

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

DIVISION OF MONETARY AFFAIRS

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**Date:** May 7, 1993  
**To:** Federal Open Market Committee  
**From:** Normand Bernard *VB*  
**Subject:** The Attached Confidential Material

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CONFIDENTIAL (FR)  
CLASS III - FOMC

The attached summary of a Systemwide research project is being given a Confidential (FR) Class III designation because of the references to a confidential memorandum and related discussion (see pages 2 - 4). The Committee's rules require that such information be withheld from public release for a period of five years.

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

DIVISION OF MONETARY AFFAIRS

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**Date:** May 5, 1993  
**To:** Federal Open Market Committee  
**From:** Al Broaddus and David Lindsey  
**Subject:** FOMC Request for a Study on Operating Procedures

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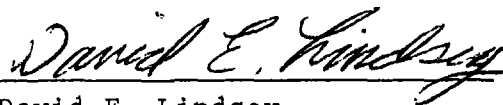
CONFIDENTIAL (FR)  
CLASS III - FOMC

A summary of a Systemwide study of monetary policy operating procedures as requested at the FOMC meeting of August 1991 is attached. The project culminated in a special meeting of the System's Committee on Financial Analysis held at the Federal Reserve Bank of St. Louis on June 18-19, 1992. Conference papers and discussant comments are also enclosed. Additional copies of the papers and comments are available from David Small at the Board of Governors (202-452-2659).

The summary was prepared by Al Broaddus and Marvin Goodfriend of the Reserve Bank of Richmond and by Donald Kohn, David Lindsey, and David Small at the Board of Governors.



Al Broaddus  
President, Federal Reserve Bank of Richmond



David E. Lindsey  
Deputy Directory, Division of Monetary Affairs  
Board of Governors

Enclosures

CONFIDENTIAL (FR)  
CLASS III - FOMC

April 14, 1992

## SUMMARY OF SYSTEMWIDE ANALYSIS OF OPERATING PROCEDURES <sup>1</sup>

This memorandum summarizes the results of the Systemwide research project focusing on the FOMC's monetary policy operating procedures. The project grew out of Committee discussion at its meetings in July and August, 1991. The research effort culminated in a special meeting of the System's Committee on Financial Analysis held at the Federal Reserve Bank of St. Louis on June 18-19, 1992,<sup>2</sup> where 16 papers were presented and formally discussed by staff economists from all the Reserve Banks and the Board. The papers covered a range of topics from relatively narrow operational issues to the broader strategy of monetary policy. Two prominent academic economists, Bennett McCallum of Carnegie-Mellon University and John Taylor of Stanford University, commented not only on two individual papers but also on the papers as a group and their policy implications.

This summary describes the principal results and implications of the papers as they relate to the Committee's initial discussions. All conference papers along with the discussants' comments will appear in the Board's Finance and Economics Discussion Series (FEDS) Working Studies series as the volume "Operating Procedures and the Conduct of Monetary Policy: Conference Proceedings".

### Background

A brief review of the genesis of this project will help put it in perspective. At the July 2-3, 1991, meeting of the Committee it was generally agreed that a recovery from the 1990-91 recession had begun

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1. This summary was prepared by Al Broaddus and Marvin Goodfriend of the Reserve Bank of Richmond and by Donald Kohn, David Lindsey, and David Small at the Board of Governors.

2. The conference agenda and a list of participants are attached to this summary.

and that the economy was strengthening, albeit gradually. In that environment, at least one Committee member expressed the hope that the Committee would not delay in reversing the recent downward path of the federal funds rate if the recovery began to develop additional momentum or inflationary pressures showed signs of increasing. In this context, one or two Committee members wondered whether such a reversal--when it became necessary--might be facilitated by a change in the System's operating procedures, possibly in the direction of a greater emphasis on some reserve measure, that would make such a policy tightening more "automatic" as under the nonborrowed reserves targeting procedures used in the 1979-82 period. Mr. Kohn was asked to address these possibilities at the next meeting.

At the August 20 meeting, Mr. Kohn discussed a memorandum by Mr. Lindsey<sup>3</sup> that presented seven alternatives to the current operating procedure.<sup>4</sup> The first three all would introduce somewhat greater short-run variability in the funds rate. They include (1) giving somewhat greater weight to reserve projections and less to the exact position of the funds rate in conducting open market operations; (2) establishing a 1/8 to 1/4 percentage point range for the rate rather than a point target; and (3) returning to relatively strict borrowed reserve targeting. By introducing somewhat greater uncertainty into the markets regarding the System's desired or expected funds rate level, the first three alternatives would stretch out market reactions to short-run policy changes by making such changes harder to detect. On the other hand, as Mr. Lindsey pointed out, the greater funds rate variability under these alternatives, following a period of relatively close control of the rate, might cause the markets to misread the System's policy intentions, especially in the early stages of the new operating regime.

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3. "Alternative Operating Procedures," memorandum to Mr. Kohn from Mr. Lindsey, August 14, 1991.

4. Officially, the Committee is still using borrowed reserves as its short-term operating instrument--i.e., setting short-term targets for borrowed reserves and attempting to hit these targets via open market operations. For several reasons, however, it has approached the borrowing targets "flexibly" in recent years, with the results that for all practical purposes it is targeting the funds rate and controlling it quite tightly.

Lindsey's fourth and fifth alternatives would approximate the 1979-82 nonborrowed reserve procedure in the current situation where M2 has taken the place of M1. One alternative would establish a borrowed reserve target and tie it in some automatic or semi-automatic way to deviations of M2 from its short- and/or longer-run targets. The other would make the funds rate the operating instrument and tie its short-run target to deviations of M2 from target. To the extent that the automatic feature of these alternatives were allowed to work unimpeded, movements in the funds rate would be seen as triggered by the behavior of M2 or, in the case of borrowing instruments, changes in market expectations rather than by discretionary FOMC actions. Consequently, whatever political and other constraints exist currently on discretionary changes in the funds rate would be lessened, although at the cost of linking movements in the Committee's instrument tightly to movements in M2 at a time when the predictability of M2 velocity-- especially in the short- and intermediate-term has come into question.

The last two alternatives in the Lindsey memorandum were (1) to establish either total reserves or the monetary base as the operating instrument and (2) to make the discount rate a penalty rate, perhaps in connection with the adoption of total reserves as the operating instrument.

A letter from Mr. Broaddus to Mr. Kohn was also distributed to the Committee and noted at the August 1991 Committee meeting. The letter supported a Committee mandate for additional research on operating procedures. In particular, the letter advocated further evaluation of the use of a total reserve or similar operating instrument on three grounds. First, a reserve instrument may improve control of the monetary aggregates compared to the current procedure, especially in view of institutional changes over the last decade such as the shift to nearly contemporaneous reserve requirements. Second, at least some recent research, cited in Broaddus' letter, has indicated that current procedures may be incompatible with the System's longer-term objective of stabilizing the price level. Finally, the letter noted recent research done outside the System that suggested that the increased

variability of the funds rate likely to accompany a move to a reserve-based procedure would not necessarily be transmitted to longer-term interest rates and the economy.

Following discussion of these materials, the Chairman endorsed Mr. Kohn's suggestion that he and the Reserve Bank research directors focus some System research on the choice among alternative operating procedures and related issues.

#### Summary of the Research Results

Many of the papers at the conference did not deal directly with the issues raised by Lindsey, Kohn and Broaddus. Rather, taking a broader perspective on Federal Reserve operating procedures, they addressed three areas related to changes in System operating procedures and strategies and a fourth which discussed how any such changes may affect the volatility of interest rates. The four areas are:

- (1) U.S. and foreign central bank regulatory structures and operating procedures related to daily open market operations,
- (2) how operational procedures could exploit information contained in various economic variables,
- (3) the design and conduct of policy to ensure attainment of the longer-term strategic goals of the Federal Reserve, and
- (4) the transmission of changes in short-term rates to long-term rates under alternative operating procedures and strategies.

The first set of papers reviewed the evolution of operating procedures in the U.S. and in other leading industrial countries. Particular attention was paid to the whether central banks enter the market more often than once a day, use a penalty discount rate, and employ clearing balance arrangements to reduce interest rate volatility. The second set of papers studied how alternative indicators may be helpful in guiding short-term policy discussions. The longer-term goals of monetary policy and how policy procedures could be designed to achieve those goals were discussed in the third set of papers. Some of

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these papers analyzed the broad characteristics of how policy has been conducted while others analyzed the use of automatic feedback rules. Finally, the linkage between movements in long- and short-term rates and how it may be altered by changes in alternative operating procedures or strategies was examined. Several papers directly addressed whether increased short-term volatility of the funds rate would be transmitted to longer-term rates, while other papers contained implications for the extent to which long-run strategies that stabilize long-term inflation expectations would thereby help reduce the volatility of long-term nominal interest rates.

Because of the number and broad coverage of the papers, summarizing their principal conclusions is challenging and inevitably involves arbitrary judgments. That said, five reasonably well-defined conclusions emerged from the research.

#### Conclusion 1

Operating procedures of central banks in major industrial countries are broadly similar to System procedures currently. Differences exist, however, and the System may wish to further investigate some of the detailed features of the procedures used abroad.

Three papers prepared for the project--by Robert Kahn and Linda Kole of the Board staff, Bruce Kasman of the New York Bank, and John Morton and Paul Wood of the Board staff--provided detailed descriptions and analysis of operating procedures and strategies used by other leading central banks. The Kahn-Kole paper focused primarily on the channels through which monetary policy is transmitted to markets and the economy in the countries considered. The Kasman and Morton-Wood papers focused more narrowly on day-to-day operating procedures, with particular attention to the specific operating instruments used, the manner in which they relied on to affect reserve market conditions, and cross-country differences in the variability of short-term interest rates.

The Kasman paper provided especially rich detail in comparing operating procedures across six countries: the United States, Japan, Germany, the United Kingdom, Canada, and Switzerland. Kasman showed

that similarities in procedures clearly dominate differences among the central banks of these countries. All of these banks use short-term interest rates as the principal operating instrument, although some, such as the German Bundesbank, use longer maturity short rates.<sup>5</sup> Further, all of these banks are evolving toward the U.S. practice of managing the interest rate instrument via open market operations, although the discount or Lombard windows continue to play an important role in daily reserve operations in several of the countries, such as Japan.

Kasman focused particular attention on the variability of the interest rate instrument and other short-term rates in the countries considered. All of the central banks limit the range over which the rate instrument is allowed to vary, and sustained changes in the rate are in each country the vehicle the bank uses to signal a change in short-run policy. At the same time, the rates are not rigidly controlled, and their short-term movements provide the banks with information regarding supply and demand conditions in reserve and other financial markets.

Of specific relevance to one of the Committee's original concerns leading to this project, Kasman (1) measured the average daily variation of interest rate instruments from their targets in each of the six countries over the 1988-1991 period, and (2) sought to determine the extent to which this variation was transmitted to longer-term money market rates. On the first point he found the least variation from target in the United States, Japan, Germany and Canada. Significantly

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5. The Swiss National Bank had been using the monetary base as both intermediate target and operating instrument before switching toward short-term interest rates and exchange rates in 1988. The change in procedures was in response to a reduction in reserve requirements and the introduction of a new electronic interbank clearing system, which reduced necessary clearing balances held at the central bank. They have gradually moved back to procedures centered on the monetary base, with objectives for the monetary base at the quarterly frequency that are tied to a multi-year objective for the base.



greater variation was found in the United Kingdom and Switzerland.<sup>6</sup> Statistical analysis indicated that only in Japan and Switzerland was variation in the rate instrument from target transmitted to longer-term money market rates. Even in these countries, the contribution of rate instrument variation to the variability of other rates was relatively small.<sup>7</sup>

In contrast to the set-up in the United States, central banks in three of the countries studied by Kasman--Germany, Switzerland, and Canada--provide lines of central bank credit that banks can use at their discretion, but at rates that normally are kept above market rates. Moreover, credit extensions appear to be made more regularly and leniently in Japan and the United Kingdom than in the United States, even though extensions in these countries are at the central bank's discretion. These facilities and practices make it possible to limit intraday movements in rates in these countries and therefore to reduce the risk that rate instrument movements reflecting unanticipated market forces may be misinterpreted as signalling policy actions. Against this background, both Kasman and Stephen Meyer of the Philadelphia Bank, who discussed the Kasman paper at the St. Louis conference, suggest that the Federal Reserve may wish to consider introducing some mechanism, such as the Bundesbank's Lombard facility, that would allow the System to cap intraday movements in the funds rate, especially in light of recent reductions in System reserve requirements.

As noted above, the paper by Kahn and Kole studied the broader channels through which monetary policy actions are transmitted to financial markets and the real economy, and more specifically how these

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6. Kasman notes that these two countries were operating with nonbinding reserve requirements during this period. Both Kasman and Anne-Marie Meulendyke of the New York Bank, in her paper prepared for this project, suggest that recent reductions in reserve requirements in the U.S. may increase short-term variation in the funds rate from target levels.

7. Morton and Wood also analyzed cross-country differences in short-term rate variability in their study--specifically for Germany, Japan, the United Kingdom, Canada, and Switzerland for the period from 1980 to 1992. They found the greatest variability in Switzerland, Canada, and the United Kingdom. Their results led them to conclude that interest rate variability is not closely linked to differences in operating strategies such as whether or not a country used monetary aggregates as intermediate targets.

channels have changed over the last decade. They found a relatively stable demand for money in some countries but evidence of a recent shift in the demand for broader aggregates in Japan as a result of ongoing deregulation, structural changes in financial markets, and financial innovation. They also found evidence that aggregate spending has become more sensitive to interest rates in some countries as consumer and mortgage credit have become more available to households. Finally, they found evidence that exchange rates are an important policy channel in some countries currently.

### Conclusion 2

The success of most operating procedures can be enhanced when the Federal Reserve has information variables it can use to predict future economic activity. Although no single information variable emerged as the best overall indicator of future economic activity, certain indicators did seem to dominate at specific forecast horizons. Additionally, in line with the results of other papers in this literature, indicators that reflect credit availability seem to have incremental power in forecasting real activity.

An evaluation of indicators of economic activity by Evans, Strongin and Eugeni of the Chicago Bank put special emphasis on testing the predictive content of alternative indicators at a variety of forecast horizons. The authors grouped variables into four classes-- interest rates, monetary aggregates, interest rate spreads, and other composite indicators--and then looked for the best combination of indicators from different classes at forecast horizons of one, two and four quarters.<sup>8</sup> At the one- and two-quarter horizons they found the NBER index of leading indicators receives the largest optimal weight. At the four-quarter horizon that index receives almost no weight, but substantial weight is placed on the spread between the twelve month Treasury bill rate and the federal funds rate and on real M2. Wenninger and Lee of the New York Bank noted that the recent instability in the

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8. Procedurally, they first found the best indicator from each of the four classes indicated, and then searched for the best combination of these indicators.

demand for M2 would argue against its value as a short- or intermediate-run guide to policy. Altering the definition of M2 to exclude small time deposits is not an attractive option for them, as the resulting aggregate behaves much as does M1 with a high interest elasticity that makes setting short-run targets difficult.

The paper by Kuttner of the Chicago Bank focused more narrowly on indicators that might be expected to be particularly useful if monetary policy operates importantly through the so called loan channel. In particular, Kuttner examined three possible indicators of credit availability: the quantity of bank loans outstanding relative to the quantity of commercial paper outstanding; the spread between the rate on bank loans and the rate on commercial paper; and the spread between the rate on commercial paper and the rate on Treasury bills. He found that, even after controlling for other indicators of monetary policy, the quantity variable and the paper-bill spread had considerable predictive power for future real activity. By contrast, the loan-paper spread had little predictive power.

### Conclusion 3

A case can be made that the Committee's current operating procedure of adjusting the federal funds rate in response to a variety of indicators can be used effectively to achieve the principal objectives of monetary policy. Credibility may be enhanced by the introduction of some legislative mandate that reinforces the System's commitment to controlling inflation.

Two papers prepared for the project evaluated the Committee's current procedure, in which the federal funds rate plays the central role as a policy instrument. One paper, by Jeff Fuhrer and George Moore of the Board staff, used model simulations to compare how the economy behaves under the authors' estimate of current operating tactics with how it might behave if the Committee were to continue using the funds rate as the policy instrument but changed the priorities it gives to stabilizing inflation, output, and interest rates. The second paper, by Marvin Goodfriend of the Richmond Bank, used a narrative approach to analyze both the risks and success of the System's monetary policy of

using interest rates as both instruments and indicators, over the period since the late 1970s.

The Fuhrer-Moore model includes a monetary policy reaction function which relates changes in the funds rate (proxied by the three-month Treasury bill rate in this quarterly model) to deviations of inflation from target and to the output gap.<sup>9</sup> Fuhrer and Moore investigated how the economy, as portrayed in their model, would behave if the Committee were to change the weights it attaches to controlling inflation, maintaining full employment, and stabilizing short-term interest rates in the short-run. On the basis of estimated parameters for their specification of the System's policy reaction function, they characterized the current conduct of policy as the System responding firmly, but not sharply, to current period deviations of inflation and output from their desired paths and responding with equal force to each type of deviation. The alternative specifications of policy behavior that they considered have the System reacting (1) weakly to both inflation and output, i.e., give high priority to smoothing interest rates in the short run, (2) strongly to both inflation and output, (3) strongly to inflation but not to output, and (4) strongly to output but not to inflation.<sup>10</sup>

On the basis of this analysis, Fuhrer and Moore concluded that the System's current approach is superior to any of the alternatives

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9. The Fuhrer-Moore model also includes a truncated representation of real aggregate demand (i.e., an "I-S curve") and a specification of the mechanism determining the price level and inflation. The mechanism determining the price level is specified in terms of the structure of contracts setting prices and wages. In contrast to earlier analyses in this vein, contracts in the Fuhrer-Moore model are specified in real terms. The authors demonstrate, through a series of model simulations, that modeling the contracting process this way allows their model to replicate the actual behavior of the economy--in particular, the persistence of inflation in actual experience once an inflationary process has begun--significantly more closely than earlier models that specified contracting in nominal terms.

10. Fuhrer and Moore simulated their model under each of these specifications and then compared the subsequent paths of inflation, output, and interest rates across simulations. They began each simulation by assuming that the Fed has reduced its long-run inflation target abruptly from about a five percent annual rate to zero. They then compared the subsequent paths of inflation, output, and interest rates across simulations.

they consider--i.e., the Committee currently is striking a good balance between the competing short-term objectives of policy as it pursues its longer-term objective of price stability. It should be noted that the simulation based on the Committee's current priorities indicated that an immediate and definite reduction in the inflation target to zero would bring the actual inflation rate down to zero in about two years, but at a significant cost in terms of lost output. Fuhrer and Moore's model, however, does not take explicit account of credibility effects, which are the principal focus of Goodfriend's analysis of the actual conduct of disinflationary policy since the late 1970s.

Although Goodfriend did not develop a formal model, like Fuhrer and Moore he sees the System conducting policy by adjusting the funds rate in reaction to a variety of indicators.<sup>11</sup> One of these is the behavior of long-term interest rates, which signals changes in longer-term inflation expectations and hence in the credibility of the System's commitment to controlling inflation. In particular, Goodfriend characterized sharp and sizable increases in long-term rates as "inflation scares," and the central focus of his historical review of policy is on how the System's response to these inflation scares evolved over time.

The essence of this evolution, in Goodfriend's view, has been a progressively stronger and more persistent response to these scares that has produced a substantial decline in the actual inflation rate and a very gradual and costly increase in the credibility of the System's commitment to controlling inflation. Goodfriend showed that the response to the dramatic inflation scare in the 1979-81 period was aggressive, but that it was interrupted on three occasions. These interruptions prevented significant gains in credibility and greatly increased the cost, in terms of lost output and economic and financial turbulence, of putting the disinflation process in motion. Subsequent

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11. Such adjustments are purely discretionary in Goodfriend's framework. Further, changes in the funds rate target typically are persistent. Therefore, these changes usually cause the expected future level of the funds rate and consequently other interest rates to adjust in the same direction. This impact on the broader spectrum of interest rates is the principal channel through which policy affects the economy.

responses to scares in the mid- and late-1980, however, have been prompter and more consistent, which has increased credibility and allowed the System to make further progress in reducing actual inflation. In particular, Goodfriend views the tightening of policy in 1988, undertaken in the aftermath of the recovery from the late-1987 stock market crash, prior to any significant rise in long-term rates, as a "preemptive" action that has significantly increased credibility in the current period. Overall, Goodfriend's historical review underscores the critical importance of credibility and strikingly portrays the historical cost to the economy of conducting policy in the current framework when credibility has been low or nonexistent. With this in mind, Goodfriend concluded that a legislative or other definitive institutional mandate directing the System to achieve and maintain price level stability would be a useful adjunct to the current strategy of policy.

#### Conclusion 4

In model simulations, achievement of the long-run goals of monetary policy can be sustained without undue short-run instabilities through the use of an appropriate feedback mechanism to guide policy. With a feedback rule in place, the operating instrument is varied in a predetermined way in response to deviations of an intermediate nominal variable from a desired path. There were, however, differences among the papers as to whether short-term interest rates or the monetary base is the appropriate operating instrument.

Over the last 25 years, economists have analyzed a wide variety of policy "rules" with mixed results. It is probably accurate to say, however, that at least some of the research in this tradition conducted in recent years has had a more practical bent and has taken somewhat greater account of the constraints confronted by the Committee in actually conducting policy. One especially prominent example of this research is a series of papers by Bennett McCallum that has analyzed the workings of a simple feedback mechanism in which (1) deviations of nominal income--serving as an intermediate variable--from a desired target path would induce a policy response and (2) the policy response

is framed in terms of the monetary base (i.e. the base, not an interest rate, would be the System's operating instrument) because the Committee can control it directly and closely. McCallum concluded that his feedback rule with these two characteristics would enable the Committee to achieve its objective of controlling inflation while reducing cyclical fluctuations in nominal GDP and possibly real GDP.

Three papers completed for this project, by Gregory Hess, David Small, and Flint Brayton of the Board staff, Joseph Gagnon and Ralph Tryon of the Board staff, and John Judd and Brian Motley of the San Francisco Bank, reviewed and extended both aspects of the McCallum feedback rule. The papers by Hess, Small and Brayton (henceforth HSB) and by Judd and Motley explicitly analyzed McCallum's reliance on the monetary base as the policy instrument and reached quite different conclusions. Judd and Motley concluded that achieving stable inflation without undue swings in real output would be more likely if, when targeting nominal GDP, the monetary base rather than the federal funds rate were used as the policy instrument. However, HSB found the reverse. The different conclusions may stem in part from differences in the models used and the specific form of the feedback rules employed. But another difference was time periods examined--Judd and Motley used the average experience over the last three decades while HSB focused on the behavior of the economy under the proposed McCallum rule not only on average over the last three decades but over the last decade in particular when the velocity of the monetary base diverged from its earlier trend line<sup>12</sup>. HSB indicate that, in this latter period, reliance on the monetary base under a McCallum feedback rule would have resulted in a serious degrading of economic performance.<sup>13</sup>

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12. Judd and Motley noted that in recent years the component of the monetary base held overseas has increased sharply and may hamper the use of the base as a policy instrument. Richard Porter of the Board staff, in an appendix to the paper by HSB, provides estimates of U.S. currency held abroad.

13. McCallum was the discussant for the HSB paper at the St. Louis conference. Later, in his written comments, he produced evidence based on simulations of his own that suggested a considerable smaller deterioration than the HSB analysis indicated. It appears that this disparity is attributable to the year used for deflating GDP; McCallum used a 1982-based series, while HSB used the current 1987-based series.

Also, HSB found that the base-instrument rule of McCallum performs less effectively in models where, in contrast to the models used by McCallum, long-term interest rates play a central role in transmitting the effects of policy actions to the economy. Estimated historical shocks to the demand for the monetary base were seen to induce large swings in short-term and long-term interest rates, although movements in long-rates were lessened to the extent the model had quick, if not forward-looking, adjustment of long rates to short rates. In particular, when embedded in the Board's large-scale MPS model, which has a prolonged response of long rates to changes in short rates and a low response of the demand for the base to changes in interest rates, McCallum's rule leads to explosively unstable financial and economic performance. However, experiments by HSB with this model suggested that targeting nominal income was feasible when the federal funds rate is the policy instrument. McCallum took issue with the HSB finding that his rule's performance was not robust across alternative models; he believed that additional forward-looking behavior in the base demand equation may well improve his rule's performance in models with long-term interest rates.

Judd and Motley also analyzed feedback mechanisms in which the federal funds rate was maintained as the policy instrument but in which the nominal GDP target was alternatively specified in terms of the level or the growth rate of nominal GDP.<sup>14</sup> They found that forcing the level of nominal GNP to return to a prespecified path after shocks had driven it from the path produced large swings in prices, real output and the federal funds rate. A long-run target specified in terms of the growth rate of nominal GDP controlled inflation in the long-run and produced more stable short-run behavior because the level effect of past

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14. Judd and Motley also considered the use of M2 as the intermediate target and found it worked about as well as nominal GDP in achieving stable inflation without inducing large swings in real output. But in light of the recent abnormal behavior of M2, they placed greater emphasis on the rules based on nominal GDP. In the context of the Board's MPS model, HSB found M2 was less successful than nominal GDP but more successful than the price level as an intermediate target in reducing the standard deviations of real GDP, nominal GDP and the GDP deflator about their simulation averages.



shocks do not need to be offset. Judd and Motley concluded the the policy prescriptions of such a rule would provide a useful baseline against which to measure the appropriateness of actual policy actions.

Finally, Gagnon and Tryon analyzed the implications of using a feedback rule within the context of the Board staff's MX3 multicountry rational-expectations model. One issue addressed was whether it is better to use nominal GDP or the base as the intermediate target in a feedback mechanism where a short-term interest rate such as the funds rate is the policy instrument and the success of a policy is judged by how well it reduces the variability of inflation and real and nominal GDP. Within this framework, they find that the variability of prices and output are about the same using either the base or nominal GDP as the target.<sup>15</sup> Finding significant variability in the short-term interest rates, especially when nominal GDP was the target, Gagnon and Tryon examined rules that additionally tried to smooth interest rate movements. They found that interest rates could be smoothed without significantly increasing the variability of prices or output. A third issue concerning nominal GDP targeting is that nominal GDP is observed contemporaneously with error. Measuring the observation error as the difference between the BEA's final estimate of nominal GDP and the consensus forecast published in Blue Chip Economic Indicators, Gagnon and Tryon found that, under a regime of targeting nominal GDP, the observation errors did not significantly impair economic performance.

#### Conclusion 5

Research done for the project reinforced the evidence from earlier studies that greater transitory deviations of the funds rate from the market's perception of the level desired by the Federal Reserve would not necessarily be transmitted strongly to other interest rates. Consequently, potential increases in such deviations should not necessarily deter the Committee from considering alternative procedures. However, if an alternative procedure allowed persistent shocks in the

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15. When the intermediate target is the monetary base, shocks to the demand for the base are partially accommodated since the intermediate target is not reached in each period.

economy to show through to the desired federal funds rate, the volatility of longer term rates could increase. Fluctuations in nominal interest rates would be muted if alternative operating procedures stabilize the expectation of inflation that is reflected in nominal rates.

In recent years, increased attention has been focused on the characteristics of the System's tendency to control the funds rate closely in the short run--a policy frequently labeled as "interest rate smoothing." In the past, the Committee has been concerned that increased variability in the funds rate would be transmitted to longer rates and therefore could tend to destabilize financial markets and the economy. Recent research cited in the Broaddus letter discussed above, however, has shed new light on this issue. Based on the expectations theory of the term structure of interest rates, this research suggests that the observed tendency of longer-term rates to rise and fall in tandem with the funds rate in the short run may reflect the System's historical practice of smoothing the funds rate. With this practice in place, the market could extrapolate the current federal funds rate into the future and base the long rate on this expected future path for the funds rate. But, if the Committee routinely allowed the funds rate to vary more freely in response to market forces or to developments in the economy that were transitory, longer-term rates might be less sensitive to movements in the funds rate

Several papers completed for this project sought to provide additional evidence on this issue. As indicated, Kasman found that transitory movements in operating instruments rates comparable to the funds rate in other countries, around their respective target levels, are not transmitted strongly to longer-maturity short rates such as three-month bill rates. Further, a paper done for the conference using daily data by William Roberds of the Atlanta Bank, David Runkle of the Minneapolis Bank, and Charles Whiteman, a former visiting scholar at the Atlanta Bank, analyzed the ability of the spread between the three-month Treasury bill rate and the federal funds rate in the United States to predict future changes in the funds rate. Evidence that changes in the funds rate were not transmitted to longer-term rates would be provided

if the spread were shown to predict future changes in the funds rate.<sup>16</sup> RRW found that the predictive power of this spread was least (in fact, nonexistent) in the period of rigid funds rate control before October 6, 1979, greatest in the 1979-82 nonborrowed reserves regime, and in an intermediate range in the more recent borrowed reserve regime.

These results suggest that the transitory component to funds rate movements was largest during the nonborrowed reserve regime, smallest during the period before October 6, 1979, and of an intermediate size after 1982. Furthermore, these results indicate that the increased transitory movements of the funds rate during the nonborrowed reserve operating regime were not reflected in movements in long rates. Consequently, an alternative procedure would not necessarily be accompanied by unacceptably large movements in longer-term money market rates if the funds rate reacted to economic or financial developments that were transitory.<sup>17</sup> However, greater volatility in longer rates may result if a new procedure gives rise to changes in the funds rate that are seen by market participants as having a large degree of persistence. This may happen if the funds rate is changed to offset economic or financial shocks that persist over time. Indeed, one aspect of the nonborrowed reserves regime that surprised some observers was the increased volatility of long rates.

Additionally, with respect to movements in long-term rates, alternative procedures presumably would allow persistent shocks in the

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16. For example, a transitory increase in the federal funds rate which is not transmitted to longer rates would decrease the spread of the long rate over the short rate. The lower spread would therefore be predicting a fall in the funds rate from its temporarily elevated level.

17. Roberds, Runkle, and Whiteman also found, however, that spreads between longer-term money market rates--for example, the spread between the six-month bill rate and the three-month bill rate--had no predictive content. The discussant for this paper, Glenn Rudebusch of the Board staff, attributed the predictive power of the three-month bill-funds rate spread in at least some periods to (1) the very short-term, transitory daily movements of the funds rate around a persistent target level and (2) the tendency of the System to adjust the target, when adjustment is needed, in discrete, somewhat forecastable steps. The absence of predictive power for spreads involving longer-maturity rates, in Rudebusch's view, reflects the persistence of a funds rate target once the target is set: usually, the market's best guess is that the average level of the funds rate in the future will equal its current level.

economy to show through to the funds rate in order to offset the inflationary impact of those shocks. The MX3 model used by Gagnon and Tryon does not incorporate a long rate, but using the simulated values of the current and (rationally) expected future short rates to calculate a 10-year bond rate, they found that the variability in the nominal long rate was held below its historical level for the variety of policy rules they examines, all of which stabilized inflation. HSB found greater short-run variability in the long rate under McCallum's rule than that observed historically, but the prolonged historical swings in nominal rates were absent. Finally, Goodfriend argued that the System's tightening of monetary policy in 1987 and 1988 helped to dampen inflation fears and contain any movements in long-term nominal rates.

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LIST OF CONTRIBUTORS

CONTRIBUTORS	AFFILIATION
Brayton, Flint	Board of Governors
Broadus, Al	Federal Reserve Bank of Richmond
Brunner, Allan D.	Board of Governors
Chatterjee, Satyajit	Federal Reserve Bank of Philadelphia
Coleman, Wilbur John, II	Board of Governors
Dotsey, Michael	Federal Reserve Bank of Richmond
Eugeni, Francesca	Federal Reserve Bank of Chicago
Evans, Charles	Federal Reserve Bank of Chicago
Fuhrer, Jeffrey	Federal Reserve Bank of Boston
Gagnon, Joseph E.	Board of Governors
Gilbert, R. Alton	Federal Reserve Bank on St. Louis
Gilles, Christian	Board of Governors
Goodfriend, Marvin	Federal Reserve Bank of Richmond
Hakkio, Craig S.	Federal Reserve Bank of Kansas City
Hess, Gregory D.	Board of Governors
Hetzl, Robert L.	Federal Reserve Bank of Richmond
Judd, John P.	Federal Reserve Bank of San Francisco
Kahn, Robert B.	Board of Governors
Kasman, Bruce	Federal Reserve Bank of New York
Koenig, Evan F.	Federal Reserve Bank of Dallas
Kohn, Donald L.	Board of Governors
Kole, Linda S.	Board of Governors
Kopcke, Richard W.	Federal Reserve Bank of Boston
Kuttner, Kenneth N.	Federal Reserve Bank of Chicago

Labadie, Pamela	Board of Governors
Lee, William	Federal Reserve Bank of New York
Leeper, Eric M.	Federal Reserve Bank of Atlanta
Lindsey, David E.	Board of Governors
Lown, Cara S.	Federal Reserve Bank of New York
McCallum, Bennett T.	Carnegie-Mellon University
Meulendyke, Ann-Marie	Federal Reserve Bank of New York
Meyer, Stephen A.	Federal Reserve Bank of Philadelphia
Moore, George	Board of Governors
Morton, John	Board of Governors
Motley, Brian	Federal Reserve Bank of San Francisco
Porter, Richard D.	Board of Governors
Roberds, William	Federal Reserve Bank of Atlanta
Rudebusch, Glenn D.	Board of Governors
Runkle, David	Federal Reserve Bank of Minneapolis
Russell, Steven	Federal Reserve Bank of St. Louis
Small, David H.	Board of Governors
Stevens, Edward J.	Federal Reserve Bank of Cleveland
Strongin, Steven	Federal Reserve Bank of Chicago
Taylor, John B.	Stanford University
Thornton, Daniel L.	Federal Reserve Bank of St. Louis
Tryon, Ralph W.	Board of Governors
Wenninger, John	Federal Reserve Bank of New York
Whiteman, Charles H.	University of Iowa
Wilcox, David	Board of Governors
Wood, Paul	Board of Governors