer run, the economic growth of the District has closely followed the national trend. (See box on page 19.)

### *Periods of Recession and Expansion*

The data in table 3 are similar to those presented in table 2 except that table 3 splits the data into periods of recession and expansion. Analysis of the data can then be used to determine whether the District and national economic indicators, although generally no different *on average* over long periods, differ significantly during episodes of boom and bust.

With one exception, neither recessions nor expansions appear to affect the relationship between the

average levels of the District and national indicators. The differences between the District and national average growth rates are not statistically significant. This holds for both recessions and expansions.

As was the case for the whole period, the one exception is the District's unemployment rate. The data in table 3 indicate that the District's unemployment rate is significantly lower than the national average during expansions. During periods of contraction, however, the District's unemployment rate does not differ significantly, on average, from that of the nation.

The data in table 4 relate the District's "share" of the various measures of economic activity during expansions and recessions. For example, personal income in the District, on average, was 5.75 percent of personal income at the national level during periods of expansion, while it was 5.68 percent of national income during periods of recession. Combined with the data in table 3, these figures can be used to assess whether recessions are more or less severe in the District than at the national level.

The evidence suggests that the District's "share" of economic activity does not change significantly during recessions. None of the means of the ratios differs significantly from periods of expansion to recession. Further, since none of the ratios of the variances differs significantly between periods of expansion and recessions,



## The Relative Performance of the District and the Law of Large Numbers

Measurements of economic performance at the national level represent averages of the economic performance of various regions that make up the nation. In general, the behavior of an average bears a certain relationship to its various components. To see this, suppose that 12 six-sided dice are being tossed. The dice are fair and alike in every respect except that one of them is red and the others are white. After each toss, both the *average* score of the 12 dice and the actual score of the one red die are recorded. If many trials were conducted, the average score made by the red die will approach 3.5 and the same will be true for the average of the mean score of the 12 dice.<sup>1</sup> This expectation follows from the law of large numbers.<sup>2</sup>

Although these "expected" values are equal, the variance of the score made by the red die will differ from the variance of the mean score of the 12 dice. In this case, the variance of the score of the red die will approach 12 times that of the mean score.<sup>3</sup>

<sup>1</sup>"This tendency to settle down to a limit has already been observed . . . in the case of a fair die. It has also been observed innumerable times by gamblers, prisoners-of-war and other bored or curious people." Thomas H. Wonnacott and Ronald J. Wonnacott, *Introductory Statistics for Business and Economics*, 2nd ed. (John Wiley and Sons, 1977), p. 36.

<sup>2</sup>Roughly, the law of large numbers says that probability equals proportion in the long run. *Ibid.*, pp. 36 and 188-89.

<sup>3</sup>More formally, let  $R$  and  $W$  be the scores of the red and white dice. The mean score on any throw is:

$$X = 1/12 (R + W_1 + \dots + W_{11}).$$

The expected value is:

$$E(X) = 1/12 [E(R) + E(W_1) + \dots + E(W_{11})].$$

Since the outcomes from the dice are independent, the variance of the average is

$$\sigma_X^2 = 1/144 (\sigma_R^2 + \sigma_{W_1}^2 + \dots + \sigma_{W_{11}}^2)$$

The behavior of the score of the red die relative to the average score of the 12 dice is similar to that of the economic performance of the District relative to the national average. Consequently, it should not be surprising that regional economic activity is more variable than that for the nation as a whole, even if there is little difference between the *average* levels of economic activity in the region and in the nation.

There are, however, two important differences between the dice experiment and economic activity. First, important longer-run economic factors may affect relative performance, causing the average levels of regional economic performance measures to differ from the national average both within and across business cycles.

Second, the level of economic activity within any region depends upon that in other regions. Business cycles cause common movements in indicators of economic activity across regions. During recessions, for example, the unemployment rate across all regions will rise. The positive correlation that exists between the levels of economic activity across regions increases the variance of the national average relative to the variance for each region. As a result, it is not unambiguously the case that the variance of economic activity in any region will be greater than at the national level, but it should not be surprising if it is.

It is worth noting that the behavior of the District's indicators presented in table 2 is roughly consistent with the way we expect them to behave relative to national indicators. If this were not the case, it would have suggested that the economic performance of the Eighth District exhibits unique characteristics.

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and, since  $\sigma_R^2 = \sigma_{W_1}^2 = \dots = \sigma_{W_{11}}^2$ ,

$$\sigma_X^2 = 1/12 \sigma_R^2.$$



Table 3

**Economic Indicators: I/1970–I/1983**

Recessions	Average				Variance		
	District	U.S.	Difference <sup>1</sup>	t-stat	District	U.S.	Ratio <sup>2</sup>
Growth rates							
Personal income	6.63%	7.20%	−0.57%	1.06%	15.63	10.53	1.48
Total employment	−0.98	−0.43	−0.55	0.87	11.61	5.07	2.29**
Total building	−11.51	−11.45	−0.06	0.00	9482.41	4291.46	2.21**
Housing starts	−12.59	−20.26	7.68	0.66	4848.14	3920.55	1.23
Mortgage loans	3.92	3.22	0.71	1.04	30.45	37.25	1.22
Level							
Unemployment rate	6.75	6.91	−0.13	0.66	6.70	3.72	1.80
Expansions							
Growth rates							
Personal income	10.14	10.11	.03	.08	15.48	8.48	1.83**
Total employment	2.11	2.50	−.38	.87	13.79	5.19	2.66**
Total building	11.37	11.62	.25	.03	6905.67	4884.97	1.41
Housing starts	2.45	2.94	−.49	.07	3348.84	2628.99	1.27
Mortgage loans	12.42	12.33	−.73	.33	24.54	17.22	1.43
Level							
Unemployment rate	5.82	6.55	−.73	6.91*	1.88	1.22	1.54

\*Significantly different from zero at the 5 percent level.

\*\*Significantly greater than one at the 5 percent level.

<sup>1</sup>For the purposes of the statistical test, the difference is the average of paired differences between the District and U.S. growth rates at each point in time. As a result, the numbers in this column may not correspond exactly to the differences between the average growth rates in the first two columns.<sup>2</sup>The numbers in this column are the ratios of the larger to smaller variance.

Table 4

**District Indicators as a Percent of National Indicators**

	Average Share			Variance		
	Expansions	Recessions	Difference	Expansions	Recessions	Ratio
Personal income	5.75	5.68	−.07	0.685	0.801	1.17
Total employment	6.66	6.60	−.06	9.729	15.801	1.62
Total building	4.10	3.96	−.14	9.196	16.324	1.78
Housing starts	4.77	4.65	−.12	354.273	376.342	1.06
Mortgage loans	5.57	5.50	−.07	13.594	12.688	1.07



sion, it does not appear that economic activity in the District is significantly more volatile relative to national averages during periods of recession than it is during periods of expansion.

On the whole, the data in tables 3 and 4 indicate that periods of recession are typically no more severe in the District than they are at the national level.

## SUMMARY

The District's performance, as reflected by the average growth rates of various indicators, has matched that of the nation over the past 14 years. The only exception to this was the level of unemployment. Dur-

ing expansions, the District's unemployment rate, on average, has been significantly below that of the nation, while matching the national average during periods of recession.

Finally, the District's indicators of economic activity tend to be somewhat more volatile than the national indicators. Since the economic activity occurring within the District represents one component of the national average, its variance would generally be expected to exceed that of the nation's. As a result, differences — even fairly large ones — that are observed at a point in time between District and national economic indicators are not surprising. Due to their random character, however, it is not possible to predict the timing or direction of the differences beforehand.



# Government Loan and Guarantee Programs

JOEL FRIED

THE U.S. government is involved heavily in providing credit assistance to the private sector. From 1971 to 1981, the total amount of federally assisted credit outstanding jumped from \$217 billion to \$678 billion, an increase of over 200 percent.<sup>1</sup> Moreover, government direct and guaranteed loans constituted almost 12.5 percent of the total funds advanced, directly or indirectly, to the non-federal sector over the period 1972–81. In 1980 and 1981, the proportion of new funds loaned to the non-federal sector in the form of a government direct loan or guarantee rose to 17 percent.<sup>2</sup>

This article examines the consequences of direct and guaranteed loan programs on interest rates and aggregate demand. The analysis focuses on shifts in the supply and demand schedules for alternative sources of credit affected by each type of program. The results indicate, under fairly standard assumptions, that an increase in government direct loan programs accompanied by an equal decrease in government-guaranteed loan programs will decrease loan rates to borrowers who are ineligible for credit assistance. This shift in loan assistance also will increase the rate of interest on

government debt, and will increase the demand price of capital and level of aggregate demand.

## GOVERNMENT LOAN PROGRAMS AND PORTFOLIO CHOICE

There are two major mechanisms by which the government provides credit to private individuals through capital markets: guaranteed loans and direct loans.<sup>3</sup> In the former, the government, having designated the potential recipients, guarantees loans made to this group by private financial intermediaries (hereafter referred to as banks) against any default. In a competitive banking environment, banks will pass on the economic value of the guarantee to the borrower. As a result, the borrower obtains the loan at a lower rate than the bank would have charged without the government guarantee.<sup>4</sup>

In the case of direct loans, a government agency acts as an intermediary in place of banks; it issues loans directly to the targeted group, obtaining the necessary

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<sup>1</sup>See *The Budget of the United States Government, 1983, Special Analysis F, Federal Credit Programs* (Washington, D.C., 1982). This credit assistance consists of direct government loans, loan guarantees and loans by government-sponsored enterprises.

<sup>2</sup>These data are calculated from *Ibid.*, table F-1, p. 6. It excludes new equity financing.

<sup>3</sup>This does not exhaust the forms of government capital market intervention. Other programs affecting capital markets that have come under the scrutiny of the Treasury in recent years include lending by government-sponsored enterprises and tax exemptions for interest income on some types of loans. These are not considered in this paper.

<sup>4</sup>This subsidy need not be restricted to the actuarially fair value of the insurance. The government also could charge the banks a fee for the provision of the insurance or could provide a cash subsidy in addition to the guarantee if, for some reason, it wished the effective subsidy rate to be different from the expected default rate.



Table 1

**Direct Loan Transactions of the Federal Government:  
1982 Fiscal Year (millions of dollars)**

	Net Outlays	Outstandings
<b>On-Budget Agencies</b>		
Funds appropriated to the President	\$ 777	\$ 17,932
Agriculture	6,164	31,186
Commerce	- 104	891
Education	641	9,859
Energy	4	13
Health programs	- 9	921
Housing and Urban Development	351	13,216
Interior	1	441
Transportation	86	1,003
Veterans Administration	228	3,368
Loans to the District of Columbia	117	1,684
Export-Import Bank	763	16,565
Federal Deposit Insurance Corporation	274	705
Federal Home Loan Bank Board	- 86	758
National Credit Union Administration	34	149
Small Business Administration	22	9,169
Tennessee Valley Authority	69	267
Other agencies and programs	- 224	1,091
Subtotal, on-budget agencies	9,107	100,220
<b>Off-Budget Federal Entities</b>		
Rural Electrification and Telephone Revolving Fund	\$ 130	\$ 9,774
Rural Telephone Bank	102	1,173
Federal Financing Bank (FFB)	14,155	96,519
U.S. Railway Association	- 42	123
Subtotal, off-budget federal entities	14,345	107,588
TOTAL, net direct loans	\$23,452	\$207,808

SOURCE: Office of Management and Budget, *Special Analyses, Budget of the United States Government, Fiscal Year 1984* (U.S. Government Printing Office, 1983), Table F-6.

funds from the capital markets by issuing Treasury securities. Because government securities are used to raise the funds, the interest cost will be lower than on funds raised by private institutions. If the government intermediary passes on this reduction, the borrower will obtain a subsidized rate of interest on his loan.<sup>5</sup>

<sup>5</sup>The subsidy here refers to the difference between the rate of interest a borrower would pay if the loan were obtained from a bank and the rate he would pay under either the loan guarantee or direct loan programs of the government. This may not correspond to the subsidy as viewed by the taxpayer; that is, the cost of the loan less the rate of interest paid on the loan. Rough estimates of the subsidies involved in the various government loan and guarantee programs are presented in *Special Analysis F, Federal Credit Programs, 1982*. See, especially, tables F-11A and F-11B.

Tables 1 and 2 present the various direct loan and guarantee programs that existed in the 1982 fiscal year. As the tables show, virtually every sector of the economy is covered by some type of program, and assistance to some sectors takes the form of both direct loans and guaranteed loans. For instance, of the \$9,943 million loans and guarantees outstanding in 1982 for the Farmers Home Administration's program for rural development, \$153 million was on-budget direct loans, \$3,387 million was off-budget direct loans through the Federal Finance Bank (FFB) and \$6,403 million was provided through government guarantees. Indeed, the FFB holdings of loans guaranteed by a variety of on- and off-budget agencies provides an especially convenient mechanism to convert loan guarantees into direct loans. The FFB simply pur-



Table 2

**Guaranteed Loan Transactions of the Federal Government:  
1982 Fiscal Year (millions of dollars)**

	Net Loans Guaranteed	Outstandings
Funds appropriated to the President	\$ 2,431	\$ 12,821
Agriculture		
Program level	4,328	25,238
Guarantees of loan assets sold to FFB	5,443	56,860
Commerce	- 70	632
National Oceanic and Atmospheric Administration	- 18	174
Education activities	5,685	27,700
Energy	782	2,156
Defense: Military	*	*
Health and Human Services	178	1,542
Housing and Urban Development	20,955	278,559
Interior	24	143
Transportation	778	10,172
Treasury	507	2,644
NASA: Long-Term Satellite Leases	120	758
Veterans Administration (Housing)	5,171	108,784
Export-Import Bank	- 914	6,069
National Credit Union Administration	- 12	106
Small Business Administration	- 23	10,264
Tennessee Valley Authority	336	1,258
Other agencies and programs	22	1,444
Subtotal, guaranteed loans (gross)	45,671	547,327
Less secondary guaranteed loans: <sup>1</sup>		
GNMA guarantees of FHA/FmHA pools	10,901	115,537
Subtotal, guaranteed loans (net)	34,770	431,789
Less guaranteed loans held as direct loans: <sup>2</sup>		
by budget agency (GNMA)	- 241	4,067
by off-budget Federal Financing Bank	14,155	96,519
TOTAL, primary guaranteed loans	\$20,856	\$331,204

\*\$500,000 or less.

<sup>1</sup>Secondary guarantees by the Export-Import Bank of the debt of the Private Export Finance Corporation have not been estimated and are excluded from the table.

<sup>2</sup>When guaranteed loans are acquired by a budget account, they become direct loans and are counted as such in table 1. They are, therefore, deducted from the totals in this table.

SOURCE: Office of Management and Budget, *Special Analyses, Budget of the United States Government, Fiscal Year 1984* (U.S. Government Printing Office, 1983), Table F-9.

chases the guaranteed loans that would otherwise have been sold to private banks.<sup>6</sup>

<sup>6</sup>It also should be noted that the distinction between "on-budget" and "off-budget" direct loans is really only an accounting distinction. Net new direct loans issued by on-budget agencies are treated as part of the budget: an increase of \$1 million in these loans shows up as an increase of \$1 million in the budget deficit. An increase of the same amount in off-budget FFB direct loans would not increase the deficit. Both will do precisely the same thing to the government debt, however, namely increase it by \$1 million. In the case of

Government loans and guarantees embrace a variety of programs, none of which is of specific interest here. Thus, the subsequent analysis assumes that recipients

on-budget direct loans, the funds are allocated by the Treasury directly to the agency; in the case of FFB direct lending, the FFB draws on its line of credit at the Treasury and the Treasury then issues debt to provide the FFB with the funds. This accounting convention, while perhaps important for congressional control, has no operational meaning for the issues considered here and is ignored.



of government direct loans or guarantees are drawn randomly from the general population. Our focus is on the effect of moving a preselected group of individuals from one type of program to the other, without regard to the specific program itself.<sup>7</sup>

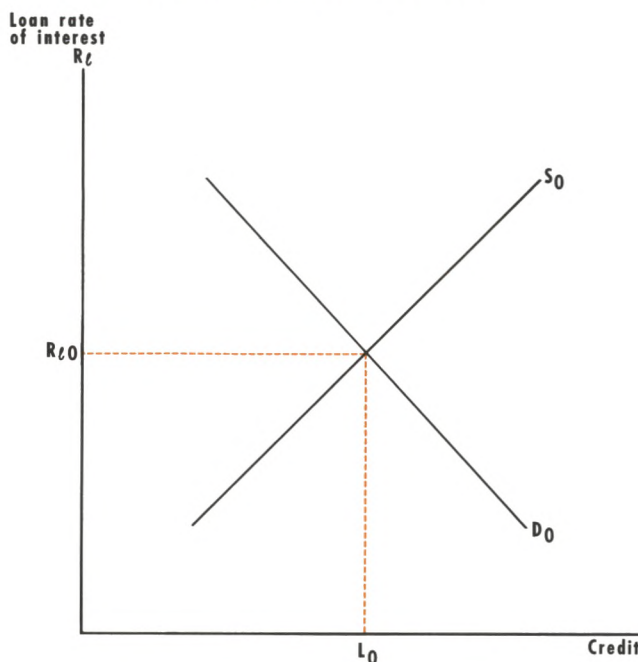
The principal difference between the government direct loan and guarantee programs lies in the portfolios that households and banks must hold as a result of these programs. For a given level of total government credit provided, an increase in the number of direct loans granted will increase the amount of government securities that must be held by either banks or households. Therefore, a general model of portfolio choice is necessary to trace the effects of differential changes in the two programs. In this article, the analysis is derived from the implications of a formal model based on the work of James Tobin and detailed elsewhere.<sup>8</sup>

To present the model, the credit market is first described for the case in which no government credit programs exist; then the impacts of introducing first a guarantee program and then a direct loan program are examined. Having examined the impact of each program separately, the differential impact of the two programs on interest rates and aggregate demand can then be assessed.

## THE MARKET FOR THE STOCK OF CREDIT

Suppose there are no government direct loan or guarantee programs. The market for credit then is characterized in figure 1.  $D_0$  describes the demand for loans by the private sector and is a function not only of the loan rate,  $R_l$ , but also of rates of return on capital goods and on government securities. An increase in the loan rate decreases the quantity of credit de-

Figure 1  
The Loan Market, Excluding Government Loan Programs



manded; increases in rates of return on other assets shift the demand curve out.<sup>9</sup>

The credit supply curve of banks is described by the upward sloping line  $S_0$ . By assumption, it is positively sloped to reflect the increasing marginal costs of lending. These costs consist of the operating costs of the bank loan department and the cost of obtaining funds to lend, either by attracting more deposits or by selling government securities from the bank's portfolio.<sup>10</sup> An increase in the rate of return on any other asset that the bank could hold would shift the supply curve for credit up, as would an increase in the rate of interest on deposits. As drawn in figure 1, the equilibrium level of credit is  $L_0$  and the equilibrium rate of interest on it is  $R_{l0}$ .

<sup>7</sup>The choice of program and recipient is, however, important in considering the impact of increases in total federal credit assistance. The answer to the question of whether such increases would increase the welfare of society hinges on whether the new assistance decreased differences in the social and private marginal benefits of credit to the recipient. The assumption that recipients are chosen randomly would be inappropriate for such an analysis. Therefore, this question is not addressed in this article.

<sup>8</sup>See Joel Fried, "Government Direct Loans and Loan Guarantee Programs: A Formal Analysis," Federal Reserve Bank of St. Louis Working Paper #83-017, October 1983. This analysis modifies the framework presented by James Tobin, "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit and Banking* (February 1969), pp. 15-29, to incorporate the two types of government credit assistance.

<sup>9</sup>In principle, at least, increases in the rate of return on any asset will increase the demand for credit as the household reshuffles its entire portfolio to take advantage of this higher return. In practice, it can be expected that increases in  $R_k$  will alter credit demand more than would an equal increase in  $R_g$  or  $R_d$ . This is because households generally do not borrow to purchase assets that yield pecuniary returns lower than the loan rate.

<sup>10</sup>The analysis in Fried, *Government Direct Loans* (see equation 1-3) supposes that government securities, like money, can be viewed as a "producer's good" that facilitates exchange activity. See also Joel Fried and Peter Howitt, "The Effects of Inflation on Real Interest Rates," *American Economic Review* (December 1983), pp. 968-80, for a more detailed presentation of this view.



## Introducing a Government-Guaranteed Loan Program

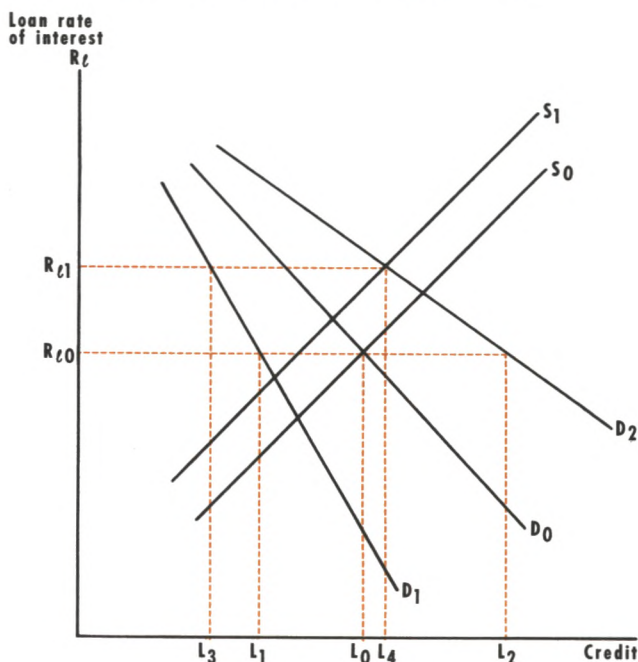
Now suppose the government institutes a government guarantee program that is available only to a portion of the population.<sup>11</sup> Figure 2 shows the consequences of this program in the credit market. For comparison,  $D_0$  and  $S_0$  are the same as in figure 1.  $D_1$  describes the demand for loanable funds by all potential borrowers *who are not eligible* for government-guaranteed loans.

To establish the effects of the guarantee program, some assumptions about the relationship between the rate of interest on loans that do not have a government guarantee,  $R_g$ , and on those that do have the guarantee,  $R_{gg}$ , must be made. We shall assume that the government wants to provide preferred borrowers a fixed subsidy rate,  $S$ , per dollar of loan, and that the banking system is sufficiently competitive that, at the margin, the profit rates on guaranteed and non-guaranteed loans are equalized.<sup>12</sup> Thus,

$$(1) R_{gg} = R_g - S.$$

Under this assumption, changes in  $S$  cause the total demand for credit, as a function of  $R_g$ , to shift; as  $S$  is increased, individuals eligible for government-guaranteed loans would increase their demand for credit at any given  $R_g$ . Thus, for a positive subsidy rate, credit demand would be greater than it otherwise would be without the guarantee program.  $D_2$  in figure 2 de-

Figure 2  
The Loan Market, Including Government Guaranteed Loans



scribes this new demand curve for total credit with the introduction of the government guarantee program. At  $R_{g0}$ , there is now an excess demand for loans of the amount  $L_2 - L_0$ . This puts pressure on  $R_g$  to rise. Furthermore, as banks issue more loans, they will sell government securities. Therefore, the rate of interest on these securities,  $R_g$ , increases. The increase in  $R_g$  causes the credit supply curve to shift up, so that less credit will be supplied at any given  $R_g$ . Finally, as individuals take out additional loans, they increase their demand for titles to capital goods, causing the rate of return on these assets,  $R_k$ , to fall. This reduces, in part, the demand for loans, but does not shift the demand schedule back to  $D_0$ .<sup>13</sup>

The new portfolio equilibrium will be at some new loan rate,  $R_{g1}$ , greater than  $R_{g0}$ , and will be characterized by a higher  $R_g$  and lower  $R_k$ . Furthermore, if the credit market is stable, the equilibrium rate of interest on guaranteed loans,  $R_{g1} - S$ , will be less than

<sup>11</sup>As mentioned earlier, it is supposed that those eligible for the government programs are chosen randomly from the population at large. This assumption is not meant to deny one rationale often given for government credit assistance programs, namely, that these are set up to provide funds to high-risk individuals and institutions. Rather, it is to clarify the exposition of the financing effects of the direct loan and guarantee programs, which is our primary concern. If this assumption is not made, then the loan supply schedule of banks would depend on how the favored group was chosen. If the government could identify the high-risk borrowers in the economy and provide them with guarantees or direct loans, then the supply curve of loans by banks to uninsured borrowers, *ceteris paribus*, would most likely shift out with the establishment of the government programs.

<sup>12</sup>Suppose banks initially did not pass on these reduced costs to the borrower. Then,  $D_0$  would continue to describe the total demand for credit. Each bank, however, would have an incentive to offer a lower rate to insured borrowers or give loans to them in preference to uninsured borrowers. Over time, therefore,  $R_{gg}$  would be forced down relative to  $R_g$ . The competitive banking industry assumption says simply that, in equilibrium, relative rates are such that any individual bank will be indifferent to offering the next loan to either an insured or an uninsured borrower.

<sup>13</sup>It is also the case that, from general portfolio considerations, the demand for credit will shift out as  $R_g$  rises. For notational convenience, these demand curve shifts have been suppressed in figure 2.



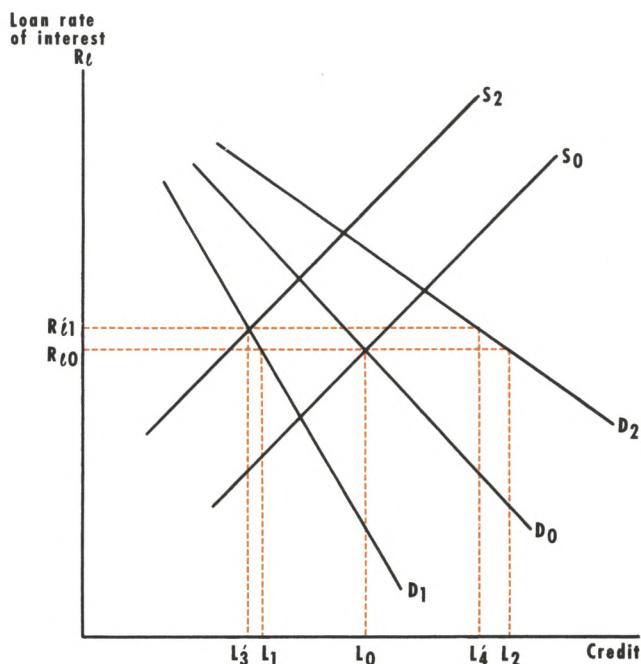
$R_{g0}$ .<sup>14</sup> At this new set of interest rates, there will be a total supply of credit of the amount  $L_4$ , consisting of  $L_3$  non-guaranteed loans and  $L_4 - L_3$  government-guaranteed loans. Loans to borrowers ineligible for government-guaranteed loans of the amount  $L_3 - L_1$  that would have been made at  $R_{g0}$  are no longer made.

The portfolio readjustment described above represents the initial response to the introduction of the government guarantee program. Because relative yields on financial instruments have been altered, the stocks that households wish to hold will change. This, in turn, will alter the allocation of flows over time. In particular, because the demand price for capital has increased ( $R_k$  has fallen), there is an increase in the demand for real capital, stimulating the production of these goods and increasing aggregate demand in general.<sup>15</sup>

The increase in aggregate demand can take the form of an increase in prices or real income. Suppose that real income begins to increase first, transiently rising above full-employment output. This increase generates increased savings to provide the real resources to accommodate the real investment.

Over time, however, the demands on real resources begin to be reflected in increased prices. These increases reduce real cash balances and real holdings of government securities by more than they otherwise would have been. In an attempt to maintain the real holdings of these assets, banks would decrease their supplies of credit, forcing loan rates up. The long-run equilibrium would then be characterized by a decline to full-employment real income, a higher price level and lower real supplies of monetary base and government interest-bearing debt. The distribution of loans

Figure 3  
The Loan Market, Including Government Direct Loans



would be such that recipients of government-guaranteed loans would have a greater command over resources at the expense of borrowers ineligible for guarantees and the population at large who pays for the subsidies in the program.

### Introducing a Government Direct Loan Program

Now consider the consequences if the government initiates a direct loan program instead of a loan guarantee program. To facilitate the comparison, suppose the government again provides the same subsidy rate per dollar of loan,  $S$ , so that the interest rate on government direct loans,  $R_{gq}$ , is

$$(2) R_{gq} = R_q - S.$$

Further, suppose the same individuals are eligible for the government direct loans as were eligible for the loan guarantees. As figure 3 shows, under these assumptions,  $D_0$ ,  $D_1$  and  $D_2$  are the same as in figure 2 except that the horizontal distance between  $D_1$  and  $D_2$  now describes the demand for government direct loans instead of guaranteed loans.  $R_{g0}$  and  $L_0$  describe the bank loan rate and volume of credit before the introduction of the direct loan program.

<sup>14</sup>To see this, note that the initial shock was an increase in loans supplied at any given  $R_q$ . If  $R_{q1} - S \geq R_{g0}$ , then demand by insured borrowers is less than  $L_0 - L_1$ , and demand by uninsured borrowers is  $L_3 < L_1$ . Thus, if  $R_{q1} - S \geq R_{g0}$ , an increase in the planned supply of loans causes a decrease in equilibrium loans supplied, implying an unstable equilibrium. For the purposes of this paper, we shall rule out unstable equilibria. See Mary Kay Plantés and David Small, "Macroeconomic Consequences of Federal Credit Activity," in *Conferences on the Economics of Federal Credit Activity, Part II—Papers* (Congressional Budget Office, 1981) and comments on it by George von Furstenberg, in *Conference on the Economics of Federal Credit Activity, Part I—Proceedings* for a more complex model that permits them.

<sup>15</sup>Over time, the subsidy on the government-guaranteed loans must also be paid. It is assumed here that lump-sum taxes are raised to pay for them, so that the subsidy itself represents a transfer from the population at large to recipients of government-guaranteed loans and, as such, does not represent a change in aggregate demand.



To examine the forces at work when the direct loan program is introduced, consider the demand and supply of credit at  $R_{g0}$ . First, there will be an *excess supply* of loans that the banks wish to issue of the amount  $L_0 - L_1$ . This is because those customers who had taken out bank loans before, now find that their eligibility for direct government loans reduces their cost of credit. Consequently, they no longer demand bank loans at  $R_{g0}$ . At  $R_{g0}$ , however, banks would not want to alter their planned supply of credit; the decreased demand and unchanged supply mean an excess supply. Second, at  $R_{g0}$ , the *total* demand for credit has increased to  $L_2$  from  $L_0$ . To finance this demand for government direct loans, the government will issue government securities. Thus, there is also an excess supply of government securities. This causes  $R_g$  to rise, shifting up the credit supply function of banks to, say,  $S_2$ .

While  $S_2$  is drawn such that  $R_g$  rises in the new portfolio equilibrium, this need not be the case. At  $R_{g0}$ , an increase in  $R_g$  increases the opportunity cost of bank loans. This may or may not offset the cost decreases that accompany the reduction of the scale of bank loan operations to  $L_1$  from  $L_0$ : if it does offset these cost decreases, then  $R_g$  will rise; if it does not,  $R_g$  will fall.

The impact on aggregate demand is qualitatively the same as occurs with an increase in guaranteed loans. There is an increase in the demand price of capital (a decrease in  $R_k$ ), making it more profitable for firms to invest. This puts pressure on output and prices to increase. The increase in price, in turn, reduces real wealth, causing output to fall to its full-employment level. This causes loan rates to rise and the demand price of capital to fall. The real quantity of monetary base will be less than it was at the initial equilibrium.

### A Compensated Change in Government-Guaranteed and Direct Loans

Columns 1 and 2 of table 3 describe the portfolio effects of both the guaranteed loan and direct loan programs. With the exception of the loan rate on uninsured bank loans, these results are identical. The question now to be addressed is: What are the consequences on interest rates and aggregate demand if the direct loan program is expanded and the guarantee program reduced, so that there is no change in the total number of individuals eligible for the government subsidized rate of interest? In other words, does it matter whether a direct loan program is used *instead* of a loan

Table 3

### The Portfolio Effects of Changes in Government Credit Programs on Interest Rates and Aggregate Demand

Effect on	Program Change		
	Increase in government guarantees	Increase in government direct loans	Increase in direct loans and decrease in guarantees
$R_g$	increase	uncertain	decrease
$R_g$	increase	increase	increase
$R_k$	decrease	decrease	decrease
Aggregate demand	increase	increase	increase

guarantee program with the same borrowing rate and the same eligibility requirements, and, if so, how?<sup>16</sup>

To answer this question, suppose the government currently has both programs in operation. Further, suppose that the interest rate on direct government loans is equal to the net of subsidy rate,  $R_g - S$ , on government-guaranteed loans. Thus,

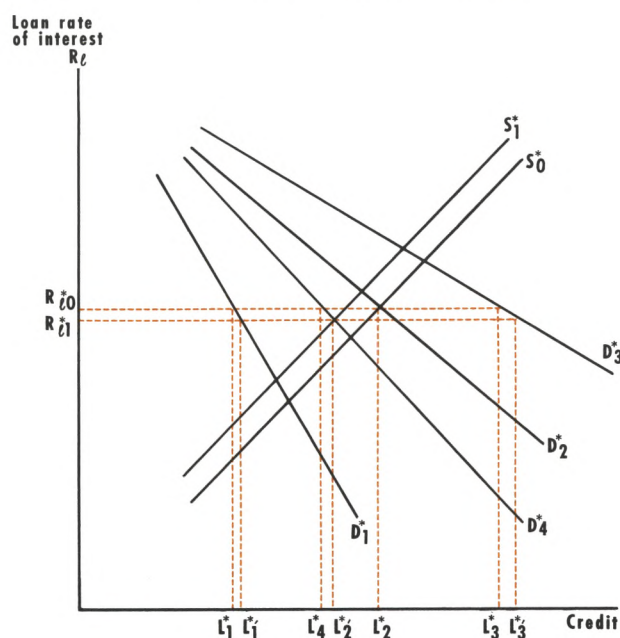
$$(3) R_g = R_{gg} + S = R_{gd} + S.$$

This ensures that potential recipients of either government program receive the same subsidized rate. The analysis can be followed in figure 4, where  $D_1^*$  describes the demand function for non-insured bank loans,  $D_2^*$  is the demand for total bank loans (govern-

<sup>16</sup>The results to this point can be explained intuitively by making an analogy to government programs in the field of medical care. If more individuals become insured under, say, the Medicare program, the total demand for hospital care will increase. If beneficiaries of the program may use any private hospital, the cost of hospital care at these institutions will rise, crowding out some uninsured individuals, though not as many as the increased number of insured patients (or costs would not have increased). If, on the other hand, insured patients can receive subsidized care only if they go to certain specified government hospitals, as required say, by the Veterans Administration programs, demand at non-VA hospitals will fall, causing hospital costs there either to decrease (because of the lower utilization) or increase (because the demand for doctors will have increased causing their salaries to rise at all hospitals). The Medicare program is similar to the loan guarantee program. The VA program is analogous to the direct loan program. Costs to the patients are analogous to the loan rates to borrowers wishing to purchase capital and the price of doctors' services is an analog to the interest rate of government securities. The question now addressed in the text — substituting direct loans for guaranteed loans — in the health care analogy is the following: What is the effect on the cost of medical care if veterans' wives over age 65 were added to the VA program and not permitted to use the Medicare program?



Figure 4  
The Loan Market, if Direct Loans Replace Guaranteed Loans



ment-guaranteed and non-guaranteed), and  $D_3^*$  is the total demand for credit under the pricing assumption made above. The initial equilibrium is at  $R_0^*$ , with  $L_1^*$  non-guaranteed loans,  $L_2^* - L_1^*$  government-guaranteed loans, and  $L_3^* - L_2^*$  direct government loans.

Now suppose that the government changes its policies so that some individuals lose their eligibility for government-guaranteed loans, but are now eligible for government direct loans. This is described in figure 4 by a shift in the demand for total bank credit from  $D_2^*$  to  $D_4^*$ . Suppose initially that the loan rate remained at  $R_0^*$  and  $R_g$  remained at its initial level. There would then be an excess supply of total bank loans of the amount  $L_2^* - L_4^*$  and, because government direct loans are financed by issuing government securities, an excess supply of government securities of an equal amount.

The former puts pressure on  $R_g$  to fall and the latter causes government security rates to rise until a new portfolio equilibrium is established. If the system is stable, then  $R_g^*$  will fall, say, to  $R_{g1}^*$ , and  $R_L$  will rise above its initial rate.<sup>17</sup> Because the total supply of

credit has increased, there will be an increase in the demand price for capital and in the level of aggregate demand.<sup>18</sup> Therefore, the analysis suggests that the use of government direct loans increases aggregate demand more than government guaranteed loans that provided credit to the same individuals at the same rate of interest.

As a consequence of the increase in aggregate demand, either quantities or prices must rise to equilibrate the goods market. If prices rise, interest rates on loans and on titles to capital tend to rise as demands for these instruments decline with the decrease in real wealth. Because both investors and consumers face decreases in wealth from the price rise, these groups will reduce their (real) planned expenditures. It further seems reasonable to suppose that personal consumption will decrease, so that borrowers obtain an increased command over the flow of real resources. Thus, even with the price adjustment, the demand price of capital is greater than it was before the change in the program.

## SUMMARY

This article has argued that government direct loan programs are more stimulative than government guarantee programs with identical amounts of credit assistance.<sup>19</sup> The use of the direct loan program will

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because direct loans by on-budget agencies are included in the budget deficit. Such direct loans could increase through a compensated decrease in government-guaranteed loans, in which case the analysis implies that private loan rates would fall. Even an uncompensated increase in direct loans by on-budget agencies may cause an initial decrease in loan rates (see Fried, *Government Direct Loans*).

<sup>18</sup>In figure 4, the fall in  $R_g$  will, for a given  $S$ , lower  $R_{gg}$  and  $R_{g1}$  and therefore increase the demand for direct and guaranteed loans. This explains only part of the increased demand. The same qualitative results also hold when the total subsidy  $(L_3^* - L_1^*)S$  remains fixed. (The case of the fixed total subsidy is derived in Fried, *Government Direct Loans*.) The rise in  $R_g$  causes individuals and banks to conserve on their cash balances and excess reserves. This permits a total expansion of credit as the yield on deposits is increased, increasing total bank deposits. The sufficient conditions for a compensated increase in government direct loans to be expansionary are that the demand for capital goods be more responsive to loan rates than to government security yields, and that the demand for the monetary base and deposits be more responsive to government security rates than to loan rates.

<sup>19</sup>Critical to this result are the assumptions that government securities and guaranteed loans are not perfect substitutes for one another in bank portfolios, that guaranteed loans are closer substitutes to non-guaranteed loans than are government securities, that the demand for capital is more responsive to loan rates than to government security rates and that demand for the monetary base responds more to government security rates than to loan rates.

<sup>17</sup>An implication of this analysis is that an increase in the federal budget need not, ceteris paribus, cause loan rates to rise nor crowd out borrowing and investment by the private sector. This is



generate lower loan rates to borrowers not receiving government assistance, higher interest rates on government securities and a higher demand price for capital.

These results can be seen intuitively by supposing that, in increasing direct loans, the government arbitrarily exchanges \$1 million of government securities for \$1 million of previously issued, government-guaranteed loans in bank portfolios. Banks then find themselves with an excess supply of government securities and too few loans in their portfolios, which puts pressure on government security rates to rise and loan

rates to uninsured borrowers to fall. The lower loan rates provide an incentive to households to purchase more capital and other commodities with borrowed funds so that either aggregate demand or the demand price of capital increases, or both.

Additional implications are that government budget deficits as currently measured may not accurately reflect the government's impact on the credit market and private capital expenditures; also, because government credit programs can change relative interest rates, any specific interest rate may be misleading as an indicator of financial market conditions.



## FEDERAL RESERVE BANK OF ST. LOUIS

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