Monetary Policy Rules Based on Real-Time Data

By ATHANASIOS ORPHANIDES*

This paper examines the magnitude of informational problems associated with the implementation and interpretation of simple monetary policy rules. Using Taylor's rule as an example, I demonstrate that real-time policy recommendations differ considerably from those obtained with ex post revised data. Further, estimated policy reaction functions based on ex post revised data provide misleading descriptions of historical policy and obscure the behavior suggested by information available to the Federal Reserve in real time. These results indicate that reliance on the information actually available to policy makers in real time is essential for the analysis of monetary policy rules. (*JEL* E52, E58)

In recent years, simple policy rules have received attention as a means toward a more transparent and effective monetary policy. A series of papers have examined the performance of such rules in theoretical as well as empirical terms.[1] Such rules typically specify that the monetary authority set its operating instrument as a function of one or two observable variables reflecting inflationary and real activity conditions in the economy.

Often, however, the analysis underlying these policy rules is based on unrealistic assumptions about the timeliness of data availability and ignores difficulties associated with the accuracy of initial data and subsequent revisions. For example, the rule proposed by Taylor (1993) recommends setting the federal funds rate using the current-quarter output gap and inflation based on the output deflator. Taylor's rule has received considerable attention in large part because he demonstrated that the simple rule described the actual behavior of the federal funds rate rather surprisingly well. But as is well known, the actual variables required for implementation of such a rule—potential output, nominal output, and real output—are not known with any accuracy until much later. That is, the rule does not describe a policy that the Federal Reserve could have actually followed.

The primary source of this problem is the reliance on *ex post* revised data for the analysis. Indeed, standard practice in empirical macroeconomics is to employ *ex post* revised data for the analysis of historical time series without adequate investigation of the possible consequences of this practice on the results.[2] However, the measurement of many concepts of interest, for instance of output and its price, is fraught with considerable uncertainties that are resolved only slowly and perhaps never completely. Although this informational problem

* Board of Governors of the Federal Reserve System, Washington, DC 20551. I thank Helen Douvogiannis and Rebecca Zarutskie for their superb assistance with the organization of the data during the summer of 1997 and Kendrew Witt for valuable research assistance. I also thank Charles Calomiris, Dean Croushore, Bill English, Charlie Evans, Marvin Goodfriend, Ken Kuttner, David Lindsey, Adrian Pagan, Dick Porter, Brian Sack, two anonymous referees, and participants at presentations at New York University, the Econometric Society, the Federal Reserve System Committee on Macroeconomics Conference, and the NBER Conference on the Formulation of Monetary Policy for useful discussions and comments. The opinions expressed are those of the author and do not necessarily reflect views of the Board of Governors of the Federal Reserve System.

[1] See Dale Henderson and Warwick J. McKibbin (1993), John B. Taylor (1993), Ray C. Fair and E. Philip Howrey (1996), Andrew Levin (1996), Laurence Ball (1997), Ben Bernanke and Michael Woodford (1997), Richard Clarida and Mark Gertler (1997), Jeffrey Fuhrer (1997), Orphanides et al. (1997), Julio Rotemberg and Woodford (1997), Lars Svensson (1997), Bennett T. McCallum (1999), John Williams (1999), and the conference volumes edited by Ralph C. Bryant et al. (1993) and Philip Lowe (1997). Clarida et al. (1999) provide an extensive survey.

[2] Throughout, I refer to the informational problem as one associated with data "revisions" but this should be interpreted to include redefinitions and rebenchmarks, although, strictly speaking, these pose slightly different problems in some respects.

may not be of significance for some purposes, it is likely to be of great importance when the investigation concentrates on how policy makers react or how they ought to react to current information for setting policy. But this is exactly the purpose of the study of simple reactive monetary policy rules.

Informational problems can have a significant impact in the analysis of policy rules for several reasons. The most direct, perhaps, regards rules based on data that are not available when they must supposedly be used. As McCallum (1993a, b) pointed out, such rules are simply not operational.[3] A thornier issue concerns the influence of data revisions on the "proper" policy setting suggested by a reactive rule. Retrospectively, the "appropriate" policy setting for a particular quarter may appear different with subsequent renditions of the data necessary to evaluate the rule for that quarter. Through a distorted glass, the interpretation of historical episodes may change. Policy that was in accordance with a fixed rule at the time the policy was set may appear instead to have been excessively easy or tight and vice versa. This issue is also of importance in the context of econometric model-based evaluations of alternative policy rules. Standard current practice in such evaluations is to specify the policy instrument in terms of the variables it is reacting to, as if these variables were known to the policy maker with certainty and were not subject to revisions. Such comparisons can be seriously misleading in the presence of significant informational problems. Reliance on *ex post* revised data can also prove misleading in efforts to identify the historical pattern of policy. Policy reaction functions estimated based on *ex post* revised concepts and data can be of questionable value for understanding how policy makers react to the information available to them in real time.

This paper examines the magnitude of these informational problems using Taylor's rule as an example. First, I construct a database of current quarter estimates/forecasts of the quantities required by the rule based only on information available in real time. Using this data I reconstruct the policy recommendations, which would have been obtained in real time. I demonstrate that the real-time policy recommendations differ considerably from those obtained with the *ex post* revised data. Further, I show that estimated policy reaction functions based on *ex post* revised data yield misleading descriptions of historical policy. Using Federal Reserve staff forecasts I show that in the 1987–1993 period simple forward-looking specifications describe policy better than comparable Taylor-type specifications, a fact that is largely obscured when the analysis is based on the *ex post* revised data.

I. Data and Measurement Issues in Taylor's Rule

I focus my attention on a well-known family of policy rules that set the federal funds rate as a linear function of inflation π, and the output gap y. Letting R_t denote the recommended level for the federal funds rate in quarter t, these rules take the simple form

$$R_t = a_0 + a_\pi \pi_t + a_y y_t. \tag{1}$$

As is well known, this family nests a parameterization proposed by Taylor (1993), which has received considerable attention, $a_0 = 1$, $a_\pi = 1.5$, and $a_y = 0.5$.[4] Taylor measured inflation for quarter t, as the rate of change of the implicit output deflator over the previous four quarters and the output gap for quarter t, as the percent deviation of real GDP from a linear trend capturing potential output. Although

[3] This problem is most common in rules requiring contemporaneous data that are typically available with a lag. In principle this problem can be dealt with, either by recognizing that the policy maker will have to employ within-period forecasts to operationalize the rule or by specifying that policy react to the latest available "current" information where current would refer to the last period for which data are available. But in either case, the suggested policy prescribed by the rule will differ from what would obtain if the rule were evaluated using *ex post* revised data.

[4] This family of rules was first examined in the policy regime evaluation project reported in Bryant et al. (1993). Orphanides (1997) provides details. Briefly, that volume suggested encouraging stabilization performance for rules of the form $R_t - R^*_t = \theta(\pi_t - \pi^*) + \theta y_t$, where R^*_t reflects a baseline setting for the federal funds rate, π^* the policy maker's inflation target, and θ the responsiveness of policy to inflation and output deviations from their targets. Taylor's parameterization obtains by using the sum of inflation and the "equilibrium" real interest rate r^* for R^*_t, and setting $r^* = \pi^* = 2$ and $\theta = 0.5$.

Taylor originally offered his parameterization as a hypothetical rule that was representative of the rules examined in the model simulation work, he also noted that it described actual Federal Reserve policy surprisingly accurately in the 1987–1992 period he examined. Because of this accuracy, which was reinforced in later studies such as Taylor (1994), his rule received considerable attention in the financial press and has been discussed by academics, policy makers, and financial practitioners. Further, his particular parameterization has been seen not simply as a guidepost to policy decisions, but also as a useful benchmark for predicting future policy, as well as judging whether current policy has been appropriately set.

Operational implementation of such a rule, however, entails a significant information burden; specifically it requires timely and accurate information regarding nominal output, real output, and the path of potential output. Unfortunately, none of these concepts is known with much accuracy until several quarters or perhaps years later.[5] To quantify the effect of these informational problems, I created a quarterly data base that could be used to reconstruct Taylor's rule as could be implemented at the Federal Reserve in real time and with later data, matching the information corresponding to Taylor's 1993 and 1994 studies. To reflect information available to the Federal Open Market Committee (FOMC) as closely as possible, I relied on information associated with the production of the Greenbook. This is a document summarizing the Federal Reserve staff's analysis of current and prospective economic conditions that is prepared by the staff for the FOMC before each FOMC meeting. For the purpose of tracking quarterly updates, I used information corresponding to the FOMC meeting closest to the middle of the quarter. In the period relevant for this study, the FOMC met eight times a year, typically in the months of February, March, May, July, August, September, November, and December. (Occasionally, the "February" and "July" meetings actually take place at the end of January and June, respectively.) I use information corresponding to the February, May, August, and November meetings. This choice has the following advantages. First, the dates always correspond to information available by (the beginning of) the middle month of a quarter. As a result, the constructed quarterly observations are spaced approximately equally apart in time. Indeed the timing of the FOMC meetings does not permit constructing a quarterly data set with approximately equally spaced apart observations corresponding to the beginning or end of a quarter. For rules such as Taylor's, which are specified at a quarterly frequency and which recommend that the policy maker set the average federal funds rate in a quarter using within-quarter information, the middle of the quarter is more appropriate than either the beginning or the end for evaluating a prescription presumed fixed for the whole quarter. Using the beginning of the quarter would not allow the policy maker to react to that quarter's data at all. Using the end would allow for more of the contemporaneous information to influence the rule but would make setting the average federal funds rate for the quarter at the recommended level virtually impossible. Second, with this timing, the Greenbook forecasts for a quarter, t, always follow the announcement of the first National Income and Product Accounts (NIPA) output estimate for the previous quarter, $t - 1$, at least for the sample relevant for this study. Consequently, moving from quarter to quarter, the NIPA data are of comparable accuracy relating to the completeness of the underlying information available. Finally, to match the information underlying Taylor's 1993 and 1994 studies I used data corresponding to the January 1993 and November 1994 Greenbooks.[6]

[5] To be sure, this is not the only difficulty with the implementation of the Taylor rule. Another major issue is identifying the appropriate level of the equilibrium real interest rate r^*, which is required for calibrating the intercept of the rule, α_0. This is particularly problematic because r^* is notoriously difficult to estimate and may well vary over time. Here, I concentrate my attention to difficulties arising even if the parameterization of the rule is assumed to be correct.

[6] The data as available on those dates (and the corresponding Greenbooks) best match the data underlying the two Taylor studies. I reconstruct Taylor's rule with both data sets. However, as data for 1992 (the end of Taylor's original sample) would have been expected to undergo substantial revisions after January 1993, I concentrate on the 1994 data set for most comparisons.

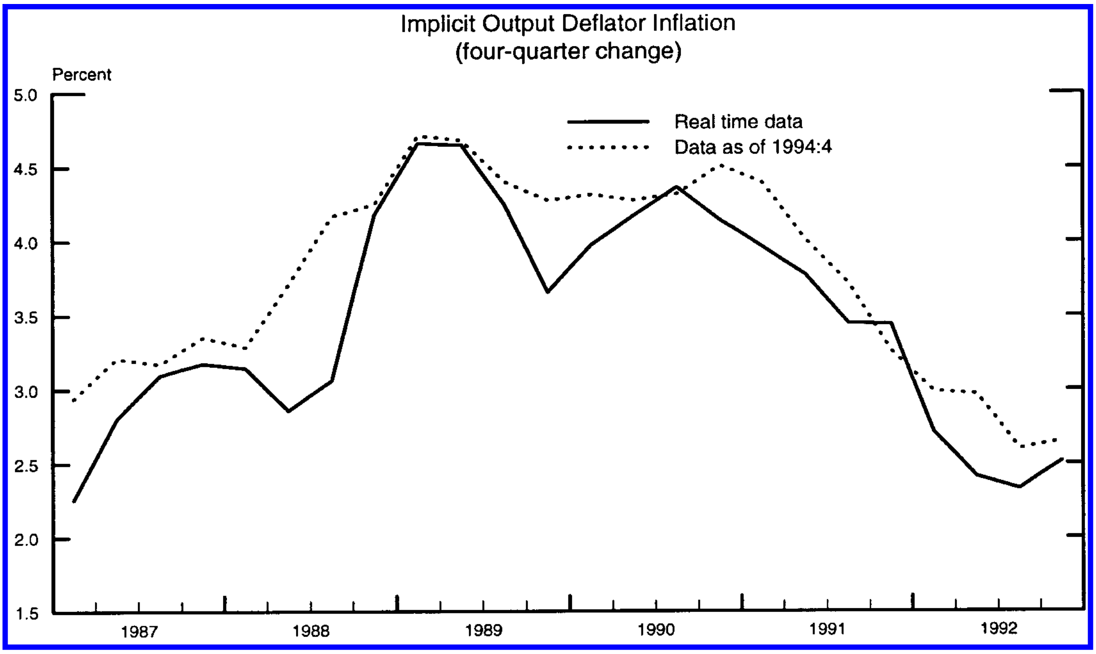

FIGURE 1. REAL-TIME AND REVISED DATA FOR INFLATION

Examine first the implications for inflation data. To keep track of the alternative data vintages, for any variable X, I use the notation $X_{t|s}$ to denote the value for quarter t as available in quarter s. Thus the series $\pi_{t|94:4}$ reflects the inflation data corresponding to Taylor's 1994 study and available to the Federal Reserve at the end of 1994, whereas $\pi_{t|t}$ reflects the within-quarter estimates available at the Federal Reserve in real time. In each case, the series reflects inflation as measured by the change in the implicit output deflator over four quarters; however, the data obviously differ in some ways. Real-time estimates are calculated with measurement concepts in use at the time rather than what Taylor used, that is, GDP in 1987 dollars for all observations. Thus before 1992, GNP and not GDP is the measure of output; and the deflator uses 1982 rather than 1987 prices. For each quarter, the data reflect historical information and unrevised contemporaneous forecasts for that quarter as available at the time. Thus, they do not incorporate information that was not available and could therefore not influence policy decisions. Figure 1 compares the real-time inflation data with the data available in 1994:4 and illustrates the significance of these differences. Summary statistics are provided in Table 1. As can be seen, differences as large as half a percentage point are not uncommon. This difference alone suggests possibly substantial differences in policy rule prescriptions based on real-time and revised data.

Next, consider the output gap input required for implementing the Taylor rule. Again, real-time estimates differ from subsequent estimates because of revisions and conceptual changes regarding real output. In addition, because output gap estimates reflect measures of both actual and potential output, revisions and conceptual changes in potential output are also reflected in revisions of the output gap. As a result, some additional detail regarding potential output is warranted. During the period relevant for this study, the Federal Reserve staff estimate of potential output—the Q^* series—was prepared according to the method outlined in Peter K. Clark (1982) and Steven Braun (1990). Briefly, this procedure defines the log of potential output as a linear spline: $\log Q_t^* = b_0 + b_1 t_1 + b_2 t_2 + \cdots + b_n t_n$, with prespecified knot points

TABLE 1—SUMMARY STATISTICS: 1987:1–1992:4

Name	MEAN	SD	MA	MAD	MIN	MAX
f_t	6.79	1.93	6.79	1.53	3.04	9.73
$f_t - f_{t-1}$	−0.13	0.54	0.45	0.43	−1.32	0.97
$\pi_{t\|t}$	3.46	0.75	3.46	0.64	2.25	4.66
$\pi_{t\|94:4}$	3.76	0.68	3.76	0.60	2.60	4.71
$y_{t\|t}$	−1.25	2.16	1.98	1.91	−4.36	1.90
$y_{t\|94:4}$	−0.23	1.78	1.57	1.59	−2.99	2.07
$y^T_{t\|t}$	−0.72	1.22	1.14	1.08	−2.85	0.81
$y^T_{t\|94:4}$	0.71	1.75	1.67	1.57	−1.98	3.00

Notes: The sample consists of 24 quarterly observations. f_t is the daily average federal funds rate for quarter t, in percent per year. y_t is the output gap for quarter t, defined as actual real output minus potential, as a fraction of potential, in percent. π_t is inflation of the implicit deflator from the same quarter in the previous year, in percent. For any variable X, $X_{t|t+i}$ denotes the estimate of X_t available in quarter $t + i$. The statistics shown for each variable are: MEAN, the mean; SD, the standard deviation; MA, the mean of the absolute value; MAD, the mean of the absolute value of the variable minus its mean; and MIN and MAX, the minimum and maximum values. The superscript T denotes reliance on a linear trend for potential output.

chosen to allow for historical breaks in potential output growth.[7]

For his original demonstration in 1993, Taylor relied instead on a linear trend of the log of output, starting in 1984 and ending in 1992, to measure the output gap. He employed a similar trend with later data in 1994. As a result of his judicious choice for the start of the detrending period, Taylor's estimate for the growth of potential output for the 1987–1992 period was very similar to the Federal Reserve staff estimate for that period. However, the level of Taylor's series was on average about half a percentage point higher than the Q^* series. This is attributed to the fact that, although Taylor's linear detrending effectively imposed a zero average output gap over the period selected for the detrending, 1984–1992, the level of the Q^* series does not impose such a condition for this sample. To illustrate the similarity of the output gap series based on Taylor's detrending and the Federal Reserve staff estimates, I reconstructed both sets of estimates. (To distinguish them, I use the superscript T to denote the simple trend based alternative.) Thus, $y^T_{t|93:1}$ and $y^T_{t|94:4}$ reflect the output gap series as in Taylor's 1993 and 1994 studies and $y_{t|93:1}$ and $y_{t|94:4}$ the Federal Reserve staff estimates corresponding to the same data vintages. For comparisons with real-time data available to the FOMC, I rely on the real-time staff estimates of the output gap $y_{t|t}$. Another approach would be to construct real-time estimates of the output gap by detrending a rolling sample with nine years of data, using the historical time series available during that quarter. The resulting real-time estimate $y^T_{t|t}$ captures Taylor's detrending quite closely. However, it is unclear whether these estimates would have been meaningful for policy decisions in real time. Significantly, this procedure would lack the judgment reflected in Taylor's sample selection. For some observations, the start of the detrending period would coincide with the 1980 or 1981 recessions. For others, the end of the detrending period would reflect the 1990 downturn. I construct this alternative to illustrate some of these problems but concentrate most of my attention on comparisons based on estimates of potential output that were actually available to the FOMC in real time and are therefore more meaningful.

Figure 2 presents the real-time and 1994:4 renditions of the alternative series for the output gap. Comparison of the 1994:4 series in the two panels shows the similarity (up to a constant) of the Federal Reserve staff estimate of the output

[7] The coefficients of the spline $b_0, \ldots, b_n$ were estimated by embedding the spline in a dynamic Okun's law relationship linking the unemployment gap $U_t - U^*_t$ to a distributed lag of the output gap defined using the spline. The unemployment gap, that is, the difference between the actual and the natural rate of unemployment, was based on a time-varying estimate of the natural rate of unemployment, which accounted for changes in demographics, trend labor productivity, and other factors. End-of-sample estimates of trend labor productivity and the natural rate of unemployment also accommodated judgmental considerations.

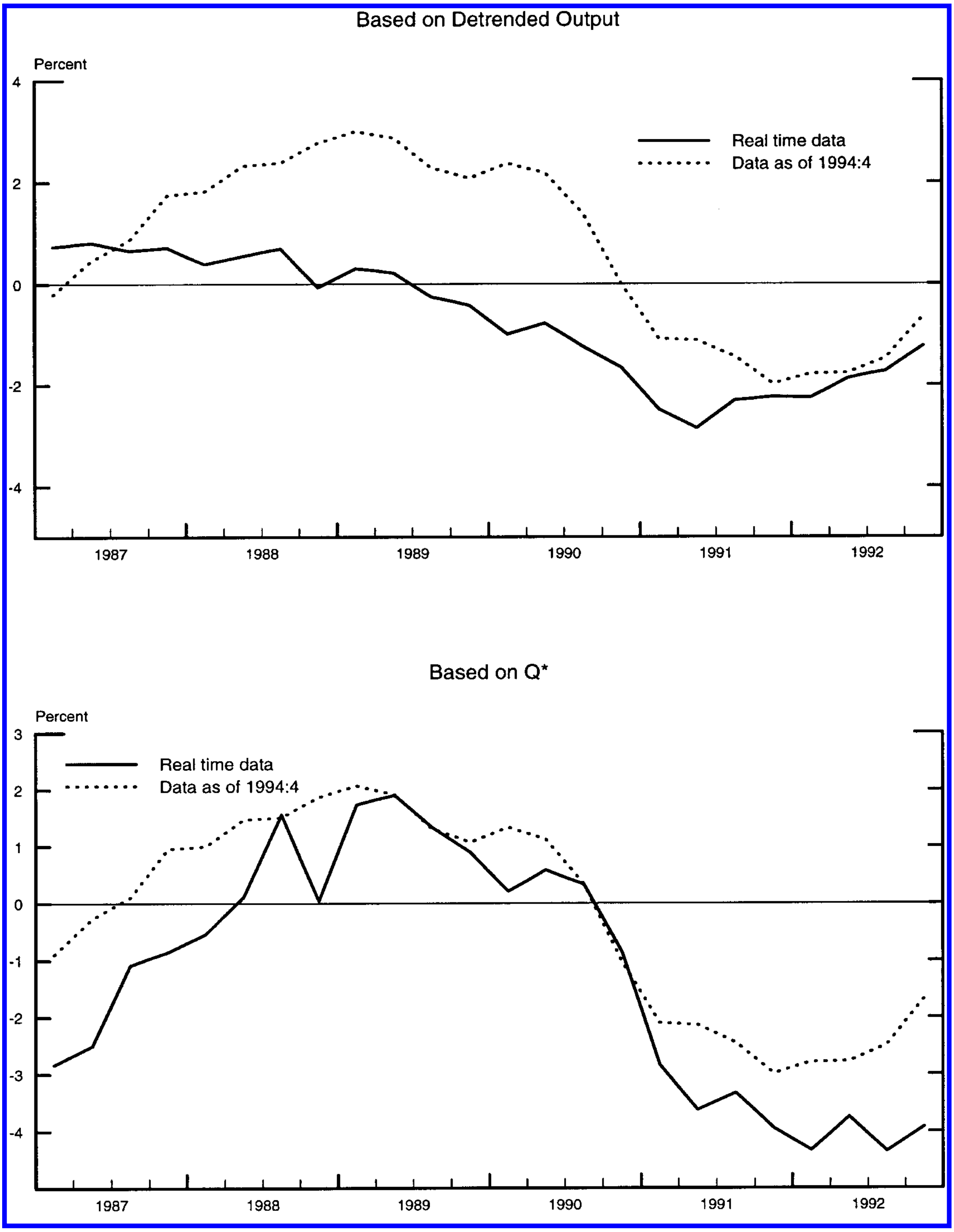

FIGURE 2. REAL-TIME AND REVISED DATA FOR OUTPUT GAP

gap and the series in Taylor's study. The top panel also confirms that the real-time estimate of the output gap based on rolling linear detrending hardly resembles Taylor's 1994 estimates of the historical output gap. However, comparison of the real-time and 1994:4 staff estimates of the output gap indicates that the revisions in this series are also very large and persistent.[8] This suggests a lack of reliability in real-time estimates of the output gap, which poses a difficult problem in implementing the Taylor rule.

II. Reconstructing Taylor's Rule

Having re-created the data required for reconstructing the Taylor rule in real time and with revised data, in this section I present comparisons of the alternative renditions of the rule. In Figure 3 I reconstruct Taylor's rule for the period he originally examined when he proposed the rule, 1987:1 to 1992:4. First, to match Taylor's rule as originally published, I use the $\pi_{t|93:1}$ and $y^T_{t|93:1}$ series described earlier, which are based on NIPA data available at the time Taylor first presented his work, as of January 1993 following the first estimate for the fourth quarter of 1992. The resulting rule is represented by the dotted line in the top panel of the figure. As noted by Taylor, the rule appears to fit the actual data for the quarterly average level of the federal funds rate over this period surprisingly well. (The actual federal funds rate is shown by the solid line.) The dash–dot line in the panel shows the rule based on the later data, $\pi_{t|94:4}$ and $y^T_{t|94:4}$, as presented in Taylor (1994). As can be seen, this variant of the rule also tracks the actual federal funds rate quite well. Confirming the prior that revisions in the data might alter the picture slightly, however, some discrepancies between the 1993 and 1994 versions of the rule become evident for the rule recommendations regarding 1992. The bottom panel of the figure plots the corresponding renditions of the rule based on the Federal Reserve staff estimates of the output gap $y_{t|93:1}$ and $y_{t|94:4}$ and the corresponding inflation data. As can be seen by comparing the top and bottom panels of the figure, the rules obtained using the linear trend and Q^* are essentially identical except for an intercept shift resulting from the difference in the output gap series explained earlier. Indeed, as shown in Table 2, on average from 1987 to 1992 the difference between $R^T_{t|94:4}$ and $R_{t|94:4}$ was 47 basis points, although the standard deviation was very small, merely 6 basis points, with the mean absolute demeaned difference only 5 basis points. As a result of this difference, comparing the corresponding rules requires an adjustment in the intercept of the rule, equal to one-half the difference of the average output gaps.[9] Beyond this adjustment, however, the differences appear to be inconsequential.[10]

Figure 4 compares the real-time rendition of the rule with the actual federal funds rate (dash line) and the comparable rule obtained using the revised data (dotted line). As is apparent from the figure, the prescriptions obtained from the rule using the real-time data do not appear to have tracked the actual federal funds rate nearly as closely as the formulation based on the *ex post* revised data suggested. Table 2 provides a

[8] A decomposition of these large revisions in the Federal Reserve staff estimates of the output gap into a component resulting from revisions in the historical output data and another resulting from revisions in estimates of potential output would be of interest. Orphanides and Simon van Norden (1999) perform such decompositions for a number of alternative statistical techniques available for estimating the output gap. Their results suggest that, although revisions in actual output data alone can, at times, contribute greatly to output gap mismeasurement, the difficulty associated with obtaining end-of-sample estimates of potential output presents a greater problem. These decompositions are based on constructing counterfactual estimates based on rolling information sets. However, such counterfactuals are not possible to implement with the staff estimates because, as noted in footnote 7, these also reflect judgmental considerations. Consequently, I do not pursue such a decomposition here.

[9] Comparisons of policy prescriptions from rule (1) based on alternative inflation and output gap measures are more meaningful when systematic differences that are known a priori are adjusted for. If δ_π is the systematic difference in inflation and δ_y the corresponding systematic difference in the output gap, an adjustment equal to $a_\pi\delta_\pi + a_y\delta_y$ in the intercept of the rule can achieve this result.

[10] I did not make this adjustment because the average difference between $y^T_{t|94:4}$ and $y_{t|94:4}$ could only be computed *ex post* and would not have been known in real time. To avoid the resulting unnecessary complications, I concentrate on comparing the *ex post* and real-time versions of the rule using only the Q^* concept of potential. As shown below, an additional bias is present when the real-time data are employed.

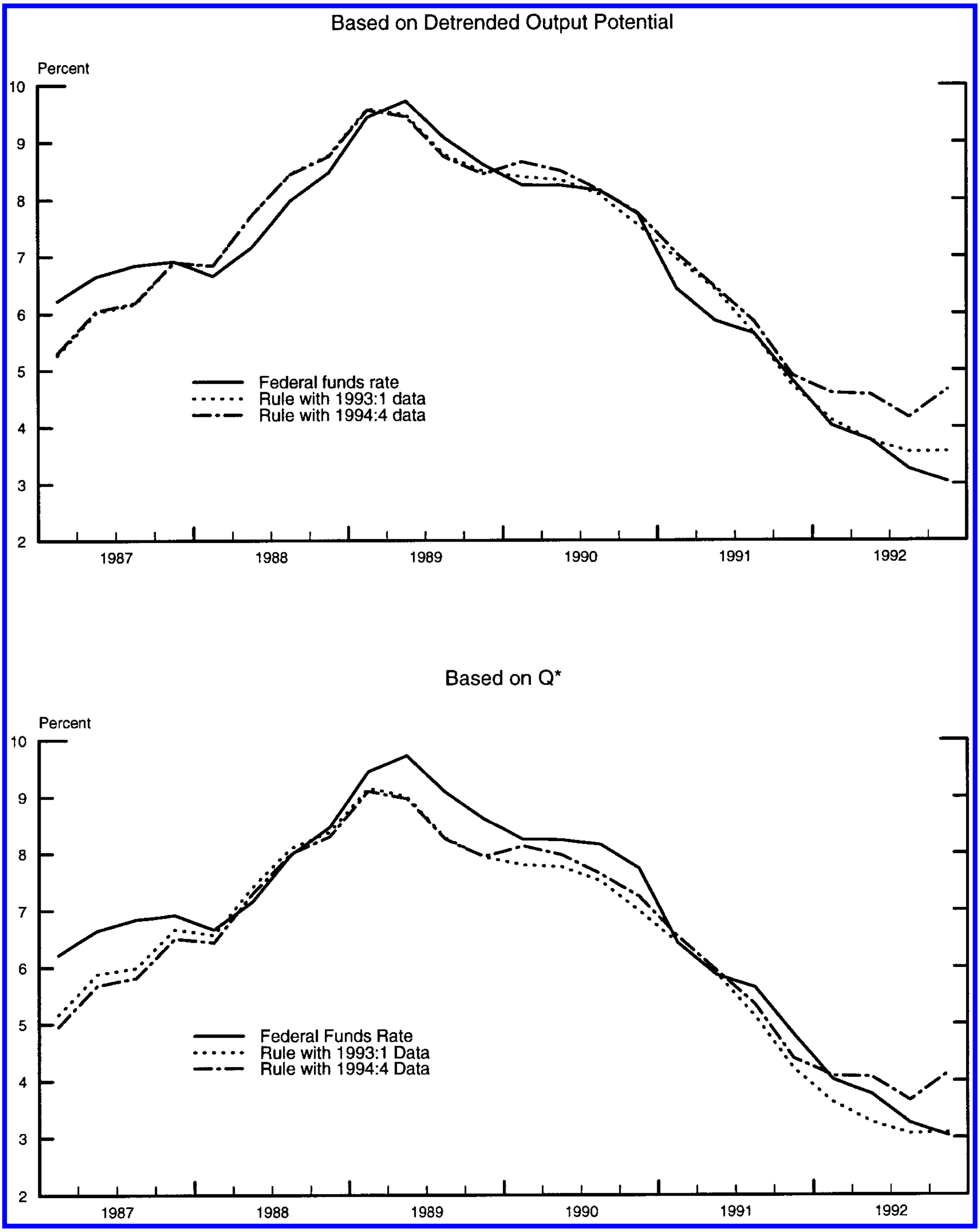

FIGURE 3. FEDERAL FUNDS RATE AND TAYLOR'S RULE

snapshot of the revisions in the Taylor rule prescriptions corresponding to alternative data vintages and concepts. Concentrating on the Taylor rule based on the Federal Reserve concept of the output gap, the differences in what the rule appears to have recommended in real

TABLE 2—DESCRIPTIVE STATISTICS OF TAYLOR'S RULE: 1987:1–1992:4

Name	MEAN	SD	MA	MAD	MIN	MAX
$f_t - R^T_{t\|93:1}$	−0.02	0.40	0.30	0.30	−0.57	0.95
$f_t - R^T_{t\|94:4}$	−0.20*	0.55	0.45	0.41	−1.62	0.92
$f_t - R^T_{t\|t}$	0.96***	0.83	1.11	0.65	−1.12	2.34
$f_t - R_{t\|93:1}$	0.40***	0.35	0.44	0.30	−0.26	1.05
$f_t - R_{t\|94:4}$	0.27**	0.52	0.46	0.39	−1.10	1.26
$f_t - R_{t\|t}$	1.23***	0.68	1.23	0.48	0.23	3.26
$R^T_{t\|94:4} - R^T_{t\|t}$	1.16***	0.68	1.17	0.55	−0.14	2.50
$R_{t\|94:4} - R_{t\|t}$	0.96***	0.58	0.96	0.46	−0.07	1.99
$R^T_{t\|94:4} - R_{t\|94:4}$	0.47***	0.06	0.47	0.05	0.35	0.53
$R^T_{t\|t} - R_{t\|t}$	0.27	0.85	0.76	0.73	−0.84	1.78

Notes: R is Taylor's rule, constructed as explained in the text. See also notes to Table 1.
* Mean is different from zero at the 10-percent level of significance.
** Mean is different from zero at the 5-percent level of significance.
*** Mean is different from zero at the 1-percent level of significance.

time $R_{t|t}$ and what would be believed to have been recommended based on the revised data $R_{t|94:4}$ can be substantial. The standard deviation of this difference is 58 basis points, with the maximum difference approaching a staggering 200 basis points. Regarding the fit of the rule, the standard deviation between the actual federal funds f_t and the rule based on the revised data $R_{t|94:4}$ is 52 basis points. The corresponding standard deviation with the real-time data $R_{t|t}$ rises to 68 basis points. For comparison, note that the standard deviation of the quarterly change in the federal funds rate over this period is only 54 basis points. That is, from a positive viewpoint, a one-quarter-ahead forecast of the federal funds rate—which naively specified that the rate would stay unchanged—would be more accurate than the forecasts obtained by a contemporaneous observer having at his or her disposal the within-quarter Greenbook forecasts and using the rule.

Besides identifying such differences, another implication from the comparison between the real-time and *ex post* revised renditions of the rule regards the historical interpretation of differences between Taylor's rule and actual policy. Viewing these differences as "residuals," it has been tempting to provide explanations for them, much as it is tempting to provide explanations for the residuals in any model. For instance, some observers have noted that one of the most pronounced departures of actual policy from the rule occurred during the early phases of the current expansion starting in 1992. This departure has been attributed to the fact the Fed responded to the so-called "financial headwinds" facing the economy at the time by holding the federal funds rate below where it would have been held in the absence of such special factors. Because such considerations are absent from the rule, such a departure from the rule could be termed, in retrospect, to have been quite appropriate. Yet, looking at the rule based on the real-time data appears to contradict the premise of this argument. Indeed, throughout 1992, the federal funds rate was higher than would be suggested by the Taylor rule. The residual is of the wrong sign. Removing any additional response resulting from "financial headwinds" would only make matters worse. The missing element, in this case, is that in real time the recovery of output coming out of the recession in 1992 looked considerably worse than the picture painted after several subsequent revisions of the data. It may be worthwhile noting in this context that the end of the recession, in March 1991, was not officially recognized by the NBER until December 1992. Throughout 1992, some ambiguity lingered on.

This brings up a more general question regarding the extent to which the recommendations suggested by the Taylor rule change just within a few quarters of the corresponding policy decision. To evaluate the extent of such revisions in the rule prescriptions and their components, I used the real-time data to track the recommendation obtained from the rule for four quarters subsequent to the quarter for which the

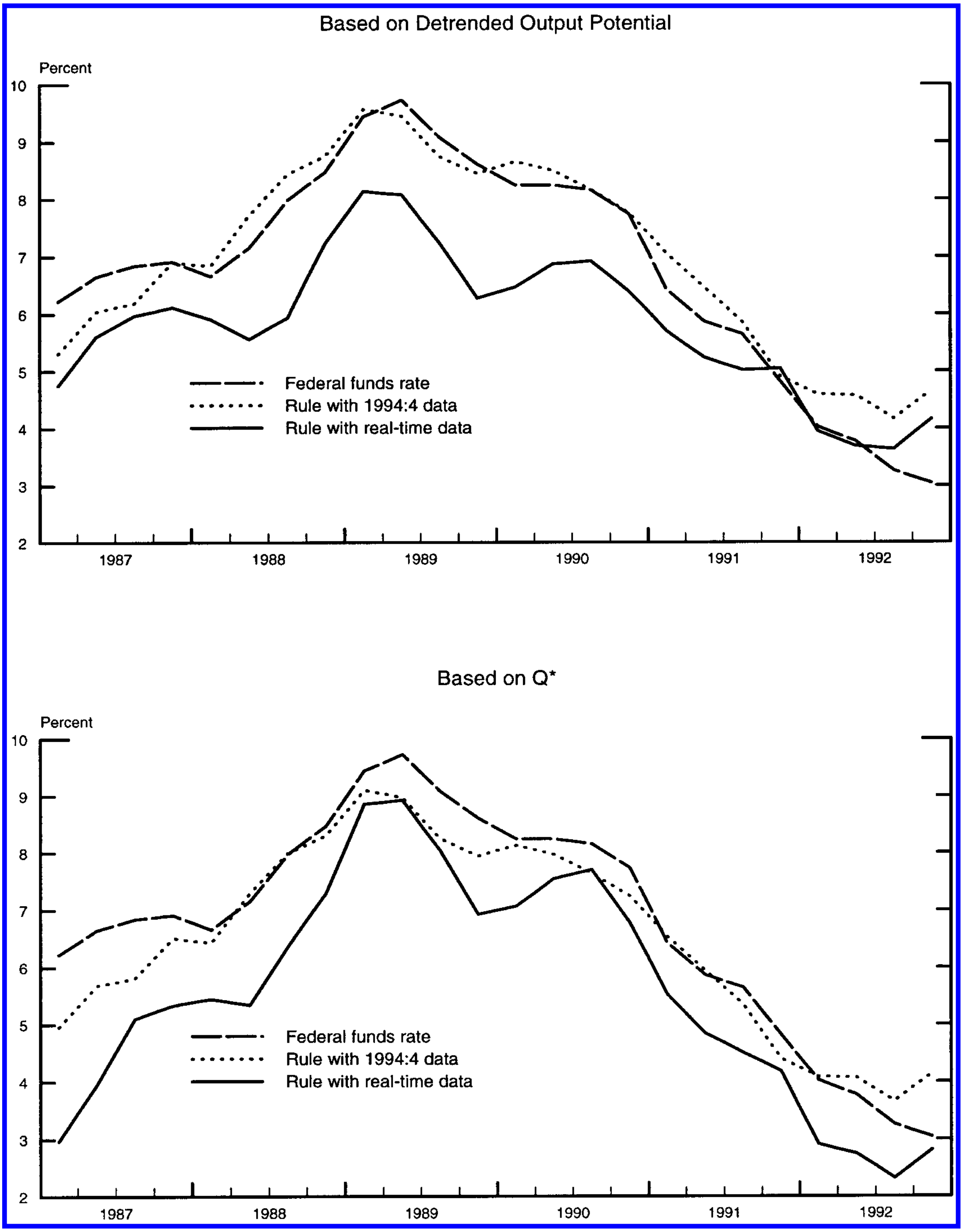

FIGURE 4. TAYLOR'S RULE BASED ON REAL-TIME AND REVISED DATA

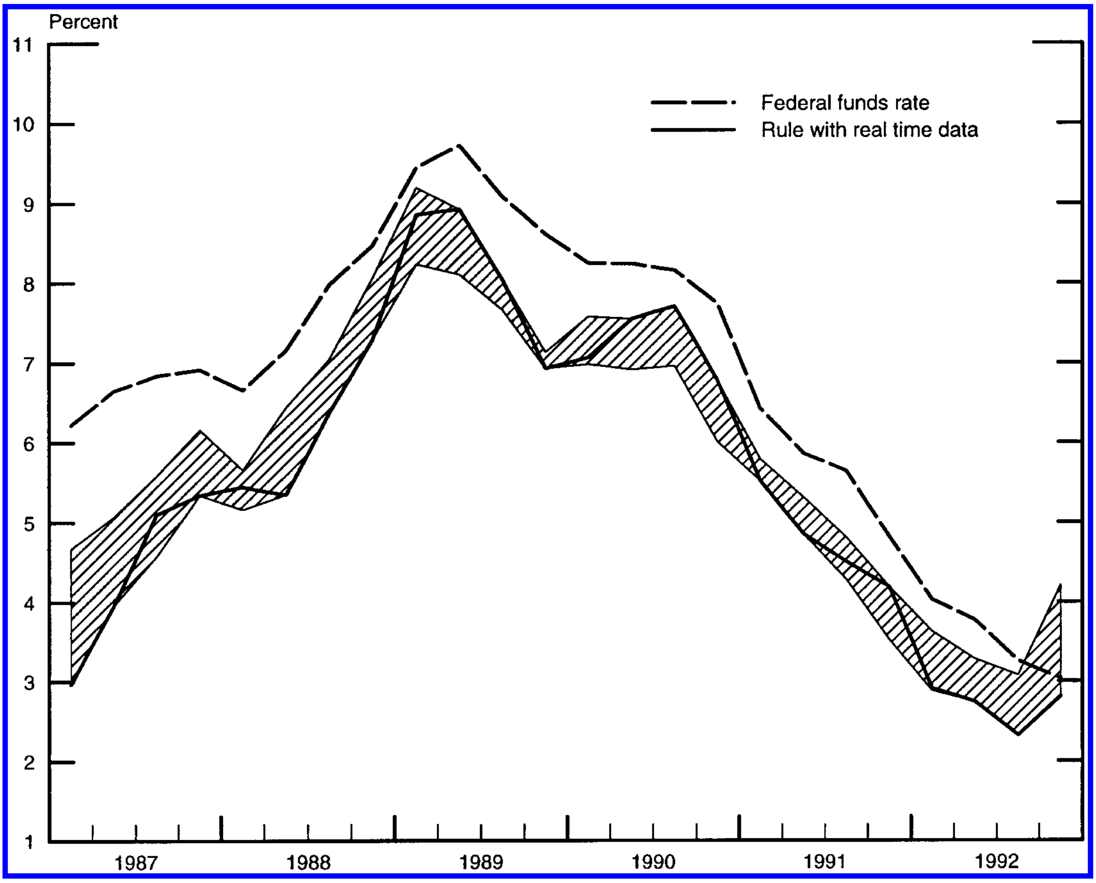

FIGURE 5. REAL-TIME RULE AND REVISIONS WITHIN A YEAR

Notes: For each quarter, the envelope around the rule indicates the range of recommendations for the federal funds rate that would obtain using data as of that quarter and as of each of the subsequent four quarters. The rule shown is based on the Q^* concept of potential output.

rule applied. That is, I constructed the revised estimates $\pi_{t|t+i}$ and $y_{t|t+i}$ for $i \in \{1, 2, 3, 4\}$ and used them to construct the corresponding rules, $R_{t|t+i} = 1 + 1.5\pi_{t|t+i} + 0.5y_{t|t+i}$ for $i \in \{1, 2, 3, 4\}$.

An envelope of the results for the rule reflecting the minimum and maximum recommendation for a given quarter obtained by using the rules with $i \in \{0, 1, 2, 3, 4\}$ is shown in Figure 5. As can be seen, considerable uncertainty regarding the correct setting of the rule is present within a year of the quarter for which the policy decision must be made. Figure 6 shows the ranges of the change in the rule recommendation and the corresponding changes in the underlying inflation and output gap estimates.

Table 3 presents some statistics associated with the cumulative revisions from the quarter the policy would have to be set to subsequent quarters for the two components of the rule as well as the rule itself. As can be seen in the middle panel, the standard deviation of the first revision of the output gap is quite large, 66 basis points. As large as this may be, the cumulative revisions in subsequent quarters reveal even greater variation. The standard deviation of the revision after a year approaches one percentage point.

Revisions to inflation are smaller in magnitude. As shown in the bottom panel of the table, the standard deviation of the first revision of inflation is 23 basis points, about a third as large as the corresponding revision for the output gap.

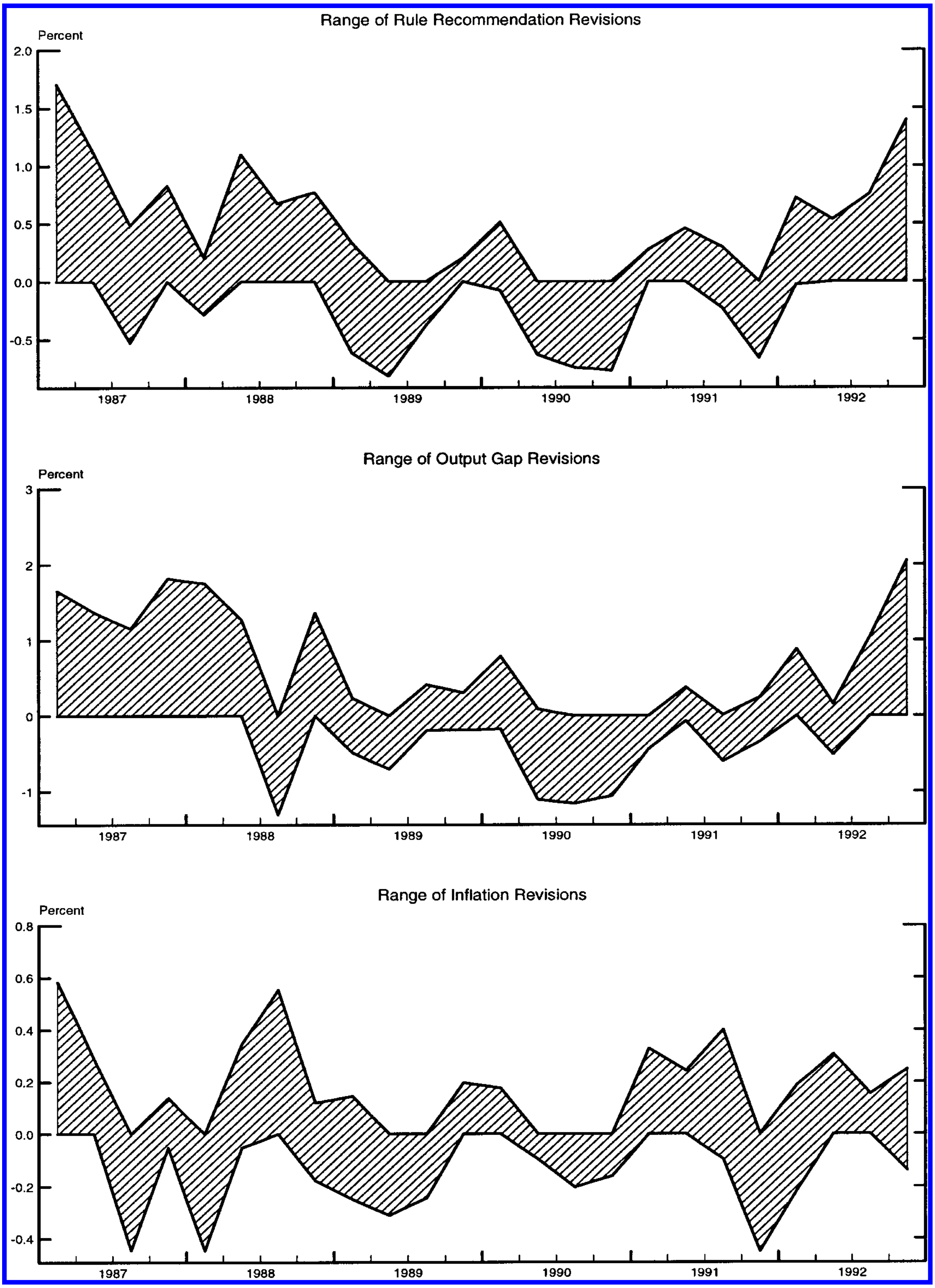

FIGURE 6. DECOMPOSITION OF WITHIN-YEAR REVISIONS

TABLE 3—SUMMARY STATISTICS FOR REVISIONS IN TAYLOR'S RULE AND ITS COMPONENTS: 1987:1–1992:4

Name	MEAN	SD	MA	MAD	MIN	MAX
$R_{t\|t+1} - R_{t\|t}$	0.07	0.46	0.37	0.37	−0.77	1.12
$R_{t\|t+2} - R_{t\|t}$	0.18	0.61	0.52	0.49	−0.82	1.70
$R_{t\|t+3} - R_{t\|t}$	0.18	0.66	0.57	0.55	−0.82	1.70
$R_{t\|t+4} - R_{t\|t}$	0.25	0.67	0.58	0.51	−0.82	1.70
$R_{t\|94:4} - R_{t\|t}$	0.96	0.58	0.96	0.46	−0.07	1.99
$y_{t\|t+1} - y_{t\|t}$	0.17	0.66	0.53	0.50	−1.30	1.37
$y_{t\|t+2} - y_{t\|t}$	0.27	0.78	0.62	0.63	−1.16	1.75
$y_{t\|t+3} - y_{t\|t}$	0.30	0.86	0.74	0.71	−1.16	1.82
$y_{t\|t+4} - y_{t\|t}$	0.33	0.94	0.83	0.80	−1.16	2.05
$y_{t\|94:4} - y_{t\|t}$	1.02	0.78	1.04	0.66	−0.17	2.25
$\pi_{t\|t+1} - \pi_{t\|t}$	−0.01	0.23	0.19	0.19	−0.45	0.45
$\pi_{t\|t+2} - \pi_{t\|t}$	0.03	0.28	0.22	0.22	−0.44	0.58
$\pi_{t\|t+3} - \pi_{t\|t}$	0.02	0.26	0.20	0.21	−0.44	0.58
$\pi_{t\|t+4} - \pi_{t\|t}$	0.06	0.26	0.22	0.22	−0.44	0.58
$\pi_{t\|94:4} - \pi_{t\|t}$	0.30	0.30	0.32	0.22	−0.18	1.11

Notes: See notes to Tables 1 and 2.

As well, the cumulative revisions are not considerably more variable in subsequent quarters. However, because inflation enters the policy rule with a coefficient that is three times as large as that of the output gap (1.5 versus 0.5), these revisions can have as large an impact on the prescribed policy as the revisions in the output gap.

An important observation is that substantial revisions in the rule's prescriptions for a given quarter can be expected not only in the quarter subsequent to the quarter for which the prescription is relevant, but also later on. Recalling that the first revision of the rule $R_{t|t+1}$ is *not based on forecasts*, but is based on the actual preliminary data releases, it is clear that much of the uncertainty concerning the appropriate prescription is attributable to actual data revisions. This is important because it suggests that operational variants of Taylor's rule, which are specified to respond to *lagged* inflation and output data, are subject to the same informational problems as rules specified to respond to within-quarter estimates. Indeed, the difference appears to be simply a matter of degree.

Comparison of the policy rules based on the alternative renditions of the data also highlights some difficulties that data revisions introduce in attempts to identify monetary policy shocks. Suppose, for instance, that the Taylor rule in fact correctly represents the monetary policy reaction function. Then, the real-time implementation of the rule $R_{t|t}$ correctly identifies the systematic component of monetary policy and the "residuals" $f_t - R_{t|t}$ provide the complete path of the nonsystematic component—the monetary policy shocks. Residuals based on revised data, on the other hand, would also reflect the artificial contribution of data revisions. It is useful to examine how closely the *ex post* constructed residuals—which is what an econometrician might reconstruct with the *ex post* data—correspond with the "true" shocks. The resulting correlations here are less than encouraging. The correlations of the real-time residuals with their 1993:1 and 1994:4 renditions, $f_t - R_{t|93:1}$ and $f_t - R_{t|94:4}$, are 0.31 and 0.56, respectively.

III. Estimated Reaction Functions

Having demonstrated the difficulties associated with implementing and interpreting the Taylor rule based on revised data, I now turn to illustrating some additional difficulties related to using revised data for estimating policy reaction functions.

Consider first the general family of real-output-plus-inflation targeting rules:

$$f_t = \rho f_{t-1} + (1-\rho)(a_0 + a_\pi \pi_t + a_y y_t) + \eta_t. \tag{2}$$

When $\rho = 0$ this collapses to the specification of

Taylor's rule. Allowing $\rho \neq 0$ embeds Taylor's specification as a notional target in a policy rule with partial adjustment reflecting the possibility of interest rate smoothing. In either case, (2) can be estimated in one step with least squares. Estimation of policy reaction functions such as (2) using *ex post* revised data is not uncommon. However, it is not at all clear that the resulting estimates are informative for describing monetary policy. Even under the assumption that the policy rule is properly specified, estimation with revised data—instead of the data available when policy is actually set—can provide misleading results.

At issue here is whether revisions to the real-time data to which the policy maker responds represent measurement error. Using the data available in 1994:4 as a proxy for "final" data, define the revisions: $e_t^{\pi} = \pi_{t|94} - \pi_{t|t}$ and $e_t^{y} = y_{t|94:4} - y_{t|t}$. Following N. Gregory Mankiw et al. (1984) and Mankiw and Matthew D. Shapiro (1986), it is useful to consider two polar hypotheses. The first hypothesis is that the real-time estimates represent rational forecasts of the true final values. In that case, the revisions represent rational forecast errors or "news." The second hypothesis is that the real-time estimates are simply the true variables measured with error. In that case, the revisions represent observation error or "noise." Given that the real-time estimates necessary for implementation of the Taylor rule incorporate within-quarter estimates of inflation and output, some element of news is undoubtedly part of the revision process. However, for the most part the data revisions in this sample represent noise. This can be seen by examining the correlations of the revisions with the real-time and final data, as suggested by Mankiw and Shapiro (1986). Specifically, if the data revisions represent noise, the revisions should be uncorrelated with the final data but correlated with the real-time values. On the other hand, if the data revisions represent news, the revisions should be uncorrelated with the real-time estimates but correlated with the final data. For inflation, the correlation between the revision and the real-time estimate is -0.44, whereas that between the revision and the final data is only -0.05. For the output gap, the correlation between the revision and the real-time estimate is -0.62, whereas that between the revision and the final data is -0.31.[11]

As a consequence of the presence of noise in these data, estimation of a policy reaction function such as (2) based on revised data yields biased parameter estimates. To illustrate the extent of the problem, in Table 4 I present least-squares estimates for the 1987–1992 period—the original sample in the Taylor rule—using the alternative vintages of data. The first three columns provide estimates of the specification without partial adjustment ($\rho = 0$). Although this restriction is rejected by the data, the resulting estimates exactly correspond to the least squares fit of the specification of the Taylor rule and are shown here to allow this comparison. The first two columns show estimates based on the revised data from 1994 using the linear trend and Q^* concepts of potential, respectively. The third column employs the real-time data available to the FOMC. As can be seen, and confirming what was already evident to the naked eye in Figure 3, using the *ex post* revised data yields an inflation response

[11] The dominance of noise in the output gap revisions may appear somewhat surprising in light of the Mankiw and Shapiro (1986) findings that revisions in the preliminary GNP reports reflect mostly news. The two findings are not inconsistent, however. A key difference is that, whereas Mankiw and Shapiro examined the properties of the quarterly *growth* rate of output revisions, my analysis concentrates on the output *gap*, which depends on the *level* of output and also potential output. The distinction is crucial for two reasons. First, revisions in the level and growth rate of output have different patterns. Annual rebenchmarks, for instance, often introduce one-sided adjustments to the *level* of output for several consecutive quarters. Such revisions may significantly change the level of output for these consecutive quarters without a large change in their corresponding quarterly growth rates. Second, and more important, is the underlying methodology for measurement and updating of potential output. As with many other detrending techniques, there is a systematic and partly forecastable component in the revisions of Q^*, which introduces serially correlated measurement error in the real-time output gap estimates. In this sample, the first-order serial correlation of the revision process for the output gap is 0.4. Although this may appear high, it is by no means unusual. The corresponding correlation in the revision to the linear trend based output gap estimates $y_{t|t}^{T}$ is 0.8 in this sample. Orphanides and van Norden (1999) show that autocorrelations of this magnitude for revisions in output gap estimates are common across a large number of alternative techniques employed for estimating potential output.

TABLE 4—TAYLOR-TYPE ESTIMATED RULES WITH ALTERNATIVE DATA

	Vintage of data and concept of potential					
	1994:4 T	1994:4 Q^*	Real-time Q^*	1994:4 T	1994:4 Q^*	Real-time Q^*
a_0	0.68	1.04	4.89	2.06	2.49	7.53
	(1.27)	(1.16)	(1.06)	(2.08)	(1.83)	(3.25)
a_π	1.51	1.57	0.79	0.99	1.15	0.10
	(0.31)	(0.28)	(0.26)	(0.61)	(0.47)	(0.84)
a_y	0.60	0.58	0.65	1.08	0.99	1.07
	(0.05)	(0.05)	(0.06)	(0.37)	(0.28)	(0.40)
ρ				0.65	0.61	0.65
				(0.16)	(0.14)	(0.19)
$\bar{R}^2$	0.92	0.93	0.91	0.97	0.97	0.96
SEE	0.55	0.51	0.57	0.34	0.32	0.36

Notes: The regressions shown are least-squares estimates of the equation

$$f_t = \rho f_{t-1} + (1 - \rho)(a_0 + a_\pi \pi_t + a_y y_t) + \eta_t$$

for the 1987:1–1992:4 period. The columns correspond to alternative vintages of data as shown. When no entry appears for ρ it is restricted to zero. The standard errors shown in parentheses are based on the Newey–West heteroskedasticity and serial correlation robust estimator.

close to 1.5 and an output gap response close to 0.5—the values in Taylor's parameterization.[12] This is not the case when the real-time data are employed. The policy reaction function appears quite different with a considerably lower response to inflation and a worse fit. The difference becomes more pronounced with the partial adjustment specification shown in the last three columns of the table. The estimates of the partial adjustment coefficient ρ also confirm considerable interest rate smoothing.

A disturbing result from the table is that the inflation coefficient estimated with the real-time data is nowhere near one and could well equal zero. This result would suggest—if one were prepared to take this policy reaction function seriously—that monetary policy over the estimation period might have led to an unstable inflation process. Henderson and McKibbin (1993) and Clarida et al. (1998) find that $a_\pi >$ 1 is required for stability in model economies with monetary policy rules of this type.

A more likely explanation, however, is that the policy reaction function is not specified properly. In particular, in asserting that the FOMC sets the federal funds rate by responding only to the current quarter outlook of economic activity and to the rate of inflation from four quarters earlier to the current quarter, the policymakers are restricted to appear myopic. Rather, because monetary policy operates with a lag, successful stabilization policy needs to be more forward looking and estimated policy reaction functions should at least accommodate as much. Indeed, as Chairman Alan Greenspan explained in a recent testimony: "Because monetary policy works with a lag, it is not the conditions prevailing today that are critical but rather those likely to prevail six to twelve months, or even longer, from now. Hence, as difficult as it is, we must arrive at some judgment about the most probable direction of the economy and the distribution of risks around that expectation" (January 21, 1997 testimony by Chairman Greenspan before the Senate Committee on the Budget).

The possibility that policy might be more appropriately described as forward looking has attracted increased attention since early 1994, following the so-called preemptive strike against inflation that year; however, it would be erroneous to presume that policy has been forward looking only since this

[12] Similar estimates obtain with the 1993 data Taylor originally employed. These are presented in Orphanides (1997).

TABLE 5—FORWARD-LOOKING RULES ESTIMATED WITH 1994:4 DATA

	Horizon relative to decision period (in quarters)					
	−1	0	1	2	3	4
a_0	10.65	2.96	1.10	−0.82	−2.05	−3.67
	(7.30)	(2.27)	(0.87)	(0.59)	(0.79)	(2.77)
a_π	−1.13	1.00	1.51	2.05	2.39	2.80
	(2.07)	(0.62)	(0.23)	(0.16)	(0.21)	(0.76)
a_y	2.15	1.17	0.95	0.62	0.47	1.56
	(1.15)	(0.44)	(0.29)	(0.29)	(0.48)	(3.09)
ρ	0.83	0.69	0.70	0.70	0.76	0.91
	(0.13)	(0.15)	(0.09)	(0.11)	(0.14)	(0.14)
$\bar{R}^2$	0.97	0.98	0.98	0.97	0.97	0.97
SEE	0.36	0.30	0.34	0.37	0.38	0.39

Notes: The regressions shown are estimates of the equation

$$f_t = \rho f_{t-1} + (1-\rho)(a_0 + a_\pi \pi_{t+i} + a_y y_{t+i}) + \eta_t$$

for the 1987:1–1993:4 period. The columns correspond to different values for i. Estimation is by instrumental variables for $i \geq 0$ as detailed in the text. The standard errors shown in parentheses are based on the Newey–West heteroskedasticity and serial correlation robust estimator.

recent episode. Some research has already begun to sort out whether monetary policy has been forwardlooking or backward looking in the past, especially since the 1980's.[13] For the most part, estimation of the forward-looking specifications has relied on instrumental variables estimation techniques using the actual (and *ex post* revised) data. Although in theory such techniques can provide consistent estimates under some assumptions, the added noise in the data may present significant complications in practice. To illustrate some of these difficulties, I compare estimated reaction functions using both the *ex post* revised and the real-time data for the 1987–1993 period. For the forward-looking variants of the estimated policy reaction functions, I employ forecasts from the same Greenbooks I use to assess the within-quarter outlook used to construct Taylor's rule in real time.[14]

The policy reaction functions I estimate take the form

$$f_t = \rho f_{t-1} + (1-\rho)(a_0 + a_\pi \pi_{t+i|t} + a_y y_{t+i|t}) + \eta_t.$$

Here, i reflects the "target" horizon relative to the quarter at which the federal funds rate is decided. For Taylor's rule the relevant horizon is the present quarter, $i = 0$. For forward-looking alternatives $i > 0$. I examine horizons ranging from 1 to 4 quarters ahead. For completeness, I also estimate a backward-looking policy reaction function for $i = -1$. This is of some interest because this timing implies reacting to the most recent available data (for the previous quarter), which renders the rule operational without reliance on forecasts.[15]

Estimation results are shown in Tables 5 and

[13] Clarida et al. (1998) investigate forward-looking reaction functions such as the ones examined here. Clarida and Gertler (1997) find such rules useful for describing German monetary policy as well.

[14] Use of Greenbook forecasts in estimating reaction functions was introduced by Stephen K. McNees (1986). Christina D. Romer and David H. Romer (1996) find these forecasts to be quite accurate relative to alternative private forecasts. To be noted, these forecasts may not represent the views of the FOMC and suffer from a serious problem in that they are conditioned on a specific policy path, which may not necessarily coincide with the path consistent with the Committee's outlook for policy. Despite this problem, they may provide as useful proxies for the appropriate forecasts as feasible with the information currently available.

[15] If, as Allan H. Meltzer (1987) argues, forecasts are too inaccurate to be useful for monetary policy decisions, and policy is formulated in terms of recent economic outcomes, such backward-looking rules might provide a better description of policy. However, because a monetary aggregate could be a superior intermediate target in that case, it might also prove a better policy indicator than the lagged output and inflation measures examined here.

TABLE 6—FORWARD-LOOKING RULES ESTIMATED WITH REAL-TIME DATA

	Horizon relative to decision period (in quarters)					
	−1	0	1	2	3	4
a_0	19.81	9.71	5.83	5.71	3.55	1.80
	(13.60)	(6.84)	(3.86)	(3.03)	(2.29)	(0.98)
a_π	−3.35	−0.49	0.57	0.62	1.18	1.64
	(3.71)	(1.76)	(0.92)	(0.70)	(0.53)	(0.22)
a_y	2.63	1.64	1.25	1.33	1.15	0.97
	(1.60)	(0.90)	(0.52)	(0.44)	(0.34)	(0.17)
ρ	0.90	0.83	0.77	0.77	0.72	0.66
	(0.08)	(0.12)	(0.12)	(0.09)	(0.09)	(0.08)
$\bar{R}^2$	0.97	0.97	0.98	0.98	0.98	0.98
SEE	0.39	0.37	0.35	0.34	0.33	0.32

Notes: The regressions shown are least-squares estimates of the equation

$$f_t = \rho f_{t-1} + (1-\rho)(a_0 + a_\pi \pi_{t+i|t} + a_y y_{t+i|t}) + \eta_t$$

for the 1987:1–1993:4 period. The columns correspond to different values for i. The standard errors shown in parentheses are based on the Newey–West heteroskedasticity and serial correlation robust estimator.

6. Table 5 presents estimates of the forward-looking policy reaction functions based on the *ex post* revised data as of 1994. Table 6 presents the comparable estimates based on the actual forecasts available in real time. As already mentioned, when the estimation is based on the *ex post* revised data, instruments are needed for the forward-looking rules. With the exception of the first column (the backward-looking case, $i = -1$), the estimates shown in Table 5 are based on instrumental variables using four lags each of the federal funds rate, inflation, and the output gap as instruments. Overall, the estimated reaction functions fit the federal funds rate quite well, regardless of the horizon. However, based on the estimated standard errors, the results shown in the table suggest that when we rely on *ex post* revised data to compare alternatives in this sample, the Taylor-type contemporaneous reaction function provides the best specification among the alternative horizons. The fit of the contemporaneous horizon is better than either the lagged specification, $i = -1$, or the forward-looking alternatives, $i > 0$. Indeed, the fit of the forward-looking alternatives progressively deteriorates with the horizon.

Table 6 presents the corresponding least squares estimates based on the real-time data. In this case, it is not necessary to instrument for the inflation and output gap forecasts because the real-time forecasts are based on exactly the information actually available contemporaneously. Comparing the fitted reaction functions corresponding to the different horizons reveals some interesting patterns. The point estimate of a_π, the coefficient reflecting the response to inflation, rises as the horizon becomes forward from an implausible negative value for the backward-looking specification to a value surprisingly close to the 1.5 value Taylor specified in his rule, and significantly greater than 1 in the four-quarter-ahead specification. Also, the point estimates of a_y drop as the horizon becomes more forward from an implausibly high value of 2.63 for the backward-looking specification to a considerably smaller value, 0.97, in the four-quarter-ahead specification. As with the estimates based on the final data, the overall fit of these reaction functions is quite high regardless of the horizon. However, based on the estimated standard errors, when we concentrate our attention to the forecasts actually available in real time at the Federal Reserve we find that the forward-looking specifications provide a somewhat better fit.

Figure 7 shows the policy prescriptions corresponding to the contemporaneous and four-quarter horizon policy reaction functions from Table 6. The bottom panel, which shows the prescriptions including the partial adjustment to the previous quarter's federal funds rate, confirms that the two specifications fit the data nearly equally well. Comparison of the implicit notional targets for the federal funds rate shown

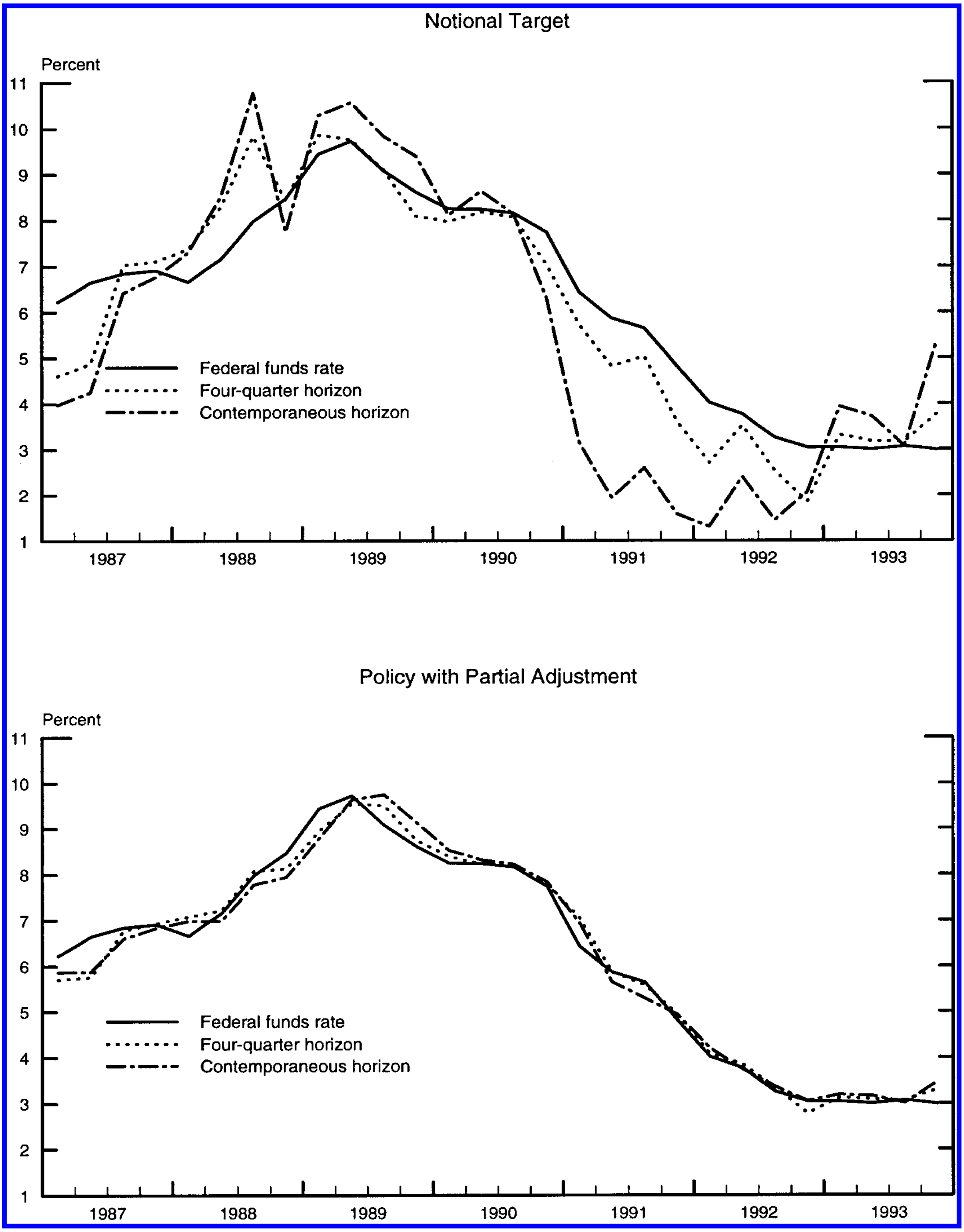

FIGURE 7. ESTIMATED POLICY RULES

in the top panel, however, illustrates that the differences in the two specifications are not trivial. The forward-looking specification captures the contours of the federal funds rate considerably better.

These results suggest that the concern regarding the validity of estimated policy reaction functions based on final data is justified. As the analysis for this sample suggests, results based on the *ex post* revised data instead of the data available in real time could easily overshadow the fact that forward-looking policy reaction functions appear to provide a more accurate description of policy than Taylor-type contemporaneous specifications.

Returning to the real-time estimates in Table 6, it may appear somewhat puzzling that the response parameters a_π and a_y vary so dramatically with the horizon, although the fit of the regressions at the different horizons are so similar. As mentioned earlier, a strong prior that policy responded sufficiently strongly to inflation over this period to maintain stability in the long run would suggest that the policy reaction functions implying $a_\pi < 1$ are likely misspecified. By this measure, only the estimated three- and four-quarter-ahead specifications would appear reasonable. As well, these specifications would correspond most closely to the "six to twelve months or even longer" horizon that Chairman Greenspan identified as critical for monetary policy decisions in the congressional testimony cited previously. With these considerations, it may be useful to examine whether the pattern of the estimated response parameters, especially a_π, is the result of a misspecification of the appropriate policy horizon.

For concreteness, suppose that the true reaction function is exactly the one corresponding to the four-quarter-ahead forecast estimated with the real-time Greenbook data. It is convenient to rewrite this as

$$f_t = b_0 + b_1 f_{t-1} + b_2 \pi_{t+4|t} + b_3 y_{t+4|t} + \eta_t,$$

where the parameters a_0, a_π, a_y, and ρ in the last column of Table 6 are simple transformations of the b_j, specifically, $a_\pi = b_2/(1 - b_1)$, $a_y = b_3/(1 - b_1)$ and $\rho = b_1$. Next, consider the case with a misspecified horizon, the estimation of the reaction function

$$f_t = c_0 + c_1 f_{t-1} + c_2 \pi_{t+i|t} + c_3 y_{t+i|t} + e_t,$$

for $i \neq 4$. Now the estimated parameters c_j reflect the estimates of a_0, a_π, a_y, and ρ in the appropriate column with $i \neq 4$ in Table 6. These estimated parameters, of course, will not necessarily reflect the true responsiveness of policy to inflation and output in this case. Rather, the parameters will be a convolution of the true response coefficients and the projection of the variables in the true reaction function $\pi_{t+4|t}$ and $y_{t+4|t}$ on the regressors, f_{t-1}, $\pi_{t+i|t}$, $y_{t+i|t}$:

$$\begin{aligned}\pi_{t+4|t} &= \gamma_{10} + \gamma_{11} f_{t-1} + \gamma_{12} \pi_{t+i|t} \\ &\quad + \gamma_{13} y_{t+i|t} + e_{1t} \\ y_{t+4|t} &= \gamma_{20} + \gamma_{21} f_{t-1} + \gamma_{22} \pi_{t+i|t} \\ &\quad + \gamma_{23} y_{t+i|t} + e_{2t}.\end{aligned}$$

Two observations are in order. First, if these projections can capture the bulk of the variation of $\pi_{t+4|t}$ and $y_{t+4|t}$, then the misspecified reaction functions will fit the data nearly as well as the true policy. (If the projections were perfect, the reaction function fit would be identical.) Indeed this is the case here. The four-quarter-ahead forecasts of inflation and the output gap are highly collinear with forecasts at the earlier horizons. This explains why the fit of the other regressions in Table 6 are nearly as high as that of the four-quarter-ahead specification. The second, is that the pattern of the projection coefficients γ_{kj} determines the pattern of the estimated parameters c_j of the misspecified policy reaction functions. Concentrating on the inflation forecast projection, as we move the horizon from $i = 4$ backward the following pattern emerges: γ_{12} falls, whereas γ_{11} and γ_{13} rise. Intuitively, the lag of the federal funds rate and the output gap become increasingly more informative for predicting $\pi_{t+4|t}$ relative to the contribution of inflation. These tend to raise the estimates of c_1 and c_3 and reduce that of c_2 in the misspecified reaction function relative to the estimates of b_1, b_2, and b_3. The result is the appearance of a greater partial adjustment coefficient ρ for the less forward-looking specifications in Table 6 and also the reduction in the inflation response coefficient a_π relative to that of output a_y. The quantitative magnitudes of these effects, of course, are specific to the sample and horizon in question and the estimated parameters c_j depend on both the inflation and the output gap projections. Importantly, as illustrated in Table 6, estimation of a policy reaction function with a misspecified horizon can yield extremely misleading information regarding the responsiveness of policy to the inflation and real economic activity outlook.

The difficulties in interpreting these coefficients can also be seen by a simple check on the implicit estimates of the equilibrium real-interest rate embedded in the policy reaction function. In steady state, the output gap equals zero, inflation equals the policy maker's target π^*, and the nominal interest rate is the sum of the inflation target and the equilibrium real interest rate. Thus, for the correctly estimated policy reaction function, and conditioning on an inflation target π^*, the parameters in Table 6 provide an estimate of the equilibrium real interest rate: $r^* = a_0 + (a_\pi - 1)\pi^*$. Based on the four-quarter-ahead horizon, the implied equilibrium real interest rates for inflation targets of 0 and 2 percent are 1.8 and 3.1 percent, respectively. On the other hand, using the parameters shown for the earlier horizons yields considerably higher and quite misleading estimates. Again, the reason is that the imputed estimates are incorrect because the parameters of the estimated policy reaction functions at the earlier horizons cannot be interpreted as behavioral parameters.

IV. Conclusion

Quantitative evidence suggesting that monetary policy guided by simple rules achieves good results in simulated models of the macroeconomy continues to accumulate. Thus, simple rules appear to offer useful baselines for policy discussions. The discussion, however, often does not place proper emphasis on the informational problem associated with some of the advocated policy rules. This paper examines the magnitude of this informational problem. The evidence suggests that it is substantial.

Reactive policy rules that require the policy maker to respond to macroeconomic conditions that are difficult to assess in practice involve much greater uncertainty than is often recognized. Using Taylor's rule as an illustration, and concentrating on the sample originally used by Taylor to formulate his rule, revisions of the recommendation obtained by the rule for a specific quarter are shown to be very large. Further, although the rule may appear to describe actual policy fairly accurately when the *ex post* revised data are employed, it does not provide nearly as accurate a picture if real-time data are used to construct what the rule would have recommended when policy was actually set.

Interpretation of historical policy based on revised data instead of the data available to policy makers when policy decisions were made appears to be of questionable value. Estimated policy reaction functions obtained using the *ex post* revised data yield misleading descriptions of historical policy. The presence of noise results in biased estimates and potentially obscures the appropriate specification of the policy reaction function. Needless to say, identification of monetary policy shocks under such circumstances becomes a haphazard enterprise.

Taking account of the information problem documented here may cloud some of the encouraging results arguing in favor of policy adhering to such rules. One of the reasons simple rules are believed useful is that they can provide the policy maker with the flexibility to achieve some of the benefits of discretionary short-run stabilization policy while retaining credibility toward the long-term goal of price stability. The rationale is that, because simple rules are easy to evaluate, departures from the rules would be easily detectable. As long as policy moves in accordance with a rule, credibility is maintained. But disagreements over the current economic outlook or the likely direction of pending data revisions can make it difficult to assess whether policy deviated from or was set in accordance with an agreed-upon fixed policy rule. Implementation of supposedly transparent feedback rules may be anything but simple.

These findings also suggest that great care is required in treating the informational requirements associated with the evaluation of simple policy rules. The presence of noise in real-time estimates of inflation and the output gap must be accounted for in evaluating rules setting policy in reaction to these variables. Ignoring this informational problem in the evaluation of alternative policies would tend to overstate the degree to which monetary policy can stabilize economic fluctuations and could yield misleading comparisons of alternative policy rules. Using an estimated model of the U.S. economy, Orphanides (1998) confirms that this is a first-order issue for efficient policy design. Notably, had the Federal Reserve adopted policies that appear efficient when the informational problem highlighted here is ignored would have resulted in worse macroeconomic performance than actual experience since the 1980's. In the absence of informational problems, activist rules that require policy to react strongly to current data appear to yield a high degree of stability. But less activist rules prove more effective once the informational limitations encountered by policy makers in practice are considered. Less activism avoids the counterproductive gyrations to the monetary policy instrument that are introduced by responding to the noise in the data instead of the true underlying developments in the economy. Unless the evaluation of the performance of policy rules reacting to noisy data addresses this informational problem, meaningful comparisons among alternative rules are not possible.

The results in this paper suggest that analysis of monetary policy rules based on data other than what is available to policy makers in real time may be difficult to interpret. The treatment of the informational limitations inherent in the formulation of monetary policy requires greater attention in analysis pertaining to policy rules. To the extent simple policy rules offer the promise to provide a useful baseline for improving policy decisions, a step toward clarification of their potential would be a welcome step in the right direction.

REFERENCES

Ball, Laurence. "Efficient Rules for Monetary Policy." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5952, March 1997.

Bernanke, Ben and Woodford, Michael. "Inflation Forecasts and Monetary Policy." *Journal of Money, Credit, and Banking*, Pt. 2, November 1997, *29*(4), pp. 653–84.

Braun, Steven. "Estimation of Current-Quarter Gross National Product by Pooling Preliminary Labor-Market Data." *Journal of Business and Economic Statistics*, July 1990, *8*(3), pp. 293–304.

Bryant, Ralph C.; Hooper, Peter and Mann, Catherine, L. eds. *Evaluating policy regimes: New research in empirical macroeconomics*. Washington, DC: Brookings Institution Press, 1993.

Clarida, Richard; Gali, Jordi and Gertler, Mark. "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 6442, March 1998.

______ **.** "The Science of Monetary Policy: A New Keynesian Perspective." *Journal of Economic Literature*, December 1999, *37*(4), pp. 1661–1707.

Clarida, Richard and Gertler, Mark. "How the Bundesbank Conducts Monetary Policy," in Christina D. Romer and David H. Romer, eds., *Reducing inflation: Motivation and strategy*. Chicago: University of Chicago, 1997.

Clark, Peter K. "Okun's Law and Potential GNP." Board of Governors of the Federal Reserve System, October 1982.

Fair, Ray C. and Howrey, E. Philip. "Evaluating Alternative Monetary Policy Rules." *Journal of Monetary Economics*, October 1996, *38*(2), pp. 173–93.

Fuhrer, Jeffrey C. "Inflation/Output Variance Trade-Offs and Optimal Monetary Policy." *Journal of Money, Credit, and Banking*, May 1997, *29*(2), pp. 214–34.

Henderson, Dale and McKibbin, Warwick J. "A Comparison of Some Basic Monetary Policy Regimes for Open Economies: Implications of Different Degrees of Instrument Adjustment and Wage Persistence." Carnegie-Rochester Conference Series on Public Policy, December 1993, *39*, pp. 221–317.

Levin, Andrew. "A Comparison of Alternative Monetary Policy Rules in the Federal Reserve Board's Multi-Country Model." BIS Conference Papers, Vol. 2, 1996, pp. 340–66.

Lowe, Philip, ed. *Monetary policy and inflation targeting*. Sydney: Reserve Bank of Australia, 1997.

Mankiw, Gregory N.; Runkle, David E. and Shapiro, Matthew. “Are Preliminary Announcements of the Money Stock Rational Forecasts?” *Journal of Monetary Economics*, July 1984, *14*(1), pp. 15–27.

Mankiw, Gregory N. and Shapiro, Matthew D. “News or Noise: An Analysis of GNP Revisions.” *Survey of Current Business*, May 1986, *66*(5), pp. 20–25.

McCallum, Bennett T. “Comment,” in Ralph C. Bryant, Peter Hooper, and Catherine L. Mann, eds., *Evaluating policy regimes: New research in empirical macroeconomics*. Washington, DC: Brookings Institution Press, 1993a, pp. 444–48.

______. “Discretion versus Policy Rules in Practice, Two Critical Points: A Comment.” Carnegie-Rochester Conference Series on Public Policy, December 1993b, *39*, pp. 215–20.

______. “Issues in the Design of Monetary Policy,” in John B. Taylor and Michael Woodford, eds., *Handbook of macroeconomics*. Amsterdam: Elsevier, 1999.

McNees, Stephen K. “Modeling the Fed: A Forward-Looking Monetary Policy Reaction Function.” *New England Economic Review*, November/December 1986, pp. 3–8.

Meltzer, Allan H. “Limits of Short-Run Stabilization Policy: Presidential Address to the Western Economic Association, July 3, 1986.” *Economic Inquiry*, January 1987, *25*(1), pp. 1–14.

Orphanides, Athanasios. “Monetary Policy Rules Based on Real-Time Data.” Finance and Economics Discussion Series 1998-03, Federal Reserve Board, December 1997.

______. “Monetary Policy Evaluation With Noisy Information.” Finance and Economics Discussion Series 1998-50, Board of Governors of the Federal Reserve System, October 1998.

Orphanides, Athanasios; Small, David; Wilcox, David and Wieland, Volker. “A Quantitative Exploration of the Opportunistic Approach to Disinflation.” Finance and Economics Discussion Series 97-36, Board of Governors of the Federal Reserve System, June 1997.

Orphanides, Athanasios and van Norden, Simon. “The Reliability of Output Gap Estimates in Real Time.” Finance and Economics Discussion Series 99-38, Board of Governors of the Federal Reserve System, August 1999.

Romer, Christina D. and Romer, David H. “Federal Reserve Private Information and the Behavior of Interest Rates.” National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5692, July 1996.

Rotemberg, Julio and Woodford, Michael. “An Optimization-Based Econometric Framework for the Evaluation of Monetary Policy.” Mimeo, Princeton University, 1997.

Svensson, Lars E. O. “Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets.” *European Economic Review*, June 1997, *41*(6), pp. 1111–46.

Taylor, John B. “Discretion versus Policy Rules in Practice.” Carnegie-Rochester Conference Series on Public Policy, December 1993, *39*, pp. 195–214.

______. “The Inflation/Output Variability Trade-off Revisited,” in Jeffrey C. Fuhrer, ed., *Goals, guidelines, and constraints facing monetary policymakers*. Boston: Federal Reserve Bank of Boston, 1994.

Williams, John. “Simple Rules for Monetary Policy.” Finance and Economics Discussion Series 99-12, Board of Governors of the Federal Reserve System, February 1999.

This article has been cited by:

1. Nikolay MarkovA Regime Switching Model for the European Central Bank 267-337. [CrossRef]
2. Nikolay MarkovActual versus Perceived Taylor Rules: How Predictable Is the European Central Bank? 195-266. [CrossRef]
3. Alexander Jung, Sophia Latsos. 2015. Do federal reserve bank presidents have a regional bias?. *European Journal of Political Economy* . [CrossRef]
4. Marcel Bluhm. 2015. Investigating the monetary policy of central banks with assessment indicators. *European Journal of Political Economy* **38**, 181-196. [CrossRef]
5. Jean-Yves Gnabo, Diego Nicolas Moccero. 2015. Risk management, nonlinearity and aggressiveness in monetary policy: The case of the US Fed. *Journal of Banking & Finance* **55**, 281-294. [CrossRef]
6. Christian J. Murray, Alex Nikolsko-Rzhevskyy, David H. Papell. 2015. MARKOV SWITCHING AND THE TAYLOR PRINCIPLE. *Macroeconomic Dynamics* **19**, 913-930. [CrossRef]
7. Stephen McKnight, Alexander Mihailov. 2015. Do Real Balance Effects Invalidate the Taylor Principle in Closed and Open Economies?. *Economica* n/a-n/a. [CrossRef]
8. Makram El-Shagi, Alexander Jung. 2015. Does the Greenspan era provide evidence on leadership in the FOMC?. *Journal of Macroeconomics* **43**, 173-190. [CrossRef]
9. Gregory E. Givens, Michael K. Salemi. 2015. Inferring monetary policy objectives with a partially observed state. *Journal of Economic Dynamics and Control* **52**, 190-208. [CrossRef]
10. KEVIN LEE, JAMES MORLEY, KALVINDER SHIELDS. 2015. The Meta Taylor Rule. *Journal of Money, Credit and Banking* **47**:10.1111/jmcb.2015.47.issue-1, 73-98. [CrossRef]
11. Kerstin Bernoth, Andrew Hughes Hallett, John Lewis. 2015. THE CYCLICALITY OF AUTOMATIC AND DISCRETIONARY FISCAL POLICY: WHAT CAN REAL-TIME DATA TELL US?. *Macroeconomic Dynamics* **19**, 221-243. [CrossRef]
12. Kwamie Dunbar, Abu S. Amin. 2015. The nature and impact of the market forecasting errors in the Federal funds futures market. *The North American Journal of Economics and Finance* **31**, 174-192. [CrossRef]
13. Maik H. Wolters. 2015. Evaluating Point and Density Forecasts of DSGE Models. *Journal of Applied Econometrics* **30**:10.1002/jae.v30.1, 74-96. [CrossRef]
14. Anastassios A. Drakos, Georgios P. Kouretas. 2015. The conduct of monetary policy in the Eurozone before and after the financial crisis. *Economic Modelling* **48**, 83. [CrossRef]
15. Francesco Grigoli, Alexander Herman, Andrew Swiston, Gabriel Di Bella. 2015. Output Gap Uncertainty and Real-Time Monetary Policy. *IMF Working Papers* **15**, 1. [CrossRef]
16. DAVIDE DEBORTOLI, RICARDO NUNES. 2014. Monetary Regime Switches and Central Bank Preferences. *Journal of Money, Credit and Banking* **46**:10.1111/jmcb.2014.46.issue-8, 1591-1626. [CrossRef]
17. Alex Nikolsko-Rzhevskyy, David H. Papell, Ruxandra Prodan. 2014. Deviations from rules-based policy and their effects. *Journal of Economic Dynamics and Control* **49**, 4-17. [CrossRef]
18. Prakash K. Shrestha, Willi Semmler. 2014. MONETARY POLICY AND INTERNATIONAL RESERVES: EMPIRICAL EVIDENCE FROM EAST ASIAN COUNTRIES. *International Journal of Finance & Economics* n/a-n/a. [CrossRef]
19. Yu-Fan Huang. 2014. Time variation in U.S. monetary policy and credit spreads. *Journal of Macroeconomics* . [CrossRef]
20. Jacopo Cimadomo. 2014. REAL-TIME DATA AND FISCAL POLICY ANALYSIS: A SURVEY OF THE LITERATURE. *Journal of Economic Surveys* n/a-n/a. [CrossRef]

21. Lei Jiang. 2014. Stock liquidity and the Taylor rule. *Journal of Empirical Finance* **28**, 202-214. [CrossRef]
22. WILLIAM A. BRANCH. 2014. Nowcasting and the Taylor Rule. *Journal of Money, Credit and Banking* **46**:10.1111/jmcb.2014.46.issue-5, 1035-1055. [CrossRef]
23. Tobias R. Rühl. 2014. Taylor rules revisited: ECB and Bundesbank in comparison. *Empirical Economics* . [CrossRef]
24. Jens Klose. 2014. Determining structural breaks in central bank reaction functions of the financial crisis. *The Journal of Economic Asymmetries* **11**, 78-90. [CrossRef]
25. HARUN MIRZA, LIDIA STORJOHANN. 2014. Making Weak Instrument Sets Stronger: Factor-Based Estimation of Inflation Dynamics and a Monetary Policy Rule. *Journal of Money, Credit and Banking* **46**:10.1111/jmcb.2014.46.issue-4, 643-664. [CrossRef]
26. HENRY W. CHAPPELL, ROB ROY MCGREGOR, TODD A. VERMILYEA. 2014. Power-Sharing in Monetary Policy Committees: Evidence from the United Kingdom and Sweden. *Journal of Money, Credit and Banking* **46**:10.1111/jmcb.2014.46.issue-4, 665-692. [CrossRef]
27. Andrew Hughes Hallett, John Lewis. 2014. Monetary policy and sovereign debt: Does the ECB take the eurozone's fiscal risks into account?. *Empirica* . [CrossRef]
28. Knut Are Aastveit, Tørres Trovik. 2014. Estimating the output gap in real time: A factor model approach. *The Quarterly Review of Economics and Finance* **54**, 180-193. [CrossRef]
29. Anindya Biswas. 2014. The output gap and expected security returns. *Review of Financial Economics* . [CrossRef]
30. Etienne Farvaque, Piotr Stanek, Stéphane Vigeant. 2014. On the Performance of Monetary Policy Committees. *Kyklos* **67**:10.1111/kykl.2014.67.issue-2, 177-203. [CrossRef]
31. Jukka Sihvonen, Sami Vähämaa. 2014. Forward-Looking Monetary Policy Rules and Option-Implied Interest Rate Expectations. *Journal of Futures Markets* **34**:10.1002/fut.v34.4, 346-373. [CrossRef]
32. Jaromír Baxa, Roman Horváth, Bořek Vašíček. 2014. HOW DOES MONETARY POLICY CHANGE? EVIDENCE ON INFLATION-TARGETING COUNTRIES. *Macroeconomic Dynamics* **18**, 593-630. [CrossRef]
33. NARAYAN KUNDAN KISHOR, MONIQUE NEWIAK. 2014. THE INSTABILITY IN THE MONETARY POLICY REACTION FUNCTION AND THE ESTIMATION OF MONETARY POLICY SHOCKS. *Contemporary Economic Policy* **32**:10.1111/coep.2014.32.issue-2, 390-402. [CrossRef]
34. Raymond J. Hawkins, Jeffrey K. Speakes, Dan E. Hamilton. 2014. Monetary policy and PID control. *Journal of Economic Interaction and Coordination* . [CrossRef]
35. KEVIN X.D. HUANG, QINGLAI MENG. 2014. Returns to Scale, Market Power, and the Nature of Price Rigidity in New Keynesian Models with Self-Fulfilling Expectations. *Journal of Money, Credit and Banking* **46**:10.1111/jmcb.2014.46.issue-2-3, 293-320. [CrossRef]
36. Janko Gorter, Fauve Stolwijk, Jan Jacobs, Jakob de Haan. 2014. EUROPEAN CENTRAL BANK POLICY-MAKING AND THE FINANCIAL CRISIS. *International Journal of Finance & Economics* **19**:10.1002/ijfe.v19.2, 132-139. [CrossRef]
37. Hippolyte d'Albis, Emmanuelle Augeraud-Véron, Hermen Jan Hupkes. 2014. Bounded interest rate feedback rules in continuous-time. *Journal of Economic Dynamics and Control* **39**, 227-236. [CrossRef]
38. Juan A. Lafuente, Rafaela Pérez, Jesús Ruiz. 2014. Time-varying inflation targeting after the nineties. *International Review of Economics & Finance* **29**, 400-408. [CrossRef]
39. Ricardo M. Sousa. 2014. WEALTH, ASSET PORTFOLIO, MONEY DEMAND AND POLICY RULE. *Bulletin of Economic Research* **66**:10.1111/boer.2014.66.issue-1, 95-111. [CrossRef]

40. Andrejs Bessonovs. 2014. Suite of Statistical Models Forecasting Latvian GDP. *Procedia - Social and Behavioral Sciences* **110**, 1094-1105. [CrossRef]
41. Anna Sznajderska. 2014. Asymmetric effects in the Polish monetary policy rule. *Economic Modelling* **36**, 547-556. [CrossRef]
42. Ales Bulir, JaromÃr HurnÃk, Katerina Smidkova. 2014. Inflation Reports and Models: How Well Do Central Banks Really Write?. *IMF Working Papers* **14**, 1. [CrossRef]
43. Matthias Neuenkirch, Pierre L. Siklos. 2013. What's in a second opinion? Shadowing the ECB and the Bank of England. *European Journal of Political Economy* **32**, 135-148. [CrossRef]
44. Antonia López-Villavicencio. 2013. Interest rates, government purchases and the Taylor rule in recessions and expansions. *Journal of Macroeconomics* **38**, 382-392. [CrossRef]
45. Xiangrong Yu. 2013. Measurement error and policy evaluation in the frequency domain. *Journal of Macroeconomics* **38**, 307-329. [CrossRef]
46. Michael A. Ellis, Dandan Liu. 2013. Do FOMC forecasts add value to staff forecasts?. *European Journal of Political Economy* **32**, 332-340. [CrossRef]
47. Kevin Lee, Nilss Olekalns, Kalvinder Shields. 2013. Meta Taylor Rules for the UK and Australia; Accommodating Regime Uncertainty in Monetary Policy Analysis Using Model Averaging Methods. *The Manchester School* **81**:10.1111/manc.2013.81.issue-s3, 28-53. [CrossRef]
48. Michael P. Clements, Ana Beatriz Galvão. 2013. Forecasting with vector autoregressive models of data vintages: US output growth and inflation. *International Journal of Forecasting* **29**, 698-714. [CrossRef]
49. Jesús Vázquez, Ramón María-Dolores, Juan-Miguel Londoño. 2013. On the informational role of term structure in the US monetary policy rule. *Journal of Economic Dynamics and Control* **37**, 1852-1871. [CrossRef]
50. Roel Beetsma, Massimo Giuliodori, Mark Walschot, Peter Wierts. 2013. Fifty years of fiscal planning and implementation in the Netherlands. *European Journal of Political Economy* **31**, 119-138. [CrossRef]
51. Ansgar Belke, Jens Klose. 2013. Modifying Taylor reaction functions in the presence of the zero-lower-bound — Evidence for the ECB and the Fed. *Economic Modelling* **35**, 515-527. [CrossRef]
52. Rangan Gupta, Monique Reid. 2013. Macroeconomic surprises and stock returns in South Africa. *Studies in Economics and Finance* **30**, 266-282. [CrossRef]
53. NICOLAS PINKWART. 2013. QUANTIFYING THE EUROPEAN CENTRAL BANK'S INTEREST RATE SMOOTHING BEHAVIOR*. *The Manchester School* **81**:10.1111/manc.2013.81.issue-4, 470-492. [CrossRef]
54. Onur Ince, David H. Papell. 2013. The (un)reliability of real-time output gap estimates with revised data. *Economic Modelling* **33**, 713-721. [CrossRef]
55. Victor Lledó, Marcos Poplawski-Ribeiro. 2013. Fiscal Policy Implementation in Sub-Saharan Africa. *World Development* **46**, 79-91. [CrossRef]
56. Ralf Fendel, Michael Frenkel, Jan-Christoph Rülke. 2013. Do professional forecasters trust in Taylor-type rules? – Evidence from the Wall Street Journal poll. *Applied Economics* **45**, 829-838. [CrossRef]
57. Florence Bouvet, Sharmila King. 2013. Do National Economic Shocks Influence European Central Bank Interest Rate Decisions? The Impact of the Financial and Sovereign Debt Crises. *JCMS: Journal of Common Market Studies* **51**:10.1111/jcms.2013.51.issue-2, 212-231. [CrossRef]
58. Nikiforos T. Laopodis. 2013. Monetary policy and stock market dynamics across monetary regimes. *Journal of International Money and Finance* **33**, 381-406. [CrossRef]
59. Aleš Bulíř, Martin Čihák, Kateřina Šmídková. 2013. Writing Clearly: The ECB's Monetary Policy Communication. *German Economic Review* **14**:10.1111/geer.2012.14.issue-1, 50-72. [CrossRef]

60. Alex Nikolsko-Rzhevskyy, David H. Papell. 2013. Taylor's Rule Versus Taylor Rules. *International Finance* **16**:10.1111/infi.v16.1, 71-93. [CrossRef]

61. PAVEL KAPINOS, MICHAEL S. HANSON. 2013. TARGETS IN THE TAYLOR RULE: INFLATION, SPEED LIMIT, OR PRICE LEVEL?. *Contemporary Economic Policy* **31**:10.1111/coep.2013.31.issue-1, 176-190. [CrossRef]

62. Volker Wieland, Maik WoltersForecasting and Policy Making 239-325. [CrossRef]

63. Alexander Erler, Christian Drescher, Damir Križanac. 2013. The Fed's TRAP. *Journal of Economics and Finance* **37**, 136-149. [CrossRef]

64. Giorgio Di Giorgio, Guido Traficante. 2013. The loss from uncertainty on policy targets. *Economic Modelling* **30**, 175-182. [CrossRef]

65. Dieter Brümmerhoff, Michael Grömling. 2012. Ökonomische Auswirkungen von VGR-Revisionen. *AStA Wirtschafts- und Sozialstatistisches Archiv* . [CrossRef]

66. KEVIN LEE, NILSS OLEKALNS, KALVINDER SHIELDS, ZHENG WANG. 2012. Australian Real-Time Database: An Overview and an Illustration of its Use in Business Cycle Analysis*. *Economic Record* **88**:10.1111/ecor.2012.88.issue-283, 495-516. [CrossRef]

67. Alexander Jung, Gergely Kiss. 2012. Preference heterogeneity in the CEE inflation-targeting countries. *European Journal of Political Economy* **28**, 445-460. [CrossRef]

68. Efrem Castelnuovo, Luciano Greco, Davide Raggi. 2012. POLICY RULES, REGIME SWITCHES, AND TREND INFLATION: AN EMPIRICAL INVESTIGATION FOR THE UNITED STATES. *Macroeconomic Dynamics* 1-23. [CrossRef]

69. Domenico Giannone, Jérôme Henry, Magdalena Lalik, Michele Modugno. 2012. An Area-Wide Real-Time Database for the Euro Area. *Review of Economics and Statistics* **94**, 1000-1013. [CrossRef]

70. Pasquale Della Corte, Ilias TsiakasStatistical and Economic Methods for Evaluating Exchange Rate Predictability 221-263. [CrossRef]

71. Michael P. Clements, Ana Beatriz Galvão. 2012. Improving Real-Time Estimates of Output and Inflation Gaps With Multiple-Vintage Models. *Journal of Business & Economic Statistics* **30**, 554-562. [CrossRef]

72. DESPINA ALEXIADOU. 2012. Finding political capital for monetary tightening: Unemployment insurance and partisan monetary cycles. *European Journal of Political Research* **51**:10.1111/ejpr.2012.51.issue-6, 809-836. [CrossRef]

73. Jinho Bae, Chang-Jin Kim, Dong Heon Kim. 2012. The evolution of the monetary policy regimes in the U.S. *Empirical Economics* **43**, 617-649. [CrossRef]

74. Christina Gerberding,, Franz Seitz,, Andreas Worms,. 2012. Interest Rate Rules and Money as an Indicator Variable. *Kredit und Kapital* **45**, 501-529. [CrossRef]

75. George Monokroussos. 2012. A Classical MCMC Approach to the Estimation of Limited Dependent Variable Models of Time Series. *Computational Economics* . [CrossRef]

76. Jens Klose. 2012. Political business cycles and monetary policy revisited–an application of a two-dimensional asymmetric Taylor reaction function. *International Economics and Economic Policy* **9**, 265-295. [CrossRef]

77. Allan H. Meltzer. 2012. The Federal Reserve (almost) 100. *Journal of Macroeconomics* **34**, 626-630. [CrossRef]

78. Dirk Bleich, Ralf Fendel, Jan-Christoph Rülke. 2012. Inflation targeting makes the difference: Novel evidence on inflation stabilization. *Journal of International Money and Finance* **31**, 1092-1105. [CrossRef]

79. Ansgar Belke, Niklas Potrafke. 2012. Does government ideology matter in monetary policy? A panel data analysis for OECD countries. *Journal of International Money and Finance* **31**, 1126-1139. [CrossRef]
80. Martin Mandler. 2012. Decomposing Federal Funds Rate forecast uncertainty using time-varying Taylor rules and real-time data. *The North American Journal of Economics and Finance* **23**, 228-245. [CrossRef]
81. Dirk Bleich, Ralf Fendel, Jan-Christoph Rülke. 2012. Monetary policy and oil price expectations. *Applied Economics Letters* **19**, 969-973. [CrossRef]
82. Rokon Bhuiyan. 2012. Identifying a Forward-looking Monetary Policy in an Open Economy. *Economica* **79**:10.1111/ecca.2012.79.issue-315, 576-599. [CrossRef]
83. Stefano Neri, Tiziano Ropele. 2012. Imperfect Information, Real-Time Data and Monetary Policy in the Euro Area*. *The Economic Journal* **122**:10.1111/ecoj.2012.122.issue-561, 651-674. [CrossRef]
84. Jesús Vázquez, Ramón María-Dolores, Juan M. Londoño. 2012. The Effect of Data Revisions on the Basic New Keynesian Model. *International Review of Economics & Finance* **24**, 235-249. [CrossRef]
85. Wolfram Wilde. 2012. The influence of Taylor rule deviations on the real exchange rate. *International Review of Economics & Finance* **24**, 51-61. [CrossRef]
86. Joshua R. Hendrickson. 2012. An overhaul of Federal Reserve doctrine: Nominal income and the Great Moderation. *Journal of Macroeconomics* **34**, 304-317. [CrossRef]
87. Maik H. Wolters. 2012. Estimating monetary policy reaction functions using quantile regressions. *Journal of Macroeconomics* **34**, 342-361. [CrossRef]
88. Ndahiriwe Kasaï, Ruthira Naraidoo. 2012. Financial assets, linear and nonlinear policy rules. *Journal of Economic Studies* **39**, 161-177. [CrossRef]
89. Michael P. Clements, Ana Beatriz Galvão. 2012. REAL-TIME FORECASTING OF INFLATION AND OUTPUT GROWTH WITH AUTOREGRESSIVE MODELS IN THE PRESENCE OF DATA REVISIONS. *Journal of Applied Econometrics* n/a-n/a. [CrossRef]
90. Guillaume L'œillet, Julien Licheron. 2012. How does the European Central Bank react to oil prices?. *Economics Letters* . [CrossRef]
91. SETH PRUITT. 2012. Uncertainty Over Models and Data: The Rise and Fall of American Inflation. *Journal of Money, Credit and Banking* **44**:10.1111/jmcb.2012.44.issue-2-3, 341-365. [CrossRef]
92. Jacopo Cimadomo. 2012. Fiscal Policy in Real Time*. *The Scandinavian Journal of Economics* no-no. [CrossRef]
93. HENNING WEBER. 2012. Product Replacement Bias in Inflation and Its Consequences for Monetary Policy. *Journal of Money, Credit and Banking* **44**:10.1111/jmcb.2012.44.issue-2-3, 255-299. [CrossRef]
94. OLIVIER COIBION, DANIEL GOLDSTEIN. 2012. One for Some or One for All? Taylor Rules and Interregional Heterogeneity. *Journal of Money, Credit and Banking* **44**:10.1111/jmcb.2012.44.issue-2-3, 401-431. [CrossRef]
95. Barbara Annicchiarico, Nicola Giammarioli, Alessandro Piergallini. 2012. Budgetary policies in a DSGE model with finite horizons. *Research in Economics* . [CrossRef]
96. Haelim Park, Gary RichardsonRetail Trade by Federal Reserve District, 1919 to 1939: A Statistical History 151-231. [CrossRef]
97. Nicholas Apergis, Stephen Miller, Efrosyni Alevizopoulou. 2012. The Bank Lending Channel and Monetary Policy Rules: Further Extensions. *Procedia Economics and Finance* **2**, 63-72. [CrossRef]
98. Ruben Atoyan, Dustin Smith, Albert Jaeger. 2012. The Pre-Crisis Capital Flow Surge to Emerging Europe: Did Countercyclical Fiscal Policy Make a Difference?. *IMF Working Papers* **12**, 1. [CrossRef]

99. Bořek Vašíček. 2011. Is monetary policy in the new EU member states asymmetric?. *Economic Systems* . [CrossRef]
100. Subrata Ghatak, Tomoe Moore. 2011. Monetary Policy Rules for Transition Economies: An Empirical Analysis. *Review of Development Economics* **15**:10.1111/rode.2011.15.issue-4, 714-728. [CrossRef]
101. Pär Österholm. 2011. The limited usefulness of macroeconomic Bayesian VARs when estimating the probability of a US recession. *Journal of Macroeconomics* . [CrossRef]
102. E. E. Meade, D. L. Thornton. 2011. The Phillips curve and US monetary policy: what the FOMC transcripts tell us. *Oxford Economic Papers* . [CrossRef]
103. Luca Benati. 2011. Estimating the financial crisis' impact on potential output. *Economics Letters* . [CrossRef]
104. Jaromír Baxa, Roman Horváth, Bořek Vašíček. 2011. Time-Varying Monetary-Policy Rules and Financial Stress: Does Financial Instability Matter for Monetary Policy?. *Journal of Financial Stability* . [CrossRef]
105. Ansgar Belke, Jens Klose. 2011. Does the ECB Rely on a Taylor Rule During the Financial Crisis? Comparing Ex-post and Real Time Data with Real Time Forecasts. *Economic Analysis and Policy* **41**, 147-171. [CrossRef]
106. ULF VON KALCKREUTH, GUNTRAM B. WOLFF. 2011. Identifying Discretionary Fiscal Policy Reactions with Real-Time Data. *Journal of Money, Credit and Banking* **43**:10.1111/jmcb.2011.43.issue-6, 1271-1285. [CrossRef]
107. Carlo Rosa. 2011. Words that shake traders. *Journal of Empirical Finance* . [CrossRef]
108. ALEX NIKOLSKO-RZHEVSKYY. 2011. Monetary Policy Estimation in Real Time: Forward-Looking Taylor Rules without Forward-Looking Data. *Journal of Money, Credit and Banking* **43**:10.1111/jmcb.2011.43.issue-5, 871-897. [CrossRef]
109. James D. Hamilton,, Seth Pruitt,, Scott Borger. 2011. Estimating the Market-Perceived Monetary Policy Rule. *American Economic Journal: Macroeconomics* **3**:3, 1-28. [Abstract] [View PDF article] [PDF with links]
110. Costas Milas, Ruthira Naraidoo. 2011. Financial conditions and nonlinearities in the European Central Bank (ECB) reaction function: In-sample and out-of-sample assessment. *Computational Statistics & Data Analysis* . [CrossRef]
111. Tara M. Sinclair, Edward N. Gamber, Herman Stekler, Elizabeth Reid. 2011. Jointly evaluating the Federal Reserve's forecasts of GDP growth and inflation. *International Journal of Forecasting* . [CrossRef]
112. José R. Sánchez-Fung. 2011. Estimating monetary policy reaction functions for emerging market economies: The case of Brazil. *Economic Modelling* **28**, 1730-1738. [CrossRef]
113. Nicolas Pinkwart. 2011. Zur Stabilität von Saisonbereinigungsverfahren: Eine Echtzeitdaten-Analyse am Beispiel BV4.1 und X-12-ARIMA. *AStA Wirtschafts- und Sozialstatistisches Archiv* . [CrossRef]
114. Michael Frömmel, Garo Garabedian, Franziska Schobert. 2011. Monetary policy rules in Central and Eastern European Countries: Does the exchange rate matter?. *Journal of Macroeconomics* . [CrossRef]
115. Q. Farooq Akram. 2011. Policy analysis in real time using IMF's monetary model. *Economic Modelling* . [CrossRef]
116. Michael Frenkel, Eliza M. Lis, Jan-Christoph Rülke. 2011. Has the economic crisis of 2007-2009 changed the expectation formation process in the Euro area?. *Economic Modelling* . [CrossRef]
117. David Vera. 2011. How robust is the Fed reaction function to changes in the output-gap specification?. *Applied Economics* **43**, 1059-1065. [CrossRef]

118. A. Ang, J. Boivin, S. Dong, R. Loo-Kung. 2011. Monetary Policy Shifts and the Term Structure. *The Review of Economic Studies* **78**, 429-457. [CrossRef]

119. Dean Croushore. 2011. Frontiers of Real-Time Data Analysis. *Journal of Economic Literature* **49**:1, 72-100. [Abstract] [View PDF article] [PDF with links]

120. GEORGE MONOKROUSSOS. 2011. Dynamic Limited Dependent Variable Modeling and U.S. Monetary Policy. *Journal of Money, Credit and Banking* **43**:10.1111/jmcb.2011.43.issue-2-3, 519-534. [CrossRef]

121. P. Segal. 2011. Oil price shocks and the macroeconomy. *Oxford Review of Economic Policy* **27**, 169-185. [CrossRef]

122. ANDREW HUGHES HALLETT, RASMUS KATTAI, JOHN LEWIS. 2011. HOW RELIABLE ARE CYCLICALLY ADJUSTED BUDGET BALANCES IN REAL TIME?. *Contemporary Economic Policy* no-no. [CrossRef]

123. Jens Klose. 2011. Asymmetric Taylor reaction functions of the ECB: An approach depending on the state of the economy. *The North American Journal of Economics and Finance* . [CrossRef]

124. HELGE BERGER, PÄR ÖSTERHOLM. 2011. Does Money Growth Granger Cause Inflation in the Euro Area? Evidence from Out-of-Sample Forecasts Using Bayesian VARs*. *Economic Record* **87**:10.1111/ecor.2011.87.issue-276, 45-60. [CrossRef]

125. TANYA MOLODTSOVA, ALEX NIKOLSKO-RZHEVSKYY, DAVID H. PAPELL. 2011. Taylor Rules and the Euro. *Journal of Money, Credit and Banking* **43**:10.1111/jmcb.2011.43.issue-2-3, 535-552. [CrossRef]

126. Elena Bojesteanu, Gabriel Bobeică. 2011. The propagation of European monetary policy shocks into Romania's economy. *Applied Economics Letters* **18**, 461-465. [CrossRef]

127. H. Berger, P. Osterholm. 2011. Does Money matter for U.S. Inflation? Evidence from Bayesian VARs. *CESifo Economic Studies* . [CrossRef]

128. Olivier Coibion,, Yuriy Gorodnichenko. 2011. Monetary Policy, Trend Inflation, and the Great Moderation: An Alternative Interpretation. *American Economic Review* **101**:1, 341-370. [Abstract] [View PDF article] [PDF with links]

129. Ralf Fendel, Michael Frenkel, Jan-Christoph Rülke. 2011. "Ex-ante" Taylor rules and expectation forming in emerging markets. *Journal of Comparative Economics* . [CrossRef]

130. Florence Bouvet, Sharmila King. 2011. Interest-Rate Setting at the ECB Following the Financial and Sovereign Debt Crises, in Real-Time. *Modern Economy* **02**, 743-756. [CrossRef]

131. Victor Duarte Lledo, Marcos Poplawski-Ribeiro. 2011. Fiscal Policy Implementation in Sub-Saharan Africa. *IMF Working Papers* **11**, 1. [CrossRef]

132. Ralf Fendel, Michael Frenkel, Jan-Christoph Rülke. 2010. 'Ex-ante' Taylor rules – Newly discovered evidence from the G7 countries. *Journal of Macroeconomics* . [CrossRef]

133. Dieter Gerdesmeier, Francesco Mongelli, Barbara Roffia. 2010. Interest Rate Setting by the Fed, the ECB, the Bank of Japan and the Bank of England Compared. *Comparative Economic Studies* **52**, 549-574. [CrossRef]

134. Michael Scharnagl, Christina Gerberding, Franz Seitz. 2010. Should Monetary Policy Respond to Money Growth? New Results for the Euro Area. *International Finance* **13**:10.1111/infi.2010.13.issue-3, 409-441. [CrossRef]

135. Bernd Hayo, Matthias Neuenkirch. 2010. Do Federal Reserve communications help predict federal funds target rate decisions?. *Journal of Macroeconomics* **32**, 1014-1024. [CrossRef]

136. Jan-Egbert Sturm, Jakob Haan. 2010. Does central bank communication really lead to better forecasts of policy decisions? New evidence based on a Taylor rule model for the ECB. *Review of World Economics* . [CrossRef]

137. Fabrizio Balassone, Maura Francese, Stefania Zotteri. 2010. Cyclical asymmetry in fiscal variables in the EU. *Empirica* **37**, 381-402. [CrossRef]

138. Ester Gutiérrez, Sebastián Lozano. 2010. A competing risks analysis of the duration of federal target funds rates. *Computers & Operations Research* . [CrossRef]

139. Zisimos Koustas, Jean-François Lamarche. 2010. Instrumental variable estimation of a nonlinear Taylor rule. *Empirical Economics* . [CrossRef]

140. George Kapetanios, Tony Yates. 2010. Estimating time variation in measurement error from data revisions: an application to backcasting and forecasting in dynamic models. *Journal of Applied Econometrics* **25**:10.1002/jae.v25:5, 869-893. [CrossRef]

141. Pierre L. Siklos. 2010. Revisiting the Coyne Affair: a singular event that changed the course of Canadian monetary history. *Canadian Journal of Economics/Revue canadienne d'économique* **43**, 994-1015. [CrossRef]

142. Roberto Tamborini. 2010. MONETARY POLICY WITH INVESTMENT-SAVING IMBALANCES. *Metroeconomica* **61**:10.1111/meca.2010.61.issue-3, 473-509. [CrossRef]

143. Vítor Castro. 2010. Can central banks' monetary policy be described by a linear (augmented) Taylor rule or by a nonlinear rule?#. *Journal of Financial Stability* . [CrossRef]

144. Jim Engle-Warnick, Nurlan Turdaliev. 2010. An experimental test of Taylor-type rules with inexperienced central bankers. *Experimental Economics* **13**, 146-166. [CrossRef]

145. Benjamin D. Keen. 2010. THE SIGNAL EXTRACTION PROBLEM REVISITED: A NOTE ON ITS IMPACT ON A MODEL OF MONETARY POLICY. *Macroeconomic Dynamics* **14**, 405-426. [CrossRef]

146. Thomas Harjes, Luca Antonio Ricci. 2010. A Bayesian-Estimated Model of Inflation Targeting in South Africa. *IMF Staff Papers* **57**, 407-426. [CrossRef]

147. Alex Cukierman. 2010. How Would Have Monetary Policy During the Great Inflation Differed, if it Had Been Conducted in the Styles of Volcker and Greenspan and with Perfect Foresight?. *Comparative Economic Studies* **52**, 159-179. [CrossRef]

148. Zisimos Koustas, Jean-Francois Lamarche. 2010. Evidence of nonlinear mean reversion in the real interest rate. *Applied Economics* **42**, 237-248. [CrossRef]

149. Eduardo Levy Yeyati, Federico SturzeneggerMonetary and Exchange Rate Policies 4215-4281. [CrossRef]

150. John B. Taylor, John C. WilliamsSimple and Robust Rules for Monetary Policy 829-859. [CrossRef]

151. Richard W. Evans, Yingyao Hu, Zhong Zhao. 2010. The fertility effect of catastrophe: U.S. hurricane births. *Journal of Population Economics* **23**, 1-36. [CrossRef]

152. IMF. Research Dept.World Economic Outlook, October 2010: Recovery, Risk, and Rebalancing . [CrossRef]

153. International Monetary Fund. 2010. Estimating Potential Output with a Multivariate Filter. *IMF Working Papers* **10**, 1. [CrossRef]

154. Andreas Billmeier. 2009. Ghostbusting: which output gap really matters?. *International Economics and Economic Policy* **6**, 391-419. [CrossRef]

155. B. Fischer, M. Lenza, H. Pill, L. Reichlin. 2009. Monetary analysis and monetary policy in the euro area 1999–2006. *Journal of International Money and Finance* **28**, 1138-1164. [CrossRef]

156. Michael P. Clements, Ana Beatriz Galvão. 2009. Forecasting US output growth using leading indicators: an appraisal using MIDAS models. *Journal of Applied Econometrics* **24**, 1187-1206. [CrossRef]

157. Roel Beetsma, Massimo Giuliodori, Peter Wierts. 2009. Planning to cheat: EU fiscal policy in real time. *Economic Policy* **24**:10.1111/ecop.2009.24.issue-60, 753-804. [CrossRef]

158. Anthony Garratt, Gary Koop, Emi Mise, Shaun P. Vahey. 2009. Real-Time Prediction With U.K. Monetary Aggregates in the Presence of Model Uncertainty. *Journal of Business and Economic Statistics* **27**, 480-491. [CrossRef]

159. Maria Eleftheriou. 2009. Monetary policy in Germany: A cointegration analysis on the relevance of interest rate rules#. *Economic Modelling* **26**, 946-960. [CrossRef]

160. David-Jan Jansen, Jakob De Haan. 2009. Has ECB communication been helpful in predicting interest rate decisions? An evaluation of the early years of the Economic and Monetary Union. *Applied Economics* **41**, 1995-2003. [CrossRef]

161. Chengsi Zhang, Denise R. Osborn, Dong Heon Kim. 2009. Observed Inflation Forecasts and the New Keynesian Phillips Curve. *Oxford Bulletin of Economics and Statistics* **71**:10.1111/obes.2009.71.issue-3, 375-398. [CrossRef]

162. Ernst Konrad. 2009. The impact of monetary policy surprises on asset return volatility: the case of Germany. *Financial Markets and Portfolio Management* **23**, 111-135. [CrossRef]

163. Tanya Molodtsova, David H. Papell. 2009. Out-of-sample exchange rate predictability with Taylor rule fundamentals. *Journal of International Economics* **77**, 167-180. [CrossRef]

164. Stephanie Schmitt-Grohé, Martín Uribe. 2009. Liquidity traps with global Taylor Rules. *International Journal of Economic Theory* **5**:10.1111/ijet.2009.5.issue-1, 85-106. [CrossRef]

165. R. Schettkat, R. Sun. 2009. Monetary policy and European unemployment. *Oxford Review of Economic Policy* **25**, 94-108. [CrossRef]

166. Anders Møller Christensen, Heino Bohn Nielsen. 2009. Monetary Policy in the Greenspan Era: A Time Series Analysis of Rules vs. Discretion. *Oxford Bulletin of Economics and Statistics* **71**:10.1111/obes.2009.71.issue-1, 69-89. [CrossRef]

167. Carlo Rosa. 2009. Forecasting the Direction of Policy Rate Changes: The Importance of ECB Words. *Economic Notes* **38**:10.1111/ecno.2009.38.issue-1-2, 39-66. [CrossRef]

168. Alex Cukierman. 2009. The Limits of Transparency. *Economic Notes* **38**:10.1111/ecno.2009.38.issue-1-2, 1-37. [CrossRef]

169. Fabrizio Mattesini, Leonardo Becchetti. 2009. The stock market and the Fed. *Applied Financial Economics* **19**, 99-110. [CrossRef]

170. A. G. Malliaris, Mary Malliaris. 2009. Modeling Federal Funds rates: a comparison of four methodologies. *Neural Computing and Applications* **18**, 37-44. [CrossRef]

171. Anthony Garratt, Kevin Lee, Emi Mise, Kalvinder Shields. 2009. Real time representation of the UK output gap in the presence of model uncertainty. *International Journal of Forecasting* **25**, 81-102. [CrossRef]

172. Alex Cukierman. 2008. Central bank independence and monetary policymaking institutions — Past, present and future. *European Journal of Political Economy* **24**, 722-736. [CrossRef]

173. Alan S. Blinder,, Michael Ehrmann,, Marcel Fratzscher,, Jakob De Haan,, David-Jan Jansen. 2008. Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence. *Journal of Economic Literature* **46**:4, 910-945. [Abstract] [View PDF article] [PDF with links]

174. Georgios Chortareas. 2008. MONETARY POLICY RULES IN THE RUN-UP TO THE EMU. *Metroeconomica* **59**:10.1111/meca.2008.59.issue-4, 687-712. [CrossRef]

175. Anthony Garratt, Kevin Lee, Emi Mise, Kalvinder Shields. 2008. Real-Time Representations of the Output Gap. *Review of Economics and Statistics* **90**, 792-804. [CrossRef]

176. Hilde C. Bjørnland, Leif Brubakk, Anne Sofie Jore. 2008. Forecasting inflation with an uncertain output gap. *Empirical Economics* **35**, 413-436. [CrossRef]
177. Michael P Clements, Ana Beatriz Galvão. 2008. Macroeconomic Forecasting With Mixed-Frequency Data. *Journal of Business and Economic Statistics* **26**, 546-554. [CrossRef]
178. J BULLARD, A SINGH. 2008. Worldwide macroeconomic stability and monetary policy rules#. *Journal of Monetary Economics* **55**, S34-S47. [CrossRef]
179. T MOLODTSOVA, A NIKOLSKORZHEVSKYY, D PAPELL. 2008. Taylor rules with real-time data: A tale of two countries and one exchange rate#. *Journal of Monetary Economics* **55**, S63-S79. [CrossRef]
180. Janko Gorter, Jan Jacobs, Jakob De Haan. 2008. Taylor Rules for the ECB using Expectations Data*. *Scandinavian Journal of Economics* **110**, 473-488. [CrossRef]
181. Naveen Srinivasan, Vidya Mahambare, M. Ramachandran. 2008. Dynamics of inflation in India: does the new inflation bias hypothesis provide an explanation?. *Macroeconomics and Finance in Emerging Market Economies* **1**, 199-212. [CrossRef]
182. Jesús Fernández-Villaverde. 2008. Horizons of Understanding: A Review of Ray Fair's Estimating How the Macroeconomy Works. *Journal of Economic Literature* **46**:3, 685-703. [Abstract] [View PDF article] [PDF with links]
183. WILLIAM A. BRANCH, TROY DAVIG, BRUCE McGOUGH. 2008. Monetary–Fiscal Policy Interactions under Implementable Monetary Policy Rules. *Journal of Money, Credit and Banking* **40**:10.1111/jmcb.2008.40.issue-5, 1095-1102. [CrossRef]
184. Ibrahim Chowdhury, Andreas Schabert. 2008. Federal reserve policy viewed through a money supply lens###. *Journal of Monetary Economics* **55**, 825-834. [CrossRef]
185. Jeff Fuhrer, Geoff Tootell. 2008. Eyes on the prize: How did the fed respond to the stock market?#. *Journal of Monetary Economics* **55**, 796-805. [CrossRef]
186. Fabio Milani. 2008. MONETARY POLICY WITH A WIDER INFORMATION SET: A BAYESIAN MODEL AVERAGING APPROACH. *Scottish Journal of Political Economy* **55**:10.1111/sjpe.2008.55.issue-1, 1-30. [CrossRef]
187. Thomas Harjes, Luca Antonio Ricci. 2008. A Bayesian-Estimated Model of Inflationtargeting in South Africa. *IMF Working Papers* **08**, 1. [CrossRef]
188. Pär Österholm, Helge Berger. 2008. Does Money Matter for U.S. Inflation? Evidence from Bayesian VARs. *IMF Working Papers* **08**, 1. [CrossRef]
189. Pär Österholm, Helge Berger. 2008. Does Money Growth Granger-Cause Inflation in the Euro Area? Evidence From Out-Of-Sample Forecasts Using Bayesian Vars. *IMF Working Papers* **08**, 1. [CrossRef]
190. alberto ortiz, federico sturzenegger. 2007. ESTIMATING SARB'S POLICY REACTION RULE. *The South African Journal of Economics* **75**, 659-680. [CrossRef]
191. G CATEAU. 2007. Monetary policy under model and data-parameter uncertainty. *Journal of Monetary Economics* **54**, 2083-2101. [CrossRef]
192. DIETER GERDESMEIER, FRANCESCO PAOLO MONGELLI, BARBARA ROFFIA. 2007. The Eurosystem, the U.S. Federal Reserve, and the Bank of Japan: Similarities and Differences. *Journal of Money, Credit and Banking* **39**:10.1111/jmcb.2007.39.issue-7, 1785-1819. [CrossRef]
193. C EVANS, D MARSHALL. 2007. Economic determinants of the nominal treasury yield curve#. *Journal of Monetary Economics* **54**, 1986-2003. [CrossRef]
194. ROBERT J. TETLOW, BRIAN IRONSIDE. 2007. Real-Time Model Uncertainty in the United States: The Fed, 1996?2003. *Journal of Money, Credit and Banking* **39**:10.1111/jmcb.2007.39.issue-7, 1533-1561. [CrossRef]

195. REBECCA HELLERSTEIN. 2007. Is There a Dead Spot? New Evidence on FOMC Decisions Before Elections. *Journal of Money, Credit and Banking* **39**:10.1111/jmcb.2007.39.issue-6, 1411-1427. [CrossRef]
196. Stephan Sauer, Jan-Egbert Sturm. 2007. Using Taylor Rules to Understand European Central Bank Monetary Policy. *German Economic Review* **8**:10.1111/geer.2007.8.issue-3, 375-398. [CrossRef]
197. Alfred Guender, Yu Xie. 2007. Is there an exchange rate channel in the forward-looking Phillips curve? A theoretical and empirical investigation. *New Zealand Economic Papers* **41**, 5-28. [CrossRef]
198. Pierre L. Siklos, Martin T. Bohl. 2007. Do actions speak louder than words? Evaluating monetary policy at the Bundesbank. *Journal of Macroeconomics* **29**, 368-386. [CrossRef]
199. Bharat Trehan, Tao Wu. 2007. Time-varying equilibrium real rates and monetary policy analysis. *Journal of Economic Dynamics and Control* **31**, 1584-1609. [CrossRef]
200. Christian Bordes, Laurent Clerc. 2007. PRICE STABILITY AND THE ECB'S MONETARY POLICY STRATEGY*. *Journal of Economic Surveys* **21**:10.1111/joes.2007.21.issue-2, 268-326. [CrossRef]
201. EFREM CASTELNUOVO. 2007. TAYLOR RULES AND INTEREST RATE SMOOTHING IN THE EURO AREA. *The Manchester School* **75**:10.1111/manc.2007.75.issue-1, 1-16. [CrossRef]
202. corné van walbeek. 2006. OFFICIAL REVISIONS TO SOUTH AFRICAN NATIONAL ACCOUNTS DATA: MAGNITUDES AND IMPLICATIONS. *The South African Journal of Economics* **74**:10.1111/saje.2006.74.issue-4, 745-765. [CrossRef]
203. Alessandro Piergallini. 2006. Fiscal Deficits, Taylor Rules, and Price Dynamics. *Atlantic Economic Journal* **34**, 395-403. [CrossRef]
204. Nikiforos T. Laopodis. 2006. Dynamic Interactions among the Stock Market, Federal Funds Rate, Inflation, and Economic Activity. *The Financial Review* **41**:10.1111/fire.2006.41.issue-4, 513-545. [CrossRef]
205. C KIM, C NELSON. 2006. Estimation of a forward-looking monetary policy rule: A time-varying parameter model using ex post data#. *Journal of Monetary Economics* **53**, 1949-1966. [CrossRef]
206. Dean Croushore, Charles L. Evans. 2006. Data revisions and the identification of monetary policy shocks#. *Journal of Monetary Economics* **53**, 1135-1160. [CrossRef]
207. Kai Carstensen. 2006. Estimating the ECB Policy Reaction Function. *German Economic Review* **7**:10.1111/geer.2006.7.issue-1, 1-34. [CrossRef]
208. Dean CroushoreChapter 17 Forecasting with Real-Time Macroeconomic Data 961-982. [CrossRef]
209. Richard Dennis. 2006. The policy preferences of the US Federal Reserve. *Journal of Applied Econometrics* **21**:10.1002/jae.v21:1, 55-77. [CrossRef]
210. Barbara Annicchiarico, Alessandro Piergallini. 2006. Monetary Rules and Deficit Shocks. *Spanish Economic Review* **9**:1, 39. [CrossRef]
211. RALF M. FENDEL, MICHAEL R. FRENKEL. 2006. FIVE YEARS OF SINGLE EUROPEAN MONETARY POLICY IN PRACTICE: IS THE ECB RULE-BASED?. *Contemporary Economic Policy* **24**, 106-115. [CrossRef]
212. Turgut Kisinbay, Eric Parrado, Rodolfo Maino, Jorge Iván Canales Kriljenko. 2006. Setting the Operational Framework for Producing Inflation Forecasts. *IMF Working Papers* **06**, 1. [CrossRef]
213. Alessandro Piergallini. 2005. Equilibrium Determinacy under Monetary and Fiscal Policies in an Overlapping Generations Model. *Economic Notes* **34**:10.1111/ecno.2005.34.issue-3, 313-330. [CrossRef]
214. Pär Österholm. 2005. The Taylor rule and real-time data – a critical appraisal. *Applied Economics Letters* **12**, 679-685. [CrossRef]

215. ALISTAIR DIEPPE, KEITH KUSTER, PETER McADAM. 2005. Optimal Monetary Policy Rules for the Euro Area: An Analysis Using the Area Wide Model*. *JCMS: Journal of Common Market Studies* **43**:10.1111/jcms.2005.43.issue-3, 507-537. [CrossRef]
216. Pär Österholm. 2005. The Taylor Rule: A Spurious Regression?*. *Bulletin of Economic Research* **57**:10.1111/boer.2005.57.issue-3, 217-247. [CrossRef]
217. MICHAEL R. PAKKO. 2005. ON THE INFORMATION CONTENT OF ASYMMETRIC FOMC POLICY STATEMENTS: EVIDENCE FROM A TAYLOR-RULE PERSPECTIVE. *Economic Inquiry* **43**, 558-569. [CrossRef]
218. F DEFIORE, Z LIU. 2005. Does trade openness matter for aggregate instability?. *Journal of Economic Dynamics and Control* **29**, 1165-1192. [CrossRef]
219. T ANDERSEN, N BEIER. 2005. International transmission of transitory and persistent monetary shocks under imperfect information. *Journal of International Economics* **66**, 485-507. [CrossRef]
220. ALVARO AGUIAR, MANUEL M.F. MARTINS. 2005. The Preferences of the Euro Area Monetary Policy-maker*. *JCMS: Journal of Common Market Studies* **43**:10.1111/jcms.2005.43.issue-2, 221-250. [CrossRef]
221. International Monetary Fund. 2005. South Africa: Selected Issues. *IMF Staff Country Reports* **05**, 1. [CrossRef]
222. Robert Tchaidze, Alina Carare. 2005. The Use and Abuse of Taylor Rules: How Precisely Can We Estimate them?. *IMF Working Papers* **05**, 1. [CrossRef]
223. Daniel Leigh. 2005. Estimating the Implicit Inflation Target: An Application to U.S. Monetary Policy. *IMF Working Papers* **05**, 1. [CrossRef]
224. Ralf Fendel. 2004. Perspektiven und Grenzen der Verwendung geldpolitischer Regeln. *Perspektiven der Wirtschaftspolitik* **5**:10.1111/pers.2004.5.issue-2, 169-192. [CrossRef]
225. S Leduc. 2004. A quantitative analysis of oil-price shocks, systematic monetary policy, and economic downturns. *Journal of Monetary Economics* **51**, 781-808. [CrossRef]
226. Eric Jondeau, Hervé Le Bihan, Clémentine Gallès. 2004. Assessing Generalized Method-of-Moments Estimates of the Federal Reserve Reaction Function. *Journal of Business and Economic Statistics* **22**, 225-239. [CrossRef]
227. Jes�s Cuaresma, Ernest Gnan, Doris Ritzberger-Gruenwald. 2004. Searching for the natural rate of interest: a euro area perspective. *Empirica* **31**, 185-204. [CrossRef]
228. Andreas Billmeier. 2004. Ghostbusting: Which Output Gap Measure Really Matters?. *IMF Working Papers* **04**, 1. [CrossRef]
229. Per Jansson, Anders Vredin. 2003. Forecast-Based Monetary Policy: The Case of Sweden. *International Finance* **6**:10.1111/infi.2003.6.issue-3, 349-380. [CrossRef]
230. Peter Vanderhart. 2003. The Bank of Canada's Reaction Function. *American Review of Canadian Studies* **33**, 357-371. [CrossRef]
231. W. A. Razzak. 2003. Is the Taylor Rule Really Different from the McCallum Rule?. *Contemporary Economic Policy* **21**, 445-457. [CrossRef]
232. William Seyfried, Dale Bremmer. 2003. Inflation Targeting as a Framework for Monetary Policy: A Cross-Country Analysis. *The Australian Economic Review* **36**:10.1111/aere.2003.36.issue-3, 291-299. [CrossRef]
233. Alexei Onatski, Noah Williams. 2003. Modeling Model Uncertainty. *Journal of the European Economic Association* **1**:10.1162/jeea.2003.1.issue-5, 1087-1122. [CrossRef]
234. Dean Croushore, Tom Stark. 2003. A Real-Time Data Set for Macroeconomists: Does the Data Vintage Matter?. *Review of Economics and Statistics* **85**, 605-617. [CrossRef]

235. A Orphanides. 2003. Historical monetary policy analysis and the Taylor rule. *Journal of Monetary Economics* **50**, 983-1022. [CrossRef]
236. A Orphanides. 2003. Monetary policy evaluation with noisy information. *Journal of Monetary Economics* . [CrossRef]
237. B Bernanke. 2003. Monetary policy in a data-rich environment. *Journal of Monetary Economics* . [CrossRef]
238. J Faust. 2003. Exchange rate forecasting: the errors we've really made. *Journal of International Economics* **60**, 35-59. [CrossRef]
239. A Orphanides. 2003. The quest for prosperity without inflation. *Journal of Monetary Economics* . [CrossRef]
240. Laurence Ball, Robert R. Tchaidze. 2002. The Fed and the New Economy. *American Economic Review* **92**:2, 108-114. [Citation] [View PDF article] [PDF with links]
241. Pierre L. SiklosChapter 7 What Can We Learn from Comprehensive Data Revisions for Forecasting Inflation? Some US Evidence 271-299. [CrossRef]
242. Michael P. Clements, David F. HendryChapter 1 Forecasting Annual UK Inflation Using an Econometric Model over 1875–1991 3-39. [CrossRef]
243. Pierre L. Siklos, Mark E. WoharEstimating Taylor-Type Rules: An Unbalanced Regression? 239-276. [CrossRef]