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1 **Recent Monetary Control Procedures and the Response of Interest Rates to Fluctuations in Money Growth**

James G. Hoehn

The apparent increase in the variability of both money growth and interest rates in 1980–82 made the 1979 introduction of a reserve-based operating procedure controversial and rendered its effect on monetary control difficult to assess from casual observation. However, a study of the relation between fluctuations of the Federal funds rate and M1 finds that the change was associated with a stronger and more immediate link between interest rates and previous money growth. This evidence suggests that the reserve-based procedure facilitated more aggressive efforts to control money growth.

11 **Deregulation and Deposit Insurance**

Eugenie D. Short and Gerald P. O'Driscoll, Jr.

Some analysts have suggested that the current federal deposit insurance system provides an incentive to insured institutions to incur more risk than they would in its absence. Such institutions are charged a fixed premium for deposit insurance without regard to portfolio risk. It is this policy, critics feel, that insulates financial intermediaries from bearing the full cost of incurring risk. The Federal Deposit Insurance Corporation has proposed a system of insurance premiums that would vary with risk. Analysts suggest, however, that the proposed system would not price risk accurately. In this article an alternative system of private deposit insurance is presented.

Recent Monetary Control Procedures and the Response of Interest Rates to Fluctuations in Money Growth

*By James G. Hoehn**

In October 1979, in an environment of accelerating inflation, the Federal Reserve adopted a new method of monetary control. Specifically, the Federal funds rate was replaced by nonborrowed bank reserves as the primary guide for open market operations.

The effect of this change on monetary control has been difficult to assess from casual observation. On the one hand, the apparent increase in the variability of money growth (Chart 1) seems consistent with the view that either the new procedure was incapable of succeeding or it was not faithfully pursued. However, much of this increase in money growth variability may be illusory, because seasonal adjustment tends to smooth data in the distant past more than data in the immediate past.[1] In addition, the period following October 1979 was marked by unusual events, aside from the change in operating procedure, that may bear responsibility for much of the monetary instability. Furthermore, the wide-ranging movements in the Federal funds rate (Chart 2) and other interest rates[2] appear consistent with a more aggressive attempt to control money.

One useful method of assessing the policy shift is an examination of the relationship between changes in the Federal funds rate and movements in the quantity of money. Policies that promote more rapid interest rate adjustments may allow closer attainment of both the monetary targets and macroeconomic objectives, particularly in an en-

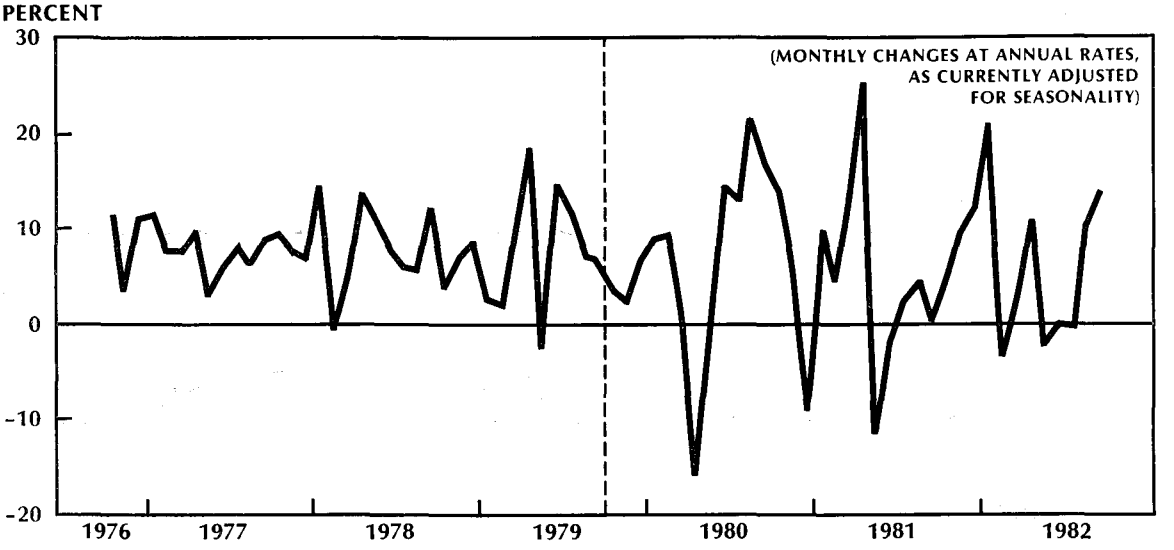
* *James G. Hoehn is an economist at the Federal Reserve Bank of Dallas.* *Thomas B. Fomby and Raymond E. Lombra provided useful comments. The views expressed are those of the author and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.*

1. A discussion and some pertinent examples of the bias arising from comparisons of the volatility of seasonally adjusted monetary aggregates in the recent versus the far past are found in David Lindsey and others, "Monetary Control Experience Under the New Operating Procedures," in Board of Governors of the Federal Reserve System, *New Monetary Control Procedures*, Federal Reserve Staff Study, vol. 2 (Washington, D.C.: Board of Governors of the Federal Reserve System, 1981).

2. See James G. Hoehn, "Recent Interest Rate Behavior in Perspective: Some Descriptive Statistics," Federal Reserve Bank of Dallas Research Paper no. 8301 (Dallas, December 1982).

Chart 1

Growth Rate of M1 Money Measure Before and After October 1979



SOURCE OF PRIMARY DATA: Board of Governors, Federal Reserve System.

vironment of uncertainty about inflation. The caution with which interest rates were adjusted under the Federal funds rate targeting procedure had limited monetary control, especially when inflation was accelerating. If a change in policy did indeed take place—one with implications beyond week-to-week fluctuations in money and interest rates—then movements in the Federal funds rate over periods of a month or more should have been more closely linked to movements in the stock of money, particularly those in the most recent months.

The next section of this article develops the hypothesis that the reserve-based procedure implied a stronger and more immediate link of interest rates to changes in money than did the Federal funds rate procedure. The two subsequent sections examine, in somewhat different ways, the observed relation between money growth and the Federal funds rate, contrasting the experience under the reserve policy with that under the Federal funds rate policy. In the first of these sections, the observed relation between changes in the Federal funds rate and deviations of M1 from the annual targets is examined. The second focuses on the timing of the observed relation between money growth and subsequent changes in the funds rate.

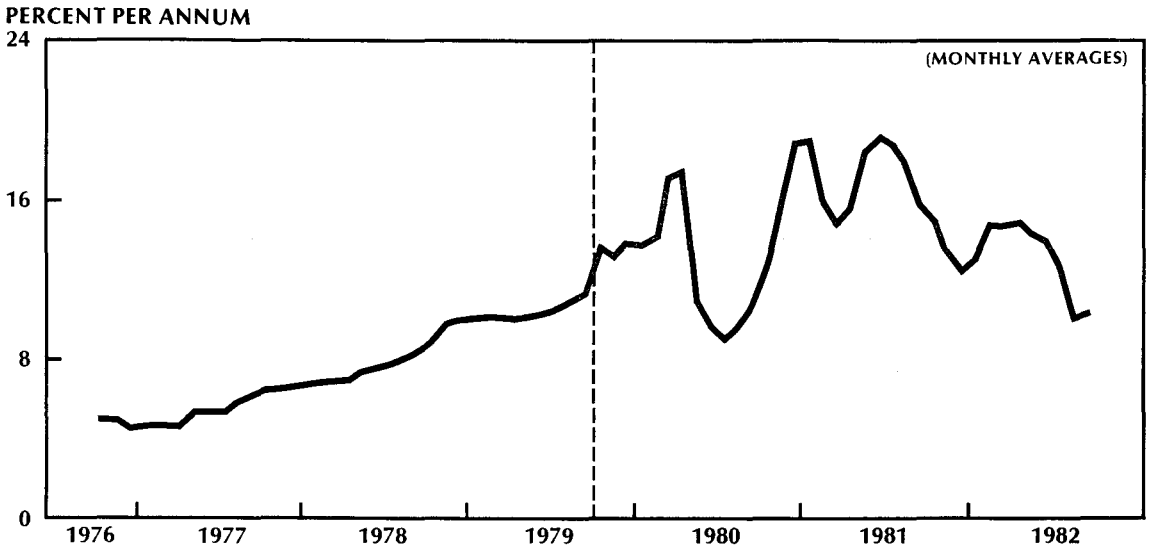
The statistical evidence presented is subjected to numerous caveats and must be interpreted with caution. Nevertheless, in the concluding section the evidence is interpreted as suggesting that the reserve-based policy was associated with the delivery of more rapid and reliable corrective actions when the money stock strayed from target.

Alternative monetary control procedures affect the link between interest rates and money growth

The control of money has increasingly been a major policy consideration since 1970. Because exact short-run control has been regarded as difficult and unnecessary, the Federal Reserve has attempted to control money growth over one-year spans. Target growth rates have been established for several monetary aggregates. These targets have been expressed as ranges to allow for some flexibility and in recognition of the impossibility of exact control. M1, the narrowly defined aggregate that includes currency and checkable deposits, has usually (until late 1982) been given the most weight, and it is

Chart 2

Federal Funds Rate Before and After October 1979



SOURCE: Board of Governors, Federal Reserve System.

more closely linked to open market operations than are the other measures of money. At meetings throughout the year, the Federal Reserve has established and reviewed interim or quarterly growth targets. When money growth strayed outside the range, actions have generally been taken that aimed to bring money growth back within the range.

The mechanism by which the Federal Reserve can influence money growth is changes in interest rates. For example, an interest rate increase reduces the amount of money the public wishes to hold, first, by raising the cost of holding money and, second, by lowering spending, thereby lowering transaction needs. The reduction takes place over a number of months. If the money stock grows more rapidly than desired, the Federal Reserve can conduct its policies in such a manner that an interest rate increase occurs.

Under the funds rate procedure, open market operations were directed toward keeping the Federal funds rate at a predetermined level, one thought to be consistent with attaining money growth objectives. The desired funds rate could be achieved with close precision by providing additional reserves to the banking system when the rate was subject to upward pressure and withdrawing reserves when the rate would otherwise fall. The funds rate was typically raised when money growth had exceeded targets and lowered when money growth had fallen short of targets

In practice, the Federal Reserve moved the funds rate cautiously, seeking to foster stability in the credit markets and avoid frequent apparent reversals of policy.[3] If movements of money away from target tended to be temporary, self-reversing fluctuations, such caution would not result in loss of control over the money stock. But if the deviations were not self-reversing or tended to be followed by further movements in the same direction, a more rapid response would improve the degree of monetary control. (Of course, actions taken to cor-

3. That the choice of the short-run criterion of open market operations—the funds rate or reserves—has important implications beyond the short term is espoused in John P. Judd and John L. Scadding, "Conducting Effective Monetary Policy: The Role of Operating Instruments," *Economic Review*, Federal Reserve Bank of San Francisco, Fall 1979, 23-37.

rect deviations in money will enhance achievement of the ultimate objectives of policy, noninflationary economic growth and stability, only to the extent that money movements reflect underlying economic trends. Should money move in disparity with prices and business activity, caution of the type described would prove desirable.)

In the late 1970's, fluctuations in money often were sustained. As the economic expansion that began in 1975 continued for an extraordinary duration while inflation accelerated to historically high levels, more aggressive interest rate adjustments became necessary to achieve monetary control. The October 1979 change in procedure sought to replace cautious interest rate adjustments with a reserve-based procedure that would deliver more automatic and rapid responses of interest rates to money deviations.[4]

The reserve-based procedure set a growth path for nonborrowed reserves.[5] Essentially, total reserve growth consistent with the interim growth targets for the monetary aggregates was calculated, and an "initial borrowing assumption" was subtracted to arrive at the path for nonborrowed reserves. The path was adjusted each week, both for technical reasons relating to changes in the money-reserve multiplier and to allow for some discretionary policy judgments. A wide range of acceptable funds rates was imposed as a constraint, but it was only occasionally binding.

The reserve-based procedure contained an automatic mechanism that tended to raise the Federal funds rate when money growth rose faster than provided for by the interim targets and to lower the funds rate when money growth fell below target. For example, an increase in deposits raised the reserves legally required of the banking system. Given the level of nonborrowed reserves, the rise in required reserves represented a decrease in free reserves, which equal excess reserves less borrowed reserves. This increased pressure on the banking system's reserve position tended to generate a rise in the Federal funds rate.

Much of the controversy over the new procedure is focused on adjustments to the nonborrowed reserve paths. It is possible for those targets to have been revised in a systematically accommodative fashion that suppressed the response of interest rates. For example, if money growth had run above target, creating growth in the demand for reserves above that provided in the path, the Federal Reserve could have prevented interest rates from rising by increasing nonborrowed reserves. Some critics emphasize discretionary aspects of adjustments to the reserve paths. The critics contend there was no assurance of more rapid or systematic corrective policy responses to money deviations than before.[6]

An appropriate way of comparing the reserve-based policy with the funds rate policy pursued in earlier years suggests itself. To the extent that the reserve policy achieved larger and more rapid responses of interest rates to persistent money fluctuations, it accomplished its purpose. Such a

4. "The choice of operating procedure . . . involves, among other things, judgments about whether there is more risk to monetary policy's ultimate objective of noninflationary growth from procedures that tend to emphasize interest rates as operating targets with some implication of a relatively gradual change in rates, or from those that tend to work more directly against money . . . variations" (Stephen H. Axilrod, "Federal Reserve Staff Study of the New Monetary Control Procedure: Overview of Findings and Evaluation," p. A22, in Board of Governors, *New Monetary Control Procedures*, vol. 1). A taxonomic analysis of the risks and advantages of various operating procedures in insulating money and the ultimate objectives from various economic disturbances is James Grant Hoehn, "The Monetary Instrument and Lagged Reserve Accounting" (Ph.D. diss., University of Virginia, 1983), especially 29-77.

5. Excellent descriptions of the reserve-based policy are found in Warren L. Coats, Jr., "Recent Monetary Policy Strategies in the United States," *Kredit und Kapital* 14, no. 4 (1981): 521-49, and David E. Lindsey, "Nonborrowed Reserve Targeting and Monetary Control," in *Improving Money Stock Control: Problems, Solutions, and Consequences*, ed. Laurence H. Meyer (Boston: Kluwer-Nijhoff Publishing, 1983), 3-41.

6. Among the critical analyses focusing on discretionary adjustments to the reserve paths are William Poole, "Federal Reserve Operating Procedures: A Survey and Evaluation of the Historical Record Since October 1979," *Journal of Money, Credit, and Banking* 14 (November 1982, pt. 2): 575-96; R. Alton Gilbert, Discussion 1 following Lindsey, "Nonborrowed Reserve Targeting and Monetary Control," 42-49; and Hoehn, "Monetary Instrument and Lagged Reserve Accounting," especially 52, 84-87, 135-36. (The last author hereby recants.) Another line of criticism argues that the discretionary adjustments did not go far enough in the direction of reinforcing the automatic mechanism, as contended by Robert L. Hetzel, "The October 1979 Regime of Monetary Control and the Behavior of the Money Supply in 1980," *Journal of Money, Credit, and Banking* 14 (May 1982): 234-51.

changed response can be assessed by examining the relation of funds rate movements both to money deviations from annual targets and to money growth over the current and preceding 12 months. Results to be presented indicate that the reserve policy was a success in this sense.

Federal funds rate showed stronger responses to deviations of money from target . . .

That the Federal Reserve exerted more aggressive efforts to keep money growth close to target is suggested by the altered relation between changes in the Federal funds rate and deviations of money growth from target. A measure of those deviations can be constructed for each month as M1 less the midpoint of the annual target range, expressed as a percentage of the fourth-quarter base.[7] This measure, while simple and useful, does ignore the interim or intrayear growth targets, the behavior of the more broadly defined aggregates, and any deliberate exercise of flexibility in allowing growth at the upper or lower end of the range or even outside the range when appropriate. These influences may affect the contrast between the reserve-policy period and the preceding period because financial innovations, the special credit restraint program, and remarkable macroeconomic instability can be argued to have called for greater flexibility in monetary control.

In calculating the deviation for each month, M1 data from the *Federal Reserve Bulletin* for two months later were used. Although subjected to early revisions from preliminary figures, such data reflect the M1 definitions and seasonal adjustment procedures in use at the time policy decisions were made. Thus, data selected this way provide a reasonably consistent basis for comparison.

In measuring the associated movement of the Federal funds rate, changes in the natural logarithm were used. Choosing this particular measure, as is also the case for the money deviation measure, is not clear-cut and can substantially affect quantitative results. If the change in the "unlogged" funds rate were used as the measure of the interest rate movement or if a longer-term interest rate were employed, the contrast described below between the reserve-policy period and the preceding period would be even sharper.

Although the widespread belief is that money deviated much further from its targets under the reserve-based procedure, that contention is not supported by the data here. Chart 3 depicts the relation between the measures of money deviation and the associated interest rate movement for the 36-month periods before and after October 1979. The range of deviations of money growth from target was typically slightly smaller in the later period. The root mean square of the absolute money growth deviation (from the midpoint of the target ranges) was 1.24 percent, compared with 1.54 percent in the earlier period.

The results are somewhat less favorable to the reserve-based policy if attention is focused on the deviations for the fourth quarter. These deviations are of special significance because the targets involve a commitment to prevent sizable deviations in the final quarter. Fourth-quarter deviations are averages of the monthly deviations for October, November, and December. They were 2.1 percent, 2.5 percent, and 0.5 percent in 1977, 1978, and 1979, respectively. The fourth-quarter deviations were 1.7 percent, −1.3 percent, and 4.5 percent in 1980, 1981, and 1982, respectively.

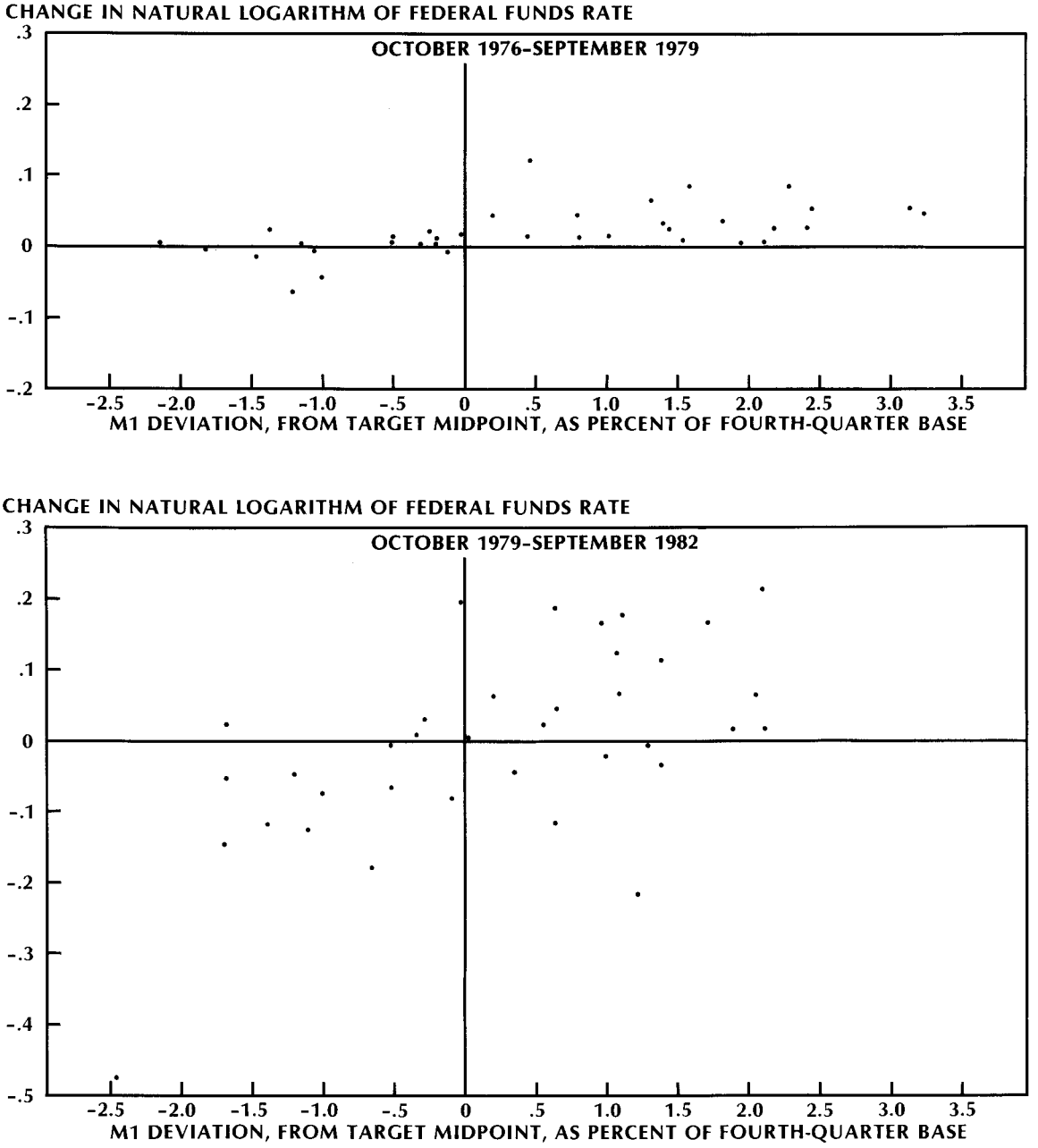
Some ambiguities arise because the reserve-based procedure was in effect during three months of 1979 and not in effect during at least three months of 1982. The close achievement of the M1 target in 1979 may partly reflect restrictive actions taken under the reserve-based procedure, and the large overshoot in 1982 may reflect relaxation of adherence to the M1 target by October, possibly even a month or two earlier. That relaxation occurred because strict adherence to the target appeared inconsistent with the ultimate objectives of policy. In view of the ambiguities, it is difficult to reach any strong conclusions about whether the reserve-based procedure was accompanied by greater or less success in reducing fourth-quarter deviations.

In contrast to the similarity in the range of money deviations from target, the range of movements in the interest rate measure was considerably wider. More interesting, a given money deviation tended to be associated with a larger interest rate movement,

7. $\{M1_i - B[1 + g(i+1)/12]\}B^{-1} \times 100$, where B is the previous year's fourth-quarter average of M1, i is the month ($i = 1, 2, \ldots, 12$), and g is the midpoint of the target growth range (for example, .04 for 1982).

Chart 3

Money Deviations and Changes in Federal Funds Rate



SOURCE OF PRIMARY DATA: Board of Governors, Federal Reserve System.

as inspection of Chart 3 suffices to suggest. Regressions of the proportional change in the funds rate on the money deviation summarize this difference:

October 1976–September 1979

$$r_t = \underset{(.005)}{.014} + \underset{(.0033)}{.0138}\, M_t + u_t + \underset{(.17)}{.06}\, u_{t-1}.$$

$\bar{R}^2 = .35$; standard error of equation = .030.

October 1979–September 1982

$$r_t = \underset{(.026)}{-.020} + \underset{(.0180)}{.0709}\, M_t + u_t + \underset{(.16)}{.30}\, u_{t-1}.$$

$\bar{R}^2 = .32$; standard error of equation = .106.

In these equations, r is the change in the natural logarithm of the Federal funds rate; M is the deviation of M1, from the midpoint of the annual target range, as a percentage of the fourth-quarter base; u is an error term; and t is a monthly time subscript. Figures in parentheses are standard errors.

For reasons to be explained in the next section, the relation between money deviations and interest rate movements cannot be interpreted strictly as the result of policy. Nevertheless, the contrast across periods in the slope of the observed relation is a substantial indication that policy exerted more aggressive efforts to control the money stock in the period after October 1979.

. . . and its movements were linked more immediately to money growth

The policy-induced response of the Federal funds rate to money fluctuations has the primary influence on the statistical relation, represented by the regression equation, that expresses changes in the interest rate as dependent on current and past money growth:

$$r_t = c + \sum_{i=0}^{k} a_i\, m_{t-i} + e_t,$$

where r = Δln(Federal funds rate)

m = Δln(M1, seasonally adjusted)

e = an error term

t = a monthly time subscript;

c and a_i are coefficients to be estimated. This regression specification allows a useful comparison of the speed and strength of funds rate adjustments to changes in the money stock before and after the October 1979 policy shift.

The statistical relation here cannot be regarded as an adequate characterization of monetary policy. The observed relation reflects not only policy but also money demand behavior and disturbances in the reserve market. The relation is a biased measure of the policy-induced response of interest rates to money fluctuations: the a_i coefficients from the regression will tend to be lower than the actual response because of the problem of simultaneity bias.[8] Unfortunately, there is no satisfactory means of correcting this bias or of quantitatively assessing it.[9]

The magnitude of the bias is greater the more unstable is the true interest rate response relation compared with the money demand relation and the greater are the true interest rate response coefficients. Both of these considerations suggest that the estimated coefficients were likely subject to greater, rather than less, bias in the post-October 1979 period than in the earlier period. The effect on the bias of a changed responsiveness of money demand to interest rate changes is harder to assess. Furthermore, if that responsiveness actually did change from one sample to the next, the direction is ambiguous.

Consequently, the presumption is that the magnitude of the bias was larger in the later period, so any estimated increase in the coefficients after the change in policy probably understates the actual increase in systematic responses to money fluctuations. One not entirely satisfactory method of reducing the bias constrains to zero the current money growth coefficient. That coefficient may, under reasonable assumptions, be the most biased. Under more restrictive conditions,[10] the constraint

8. A discussion of simultaneity bias is found in G. S. Maddala, *Econometrics* (New York: McGraw-Hill Book Company, 1977), notably least-squares bias, 242–51.

9. The intractability of the bias problem for estimates of the money demand relation, which is analogous in many ways to the problem at hand, is shown by Thomas F. Cooley and Stephen F. LeRoy, "Identification and Estimation of Money Demand," *American Economic Review* 71 (December 1981): 825–44.

10. Sufficient conditions are that the funds rate is predetermined a month in advance and there is no autocorrelation present in

REGRESSIONS OF FEDERAL FUNDS RATE ON M1 GROWTH

$$\Delta \ln(\text{Federal funds rate})_t = c + \sum_{i=0}^{12} a_i \Delta \ln(M1)_{t-i} + e_t$$

Variable	Oct. 1976–Sept. 1979	Oct. 1979–Sept. 1982	Oct. 1976–Sept. 1979	Oct. 1979–Sept. 1982	Oct. 1980–Sept. 1982	Using shift-adjusted M1[1] Oct. 1979–Sept. 1982
Constant	-.21**	-.30***	-.18**	-.24***	-.18*	-.25***
Coefficients on M1 growth						
Current	1.4	3.5			2.0	2.3
Lagged						
1 month	3.7	11.4***	3.0	12.0***	6.2*	12.5***
2 months	3.2	10.5***	2.6	9.1***	8.6**	9.2**
3 months	2.2	5.8*	2.0	5.8*	5.7*	5.5*
4 months	4.7**	4.1	4.6**	2.3	2.9	2.7
5 months	6.0**	2.2	5.6**	2.4	.6	2.5
6 months	5.3**	6.8**	4.9*	5.4*	4.0	6.8**
7 months	5.3**	-.4	5.0*	-.6	-1.7	.3
8 months	2.1	1.6	1.7	.6	-.6	1.9
9 months	1.3	2.4	1.2	2.6	.9	4.1
10 months	1.8	3.8	1.7	2.7	4.1	3.4
11 months	-1.1	.9	-.6	.2	-.3	.7
12 months	1.3	5.6*	1.5	4.9*	.6	5.4*
Sum of M1 growth coefficients	37.2***	57.9***	33.3***	47.5***	32.8*	57.4***
Standard error	9.7	12.9	8.3	11.3	11.4	11.0
$\bar{R}^2$	.38	.68	.39	.66	.78	.69
Standard error of equation	.0277	.0770	.0274	.0793	.0534	.0758
DW	2.12	1.90	2.02	2.13	2.03	1.85

1. Adjusted for impact of nationwide introduction of NOW (negotiable order of withdrawal) accounts in 1981.

NOTE: In the presence of simultaneity bias, the significance levels and standard errors are not strictly valid for the true, policy-induced relation; * indicates significance at the .05 level, ** at the .01 level, and *** at the .001 level.
$\bar{R}^2$ is the coefficient of determination adjusted for degrees of freedom.
DW is the Durbin-Watson autocorrelation test statistic.

SOURCE OF PRIMARY DATA: Board of Governors, Federal Reserve System.

eliminates bias altogether.

Regressions with lag lengths ranging up to 12 months were estimated because the correct lag length is not known *a priori*. Only the 12-month lag specifications are reported here, and they are representative in terms of the conclusions drawn. There is no particular reason to expect the coefficients to be a "smooth" function of the lag, so no restrictions have been placed on them. Results are presented in the accompanying table.

The relationship between money growth and changes in the funds rate in the following three months became stronger after the change in policy. Also, money growth accounted for a larger proportion of the monthly variation in the funds rate. The result most favorable to the reserve-based policy is the more immediate link between money growth and funds rate changes in the three years after October 1979, as seen by comparing the first and second columns of the table. The coefficients on the current and first three lagged money growth rates increased quite substantially, while coefficients on money growth lagged four to seven months generally declined. The sum of the coefficients increased after October 1979, but the difference was insignificant at the .05 level. These results are preserved if the current money term is dropped from the regressions, as shown in the third and fourth columns.

Hypothesis tests for stability of the coefficients characterizing the observed relationship indicate a significant change, at the .01 level, in the regression coefficients taken collectively.[11] It must be emphasized that such tests are not strictly valid as tests of the stability of the policy-induced response in the presence of simultaneity bias. A similar caveat applies to the significance levels of individual regression coefficients indicated in the table.

The random element in the observed relationship (which is suggestive of the random volatility of the Federal funds rate), measured by the standard error of the equation, rose by a factor of nearly 3. Nevertheless, the proportion of total variation of the funds rate statistically related to money growth, measured by $\bar{R}^2$, actually rose for each lag length specification. This latter result is particularly favorable to the reserve-based procedure, because it suggests that much of the increased volatility of the funds rate represented purposeful responses.

The results obtained generally hold up if the turbulent first year of the new procedure is dropped from the regression sample. The regression coefficients typically decline, but the measures of goodness of fit indicate a closer relation (compare the fifth column with the second column). If M1 data for 1981 are adjusted for the impact of shifts of funds to NOW accounts (last column), there is no systematic increase or decrease in the coefficients or measures of the closeness of the relationship compared with the regression using unadjusted data. Most important, neither modification of the regression alters the result that the funds rate typically changed more rapidly in the wake of money fluctuations under the reserve-based policy.

Subject to the caveats enumerated above, the results in the table can be interpreted as follows. The new procedure speeded the adjustment of the funds rate to changes in the quantity of money, with a substantially greater response during the first three or four months. The total response may also have increased but not after the first year of the new procedure. Despite the greater random volatility of the funds rate under the reserve-based strategy, the proportion of the rate's total variance that represented systematic response to money increased. These results are insensitive to whether M1 is shift-adjusted, and there is little evidence uncovered here to help choose between M1 and shift-adjusted M1 specifications. The policy shift apparently constituted a substantial change in monetary policy, with significant implications beyond the short run.

The reserve-based procedure facilitated more aggressive responses to money growth

The characteristics and relative usefulness of any policy procedure generally depend on the economic environment, the regulatory and institutional setting,

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the disturbance term of the (true) funds rate equation. Although neither condition is very credible, those who would accept them will be interested in the results reported for regressions that exclude the current money term.

11. The *F* statistic used in the test is a variant of that described by Gregory C. Chow, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," *Econometrica* 28 (July 1960): 591–605. In the variant used, the stability of c and the a_i coefficients, taken collectively, was tested. Correction was made for heteroscedasticity of the errors across periods.

and the nature and scope of discretionary actions.[12] Because there is no strategy that insulates the objectives of monetary policy from all types of economic disturbances, changes in the economic environment motivate periodic alterations in policy procedures. The October 1979 change from the Federal funds rate to reserve measures as the primary guide for open market policy facilitated the provision of superior protection against inflation and persistent fluctuations in the money stock. The substantially more rapid responses of the Federal funds rate suggested by observed relationships, as well as the comparable range of deviations in M1 from the annual target midpoint in the face of inherently greater instability, suggest that such protection was provided. Thus, the reserve-based procedure facilitated the strategy of gradually reducing inflation by slowing the rate of monetary expansion.

In the current economic environment, accelerating inflation does not appear to be an immediate prospect. The relation between money growth, particularly M1 growth, and ultimate concerns such as inflation and real activity has become less reliable and predictable, partly because of the rapid pace of depository institution deregulation. Consequently, policy has rightly placed somewhat less emphasis on M1 and more on the broader aggregates and other financial and economic indicators.

Conditions in the future may call for a renewed emphasis on reserves and M1. Efforts are being pursued to improve the ability of a reserve-based procedure to deliver monetary control without undue interest rate volatility, if and when necessary. Among the more important of these efforts are the reimposition of contemporaneous reserve requirements on most transaction balances, the phase-in of uniform reserve requirements among institutions, and the reduction of float.[13]

12. For an extensive analysis of the effect of different economic disturbances, regulatory and institutional factors, and discretionary actions on monetary control under alternative operating procedures, see Hoehn, "Monetary Instrument and Lagged Reserve Accounting." A shorter analysis of lagged reserve requirements is found in Bennett T. McCallum and James G. Hoehn, "Instrument Choice for Money Stock Control with Contemporaneous and Lagged Reserve Requirements," *Journal of Money, Credit, and Banking* 15 (February 1983): 96-101.

13. See Kenneth J. Kopecky, Darrel W. Parke, and Richard D. Porter, "A Framework for Analyzing Money Stock Control Under the Monetary Control Act," *Journal of Economics and Business* 35 (June 1983): 139-57.

Deregulation and Deposit Insurance

*By Eugenie D. Short and Gerald P. O'Driscoll, Jr.**

Banks, thrifts, and other financial institutions have been experiencing severe strains. Public attention has focused on these problems, and their severity raises long-term questions about the institutional environment that motivated financial institutions to undertake what appears to have been excessive risk.

These financial sector problems emerged in an era of partial deregulation. Accordingly, it is important to examine whether they resulted from increased freedom gained in the deregulation process or from policies left over from the era of binding regulation. Analysis of this issue helps determine the long-run implications of financial deregulation. This article suggests that deregulation alone is not responsible for current financial sector difficulties. Rather, new banking freedoms, coupled with the existing deposit insurance system, have contributed to present problems.[1]

The policies and procedures of the Federal Deposit Insurance Corporation (FDIC) are analyzed here. In agreement with earlier work on the subject, this article concludes that FDIC insurance provides banks with an incentive to incur more risk than they would in its absence.[2] The FDIC charges a fixed

* *Eugenie D. Short is a senior economist and assistant director of research at the Federal Reserve Bank of Dallas. Gerald P. O'Driscoll, Jr., is a senior economist at the Federal Reserve Bank of Dallas. The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.*

1. For a more thorough discussion of the causes of recent financial stress, see Eugenie D. Short and Gerald P. O'Driscoll, Jr., "Deposit Insurance and Financial Stability," *Business Forum* 8 (Summer 1983): 10–13. In that article we note various factors, including cyclical instability and changes in monetary policy procedures, that were operative in generating financial instability.

2. The problem is analyzed in the following recent articles and papers: John H. Kareken, "Deregulating Commercial Banks: The Watchword Should Be Caution," *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring–Summer 1981, 1–5; Mark J. Flannery, "Deposit Insurance Creates a Need for Bank Regulation," *Business Review*, Federal Reserve Bank of Philadelphia, January/February 1982, 17–27; George J. Benston, "Deposit Insurance and Bank Failures," *Economic Review*, Federal Reserve Bank of Atlanta, March 1983, 4–17; and John H. Kareken, "The First Step in Bank Deregulation: What About the FDIC?" *American Economic Review* 73 (May 1983): 198–203.

premium for deposit insurance without regard to the riskiness of bank portfolios—a policy that effectively insulates banks from the full cost of incurring risk. The FDIC has recently proposed a system of premiums that would vary with risk,[3] but this system is not likely to price risk accurately.

This article elaborates the advantages of competitive provision of deposit insurance and describes a plan for bringing about a competitive system. The plan draws upon the experience of Federal Reserve banks in implementing competitive pricing of check-clearing services. It has long been recognized that insurance premiums should vary with risk, but only recently have contributions offered a means by which a system of competitive deposit insurance could be implemented.[4]

FDIC insurance: goals and effects

Federal deposit insurance was authorized by the Banking Act of 1933 in order to restore public confidence in the U.S. banking system. The primary objective of deposit insurance has been to maintain financial stability by forestalling deposit runs on commercial banks. This has been accomplished by allaying depositors' fears of capital loss from bank failure. It has also satisfied a related but secondary objective of protecting small depositors.

Despite initial concerns to the contrary, the federal deposit insurance system has worked remarkably well. Together with the federal regulatory system, the FDIC reduced the number of bank failures and virtually eliminated depositor loss. The total number of insured bank failures since 1933 has not greatly exceeded the average number of bank failures in any single year during the 1920's and is far below the failure record in the depression era of the early 1930's. Moreover, between 1933 and 1982, nearly 99 percent of all deposits in insured banks that failed were recovered by depositors.

The FDIC was created, however, as one component of financial legislation, most of which imposed restrictions on bank activity in order to constrain risk taking. Banks were prohibited, among other things, from underwriting corporate securities, paying interest on demand deposits, and paying interest on savings and time deposits in excess of allowed limits. Asset and liability constraints, restrictive chartering policies, and limits to geographic expansion were intended to ensure safe banking by reducing competition. Incentives provided by deposit insurance to undertake excessive risk were thus partially offset.

The era of binding regulation continued through the early 1960's. By the middle 1960's, however, financial innovation and technological change initiated a period of gradual or *de facto* deregulation. As regulations were removed or circumvented, FDIC insurance played an increasingly important role in insulating insured banks from the full cost of accepting additional risk. The regulatory restraints on risk taking were weakened, but market discipline was not effectively introduced to take their place.

By law, the FDIC protects deposit accounts up to $100,000 at insured institutions. But the usual manner in which the FDIC settles failed banks has provided *de facto* 100-percent insurance coverage to most depositors and general creditors. This refers to the purchase and assumption (P&A) policy used by the FDIC. In these transactions all liabilities, including uninsured deposits, are transferred to an assuming bank. If accomplished overnight, a P&A transaction avoids any interruption in the availability of funds to a depositor. Depositors are therefore more willing to place funds at troubled institutions with little or no risk premium.[5]

Normally, investors require compensation for assuming additional risk. Conversely, if they are less

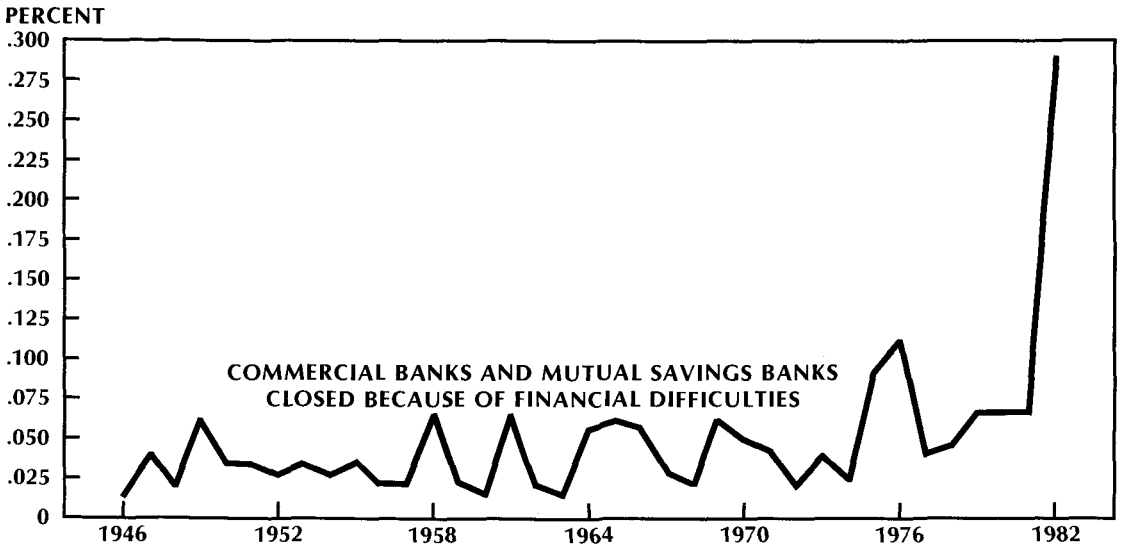
3. In *Deposit Insurance in a Changing Environment: A Study of the Current System of Deposit Insurance Pursuant to Section 712 of the Garn-St Germain Depository Institution Act of 1982, Submitted to the United States Congress by the Federal Deposit Insurance Corporation* (Washington, D.C.: Federal Deposit Insurance Corporation, April 1983). See also Federal Home Loan Bank Board, *Agenda for Reform: A Report on Deposit Insurance to the Congress from the Federal Home Loan Bank Board* (Washington, D.C.: Federal Home Loan Bank Board, March 1983).

4. For some alternative approaches, see the following papers in *Proceedings of a Conference on Bank Structure and Competition*, May 2-3, 1983 (Chicago: Federal Reserve Bank of Chicago, forthcoming): Evelyn F. Carroll and Arthur J. Rolnick, "After Penn Square: The Insurance Dilemma," and Edward J. Kane, "A Six-Point Program for Deposit-Insurance Reform." Also relevant is Catherine England and John Palffy, "Replacing the FDIC: Private Insurance for Bank Deposits," *Backgrounder*, Heritage Foundation, no. 229 (2 December 1982).

5. "Since the FDIC began operations, some portion of failed bank situations have been handled in ways that have provided *de facto* 100 percent insurance coverage to all depositors and general creditors. . . . Especially in large banks, there probably

Chart 1

Bank Failures as a Percentage of All Banks



SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census.

exposed to capital loss, they are satisfied with a smaller pecuniary return. With FDIC insurance, banks with riskier portfolios pay less for deposits than they would pay in the absence of deposit insurance. Thus, less conservatively run banks can assume greater risk in anticipation of earning larger profits for stockholders. If they pay more for funds, this premium is not proportional to the risks being incurred.

Because the FDIC insurance subsidizes risk taking, insured institutions can engage in more of it than would otherwise be the case. This increases the FDIC's potential exposure to loss and, at one remove, taxpayers' liability. Excessive or undercompensated risk also decreases the stability of the financial system, producing undesirable consequences for other institutions and individuals. The sharp increase in bank failures last year (Chart 1) underscores the problems caused by excessive risk taking. Although partly reflecting cyclical factors, the magnitude of the increase suggests that structural changes have occurred.

Moral hazard and pricing insurance

At present, the FDIC charges a premium of one-twelfth of 1 percent of all domestic deposits at each insured institution. This pricing scheme generates a particular kind of negative externality, one known as "moral hazard."

Competitively supplied insurance is priced on the basis of the probability of claims by covered policyholders. The insurer initially bases his premium on the unavoidable or irreducible risk of a loss. Actual or observed losses, however, are the result of both unavoidable risk (for example, hail damage to a house) and human decisions (for example, failure to take ordinary precautions against hail damage). The latter type of risk tends to increase if an individual is insured against loss. Because provision of insurance alters the insured's behavior, the insurer's exposure to loss is over and above what he anticipated in setting rates.

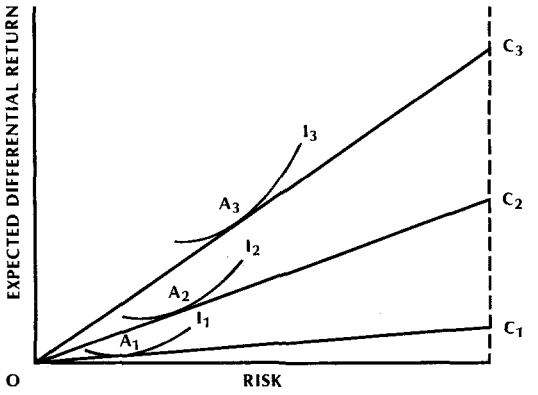
is the perception among depositors of minimal risk of loss, and therefore there are few incentives to choose between banks based on financial condition" (FDIC, *Deposit Insurance in a Changing Environment*, chap. 1, p. 1).

Box A

Risk-Reward Trade-off and FDIC Subsidy

The impact of the FDIC subsidy on bank behavior can be analyzed using a graphical representation of risk-reward trade-offs motivating bank behavior. In the following analysis, Professor James Tobin's model of liquidity preference (a construct quite familiar to most students of monetary theory) is used to illustrate the effect of FDIC insurance on bank asset portfolio decisions.[1] The model is applied to the risk and return trade-offs confronting a representative bank.[2]

Figure 1
Risk-Reward Trade-off



A financial firm's risk-reward choice is illustrated in Figure 1. OC_1, OC_2, and OC_3 are opportunity loci, which show the rate at which the firm can obtain a higher expected yield for a given risk incurred. I_1, I_2, and I_3 represent a set of indifference curves for the representative firm. Each curve maps combinations of expected return and risk that leave the firm at an equal level of utility. The indifference curves have a positive slope because the representative firm is assumed to be a risk avoider, implying that the firm will accept higher levels of risk only if it receives higher returns; and curves are concave from above, implying that individuals demand increasing amounts of additional return as they assume additional risk.

Higher indifference curves reflect higher levels of utility. Tangency points between the opportunity loci and the utility curves represent the amount of risk and expected differential return that a firm chooses, given the available opportunities and cost constraints it faces.

For simplicity, it is assumed that the firm can choose between two types of assets: riskless and risky. U.S. Treasury bills may be thought of as constituting the riskless asset; T-bills involve no risk of default. In addition, financial institutions can avoid interest-rate risk by hedging or matching asset and liability maturities. A firm operating at the origin (O) would be holding a portfolio of completely matched or hedged Treasury securities. Risky assets can be defined as those assets subject to credit or interest-rate risk.

For purposes here, it is sufficient to represent a risk characteristic that the financial firm cannot alter once

1. James Tobin, "Liquidity Preference as Behavior Towards Risk," in *Monetary Theory and Policy: Major Contributions to Contemporary Thought*, ed. Richard S. Thorn (New York: Random House, 1966), 178–204.

2. Tobin applied the model only to the case of interest-rate risk—the risk of capital loss (or opportunity for capital gain) resulting from interest-rate fluctuations. Financial institutions also are subject to financial loss from default. Loan losses can be capitalized, which occurs if a nonperforming loan is partially written down on the institution's books or if the institution sells the loan at a discount. For conventional loans this would result in capital losses; there are no capital gains from higher than expected payments. Loans are now being written, however, with equity-participation features. These loans are symmetrical in their risk of loss and opportunity for gain. Savings and loan associations already have the power to book such loans. Banks can do so through parent holding company subsidiaries. Moreover, for straightforward equity assets, there is perfect symmetry between the risk of capital loss and the opportunity for capital gain.

the asset has been acquired. The firm can vary the riskiness of its portfolio, however, by changing the proportion of risky assets it holds. As the firm acquires a higher proportion of risky assets, its portfolio becomes riskier, and conversely. Firms are compensated for assuming more risk by higher expected earnings. This is shown by the positive slope of the OC_i lines.

Given the representative firm's risk preferences reflected by the utility map I_i, as opportunities (the opportunity loci) change, firms will choose different expected differential risk-return combinations. If the locus is OC_1, firms will choose the combination given by A_1, which is the tangency of I_1 and OC_1. Similarly, for OC_2, A_2 will be chosen; and for OC_3, A_3 will be chosen.

The slope of the opportunity locus can change either because of a change in the differential between interest rates on riskless and risky assets or because of a change in the degree of riskiness of the risky assets. Consider the case of a *decrease* in the riskiness of risky assets. Graphically, this change translates into a rotation of the opportunity locus; the OC locus becomes steeper. Thus, the expected rate differential between risky and riskless assets will be higher for any additional risk incurred after the change than before it. Given the firm's risk-reward preferences, as the opportunity locus becomes steeper, the firm will increase the proportion of risky assets held in its portfolio. The new equilibrium position will be to the northeast of the old.[3] For the mathematical derivation of this graphical analysis, see the Appendix.

The analysis can be used to illustrate the effect of the present system of deposit insurance on portfolio choices made by banks. Let OC_1 be a reference point, reflecting a representative bank's desired trade-off between risk and reward before the introduction of FDIC insurance. The introduction of FDIC insurance allays depositors' fears about the riskiness of the bank's asset portfolio. With depositors protected from financial loss by insurance, the expected differential return from incurring more risk is increased for the bank. This is reflected by a rotation of the opportunity locus in Figure 1 from OC_1 to OC_2. OC_2 then becomes the relevant constraint to the bank, even though OC_1 is the actual market trade-off between risk and return. By altering the opportunity locus the firm faces, FDIC insurance induces the bank to behave as if risk of loss has decreased. Hence, the bank is willing to incur more risk than it would if risk were priced according to market costs.

With FDIC insurance, depositors do not send, nor does the bank receive, relevant price signals about the added return (risk premiums) that would have been required to compensate depositors for the added risk incurred. Similarly, since FDIC premiums on deposit insurance are unrelated to risk, insured banks do not receive signals from insurance premiums that reflect the incremental cost of incurring additional risk.

In the era of binding regulation, regulators were better able to constrain excessive risk taking by nonmarket controls. In the era of *de facto* deregulation, banks gained powers that induced them to take advantage of the subsidy to risk taking provided by FDIC insurance. As banks move into an era of *de jure* deregulation, this process will accelerate. If the representative bank is now operating at A_2, it will move to some point like A_3. So long as bank deposits are insured under the present system, the insured institution will tend to underestimate the cost of incurring additional risk. In the aggregate, these actions will tend to destabilize the financial system.

3. This result depends upon the conventional assumption that substitution effects dominate income effects in economic decisionmaking. In the relevant range, as OC becomes steeper, tangencies with indifference curves occur to the northeast of previous equilibrium positions.

Insurance companies attempt to avoid or control moral hazard in a number of ways. Aside from attempting to control policyholders' activities directly, insurance companies rely on four pricing policies to avoid the moral hazard problem. First, an insurance company may require the policyholder to coinsure, by assuming some of the risk and sharing the losses. (For example, many medical benefits cover only 80 percent of expenses.) The insured party has an incentive to adopt precautionary measures to avoid losses. Second, the insured may be subject to a deductible amount on each loss or on the total losses in a year. The rationale is similar to that for coinsurance: to induce the insured to avoid losses. Third, insurers charge more for high-risk than for low-risk coverage. (For example, sky divers and race-car drivers pay more for accident and liability insurance than do bankers and accountants.) The insured accordingly has a pecuniary incentive to curtail or control his exposure to risk. Fourth, insurers place an upper bound on their coverage, limiting their exposure to moral hazard.[6]

The FDIC uses none of these pricing techniques to avoid moral hazard. There is no coinsurance. At least up to statutory limits, coverage is 100 percent of losses. In practice, until the Penn Square National Bank failure, there was 100-percent coverage of deposits at larger institutions. There is no deductible amount, and the insurance premium is unrelated to risk. Finally, there are no stated limits on FDIC liability to a covered institution. Because failing institutions frequently increase their liabilities significantly just before being closed, the FDIC's loss is exacerbated.

The FDIC's primary control mechanism has been to rely on regulation and supervision to constrain bank behavior. In the era of binding regulation, restrictions existed on both the asset and the liability side of banks' balance sheets. Entry restrictions (McFadden Act), limitations on costs (Federal Reserve Regulation Q), and asset restrictions (Banking Act of 1933) combined to restrain risk taking. In the context of this regulatory environment, the FDIC was able to minimize the losses that would otherwise have been generated by its pricing of deposit insurance. Regulation served as a substitute for direct pricing of risk.[7]

Banking is now being formally deregulated, but for nearly two decades entrepreneurial innovation has been diminishing the effectiveness of regulations. In the process, banks have accepted both more interest-rate and more credit risk. Current financial problems suggest that excessive risk was undertaken, in part because deposit insurance did not change with the regulatory environment. As regulations were removed or circumvented, banks were able to take advantage of the FDIC subsidy to risk taking. Moreover, as we move into an environment of *de jure* deregulation, the potential for incurring even greater exposure to risk is likely to increase.

This analysis does not suggest that the risk-reward choices made by bankers were irresponsible or inept. The decisions made reflect rational behavior. Bankers responded to the incentives to incur additional risk that were provided by deposit insurance. If incentives were appropriately changed, behavior would also change. This point is emphasized in the discussion in Box A.

The FDIC's proposal for pricing deposit insurance

The FDIC has proposed specific changes in the deposit insurance system. With regard to the direct pricing of insurance, the agency recommends a system of variable-rate premiums based on three risk categories: normal, high, and very high.[8] The system would rate capital adequacy and exposure to credit and interest-rate risk. The FDIC has divided the categories so that the vast majority of banks would be classified as normal. At least initially, these banks would pay the same effective premium as they do under the current system. The high risk category would consist of banks with high exposure to either interest-rate or credit risk. The very high

6. "Insurance, Risk and Resource Allocation," in Kenneth J. Arrow, *Essays in the Theory of Risk-Bearing* (Chicago: Markham Publishing Company, 1971), 142-43.

7. In a real sense, the alternative is either regulating behavior or pricing risk. Compare Kareken, "First Step in Bank Deregulation."

8. The FDIC has also proposed using either a modified payout approach or coinsurance when settling failed institutions, rather than relying extensively on purchase and assumption transactions. Among other suggestions, the agency recommends providing some additional information on the financial conditions of FDIC-insured institutions. For details, see *Deposit Insurance in a Changing Environment*, chaps. 3, 4.

risk class would include banks with high exposure to both interest-rate and credit risk. Institutions with dangerously low capital ratios would also fall into the very high risk class.

The FDIC now normally rebates 60 percent of the premium after deducting operating expenses for the year. Banks in the normal category would continue to receive the full rebate. Banks in the high risk category would lose half the rebate, while institutions in the very high risk category would forfeit the entire rebate. The effective premium, then, increases for banks in successively riskier categories. Based on past experience, the effective cost of not receiving FDIC rebates would only amount to an incremental increase of 2½ to 5 basis points in funding costs. By itself, this is unlikely to have a noticeable impact on behavior.

The FDIC proposes implementing a feature of competitively supplied insurance—a variable-rate pricing scheme—without the benefit of market competition. Where markets exist, categorization and pricing of risk evolve from competitive interaction among suppliers and demanders of insurance. In terms of resource allocation, the FDIC faces the calculation problem of seeking the "right" price in the absence of a market. Without a market test, however, the agency has almost no basis on which to decide the correctness or appropriateness of its premiums. Competitive markets not only define the meaning of prices but also reveal the degree of appropriateness of prices. They do this by the profit-and-loss test. If firms cannot calculate profits, they cannot price consistently. Accordingly, they cannot even approximate a market test.

Failure to resolve the FDIC's pricing problem could have deleterious long-run consequences. Without a market test, all that can be ascertained is whether the FDIC has severely underpriced risk. And this can only be revealed after the fact. Moreover, if there is an institutional bias, it is toward underpricing risk.[9]

An alternative proposal: a competitive system of deposit insurance

In what follows, a transition program to move to a competitive system of deposit insurance is developed. The proposal recognizes that private insurance companies currently are not in a position to provide a substantial portion of deposit insurance,[10] but an environment can be established that would enable firms to enter gradually as competitors to the FDIC. During the transition phase the FDIC would remain the dominant provider of deposit insurance. Thereafter, it would likely be one among the competitive insurers of deposits.

A number of different policy changes could be introduced to foster competition. Four changes are suggested here. The first one is possibly the most important change. It alone would probably be sufficient to enable private firms to offer deposit insurance. Moreover, even if policymakers do not wish to foster a competitive deposit insurance system, the first and third policy recommendations would reduce moral hazard.

1. Eliminate *de facto* coverage of deposits above statutory limits; reduce coverage limits; introduce some form of coinsurance.
2. Eliminate the statutory requirement that nationally chartered and state-chartered member banks, as well as banks in bank holding companies, purchase deposit insurance from the FDIC.
3. Require the FDIC to utilize the best available information to determine risk categories; require that these risk classifications be used to set premiums that minimize cross-subsidization among risk categories.
4. Require the FDIC to cover costs plus earn a reasonable return on capital.

The first policy change is needed to price risk more appropriately and to attract private firms to the deposit insurance business. The policy of providing *de facto* 100-percent coverage to all depositors not only has lessened market discipline on banks but also has effectively precluded any market for excess deposit insurance. The market for excess coverage (that is, coverage on deposits in excess of FDIC limits) is probably the most likely place for private competitors to enter. The scope

9. The FDIC has suggested that "standards should be set to minimize the extent to which errors of overpricing risk occur" (*Deposit Insurance in a Changing Environment*, chap. 2, p. 5). If the problem of overpricing is minimized, there will be a bias toward underpricing. For elaboration, see Eugenie Dudding Short and Gerald P. O'Driscoll, Jr., "Deposit Insurance in a Deregulated Financial Environment: The Case for Reform" (Federal Reserve Bank of Dallas, Research Department, Dallas, Tex., August 1983, Photocopy), 13-14.

10. See FDIC, *Deposit Insurance in a Changing Environment*, chap. 7, p. 5.

for competition would be increased by lowering maximum deposit limits on existing FDIC coverage.

In offering excess coverage, private insurers would price insurance to reflect expected losses. Risk would thereby be priced on the margin. In addition, basic FDIC coverage could be altered to include some form of coinsurance. For example, coverage could be reduced to 80 percent of losses. This too would reduce the moral hazard problem by encouraging risk to be priced more accurately at the margin. The growing practice of offering FDIC-insured deposits through money brokers underscores the need for introducing either coinsurance or a deductible amount in deposit coverage. Brokers can economically package accounts as small as $1,000, so reducing the limits of basic coverage alone will not eliminate the problem. Forbidding the brokering of funds, if not infeasible, certainly would involve a reversal of deregulation policy. It would also be largely ineffective, as banks themselves now aggressively sell deposits directly in a nationwide market.

After substantial experience with excess coverage, some companies might choose to compete with the FDIC in providing minimum or basic insurance for depositors. The second policy change would open the market for basic insurance coverage. At present, private deposit insurance is not prohibited by any federal or state statute. But nationally chartered and state-chartered Federal Reserve member banks, as well as banks associated with bank holding companies, are required to purchase FDIC insurance. When coupled with FDIC's *de facto* provision of 100-percent coverage, this requirement eliminates incentives for banks to obtain private insurance. If broad-based coverage by private insurers is to develop, the requirement would have to be eliminated.

The third change is motivated by the FDIC's reluctance to use the CAMEL rating system to determine risk classifications for deposit insurance. The rating system is used to rank banks on a 1-to-5 scale in five categories: capital, assets, management, earnings, and liquidity. The FDIC uses CAMEL in its bank supervision process but is reluctant to use it to price deposit insurance. Its reluctance derives from the agency's concern that insured institutions would have no recourse to alternative providers of deposit insurance. This problem stems from the FDIC's position as a monopoly provider of deposit insurance. It is aggravated by the FDIC's regulatory role, which

Box B

Illustration of the Effects of Pricing Deposit Insurance

The effects of pricing deposit insurance are shown here for a hypothetical bank. Period 1 in the table predates any deposit insurance reform. The bank's position is revealed by its balance sheet, which is a simplified version of an actual financial balance sheet. The bank can invest in U.S. Treasury bills (T-bills), conservative loans, or risky loans; rates of interest earned on such assets are 8 percent, 10 percent, and 12 percent, respectively. The bank issues checking accounts, passbook savings accounts, and large certificates of deposit (purchased funds); interest rates paid on such accounts are 0 percent, 5 percent, and 8 percent, respectively. Net interest income is the difference between interest received and interest paid. Net interest is "profit," exclusive of noninterest expenses. In this example, insurance expenses will be treated as if they are interest expenses.

"Reform" consists of pricing risk at the margin. In Period 2, deposit insurance reform is introduced. It is assumed that depositors are now exposed to possible losses, at least at the margin. The effective cost of purchasing deposits (marginal funds) increases for the hypothetical bank. The effective cost may rise for either of two reasons (or both): the bank will pay a higher return to depositors for the additional risk to which they are exposed, or the bank will incur costs as a result of excess deposit insurance. These costs will be incurred because depositors are now taking into account the risk of loss. This, in turn, compels the bank to internalize more fully the cost of incurring additional risk. Private costs now more closely reflect social opportunity costs. The costs show up as reduced net interest income for the bank.

In Period 3 the bank adjusts its portfolio in order to reduce its interest expenses. It will reduce the percentage of risky loans in its portfolio so long as interest expenses fall more rapidly than earnings. In this example, net interest income rises again but remains $200,000 less than its level before reform. This difference represents the effects of subsidizing risk taking. Before reform, profits of the hypothetical bank were higher. The financial system, however, was less stable. The bank's portfolio adjustment reduces its exposure to loss. In the aggregate, changes made by individual institutions would improve the stability of the financial system.[1]

1. The analysis is simplified in several respects. The bank might also have chosen to alter its size as well as the composition of its assets. No consideration is given to overall effects on market interest rates. In a complete general equilibrium analysis, these and other effects would have to be considered.

EFFECT OF DEPOSIT INSURANCE REFORM ON A HYPOTHETICAL BANK

(Thousands of dollars)

Period 1. Before Reform

Assets		Liabilities	
Cash	5,000	Non-interest-bearing accounts	2,500
T-bills	15,000	Passbook savings	5,000
Conservative loans	10,000	Purchased funds	40,000
Risky loans	20,000	Capital and surplus	2,500
Interest earned		Interest paid	
T-bills (8 percent)	1,200	Passbook savings (5 percent)	250
Conservative loans (10 percent)	1,000	Purchased funds (8 percent)	3,200
Risky loans (12 percent)	2,400		
	4,600		3,450
		Net interest income	1,150

Period 2. After Reform

Interest earned		Interest paid	
T-bills (8 percent)	1,200	Passbook savings (5 percent)	250
Conservative loans (10 percent)	1,000	Purchased funds (10 percent)	4,000
Risky loans (12 percent)	2,400		
	4,600		4,250
		Net interest income	350

Period 3. After Portfolio Adjustment

Assets		Liabilities	
Cash	5,000	Non-interest-bearing accounts	2,500
T-bills	15,000	Passbook savings	5,000
Conservative loans	20,000	Purchased funds	40,000
Risky loans	10,000	Capital and surplus	2,500
Interest earned		Interest paid	
T-bills (8 percent)	1,200	Passbook savings (5 percent)	250
Conservative loans (10 percent)	2,000	Purchased funds (8 percent)	3,200
Risky loans (12 percent)	1,200		
	4,400		3,450
		Net interest income	950

can place the agency in an adversary position *vis-a-vis* insured institutions.

Robust information about risk is needed to price it accurately. A premium structure based on a system like CAMEL would more closely approximate risk differentials among insured banks than the proposed three-tier pricing system and would tend to reduce cross-subsidization.[11] Since the FDIC will remain the dominant provider of deposit insurance for banks in the foreseeable future, efforts should be made to minimize cross-subsidization by utilizing the best available information about banks' risk characteristics.

The fourth change also would help make competition feasible for both basic and excess deposit insurance coverage. Although the experience of public utility regulation suggests that it is difficult to determine a "normal" or "necessary" return on capital, some attempt must be made to set a required rate of return on FDIC operations. The problem is that if set too low, the FDIC's premiums would preclude entry. If set too high, the FDIC's premiums would act as an umbrella protecting private competitors. Entry would be restricted in the first case. In the latter case, private returns would be greater than normal in the short run, while in the long run too much entry would occur.

The suggested changes could be implemented by using the current system of pricing check-clearing services as a transition model. In the Monetary Control Act of 1980, the Congress mandated that the Federal Reserve System price its services, including check-clearing, with the aim of promoting competition with private firms. Federal Reserve banks have had to identify costs directly attributable to clearing checks. And they are required to earn a reasonable rate of return on imputed capital.

The judgment of Federal Reserve banks on their respective costs has not gone unchallenged. Nonetheless, the cost analysis used thus far has withstood criticism. A good deal of vigorous competition has developed.[12] The criteria and operating procedures used by Federal Reserve banks will presumably evolve over time in response to competitive pressures. This has already occurred in some respects. Any arbitrariness in cost and profit criteria can be lessened over time as evidence accumulates about competitive practices in the industry. The same process would operate for deposit insurance.

Feasibility of a private system

Concerns about the current deposit insurance system are broad based. The pricing problem is complex but not insoluble. Its apparent insolubility stems from the presumption that deposit insurance must be provided exclusively by a governmental instrumentality. It is the present conception of the problem, not the problem itself, that introduces obstacles to pricing risk.

For instance, some have suggested that while a single risk can be priced, the number and complexity of risks faced by banks defy any attempt at pricing them. Experience in other areas indicates, however, that this suggestion is not well-founded. A hypothetical case illustrates this point. Assume that the Federal Government had been the only provider of personal liability insurance. At some stage it became feasible for private insurers to enter, but the Government's below-cost pricing precluded entry. Concerns arose, however, about the Federal Liability Insurance Corporation (FLIC), which was not pricing risk correctly. The FLIC's reserve fund was being depleted, and fears were expressed that general revenue from the U.S. Treasury might be needed in the future to pay policyholder claims.

Most agreed that reform was needed. Yet the complexity of liability risks appeared to preclude market pricing. Pointing to the many types of risk exposure protected by personal liability, critics suggested that they could not be reduced to a single dimension.

In such a situation, however, the critics' conception would be at fault for assuming that the problem is to be solved by the FLIC or by any other single agency or firm. *A priori* pricing complexity is not an argument against market provision of a service but an argument in favor of it. Markets daily solve the theoretically intractable problem of

11. Cross-subsidization occurs if insurance premiums do not fully compensate the insurer for losses incurred by banks within a given risk category. By using a finer system of categorization, the FDIC can better group risks. This lowers the amount of cross-subsidization.

12. See Joanna H. Frodin, "The Effect of Fed Pricing on Private Clearing Arrangements for Checks," *Business Review*, Federal Reserve Bank of Philadelphia, January/February 1984.

allocating an indefinitely large number of goods, each with several dimensions, among numerous individuals in a world in which parameter values change in unanticipated ways.

With regard to the hypothetical example, private provision of personal liability policies does exist. A standard policy covers, among other things: liability arising from the operation of motor vehicles and watercraft (excess coverage); libel, slander, defamation, humiliation, or a publication or utterance in violation of a person's right of privacy; wrongful entry or eviction or other invasion of the right of private occupancy. Moreover, the policy distinguishes carefully among apparently similar risks. The price for a $1 million personal liability policy is generally between $50 and $100 per year.

The complexity of risks covered in a standard personal liability policy at least equals, if it does not exceed, the complexity of risks covered by deposit insurance. Moreover, private insurers already protect policyholders against even more exotic risks. Insurance against political risk can be purchased to protect a company's investments in foreign countries. Among other things, such a policy protects the insured against blockage of currency transfers by a foreign government, governmental abrogation of contracts, and arbitrary seizure of private property.

In addition, private insurers already provide extensive coverage over financial risk. The Municipal Bond Insurance Association, a consortium of five major insurance companies, provides an irrevocable insurance policy against default by insured governmental issuers of debt obligations. Private policies also are issued to cover financial loss from theft, mysterious disappearance of securities, and malfeasance by officers and directors. In fact, the FDIC itself is apparently relying on underlying private insurance policies to help finance bank mergers when an insured bank fails. To collect on underlying liability policies, the FDIC can sue officers and directors of the failed institution. Since private insurers are held liable for damages in such circumstances, they must assess the risk of bank failure.

In short, the market prices complex liability risks. Assessing credit risk is the market's forte. Those critical of private deposit insurance may argue that there is something unique about financial risks assumed by depository institutions, but private insurance already is part of the financial network protecting investors and depositors.

Conclusion

This article offers a transition model that could enable a private market for deposit insurance to emerge. The analysis suggests that such a system is feasible. Nonetheless, certain potential problems would have to be considered before introducing changes intended to permit competitive provision of deposit insurance. In particular, three related issues require further attention: the impact on bank failure, bank runs, and Federal Reserve policy. The article suggests that deposit insurance has enabled banks to incur more risk than would have occurred if risk were priced according to market costs. By lessening rational concerns of depositors about risk, deposit insurance may have made the overall banking system less stable. Reform is needed to reverse this trend.

Critics of reform are concerned about the negative impact that deposit insurance reform may have on a bank's ability to raise funds. Depositors' reaction to a poor insurance rating could involve sudden deposit withdrawals from the affected institution. In addition to the impact on the individual bank, this process could spill over to other banks. The liquidity issue requires more systematic analysis.

Finally, the ramifications of deposit insurance reform for Federal Reserve policy also require attention. Changes in the deposit insurance system may induce financial institutions to rely more heavily on Federal Reserve borrowings to meet funding needs. These three issues must be addressed before implementation of far-reaching changes.

In focusing on these issues, however, policymakers should not lose sight of the financial problems that have generated proposals for changing the deposit insurance system. Symptoms of financial sector weakness highlighted in this article underscore potential consequences of not changing the financial safety net mechanisms in a deregulated environment. In particular, conventional bank supervision no longer appears capable of controlling the moral hazard problem in banking. If the proposal for a competitive deposit insurance system outlined in this article were implemented, one facet of the problem would have been addressed.

Appendix

Derivation of Risk-Reward Trade-off

From Tobin, the derivation used in constructing the graphical analysis presented in Box A is as follows:

P_1 = proportion of riskless assets in the institution's portfolio

P_2 = proportion of risky assets in the institution's portfolio

r = current yield differential between risky and riskless assets

g = capital gain or loss

R = differential return on the institution's portfolio from investing in risky assets

$E(R)$ = expected differential return on the portfolio

σ_R = standard deviation of R

σ_g = standard deviation of g.

The following analysis focuses on the differential return earned on risky over riskless assets. The differential between riskless and risky assets is expressed as the rate r. R measures the differential return earned on the entire asset portfolio. The standard deviation is used as the risk measure. In equation 1 the differential return earned on the portfolio is specified

$$R = P_2 (r+g), \qquad 0 \leqslant P_2 \leqslant 1. \tag{1}$$

By assumption, g is a random variable with an expected value of zero. The expected return on the portfolio is

$$E(R) = \mu_R = P_2 r. \tag{2}$$

The standard deviation of the realized yield differential on the portfolio (R) depends on the standard deviation of g and on the proportion of funds invested in risky assets:

$$\sigma_R = P_2 \sigma_g, \qquad 0 \leqslant P_2 \leqslant 1. \tag{3}$$

From the above the terms on which a firm can obtain a higher yield differential at the cost of incurring additional risk can be derived. Since ($\mu_R = P_2 r$) and ($\sigma_R = P_2 \sigma_g$), we know that

$$\frac{\mu_R}{r} = \frac{\sigma_R}{\sigma_g} \quad \text{for} \quad 0 \leqslant \sigma_R \leqslant \sigma_g.$$

Hence,

$$\mu_R = \frac{r}{\sigma_g} \sigma_R. \tag{4}$$

Equation 4 describes the opportunity locus, or trade-off between risk and reward, for a firm. It is the equation for a ray, OC. This article focuses on changes in σ_g. As σ_g decreases or appears to decrease, decision-makers will confront a steeper OC line. A decrease in σ_g corresponds, for instance, to a movement from OC_1 to OC_2 or from OC_2 to OC_3.

Erratum

When equation 1 was printed in "Will Deregulating Natural Gas Increase Its Price to Consumers?" in the July 1983 issue of the *Economic Review*, page 2, the solidus was omitted:

$$(1) \quad P_d = \bar{P} + \pi = \left[\left(\sum_{i=1}^{n} P_i Q_i\right) \sum_{i=1}^{n} Q_i\right] + \pi.$$

The equation should read:

$$(1) \quad P_d = \bar{P} + \pi = \left[\left(\sum_{i=1}^{n} P_i Q_i\right) \Big/ \sum_{i=1}^{n} Q_i\right] + \pi.$$

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