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Tales from the FOMC Transcripts 1984-1991**

Hali J. Edison and Jaime Marquez

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U.S. Monetary Policy and Econometric Modeling: Tales from the FOMC Transcripts 1984-1991

Hali J. Edison and Jaime Marquez*

Abstract: This paper uses the transcripts from the FOMC meetings to characterize the interactions between policymakers and macro models in the formulation of U.S. monetary policy. We develop a taxonomy of these interactions and present two case studies. The first case focuses on the debate on the choice of monetary target and the second case focuses on the 1990/1991 recession. The analysis reveals that U.S. monetary policy relies on models for information. Models give estimates of both the outlook and the response of the economy to policy changes. Models also evolve to recognize the changing context in which policymakers operate – exchange rate flexibility, financial deregulation, and international trade agreements.

Keywords: FOMC, econometric modelling, monetary policy, United States

*Edison and Marquez are senior economists in the Division of International Finance at the Federal Reserve Board. Comments from Joseph Coyne, Frank den Butter, William Helkie, Dale Henderson, Karen Johnson, David Lindsey, Mary Morgan, Adrian Pagan, Peter Tinsley, and Ted Truman are gratefully acknowledged; Molly Wetzel cross-checked our quotations and Katherine Vanderhook provided editorial comments. This paper was written for the Conference on Empirical Models and Policy Making at the Tinbergen Institute, Amsterdam May 14 - 16, 1997. We also thank the participants of the conference for many useful comments, especially Ralph Bryant and Ken Wallis. The views in this paper are responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of any other person associated with the Federal Reserve System.

"Our short-term models are poor but our intermediate-term models are really extraordinarily difficult to deal with. In these different and separate models, to which I think you are referring, are a lot of very interesting results. But they give you really quite different scenarios as to what would happen under various conditions. I think what we're dealing with is a very difficult conceptual problem of how our economy functions, especially in the growing world environment, under these different scenarios. I think what you succeeded in doing was getting some idea of dimension on some of the areas, but the range of error has to be awfully high. And I think all we can do is pick up one or two major notions."

Chairman Greenspan, December 1989 FOMC meeting, page 3.

Introduction

How is U.S. monetary policy formulated? The Federal Reserve Act states the goals of monetary policy by specifying that, in conducting monetary policy, the Federal Open Market Committee (FOMC) should "promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates." There is, however, considerable debate among economists about translating these goals into a coherent description of U.S. monetary policy. One reason for the debate is the secrecy surrounding the details of how such policy is formulated. Detailed information about the FOMC meetings is necessary to understand the conduct of U.S. monetary policy; the FOMC transcripts offer such information. These transcripts, however, have only recently been made available to the public and we use them here to examine interdependencies between econometric models and policymakers.¹

¹On May 18, 1976 the FOMC voted to discontinue its policy of releasing to the public a detailed memorandum of discussion of its meetings. This was a controversial decision at the time, but was motivated by the threat of "Sunshine Legislation" -- which called for prompt public disclosure of government meetings -- and a lawsuit challenging the 45-day delay in releasing the domestic policy directive. Since 1976, the Federal Reserve has issued "policy record" or "minutes", which is released six or seven weeks after each meeting, a couple of days after it is approved at the next FOMC meeting. This document is a summary of the substance of the discussion at the meeting and does not indicate the individual FOMC members' policy position.

In the autumn of 1993 in the course of conducting hearings, the House Banking committee learned that the FOMC continued to tape FOMC meetings in their entirety and retain transcriptions of the tapes. The Federal Reserve has issued, with a five year lag, transcripts of the FOMC meetings. At present the years 1984 - 1992 have been issued. (See the Committee on

To our knowledge, no one has used transcripts of past FOMC meetings to examine the interactions between model formulation and monetary policy at the Fed.² Several papers, including Brayton et al. (1997), Reifschneider et al. (1997), Duguay and Longworth (1998), and Whitley (1998), examine the development of models and their use in monetary policy at the Federal Reserve and at other central banks. Our paper differs from previous work by drawing on FOMC transcripts and thus offering an unprecedented look at the role of econometric models in the policymaking process.

The paper is organized as follows: Section 2 summarizes the structure of the FOMC and how models are used in the policy discussion. Section 3 provides a taxonomy of the interactions between policymakers and models. Section 4 deals with the role of models in the debate on disinflation. Section 5 examines the role of models in policy discussions regarding the 1990-91 recession. Section 6 gives our conclusions.

2. The Federal Reserve Board and the Federal Open Market Committee

2.1 Background³

The Federal Reserve System, created in 1913, consists of the Board of Governors (Board) and twelve regional Federal Reserve Banks. The Board of Governors consists of seven members appointed by the President and confirmed by the U.S. Senate. These governors have 14-year appointments (with one appointment ending every two years), and one governor is appointed the Board's Chairman and another is appointed Vice Chairman. The Federal Open Market

Banking, Finance and Urban Affairs (1994).)

²See Beckner (1996) for a journalistic narrative of the Greenspan period making use of the FOMC transcripts.

³For more details see Federal Reserve (1994).

Committee (FOMC) is made up of the Board of Governors, the president of the Federal Reserve Bank of New York, and presidents of four other Federal Reserve Banks who serve on a rotating basis. All of the presidents participate in the FOMC discussions but only the five presidents who are members of the Committee vote on policy decisions.

FOMC decision-making involves two stages: setting annual objectives for monetary and credit growth, and adopting an FOMC directive to give operating instructions to the trading desk of the Federal Reserve Bank of New York. These decisions are taken in formal meetings held eight times each year in Washington, D.C. (When necessary, telephone consultations are used to amend the operating instructions.) In the February and July meetings, the FOMC adopts the annual objectives for money and credit growth which are reported to Congress.⁵ At these meetings the staff reports on recent developments and presents both the macroeconomic outlook and its sensitivity to different monetary policies. The July meeting updates the forecast and extends it one year.

The Federal Reserve System conducts monetary policy using three tools: 1) open market operations -- the buying and selling of U.S. government securities in the open market to influence the level of reserves in the depository system; 2) reserve requirements -- regarding the amount of funds that commercial banks and other depository institutions must hold in reserve against deposits; and 3) the discount rate -- the interest rates charged to commercial banks and other depository institutions when they borrow reserves from a regional Federal Reserve Bank. The FOMC oversees open market operations, whereas the Board of Governors

⁵This reporting follows The Full Employment and Balanced Growth Act (Humphrey-Hawkins Act) of 1978. This Act specifies that each February the Federal Reserve must announce publicly its objectives for growth in money and credit and that at midyear (July) it must review its objectives and revise them if appropriate.

oversees reserve requirements and the discount rate.

2.2 The Structure of FOMC Meetings

2.2.1 Preparations for the Meeting

The FOMC policy process begins with the preparation of two key internal documents which are circulated before the meeting (see Lindsey, 1997): The *Greenbook* and the *Bluebook*.⁶ The *Greenbook* contains a detailed forecast of the U.S. and foreign economies which serves as a baseline for the FOMC discussion; this forecast is the view of the Board's staff and not of the members of the FOMC. This forecast is referred to as a "judgmental" projection because it does not rest solely on projections from any large scale econometric model. The Federal Reserve staff's models play a role, however, by (1) providing a baseline from which staff develop their judgmental *Greenbook* forecasts and (2) constructing alternative scenarios. The *Bluebook* presents the staff's view on the behavior of reserves, interest rates, and gives alternative paths for key monetary aggregates.

2.2.2 Presentations and Discussions at the FOMC Meeting

During the 1984-91 period, FOMC meetings began with a report by the manager for foreign exchange operations on developments and associated actions regarding foreign exchange operations. Then the manager for domestic open market operations reports on trading desk activity under the committee's instructions since the last meeting. The committee then discusses these reports and votes on approving them.⁷

⁶A third document, publicly available, is the *Beigebook*. For more details see Meek (1982)

⁷Currently, FOMC meetings begin with one review of both foreign and domestic financial developments and the actions of the trading desk. This report is usually given by the Manager of the System Open Market Account at the Federal Reserve Bank of New York.

Following these presentations, senior staff report on the economic outlook. The director of the Monetary Affairs division then comments on recent behavior of monetary and credit aggregates and reports on the alternative paths laid out for money growth in the *Bluebook*. Each alternative specifies a different growth rate for the key monetary aggregates and an associated range for the federal funds rate. Each presentation is followed by a discussion in which policymakers focus on those elements that suggest a stronger, or weaker, outcome than that projected by the Board staff. The committee's discussion gives rise to an FOMC directive over which FOMC members vote. The directive contains the instructions to the trading desk in New York for pursuing the policy objectives.

The entirety of the meeting is taped to produce a transcript which includes, as appendices, the material presented by the staff to the FOMC. Thus the transcripts are a complete official record regarding the conduct of monetary policy.

3. Taxonomy of the Interactions between Policymakers and Model Developments

The transcripts are simply a record of the discussion at the FOMC. Therefore we develop a taxonomy to interpret the record and assess the interactions between policymakers and model developers. There are no numbers, no test statistics, or other quantitative measures to judge the extent of interactions between policymakers and model builders. In our paper, the written word rules, but we hope to minimize the effect of our choice of words by quoting extensively so as to give the reader an opportunity to disagree with our interpretation. Moreover, the transcripts are publicly available and thus our interpretation can be challenged. Our interpretation of the official record also benefits from our direct responsibilities in developing and maintaining the international models and using them for implementing simulation scenarios during the period under examination.

3.1 Policymakers Influencing Modeling

Policymakers can influence model building through their requests for model respecification and we group them into three categories.

Direct Requests: Policymakers are said to make direct requests for model respecification when they request that the model incorporate a certain feature: explaining a particular variable, modeling a particular transmission channel, or adding a particular country to the model. We did not find this sort of request in the FOMC transcripts.

One explanation for this absence is that the Board staff uses relatively standard models, embodying well-accepted economic relationships. Another, less obvious, explanation would involve FOMC members placing their direct requests for model changes outside FOMC sessions, which would not be reflected in the transcripts. Those requests, however, would have to be implemented at some point by the model managers and, as "model managers" of the Multicountry model (MCM) over the period covered, we did not implement such requests, so we rule out this channel during the 1984 - 1991 period. However, the absence of direct requests in these transcripts does not rule out their presence in future transcripts and, unless such possibility can be satisfactorily ruled out, we allow for them in our taxonomy.

Persuasive Requests: Policymakers are said to make persuasive requests for model respecification when their concerns involve modifying the model. As questions of this sort arise with some regularity, senior staff request research from economists to investigate them. Upon completion, the research is presented in a briefing to the Board and often is incorporated into the model(s).⁸ Our analysis of the cost of disinflation (section 4 below) offers an instance of

⁸Examples of such briefings over 1984-91 include Long-Term Perspective on External Position of the U.S. Economy (May 1984); Economic and Monetary Policy Issues raised by the

persuasive requests.

Idiosyncratic Requests: Policymakers are said to make idiosyncratic requests when their questions are best answered with tailor-made models. For example, the appreciation of the dollar during the 1980s generated requests for examining the predictive accuracy of alternative exchange-rate models [see Edison (1991)].

3.2 Models Influencing Policymaking

Models can influence the conduct of policymaking by providing information. We postulate three roles depending on the effect of that information on the decision process:

Institutional Role: A model is said to have an institutional role when it provides routine information about the future state of the economy or about its response to hypothetical changes in assumptions. One example is senior staff's presentation on the state of the economy at the February/July FOMC meeting. Another example is the discussion of the *Bluebook* examining recent behavior of monetary aggregates and model-based paths for money growth. The role of models at the Fed may differ from the role of models at other central banks.

Influential Role: A model is said to have an influential role when its results are discussed extensively. Extensive discussions of model results normally take three or four pages of a 40-page document. Our analysis of the role of models during the 1990-91 recession (section 5 below) reveals instances where the models exercised this role.

Decisive Role: A model is said to have a decisive role on policy when information based on model properties alters the course that monetary policy would have taken in the absence of

Weakening of the Dollar (November 1985); Treatment of Special Situation and Seasonal Borrowing in Desk Operations (October 1987); Description of the P-Star Model (November 1988); The Effects of Large Oil Price Increase (August 1990).

that information. As evidence of a decisive role one would like to see unambiguous statements from FOMC members indicating that the decision is solely based on the model or that, out of all considerations, model simulations were decisive. We did not find such statements. This category is, nevertheless, useful because one cannot rule out a priori such a role as new transcripts become available.

4. Case Study 1: Policymakers, Models, and the Price-Stability Debate

This section considers how the models developed by Board staff were used in a special briefing (December 1989) to address the question of whether price stability should be the main objective of monetary policy.⁹

4.1 Historical Perspective

Congressman Neal, Chairman of the House Banking Subcommittee on Domestic Monetary Policy introduced legislation (H.J. RES 409, September 25, 1989) requiring

"...that the Federal Open Market Committee of the Federal Reserve System shall adopt and pursue monetary policies to reduce inflation gradually in order to eliminate inflation by not later than 5 years from the date of this enactment of this legislation and shall then adopt and pursue monetary policies to maintain price stability."

To consider the ramifications of such a change for monetary policy, Vice Chairman (of the FOMC and New York Fed President) Corrigan proposed at the October 1989 FOMC meeting that the Board staff prepare for the Committee a special briefing on the question of achieving price stability in five years. In framing his proposal, Corrigan (page 45) indicated that

" ... I'm not suggesting a forecast but alternative scenarios, problems, obstacles, and costs, so that we could really get a systematic feel of what kinds of problems would be involved in that kind of underlying policy goal."

⁹See Mayes and Razzah (1997) for a discussion on price stability and the interaction of models and policymaker at the Reserve Bank of New Zealand.

This quote suggests that the models should be used to give "a systematic feel", highlighting one role models play – influential.

The implementation of the special briefing faced two concerns. First, how to quantify the adjustment cost and its sensitivity to the time horizon. Second, how to ensure that the transmission channels embodied in the model did not assume, implicitly, the answer. As an example of the role of model in addressing this question, Angell [F] (page 47) notes that ¹⁰

"... the model that we're going to use is going to be rather important. It seems to me that if you're going to use the Phillips curve trade-off model you're going to defeat the Neal Amendment."

Statements such as the one above suggest that these special briefings provide a venue to initiate model changes, an example of a persuasive request.

4.2 Highlights of the Special Presentation

The special FOMC presentation focused on identifying the macroeconomic consequences of stabilizing the price level by 1995 using monetary policy. To address the concerns of the FOMC on the choice of model, the Board staff used three different models in their presentation.

A first set of simulation results was based on the P-star model in which the equilibrium price level depends on M2, given velocity and output. The model suggests that prices adjust when the equilibrium price differs from the actual price level. The model, thus, can be used to solve for the path of M2 growth that yields an inflation rate close to zero. The results suggested that a five-year horizon is too short a time period to eliminate inflation gradually.

A second set of simulation results was provided using an experimental multicountry system with forward-looking expectations--MX3. Two cases, differing in the degree to which

¹⁰An F in brackets denotes an FOMC member; an S in brackets denotes a staff member.

monetary policy announcements are viewed as credible by workers and firms, were examined. In the case of high credibility, people alter their beliefs about the behavior of the central bank whereas in the weak credibility case they do not alter their beliefs. For both cases, the analysis assumed that the FOMC announces in advance its intention to slow money growth to rates consistent with attaining price stability by 1995.

A third set of simulation results was presented using the global model, FRB/GLOBAL, which combines the U.S. model (MPS model) with models for foreign economies (MCM). The structure of the combined model is similar to MX3 except that expectations are adaptive, implying the absence of credibility (see Brayton et al. 1997 for a description of the evolution of modeling at the Federal Reserve).

To compare the costs of lowering the inflation rate across models, the presentation used the "sacrifice" ratio - a measure of the amount of excess unemployment over a period associated with each one percentage point decline in inflation. The larger the sacrifice ratio, the greater the cost for each percentage point of disinflation. The sacrifice ratio generated by the FRB/GLOBAL model was 2.2 whereas the ratio generated by MX3 ranged from 0.2 for the strong credibility to 0.6 for the weak credibility. These results suggested that the more forward-looking and flexible expectations are, the lower the costs of disinflation will be.

To give the FOMC some indication of how the sacrifice ratio would differ if economic conditions became less favorable, three alternative scenarios were considered: a weaker dollar, higher oil prices, and higher budget deficit. Relative to the base case, achieving zero inflation with the weaker dollar increases the loss of output and the sacrifice ratio (exhibit 1). Losses in the scenario of higher oil prices were reported as highest. By contrast, the budget deficit scenario yielded results similar to those of the base case.

4.3 Highlights of the Policy Discussion

The issue that received the most attention is the sensitivity of the cost of disinflation to both the policy horizon and the degree/impact of credibility. Specifically, Parry [F] asks (page 3):

"I'd like to ask an opinion about the credibility issue. If one had a Neal resolution, and in addition to that had publicly announced some kind of multiyear path on something such as either nominal GNP or money, do you think that that would have a significant impact on credibility? And, therefore, would that lead you more in the direction of faster adjustment than was incorporated in the model? "

No single test can provide an unambiguous answer to this question. Thus Stockton [S] (pages 3-4) replies:

"My own view is that it would be difficult to expect an immediate adjustment and a response to that. If you look back at inflation expectations survey data, for example, in 1979 there wasn't an immediate reaction to the announcement of a change in Federal Reserve operating procedures. ..."

With respect to the sensitivity of the sacrifice ratio to the horizon, Angell [F] (page 4) asks:

"... Since we're already getting something we don't know about, maybe we might as well go ahead and do another five years because we're only doing more of that which we don't know about; and thereby, we would have a base case movement to zero inflation in 1995 and then [we could] look at the adjustment to the natural rate of unemployment. And that would also give us an opportunity to look at the current account deficit. ... "

Though not transparent from Angell's remark, the question of horizon is important because the costs and benefits of disinflation do not materialize at the same pace. Hoskins [F] makes this observation (page 8):

"... Having said all that, one observation I'd make, which I think Governor Angell was getting at, is that we are measuring the cost of reducing inflation. If one is trying to make a decision about whether or not it's worthwhile doing, one needs to measure the benefits of having a zero rate of inflation--that is, in the next 5 years

out or 10 years--and then compare that with the cost of the transition, because many of us believe there are some gains to maintaining price stability in terms of economic performance. "

But Melzer [F] places the issue in its influential context (page 13):

"... what would happen to the sacrifice ratio if the time frame were longer? I think I know what would happen to the expectational effects and the credibility and so forth. But do you have any sense of that? If you made it 10 years instead of 5, does the sacrifice ratio come down materially? "

Thus this record reveals that the model had an influential role in the policy process by providing estimates of the sensitivity of the cost of achieving price stability. Moreover, the record contains neither evidence contradicting the models' predictions nor remarks about using methods not based on models. The overall position is best summarized by Black [F] (pages 21-22):

"...I know no one would have a lot of confidence in the econometric measures that one would use to determine what the costs of eliminating inflation are, but what to me comes out as most important is the qualitative differences between these various approaches. The backward-looking model, which is the traditional way we've looked at it here, makes the cost very, very high. But if we can assume that we have something like rational expectations and forward-looking expectations and if we can assume that we have some kind of credibility and strength in that credibility, then the cost becomes considerably less. ..."

In the end, the Neal Resolution was not passed in Congress and the Federal Reserve Act of 1978 remains relevant. Nevertheless the sensitivity of the results to both credibility and policymakers' emphasis on long-term goals called for models with forward looking expectations. This capability, available on experimental basis in 1989, is now operational in 1997 (see Brayton et al. 1997, Levin et al. 1997). This modification of the models provides an example in which policymakers exerted a persuasive influence in the respecification of the models.

5. Case Study 2: Policymakers, Models, and the 1990-91 Recession

From December 18, 1990 to December 20, 1991, the discount rate declined by 350 basis

points—one of the largest one-year declines in the discount rate in the postwar period. During 1991, policymakers faced: a military conflict in the Persian Gulf, the strains stemming from the disintegration of the Soviet economy, the international ramifications of German re-unification, and a recession in the United States. This section examines the role models played in this decline in interest rates.

5.1 Phase I: December 1990 - January 1991

The December 1990 FOMC meeting was concerned about the sluggish growth rates for the various monetary aggregates as well the relatively small growth rates predicted for the next two years. In that context, M2 was viewed as key policy indicator and, as the following exchange reveals, the institutional role of the model was key to the discussion:

Mr. Mullins [F] (page 28): What interest rate elasticities do we assume for money demand, roughly speaking?

Mr. Kohn [S] (page 28): I can give you some numbers on what if the funds rate changes by x basis points, that kind of thing.

Mr. Mullins [F] (page 28): Yes.

Mr. Kohn [S] (page 28): A 50 basis point decrease in the funds rate--now this is a quarterly average, so it won't show up the way it would in the monthly numbers--gets you about 3/4 point for the year, but it's loaded into the first and particularly the second quarters.

Just prior to the discussion for the vote on whether to cut the discount rate, Chairman Greenspan [F] states his views (page 34):

"... I would suspect the two percentage point difference that Don [Kohn, S] is getting between the growth of M2 and that in his model may in fact reflect something we don't measure--namely, the inclination of individuals to hold liquid deposits which in the previous calculations are all presumed to be risk free. ..."

This remark suggests that the model, in its institutional role, estimates the systematic behavior of the economy which allows policymakers to formulate hypotheses about the unsystematic

behavior and thus to craft the associated response. Specifically, when Greenspan identifies the gap between the data and the model's predictions as arising from individuals' propensity to hold risky assets, he is formulating a hypothesis which can then be used as the basis for a discussion on lowering the discount rate. The discount rate was lowered by 50 basis points immediately after the December 1990 FOMC meeting.

Immediately before the February 1991 meeting, the Board decided to lower the discount rate by 50 basis points due to the worsening of the credit situation as envisaged in the FOMC directive of December 1990.

5.2 Phase II: February - April

After lowering the interest rate by what was thought then to be an aggressive magnitude, FOMC members devoted the February 1991 meeting, which sets monetary targets for the year, to a thorough examination of the effects of past policies. Exhibit 2 displays the outlook presented at that meeting and how it would change under alternative policy options. To put these results in perspective, Prell [S] (appendix, page 26) argues:

"... Admittedly, these scenarios are quite arbitrary constructs, but they do seem relevant in light of the differences between the staff and FOMC forecasts that I presented earlier. I hope that, in combination with the model simulations presented in the Bluebook, they will at least give you some rough indication of the sensitivity of the economy to your policy decisions."

This remark illustrates the sense in which models exert an influential role. The design of the different scenarios are left to the staff, but the ultimate decisions remain with the FOMC.

Interest rates were kept unchanged as committee members saw the economic situation as marked by "heightened uncertainties" and that not enough time had elapsed for the effects of the lower interest rates to be felt in the economy.

At the March meeting there continued to be uncertainty about the outlook for the

economy and the FOMC examined another round of model results. The major question related to the extent to which the effects of monetary policy could be offset by the effects of the dollar appreciation that had been taking place in the first quarter of 1991. Specifically, Siegman [S] (appendix, page 4) reports that

"In order to offset the impact of a 10 percent appreciation on real GNP and bring the economy back on track by the end of the year, the staff's model suggests that U.S. short-term interest would need to decline by about 100-125 basis points by the end of 1992, depending on the pace of offsetting the impact on GNP."

By estimating the trade-off between interest rates and exchange rates consistent with a given path of GDP, the statement reveals an instance in which the model has an influential role. Once again, interest rates were left unchanged.

However, before the next FOMC meeting on April 30th the discount rate was lowered by 50 basis points. Explaining the decision to the non-Board members of the FOMC, Chairman Greenspan [F] argued (in a telephone conference call dated April 30th, page 1):

"... In summary, I would say that, in line with the FOMC discussion on how events might or might not materialize, clearly what is happening at this stage is a slowing in the rate of decline but virtually no useful evidence in the order books or in the advance indicators of activity that suggests we are coming out of this [recession] any time in the immediate future. ..."

Greenspan's statement suggests a disappointment with the speed of recovery or a reaction to the realization that earlier forecasts were optimistic. Though the statement does not provide unambiguous evidence of a decisive role for models, the February FOMC meeting examined model simulations (see exhibit 2) contemplating further interest-rate reductions should the economy appear weaker than what was forecasted. Though no formal statistical test exists to discriminate among the various pieces of information, the transcripts provide the closest evidence of a model exerting a decisive influence.

5.3 Phase III: May - August

The discount rate remained unchanged from May to end-August. Nevertheless, there are plenty of examples of the interaction of the FOMC and models.

At the July 1991 meeting, when members can update the targets for the monetary aggregates, attention was focused on the extent to which movements in the dollar were offsetting movements in interest rates. Specifically, exhibit 3 reports the sensitivity of the forecast to factors perceived to be contributing to the relatively slow recovery of U.S. economic activity: The appreciation of the dollar and the weakening of foreign economic activity. One scenario that was not included among the charts, but that was discussed in the staff presentation, involved the trade-off between interest rates and exchange rates. Specifically, Truman [S] (appendix, page 9) reports:

"... We tried a modification of the February dollar scenario in our econometric models. In it, the dollar remained at its February level, but the federal funds rate was adjusted to leave the path of U.S. real GNP essentially the same as in the baseline forecast. Our models suggest that to achieve this result, the federal funds rate today would have to be about 130 basis points higher now and increase another 20 basis points or so over the course of 1992. Given all the factors that can affect our forecasts, this correspondence of judgmental and model-based results is remarkably close. In essence, it can be said that the decline in the funds rate has offset the unexpected strength of the dollar."

This statement suggests that, based on the model, the lack of recovery expected by the FOMC was due to an unexpected appreciation of the dollar and the influential role of the model in its implications for interest rates is clear: They would have to decline again to offset this unexpected appreciation.

Interest in quantifying the role of the dollar in the slowing of economic recovery using model-based results reappears in the August 20th meeting. Specifically, Parry [F] (page 18) asks:

" The assumption made in the forecast with regard to the dollar is that it remains

constant. Is that an exogenous determination? And if it is, what, for example, would the MPS model give for the dollar and what would be its implications? ”

To this question, Truman [S] (page 18) responds:

“Well, viewing the forecast as a whole, it is not an assumption that is part of the projection process. It is endogenous to our outlook for interest rates here, which is where we start from, our outlook for interest rates abroad, and what else is going on in the forecast. ...”

Though Truman does not report the estimates from the MPS model, he indicates:

“... The MPS model has a slightly different exchange rate equation than most others, none of which does very well. ... ”

The remarks from Truman illustrate the manner in which persuasive requests from policymakers lead to changes in the model. Specifically, addressing the adequacy of exchange-rate models led to permanent modifications in the exchange-rate equations of the operational models [see Edison and Pauls, (1993)].

5.4 Phase IV: September - December

The Board lowered the discount rate by 50 basis points on September 13th. The discussion motivating that reduction relied only on data developments and not on model predictions. Nevertheless, the magnitude of the reduction in interest rates matches closely the one that, at the February meetings, was reported as being needed (exhibit 2, scenario 1) to raise output in 1992 to the level forecasted in February of 1991.

The discount rate declined again on November 6th by 50 basis points. Prior to this date, the FOMC had two scheduled meetings and a conference call. The first of the scheduled meetings (October 1, 1991) revealed continuing concern about the extent to which the unexpected behavior of the dollar was offsetting the easing of monetary policy. Prell [S] (page 8) notes:

"Ted Truman presented an interesting econometric result--I think it was in the chart show--which indicated in essence that to a first approximation the decline in interest rates that had occurred since the beginning of this year had effectively offset the surprise we have seen in the dollar, which we had not anticipated to appreciate as it did. Thus, if you looked at where output would be sometime out in 1992, these were compensating forces. ..."

Thus models are playing an influential role by identifying the factors that account for the gap between the functioning of the economy and the expectations the FOMC. Indeed, the initial decision to lower interest rates implicitly relied on an exchange-rate response that would, if anything, accentuate the expansion of income. The dollar, contrary to expectations, appreciated and the models were then used to quantify the resulting offsetting effect on income.

Model estimates are clearly not the only input to the policy formation process but no other analytical tool could provide a quantitative estimate of the extent to which different forces in the economy offset changes in monetary policy. In this regard, Chairman Greenspan expressed his views in the October 30th Conference Call (page 1):

"... I've concluded from this myself that we probably have to do something further, but I'm uncomfortable about a variety of different alternatives. What I'd like to do is to get a sense of this Committee with respect to: (1) an update on how all of you view your various Districts and the nation as a whole; and (2) any suggestions you might wish to offer regarding various alternative ways we might move. For example, we could, were we to choose to do so, do a 25 basis point reduction in the federal funds rate today. We could wait perhaps until Friday and do a [cut in the] discount rate and 50 basis points [on the federal funds rate]; we could wait until after the FOMC meeting and do either or both of those; ... "

Changes in interest rates were delayed until the next meeting. That meeting revealed continued disappointment between expectations and performance. A question posed by Syron [F] (page 2) succinctly summarized this disappointment:

"Mike, I have two questions. Is it fair to say, looking at the probability distribution in your forecast now, that you still would consider the negative tail fatter, even after your revision? "

Some of that disappointment might have been 'home grown' as Lindsey [S] (appendix, page 3) indicates:

"... Indeed, when we prepared the previous bluebook, we concluded that the near-term sensitivity of M2 to changes in short-term interest rates was lower than we had previously thought. We did so in recognition of the heightened importance of partially offsetting movements in the yield curve.... "

The discount rate was lowered 50 basis points on November 6th. This timing, however, was influenced by considerations generally neglected in theoretical papers but crucial for actual decisions: the timing of quarterly auctions and the meetings of Federal Reserve Banks Presidents with their respective boards.

The last decrease in the discount rate in 1991 took place on December 20th. At the FOMC meeting, Truman [S] (appendix, page 4) offered a "worst case" scenario:

"... We have estimated the effects on our outlook for the U.S. external sector of a 'worst case' scenario in which there is little or no growth abroad in the near term and only a weak recovery in 1992, producing growth over the four quarters of next year about one percent lower than we are now projecting. Our model simulation suggests that such a scenario would chop almost 3/4 of a percentage point from the level of U.S. real GDP by the fourth quarter of 1992. ..."

Once again, for meetings that involve absorbing substantial amounts of data, conjectures, and estimates, one cannot tell unambiguously the weight of model simulations in the crafting of the FOMC directive. Did the results of the model change monetary policy or did it merely provide empirical support for decisions that would been taken anyway? Though our reading of the record does not suggest a clear-cut answer to that question, we do not see how a reading of the record would deny an influential role of the models in the interest-rate reductions of 1991.

6. Conclusions

This paper shows that the conduct of U.S. monetary policy relies on models for information. Models give estimates of both the outlook and the response of the economy to policy

changes. Just as clear, models evolve to recognize changing the context in which policymakers operate – exchange rate flexibility, financial deregulation, and international trade agreements. What has not been clear until now, however, is how this model-based information gets channeled to policymakers and how models evolve to recognize the character of the questions faced by policymakers? This paper examines these questions with the transcripts from the FOMC meetings and provides an insiders' look at the formulation of monetary policy.

The transcripts indicate that models are shaped by the judgement of policymakers. Indeed policymakers can influence model building through their requests for the models to address issues central to the conduct of monetary policy. The debate on how to conduct monetary policy to attain price stability led to modifications of the treatment of expectations in the models (section 4).

The transcripts also indicate that, as informational devices, models play an institutional role, as reflected in the regular reporting of forecasts and their sensitivity to hypothetical changes in policies (section 2.2). Models also exert an influential role by estimating the systematic component of economy and allowing policymakers to craft policy responses to address the unsystematic component. This role, previously undocumented in the literature, is reported in our analysis of the 350 basis points decline in interest rates in 1991 (section 5).

On the whole, we conclude that far from being mechanistic providers of policy constraints, models shape and are shaped by the judgement of policymakers, at least in the conduct of monetary policy in the United States from 1984 to 1991.

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Costs of Achieving Zero Inflation Under Alternative Scenarios

	Cumulative Losses 1989-95		
	Shortfall of GNP from potential ¹ (percent)	Excess of unemployment over natural rate ² (percent)	Sacrifice ³ ratio (3)
	(1)	(2)	(3)
1. Zero inflation base case	20	8-1/2	2.2
2. With weaker dollar	24-1/2	9-1/2	2.5
3. With higher oil prices	25-1/2	10-1/2	2.7
4. With unchanged full-employment budget deficit	20	8	2.1

1. Calculated as the cumulative percentage gap between potential GNP and actual GNP from 1989 to 1995.
2. Calculated as the cumulative gap between the actual unemployment rate and the natural rate (assume to be 5-1/2 percent) from 1989 to 1995.
3. Calculated as the cumulative excess of unemployment over the natural rate divided by 3.9 (the reduction in inflation between 1989 and 1995).

EXHIBIT 1

Source: Material for Special Presentation to the Federal Open Market Committee, December 18-19, 1989.

WHAT IF THE FED WERE TO EASE SUBSTANTIALLY IN THE NEAR TERM?

SCENARIO 1: FOMC judges, correctly, that the economy is "one percent weaker" than Greenbook suggests; it lowers fed funds rate to achieve the same output level in late 1992 as in the Greenbook.

SCENARIO 2: FOMC judges, incorrectly, that economy is weaker than Greenbook suggests; it eases now, but realizes by midyear that the Greenbook was right and reverses course to avoid seriously overshooting the Greenbook output path in 1992.

	1991	1992
Real GNP, Q4/Q4		
Greenbook	1.9	2.6
Scenario 1	1.6	2.9
Scenario 2	2.3	2.2
Unemployment rate, Q4		
Greenbook	6.1	6.0
Scenario 1	6.2	6.0
Scenario 2	6.0	6.0
CPI, Q4/Q4		
Greenbook	3.9	3.9
Scenario 1	3.9	3.8
Scenario 2	3.9	4.0

	1991				1992			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Federal funds rate								
Greenbook	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
Scenario 1	6.25	5.0	5.0	5.0	5.25	5.5	6.0	6.75
Scenario 2	6.25	5.0	6.25	7.5	8.0	7.75	7.25	6.75

EXHIBIT 2

Source: Material for Staff Presentation to the Federal Open Market Committee, February 5, 1991.

Alternative Scenarios

- Baseline:** Greenbook forecast extended through 1993; M2 growth at 5-1/2 percent in 1992 and 1993.
- February Dollar:** Dollar at the level projected in February, almost 15 percent below level now projected; federal funds rate unchanged from baseline.
- Weak Foreign Growth:** Foreign growth remains at about 1-1/2 percent; federal funds rate unchanged from baseline.

	<u>1991</u>	<u>1992</u>	<u>1993</u>
Percent change, Q4 to Q4			
Real GNP, U.S.			
Baseline	1-1/2	2-3/4	2-1/2
February Dollar	2-1/2	4-1/4	5
Weak Foreign Growth	1-1/2	2	1
GNP Prices			
Baseline	4	3-1/2	3-1/4
February Dollar	4-1/2	4-1/2	5
Weak Foreign Growth	4	3-1/4	2-1/2
Real GNP, Foreign *			
Baseline	2-1/4	3-1/2	3-1/2
February Dollar	2-1/4	3-1/4	4
Weak Foreign Growth	1-1/2	1-1/2	1-1/2
Q4 Level, \$ billions			
Current Account			
Baseline	-45	-52	-56
February Dollar	-37	-20	-32
Weak Foreign Growth	-48	-73	-95

* Average of 22 industrial and 8 developing countries weighted by bilateral shares in U.S. non-agricultural exports.