Conducting Monetary Policy With Inflation Targets

By George A. Kahn and Klara Parrish

Since the early 1990s, a number of central banks have adopted numerical inflation targets as a guide for monetary policy. The targets are intended to help central banks achieve and maintain price stability by specifying an explicit goal for monetary policy based on a given time path for a particular measure of inflation. In some cases the targets are expressed as a range for inflation over time, while in other cases they are expressed as a path for the inflation rate itself. The measure of inflation that is targeted varies but is typically a broad measure of prices, such as a consumer or retail price index.

At a conceptual level, adopting inflation targets may necessitate fundamental changes in the way monetary policy responds to economic conditions. For example, inflation targeting requires a highly forward looking monetary policy. Given lags in the effects of monetary policy on inflation, central banks seeking to achieve a target for inflation need to forecast inflation and adjust policy in response to projected deviations of inflation from target. But central banks without an explicit inflation target may also be forward looking and equally focused on a long-run goal of price stability. Thus, at a practical level, adopting inflation targets may only formalize a strategy for policy that was already more or less in place. If so, targets might improve the transparency, accountability, and credibility of monetary policy but have little or no impact on the way policy instruments are adjusted to incoming information about the economy.

This article examines how central banks have changed their policy procedures after adopting explicit inflation targets. The first section summarizes the key features that characterize and motivate most inflation targeting regimes. The second section documents the procedural changes that a number of central banks have taken to implement inflation targeting. The third section examines empirical evidence to see if and how inflation targets have changed the way monetary policy reacts to economic information. The article concludes that, while inflation targets have perhaps improved the transparency, accountability, and credibility of monetary policy, it is difficult to discern any significant and systematic changes in the way policymakers adjust policy instruments to incoming information after adopting inflation targets.

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I. RATIONALE FOR AND KEY FEATURES OF INFLATION TARGETING

Central banks have adopted inflation targets as a strategy for achieving, and then maintaining, price stability. Inflation targeting regimes share several common features. This section describes the conceptual rationale for most inflation targeting regimes, as well as their common features.[1]

Rationale

Inflation targets can be set by the government, jointly agreed upon by the central bank and the government, or set by the central bank itself. The ultimate rationale for targets is to help the central bank achieve a desired long-run level of inflation, usually a measured rate of inflation consistent with "price stability." The inflation rate deemed consistent with price stability varies from country to country but generally falls within a range of 0 to 3 percent annually as measured by a broad index of consumer prices.[2] Inflation targets are designed to help the central bank achieve long-run price stability in three principal ways: by providing a nominal anchor for monetary policy, by improving the transparency and accountability of monetary policy, and by enhancing the central bank's inflation-fighting credibility.

Providing a nominal anchor. One rationale for inflation targets is that they supply a nominal anchor for monetary policy. Without such an anchor, policy actions can drift under the influence of short-run economic disturbances and, in the process, become inconsistent with long-run goals. With a nominal anchor, policy is bound to a long-run goal—such as price stability—that ties down inflation expectations but retains the slack needed to respond to short-run disturbances. Traditional nominal anchors for monetary policy have included monetary aggregates and exchange rates.

During the 1980s and 1990s, a number of countries abandoned these more traditional anchors. One reason was that the relationship of monetary aggregates to economic activity broke down in many countries, leaving those central banks that targeted monetary aggregates relying more on discretion and looking at a wide range of information for guidance. With most of these central banks using a very short-term nominal interest rate as the instrument of monetary policy, some analysts became concerned that, without an explicit target, monetary policy could develop an inflationary bias. For example, if policymakers were slow to react to rising inflation expectations, short-run real interest rates would fall, leading to an increasingly accommodative policy at a time when policy might need to be tightened.

Other countries that used exchange rate targets abandoned them when exchange rates became misaligned. The problem with using exchange rates as targets is that monetary policy must be directed at keeping the exchange rate within its target range, sometimes at the expense of promoting favorable domestic macroeconomic performance. If exchange rate targets are consistent with favorable macroeconomic performance, they can work well as an anchor for policy. When exchange rates become misaligned, however, a central bank may find itself defending the foreign exchange value of its currency at the cost of achieving goals for the domestic economy. When this happens, speculators may attack the currency, leading possibly to a realignment of exchange rate targets or, at the extreme, their demise as a guide to monetary policy. An example of this phenomenon occurred in the United Kingdom during the crisis in Europe's exchange rate mechanism (ERM) in 1992, when the UK left the ERM and established inflation targets as its anchor for monetary policy.

Improving transparency and accountability. Another rationale for inflation targets is that they can improve the transparency of monetary

policy and the accountability of monetary policymakers. Inflation targets are highly transparent because they convey to the public a precise, readily understood goal for monetary policy. For example, an inflation target under which a central bank commits to "keep increases in the consumer price index between 1 and 3 percent annually from now until the end of the year 2001" gives the public a clear signal of both near-term and longer term plans. A central bank with such a target provides a clearer signal than a bank that simply commits to "achieving price stability in the long run," without specifying a numerical definition of price stability or a time frame for achieving it. Of course, the more precise a target, the easier it is to tell whether a target is hit or missed. And when targets are missed, policymakers have to explain why. Advocates of inflation targeting argue that explaining target misses increases transparency. Critics contend that inflation targets might give policymakers too strong an incentive to hit the target at the expense of adverse short-run fluctuations in output and employment.[3]

Along with increased transparency, inflation targets enhance accountability.[4] They do this by making it easier to judge whether policy is on track. An explicit numerical target for a specific measure of inflation is either hit or missed. When the target is missed, policymakers can be called on to explain why the target was missed. In many cases, the target will be missed because of special circumstances that are entirely justifiable. For example, if oil prices rise sharply and unexpectedly, policymakers might be unable to prevent a temporary increase in the overall inflation rate. And, to the extent the increase in inflation stemming from a one-time increase in oil prices was expected to be temporary, the appropriate monetary policy response might be to do nothing, accepting temporarily higher inflation.[5]

If the target is missed because of monetary policy mismanagement—admittedly a difficult thing to prove given the technical nature of monetary policy and the wide range of views about the effects of monetary policy on the economy—the government can hold the central bank accountable. Theoretically and in the extreme, the government could dismiss the chief monetary policymaker(s) or restructure the central bank. More realistically, the government can ask the central bank to improve its performance under threat of a range of sanctions.

Enhancing credibility. One reason transparency and accountability are important is that they potentially enhance central bank credibility. That is, they help the public understand the goal of monetary policy and the commitment of the central bank to the goal. Credibility is important in central banking because it feeds into the public's formulation of expectations about future inflation. If consumers and businesses believe the central bank is committed to achieving price stability, they will accept lower nominal wage increases, incorporate lower inflation and inflation risk premiums into asset prices, and be more willing to make long-term commitments based on economic fundamentals instead of inflation expectations. This "credibility effect" can help reduce the output loss that typically accompanies disinflationary monetary policies.[6]

Features

Many inflation targeting regimes share common features designed to help the central bank achieve a more transparent, accountable, and credible monetary policy.

Reliance on forecasts. Because monetary policy actions affect the economy with significant lags, policymakers must rely on inflation forecasts to help them aim for an inflation target. Specifically, monetary policy actions generally affect output and employment with lags of six months or longer and affect inflation with lags of 18 months or more. As a result, policymakers must take action based on forecasts of inflation

one to two years into the future. For example, if under the current setting of monetary policy instruments, inflation is projected to rise above target one year from today, policymakers might need to take action *now* to tighten the current stance of monetary policy. Waiting to see inflation rise before tightening policy may result in missing the inflation target.

Policymakers can, and do, use a variety of methods to forecast inflation. They can look at private forecasts, use information from financial markets, and make projections based on various econometric models of the economy. Whatever the approach, a necessary condition for the successful use of inflation targets is that the central bank has some capability of forecasting inflation based on the current stance of monetary policy. And, except in unusual circumstances, the central bank has to be willing to take timely actions to change the stance of policy when an unchanged stance would lead to a target miss.

Use of inflation reports. In helping to achieve transparency, most central banks that target inflation regularly issue an inflation report. The publication of these inflation reports is one of the key innovations of inflation targeting regimes. The purpose of the report is to explain what the central bank's inflation target is, describe how inflation has behaved relative to its target, and indicate where inflation may be headed in the future. Toward this end, some inflation targeting central banks actually publish their forecast for inflation, as well as a discussion of the risks surrounding that forecast. In addition, the central bank may use the inflation report to explain why a target may have been missed and what actions, if any, might be necessary to bring inflation back to its target.

Allowance for flexibility. A final common feature of inflation targeting regimes is built-in flexibility. Given the difficulty of forecasting inflation and the likelihood that many economic shocks will have only temporary effects on inflation, all inflation targeting regimes allow the central bank to sometimes miss its target. When such misses occur, however, the central bank is expected to explain why. Acceptable explanations include transitory inflation shocks beyond the control of the central bank, such as changes in oil prices, natural disasters, and the first-round effect of excise tax changes. In addition, when the economy is weak and unemployment rising, most inflation targeting regimes allow inflation to temporarily exceed its target. To the extent rising unemployment is associated with future declines in inflation, an easing of monetary policy may very well be consistent with the long-run target for inflation even though it may exacerbate the near-term overshooting of the inflation target.

Why doesn't every central bank target inflation?

Given the favorable rationale and features of inflation targets, why don't all central banks target inflation? There are three main reasons. First, a number of central banks have effectively managed monetary policy without the use of inflation targets. For example, in the United States the Federal Reserve has managed to lower inflation over the last several years while fostering sustained economic growth without explicit numerical inflation targets. Second, some governments have mandated that the central bank achieve multiple goals. Again, in the United States, Congress has required the Federal Reserve "to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates." Some analysts argue that inflation targets place too great an emphasis on the long-run inflation objective without providing explicit short-run objectives for output and employment variability (Cecchetti). And third, inflation targets require the support of the government and, in some cases, are given to the central bank by the government—usually the finance minister. Unless a political consensus has emerged that inflation

targets are useful, governments are unlikely to impose them and central banks are less likely to adopt them on their own.

II. PROCEDURAL CHANGES FROM INFLATION TARGETING: CASE STUDIES

Central banks in nine countries currently conduct monetary policy with explicit inflation targets (Table 1). Following the lead of the Reserve Bank of New Zealand in 1990, these banks generally target an inflation rate below 3 percent. The Central Bank of Chile and the Bank of Israel target higher inflation rates—along with exchange rates—as they seek to bring inflation down from relatively high levels. While some banks specify a particular date for reaching their inflation targets, others do not give a time frame—either for when the target must be reached or for how long it will be valid.[7] Most countries target a broad price measure, such as an all-items consumer or retail price index, but allow temporary departures or "exemptions" from the targets. Some countries, such as the United Kingdom and New Zealand, have incorporated certain exemptions into the price measure itself. In roughly half of the countries, the government establishes the target, often in consultation with the central bank. In the other half, the central bank sets the target itself. Almost all banks publish an inflation report, but only a few currently publish an inflation forecast.

Despite the variety of institutional procedures used in implementing inflation targets, most inflation targeting regimes can be characterized along a few key dimensions. This section examines, in detail, how four of the banks using explicit inflation targets have changed monetary policy procedures to accommodate inflation targets. The banks—the Reserve Bank of New Zealand, the Bank of Canada, the Bank of England, and the Swedish Riksbank—were among the first to explicitly target inflation and represent a range of procedures and experiences. For each bank, this section examines the price index used as a target, some of the caveats or exemptions employed, the inflation forecasting procedures, and the different approaches used to ensure transparency and accountability.

New Zealand

Prior to 1984, the Reserve Bank of New Zealand acted on behalf of the government in implementing the government's daily monetary policy decisions (Brash 1996). To do so, the bank used "a web of regulations and direct controls" until a new government, which came into power in July 1984, introduced substantial economic reforms (Brash 1993). The reforms included assigning the Reserve Bank of New Zealand the goal of reducing inflation and granting the central bank more independence in its actions. The Reserve Bank of New Zealand Act 1989, which took effect in 1990, formalized the goal of lower inflation and required that the primary function of the central bank be to achieve and maintain price stability. The Act stipulated that the Minister of Finance and the Governor of the Reserve Bank of New Zealand establish an economic target for monetary policy through a *Policy Targets Agreement* (*PTA*), a formal agreement between the Minister and the Governor. A new *PTA* is issued whenever economic circumstances demand renegotiation of the previous target, but no later than the year before a new five-year term of the Governor. All five *PTAs* issued so far (the first one in March 1990) have called for the economic target to be an inflation target (Fischer 1995).

Price index and caveats. The most recent *PTA* of December 1997 states that the inflation target should be measured in 12-month changes in the "All Groups Consumers Price Index excluding Credit Services" (CPIX), and that the CPIX should be between 0 and 3 percent.[8] The *PTA* mentions "unusual events" that can lead to CPIX inflation moving temporarily outside the targeted range. These events include exceptional

Table 1
SUMMARY OF INFLATION TARGETING FRAMEWORKS

	New Zealand	Canada	United Kingdom	Sweden	Finland	Australia	Spain	Israel*	Chile*
Date first issued	March 1990	February 1991	October 1992	January 1993	February 1993	Approx. April 1993**	Summer 1994**	December 1991***	Approx. 1990****
Current target	0%-3%	1%-3% with "mid-point" 2%	2.5%	2% ± 1%	2%	2%-3% ("thick point")	Less than 3%	7%-10%	4.5%
Time frame	5 years (to 2003)	through end-2001	1997 onward	1995 onward	1996 onward	On average over the cycle	By late 1997, less than 2% thereafter	1 year	1 year
Inflation measure	CPIX (CPI excluding credit services)	CPI (Underlying inflation used operationally)	RPIX (retail price index excl. mortgage interest payments)	CPI	Underlying CPI	Underlying CPI	CPI	CPI	CPI
Target announcement	Defined in Policy Target Agreement (PTA) between the Minister of Finance and the Governor of the central bank	Joint agreement between the Minister of Finance and the Governor of the central bank	Chancellor of the Exchequer	Governing Board of the Bank of Sweden (Sveriges Riksbank), which is an authority of the parliament	Bank of Finland	Reserve Bank of Australia	Bank of Spain	Minister of Finance in consultation with the Prime Minister and the Governor of the central bank	Central Bank of Chile
Inflation report	Since March 1990. Quarterly today, formerly semi-annually	Semi-annual, since May 1995	Quarterly, since February 1993	Since October 1993. Quarterly today, formerly three times per year	No	Semi-annual, since May 1997	Semi-annual, since March 1995	Since March 1998	Annual, every September
Inflation forecasts published?	Yes	No	Yes	Yes	No	No	No	No	No

* Israel and Chile also target the exchange rate.
** The Reserve Bank of Australia dates the introduction of inflation targets to approximately April 1993 and the Bank of Spain to summer 1994. However, Bernanke, Laubach, Mishkin, and Posen argue that Australia did not introduce targets until September 1994 and Spain until November 1994.
*** *Financial Times*, December 18, 1990.
**** Since 1990, the Central Bank of Chile has been required by law to announce each September an inflation rate to be reached the following year. By the mid-1990s, these "targets" had gained credibility.

Source: Debelle; Bernanke, Laubach, Mishkin, and Posen; Reserve Bank of New Zealand's Policy Targets Agreement (December 1997); Bank of Canada (May 1998); Bank of England (August 1997); Sveriges Riksbank (June 1998); Bank of Israel; and Banco Central de Chile.

movements in the prices of commodities traded in world markets, changes in indirect taxes, significant government policy changes that affect prices directly, or natural disasters (Reserve Bank of New Zealand, December 1997). Before December 1997, the *PTAs* stated an inflation target for the "All Groups Consumers Price Index" (CPI), but the bank focused on *underlying* inflation in explaining monetary policy and measuring performance (Bernanke, Laubach, Mishkin, and Posen; Reserve Bank of New Zealand). The bank calculated underlying inflation by excluding from the CPI large movements in components that reflected interest rate changes, government policy initiatives, and oil price changes (Reserve Bank of New Zealand, June 1997 and September 1997).

Inflation forecast. The Reserve Bank of New Zealand uses a system of models complemented by judgment to prepare its economic projections and inflation forecast. The system consists of a comprehensive "core" macroeconomic model, partial "satellite" models that analyze specific components of the economy in more detail, and "indicator" models which use statistical techniques to make short-term projections based on a range of current economic indicators. The forecast is conditioned on inflation staying at the midpoint of the inflation target range, and its goal is to pinpoint the path for monetary conditions (exchange rate and interest rates) needed to maintain the target (Reserve Bank of New Zealand 1997).

Transparency. The Reserve Bank of New Zealand Act 1989 requires the bank to produce a statement at least every six months. The statement must explain the bank's plan to implement monetary policy in a way consistent with the *PTA's* objective and comment on the bank's inflation forecast and on various leading indicators (Fischer 1995, Reserve Bank of New Zealand 1996). To fulfill these requirements, the bank publishes a report called the *Monetary Policy Statement* every June and December. In addition, the bank issues a brochure called *Economic Projections* every March and September, the Governor gives numerous speeches, and the bank maintains a comprehensive, easy-to-understand Internet site. The *Monetary Policy Statements* and *Economic Projections* review recent monetary policy, give forecasts of many economic variables, including inflation, and assess monetary conditions and risks to the forecasts (Reserve Bank of New Zealand, June 1997; Reserve Bank of New Zealand 1998). Because of a highly transparent policy, the bank has often been able to achieve adjustments to monetary conditions by communicating its desired path of policy, without actually intervening directly in the market (McCallum).

Accountability. According to the Reserve Bank Act, the Governor is held accountable for the outcome of monetary policy. The Governor can be dismissed if either the Minister of Finance or the bank's Board of Directors believes performance has been inadequate. Inadequate performance in monetary policy can be measured by comparing the *PTA*, which forms a contract between the government and the Governor, with the inflation outcome. To explain monetary policy actions and their compliance with the *PTA* goals, the Governor is required to produce a policy statement at least once every six months (Fischer 1995, Reserve Bank of New Zealand 1996).

Canada

Since the mid-1980s, the Bank of Canada has focused on attaining price stability as the underlying objective of monetary policy (Crow). Prior to introducing explicit inflation targets, the bank used various monetary and credit aggregates as guides for monetary policy, but it had neither an explicit target nor a time path for achieving a long-term goal (Freedman 1995a). In February 1991, the Governor of the Bank of Canada and the Minister of Finance jointly announced a series of formal targets for reducing inflation.

The goal was to lower inflation to the midpoint of an assigned range—between 1 and 3 percent—by the end of 1995 (Bank of Canada, November 1997).

Price index and caveats. The Bank of Canada and the Minister of Finance identify the inflation targets in terms of the 12-month rate of change in the overall consumer price index. The target is announced as a range whose midpoint is the ultimate target level for the specified time horizon. The original goal to keep inflation close to the midpoint of a range between 1 and 3 percent has been extended twice: In December 1993 to last until the end of 1998, and in February 1998 to last until the end of 2001 (Bank of Canada, May 1998). For the short run, the bank focuses on "underlying" inflation, which excludes volatile food and energy prices as well as large first-round changes in indirect taxes from the overall consumer price index (Freedman 1995a; Bank of Canada, November 1997). In addition, large increases in oil prices and "unexpected developments," such as natural disasters, are treated as caveats or exemptions. After such shocks, inflation needs to return to the target level with no compensation for the resulting change in the price level (Ammer and Freeman, Almeida and Goodhart).

Inflation forecast. While the Bank of Canada does not publish a quantitative inflation forecast (it only publishes a nontechnical, qualitative "outlook" for inflation), it still uses forecasts in conducting monetary policy. According to Freedman and Longworth, the Bank of Canada uses a structural forecasting model of the economy as the key initial input into the policy process. The bank supplements the model by using its judgment, especially for the first few quarters. The first step in this process is for the staff to make a projection based on an econometric model. This projection is conditional on inflation being on target and states what path monetary conditions (short-term interest rates and the exchange rate) must take for inflation to be within the target range in six to eight quarters. The bank's staff prepares a base scenario and some alternative scenarios, which the management uses as a starting-point for policy decisions. Since the staff projections are based on models—which naturally simplify reality and therefore cannot account for all potentially important market events—the management adjusts the projections at the end of the forecasting process to make them more realistic (Freedman 1995b).[9]

Transparency. Inflation targets were introduced in Canada to make the bank's actions "more readily understandable to financial market participants and to the general public" (Freedman 1995a). To communicate the targets and the policy actions, the bank publishes an easy-to-read *Monetary Policy Report* twice a year. The report explains the goals of the policy, discusses recent developments in inflation, reviews the policy actions taken to keep inflation on target, and describes the inflation outlook. The outlook covers aggregate demand and supply conditions, temporary influences on inflation, inflation expectations, and monetary indicators. While the report describes the bank's inflation projections qualitatively, it does not give a quantitative inflation forecast, nor does it give a specific time frame for the projections (Bank of Canada, November 1997). In addition to the *Monetary Policy Report*, the bank periodically issues press releases about changes in policy and has an outreach program informing the public about monetary policy. Furthermore, the Governor meets regularly with the Minister of Finance and appears before the committees of the House and the Senate (Mishkin and Posen, Almeida and Goodhart).

Accountability. Even though inflation targets are specified in a contract between the Bank of Canada and the Canadian government, no formal arrangements are in place for holding the Bank of Canada accountable if targets are missed. Indeed, the bank is required neither to explain its policies nor to publish an outlook for monetary policy, and the agreement between the bank and

the government is subject to cancellation in the event of a political crisis (Fischer 1993). However, by observing the bank's actions, the public can monitor the bank's performance. Thus, the Bank of Canada is informally accountable to the public (Mishkin and Posen).

United Kingdom

The primary goals of monetary policy in the United Kingdom since the early 1980s have been to achieve price stability and to improve the credibility of monetary authorities. In the early 1980s, the authorities used monetary aggregates as targets. In 1986, they switched to informal exchange rate targets. From 1990 to 1992, the UK participated in the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS), pegging the exchange rate of the pound to other European exchange rates. In this way, the UK "imported" price stability by linking its monetary policy to the policies of other European countries (mainly Germany). After suspending sterling from the ERM, the United Kingdom needed a new anchor for its monetary policy. In October 1992, the Chancellor of the Exchequer announced the initial inflation target (Bowen, McCallum).

At the time, the Bank of England had little independence from the Treasury. In May 1997, however, the bank gained more autonomy when the Chancellor announced that the government was giving the bank "operational responsibility for setting interest rates to meet the Government's inflation target." In addition, the Chancellor announced that the bank's Monetary Policy Committee (MPC) was to make operational decisions (Bank of England, August 1997).

Price index and caveats. The Chancellor expresses the inflation target in terms of 12-month changes in the retail price index excluding mortgage interest payments. The current target rate of inflation is set at 2.5 percent. Recognizing that shocks and disturbances can lead to a deviation from the target, the rate of inflation is allowed to stray from the target by up to 1 percent before the bank must justify the deviation (Bank of England, August 1997).[10] In addition, effects of indirect taxes, subsidies, and interest costs are treated as caveats or exemptions, allowing inflation to move temporarily away from the target (Almeida and Goodhart).

Inflation forecast. The Bank of England bases its forecasts on several models and key information variables. The bank uses atheoretical single-equation techniques for its short-term projections (three months) and a structural model for its medium-term projections (approximately two years). To complement the structural model, the bank's staff has turned to using information from a wider set of quantitative models (including detailed sectoral models) and qualitative information (such as surveys), encompassing a variety of real and monetary information (Haldane).

Britton, Fisher, and Whitley describe the forecasting process since the MPC took charge of monetary policy as a "series of meetings between the MPC and the Bank staff." The focus of the first meeting is to identify the key assumptions of the forecasts. The staff then uses the assumptions to prepare a central projection and a risk distribution. In following meetings, the MPC reviews the forecasts, and the staff and MPC make adjustments to the assumptions based on perceived risks and new data. This process continues until the MPC agrees on a final forecast and risk distribution, which it then publishes in its *Inflation Report*. The *Inflation Report* presents the forecast and the risk scenarios in what the bank calls a "fan chart." The fan chart shows the projected path for inflation as a narrow confidence band, with the MPC's subjective assessment of risks as shaded distributions around the main band. The distributions "fan out" as the time horizon moves further into the future and are often asymmetric, suggesting that forecast risk can lean more in one direction than another (Britton, Fisher, and Whitley).

Transparency. The Bank of England strives to achieve a transparent monetary policy by communicating policy actions in a variety of publications and by publishing its inflation forecasts.[11] Accordingly, the bank has introduced a variety of new publications since adopting inflation targets. The most important new publication is the fairly technical *Inflation Report*. It states the goals of monetary policy, examines an array of recent monetary and real variables critical to inflationary developments, explains recent monetary policy actions, and publishes the quantitative inflation forecast of the MPC. In addition, the MPC meets on a monthly basis and publishes minutes from its meetings two weeks after the following meeting. The minutes also appear as an annex to the *Inflation Report*.[12] When the bank changes interest rates, it also issues a press notice informing the public. In addition, the Governor and other members of the MPC appear before the Treasury on a regular basis and give more public speeches than before (Almeida and Goodhart).

Accountability. The Bank of England is expected to explain deviations of inflation from the inflation target. If inflation strays more than 1 percent from target, the Governor of the bank must send an open letter on behalf of the MPC to the Chancellor of the Exchequer. In this letter, the Governor must explain the divergence, describe the policy actions being taken to deal with it, and state how long before inflation is expected to return to target (Bank of England 1997). In this way, the Bank of England is accountable directly to the Treasury.

Sweden

The main goal of the Swedish central bank (the Sveriges Riksbank) since it gave up the gold standard in 1931 has been to "stabilize domestic purchasing power" (Bäckström 1998a). Through the postwar period until 1992, the Riksbank operated under a fixed exchange rate regime. From 1991 to 1992, the bank pegged the Swedish krona unilaterally to the ECU—the European currency unit, based on a basket of currencies from members of the European Union. When Sweden was forced to abandon the fixed exchange rate regime in November 1992, the Riksbank needed a new anchor for monetary policy. In January 1993, the Governing Board of the Riksbank introduced explicit inflation targets as the new anchor. The targeted level of inflation was to be reached by 1995 and maintained thereafter (Andersson and Berg, Padoa-Schioppa).

Price index and caveats. The Riksbank expresses the inflation target in 12-month changes of the "headline" consumer price index (CPI).[13] The bank gives a central value with tolerance bands for the target rate of inflation. The current target rate is 2 percent, with a tolerance interval of plus or minus one percentage point—the same as the bank had established at the announcement of its inflation targeting regime in 1993 (Andersson and Berg, Sveriges Riksbank, March 1998). The bank does not have a list of automatic caveats. When a shock occurs, the Riksbank analyzes whether the shock will have a temporary or permanent effect on inflation, and changes monetary policy actions only if it anticipates a permanent effect. As a result, the bank allows inflation to move outside the target temporarily in response to transitory shocks such as the first-round effects of changes in taxes and subsidies. Other potential caveats include changes in mortgage interest costs that are due to monetary policy adjustments and large external shocks, such as oil price shocks (Bäckström 1998b).

Inflation forecast. The Riksbank uses a wide range of real and financial indicators to monitor inflationary pressures and to forecast inflation. To assess immediate inflationary pressures, the bank monitors indicators such as various price indexes, the output gap, capacity utilization, and the unemployment rate.[14] For a medium-term time horizon (up to one year), the bank analyzes

variables such as wages, import prices, changes in the exchange rate, and raw material and intermediate goods prices. For one-year to two-year forecasts, the bank uses monetary aggregates, interest rates, and surveys of inflation expectations as indicators. The bank evaluates the influence of these indicators on future inflation and develops an inflation forecast, assuming the repo rate is unchanged.[15] The bank then publishes the quantitative inflation forecast for the following two years and discusses alternative inflation paths and potentially asymmetric risk scenarios (Andersson and Berg, Sveriges Riksbank, March 1998).

Transparency. The Riksbank publishes a quarterly *Inflation Report*.[16] The report explains monetary policy, analyzes recent economic developments, discusses determinants of inflation and their projections, derives a quantified inflation forecast from them, and draws conclusions for monetary policy from the forecast. The report also contains a discussion of alternative paths for inflation under various additional scenarios (Sveriges Riksbank, March 1998). Further means to increase transparency include public hearings before the Finance Committee of the parliament, reviews of central bank actions in speeches by the Governor and the staff (Andersson and Berg, Almeida and Goodhart), and an Internet site providing information about monetary policy actions.

Accountability. While there is no contract, agreement, or directive that binds the Riksbank to pursue the inflation target, the bank is accountable for achieving the target through the political process. The Sveriges Riksbank is an authority of the parliament, not a government agency like many other central banks, and seven of the eight members of its Governing Board are appointed by the parliament. Because the parliament monitors the bank's actions and the public elects the parliament, the bank is ultimately accountable to the public.

III. CHANGES IN THE SHORT-RUN CONDUCT OF POLICY: EMPIRICAL EVIDENCE

While inflation targets have clearly changed the institutional framework and many of the procedures of monetary policymaking, it is less clear that inflation targets have led to discernable changes in the way policy instruments are adjusted in response to economic information. On the surface, changes in the short-run conduct of policy seem plausible because of the magnitude of the procedural changes and the fact that inflation has tended to be lower and in some cases more stable after the introduction of inflation targets. However, over the last several years, inflation has also been lower and more stable in many countries without inflation targets.

This section analyzes fluctuations in short-term interest rates for evidence of significant and systematic changes in the way monetary policy is conducted after the introduction of inflation targets. As in the previous section, the analysis focuses on the four countries with the most experience using inflation targets. In addition, however, the experience of the United States—a country that has not introduced explicit numerical targets for inflation—is examined as a "control" case for weighing evidence on the operational significance of inflation targets.

The behavior of inflation

In the sample of four countries that adopted inflation targets in the early 1990s, inflation has declined and, in some cases, become more stable (Chart 1). Inflation targets were introduced in these countries when inflation was in the 4 to 8 percent range—substantially higher than the inflation rate most central banks considered consistent with price stability. Moreover, in New Zealand, Canada, and Sweden, inflation was rising at the time targets were introduced. In the 10 to 12 years prior to the introduction of targets, inflation had reached as high as 20 percent in

Chart 1
INFLATION AND INFLATION TARGETS

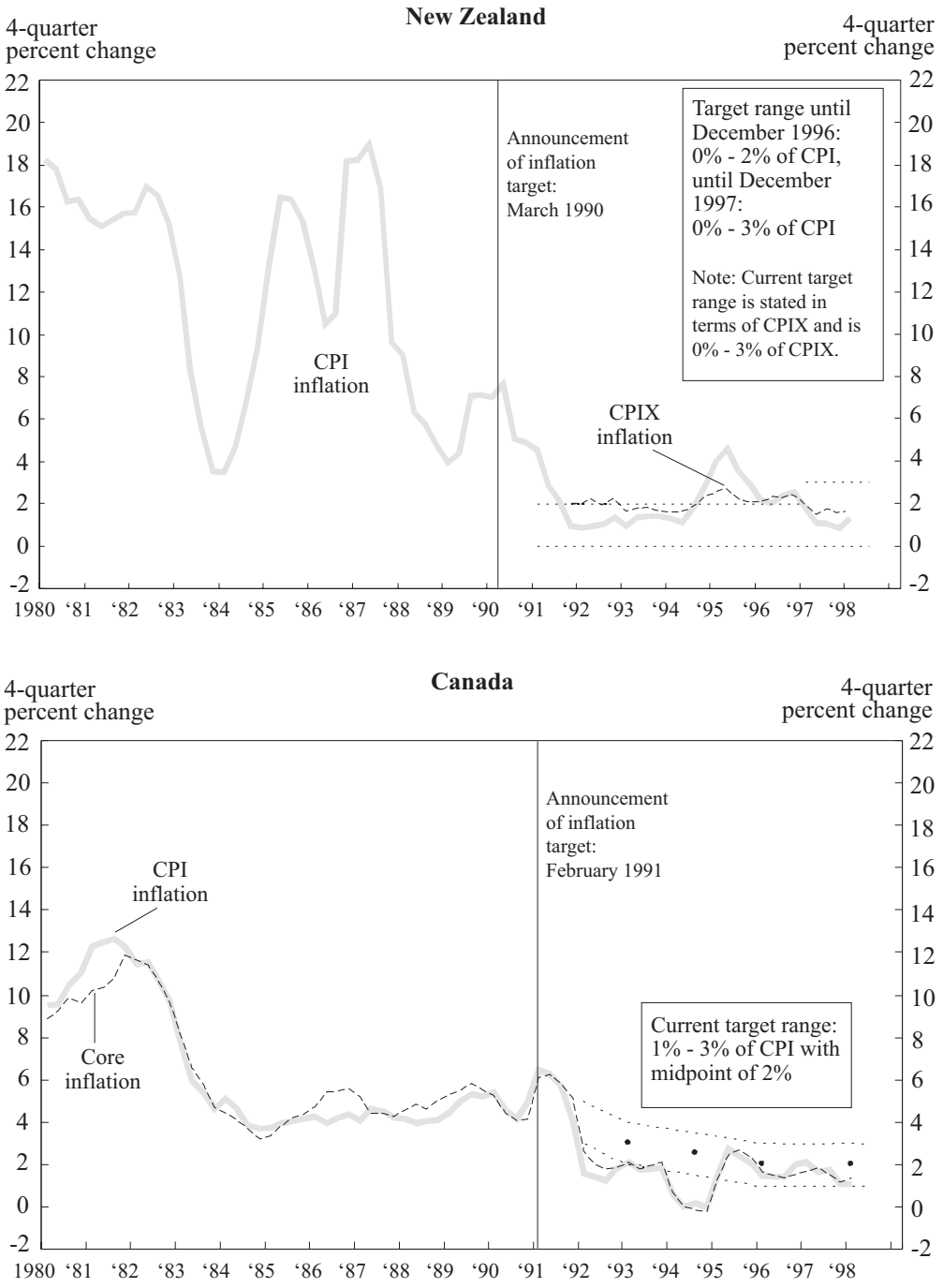
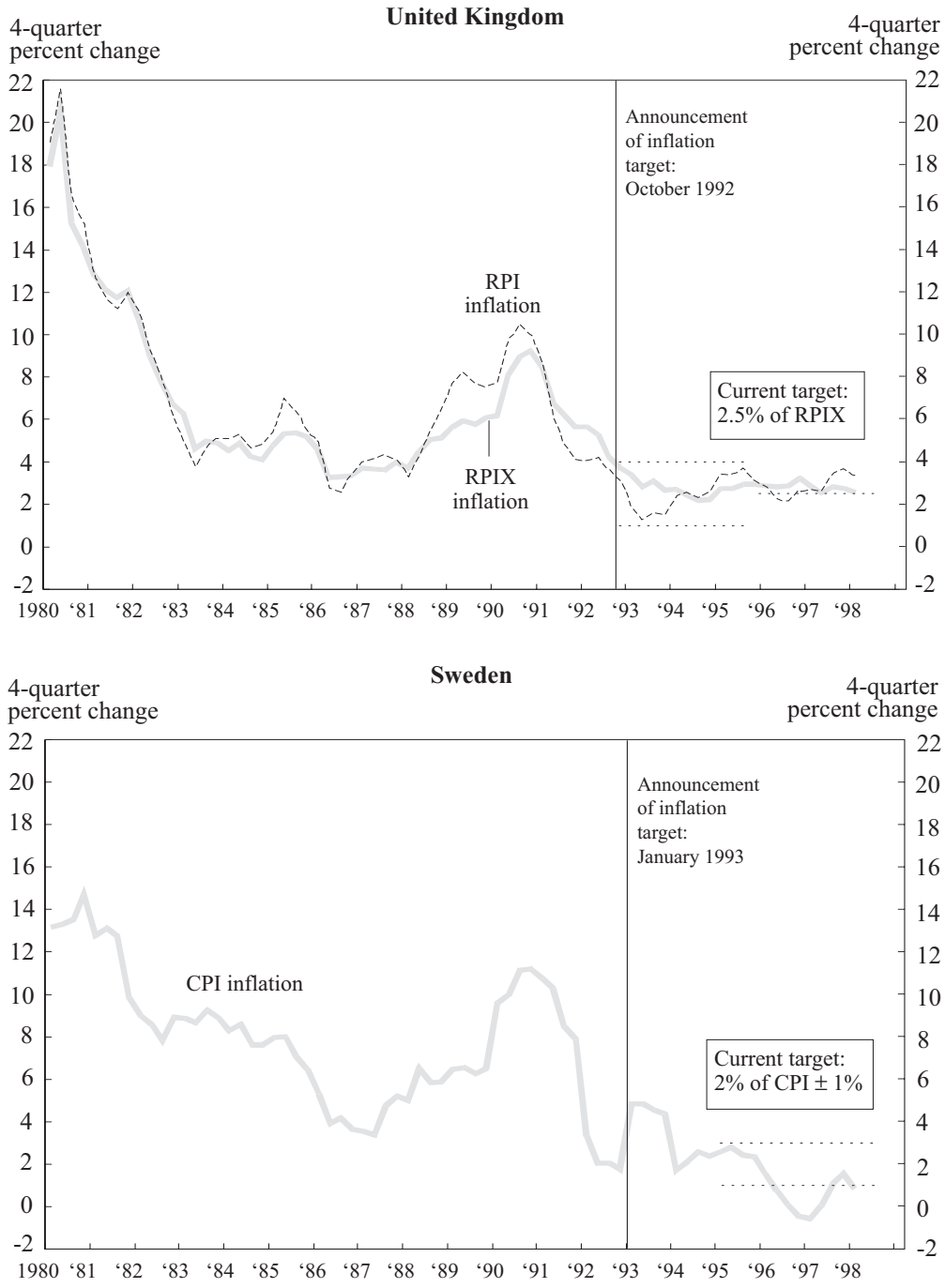
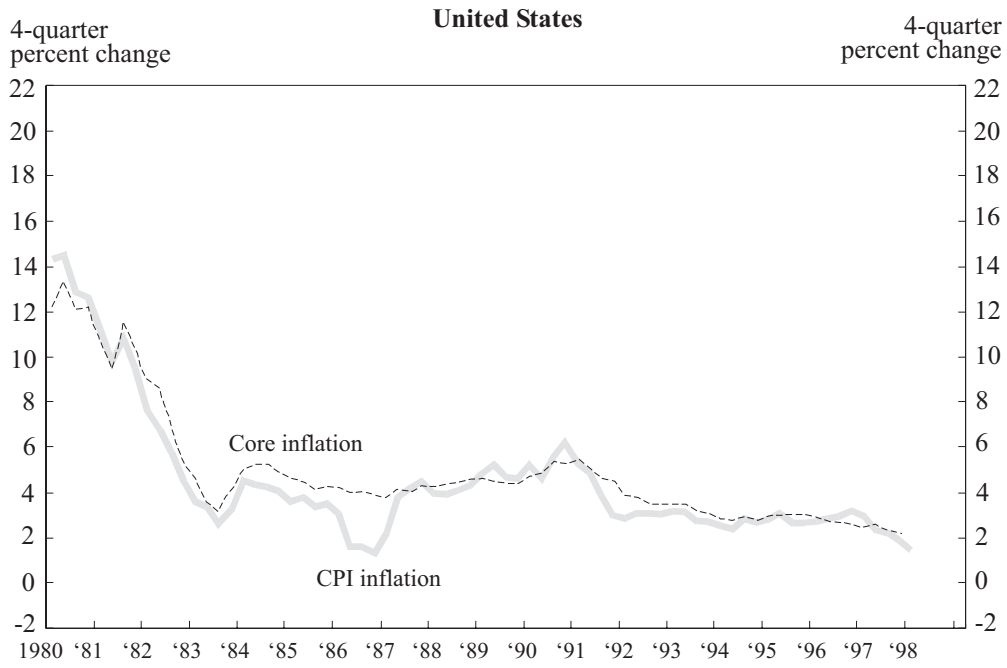


Chart 1 - continued
INFLATION AND INFLATION TARGETS



Source: See Table 3 for inflation data sources. Target data are from Reserve Bank of New Zealand, Bank of Canada, Bank of England, and Riksbank.

Chart 2
INFLATION AND INFLATION TARGETS



Source: See Table 3 for inflation data sources.

New Zealand and the United Kingdom and 12-15 percent in Canada and Sweden.

All of the inflation targeting countries in the sample have successfully brought inflation down to a level that is near or within target. In New Zealand, except for a temporary increase in 1995-96, consumer price inflation has remained below 2 percent. In Canada, inflation fell rapidly after the introduction of targets and, in fact, frequently undershot the target range in the first few years of inflation targeting. Since 1995, however, consumer price inflation has remained in a range of 1 to 3 percent. In the United Kingdom, retail price inflation fell relatively quickly after the introduction of targets, from around 4 percent to a level in 1997 that was very close to its current target of 2.5 percent. Finally, in Sweden consumer price inflation has fallen to a rate within or below the target of 2 percent plus or minus 1 percent.

The behavior of inflation has clearly improved after the introduction of inflation targets. But the behavior of inflation has also improved since the early 1990s in a number of countries that have not introduced explicit numerical inflation targets. In the United States, for example, consumer price inflation fell from over 5 percent in 1990 to around 2 percent in 1997 (Chart 2). Thus, while inflation targeting may help some central banks lower inflation, the adoption of inflation

targets has not been necessary for other central banks to lower inflation.

Behavior of short-term interest rates

Can the improved behavior of inflation in countries that target inflation be attributable to changes in the way monetary policy responds to incoming information? One approach to answering this question is to examine the behavior of short-term interest rates that are used as policy levers by central banks. Most central banks in recent years—whether they explicitly target inflation or not—have come to use short-term interest rates as the primary instrument of monetary policy (Sellon and Weiner). Through their control over reserves in the commercial banking system, central banks seek to achieve levels of short-term interest rates that are consistent with the goals of monetary policy.

Because of the critical role of short-term interest rates in monetary policy, fundamental changes in the conduct of policy should affect how these interest rates move over time. If inflation targets imply a change in the central bank's inflation fighting commitment, they should cause systematic changes in the behavior of short-term interest rates. Alternatively, if the introduction of inflation targets is mainly a communication device designed to increase transparency and accountability—and not representative of fundamental changes in the central bank's inflation fighting resolve—the introduction of inflation targets may have little impact on the behavior of short-term interest rates.

Means and standard deviations. Nominal short-term interest rates have, on average, been lower and less volatile after the introduction of inflation targets than before their introduction (Table 2). Mean "official" rates—rates that central banks focus on in their day-to-day provision of reserves to the banking system—declined by anywhere from 622 basis points in New Zealand to 284 basis points in Sweden.[17] Because nominal interest rates incorporate an inflation premium, the decline in their mean primarily reflects lower inflation, not necessarily a shift in monetary policy. The standard deviation of official rates also declined in all countries, with the United Kingdom showing the sharpest decline and Sweden the least. Again, the decline in standard deviation likely reflected more stable inflation and therefore, perhaps, a decline in the inflation risk premium. Thus, while nominal rates indicate that inflation expectations changed over the two periods, they are not necessarily informative about whether the short-run conduct of monetary policy changed. In addition, nominal rates in the United States followed the same trends with no shift to inflation targets.

Real short-term rates provide a better measure of the stance of monetary policy than nominal rates because they are adjusted for changes in inflation expectations. Over the long run, real rates tend toward an equilibrium level determined by nonmonetary factors. Because inflation expectations adjust slowly, monetary policy has some control over short-term real rates through its ability to affect the level of short-term nominal rates. When real rates are high relative to their long-run equilibrium, monetary policy is restrictive and, other things equal, inflation tends to fall. When real rates are low relative to their long-run equilibrium, monetary policy is accommodative and, other things equal, inflation tends to rise.

Real "official" rates have tended to be higher after the introduction of inflation targets than before their introduction (Table 2). Of the four countries in the inflation targeting sample, only Canada has seen a decline in real rates after introducing inflation targets, but the decline was from an already high level. In contrast, in the United States real short-term interest rates have fallen in the 1990s relative to their average in the previous 20-year period. Thus, the introduction of inflation targets seems to be associated with an increase in real rates—possibly suggesting

Table 2
"OFFICIAL" RATES BEFORE AND AFTER INFLATION TARGETS
Summary statistics

	New Zealand	Canada	United Kingdom	Sweden	United States*
Mean					
Nominal rate:					
Before	15.73	10.86	11.38	9.51	8.58
After	9.51	5.52	6.05	6.67	4.77
Real rate:					
Before	4.72	4.30	2.76	1.75	2.52
After	7.45	4.07	3.20	5.01	2.12
Standard deviation					
Nominal rate:					
Before	4.45	2.78	2.67	3.46	3.28
After	2.43	1.87	.85	1.96	1.11
Real rate:					
Before	19.40	4.76	8.69	8.45	4.22
After	4.43	3.05	4.92	5.37	2.15
Sample period					
Before	1979:2-1990:2	1977:10-1991:1	1975:2-1992:9	1971:1-1992:12	1971:1-1990:12
After	1990:3-1998:3	1991:2-1998:2	1992:10-1998:5	1993:1-1998:4	1991:1-1998:5

* In the absence of a regime shift to inflation targets, the sample is arbitrarily split at 1990:12 in the United States.

Note: The "official" rate is the discount rate for New Zealand, the day-to-day call money rate for Canada, the two-day London local authority call money rate for the United Kingdom, the 3-month Treasury bill rate for Sweden, and the federal funds rate for the United States. The real rate was calculated as the nominal rate minus the annualized monthly change in the consumer price index over the same period. Because monthly CPI data were not available for New Zealand, a monthly rate was calculated by subtracting a quarterly CPI inflation series from the monthly average nominal rate.

Sources: IMF (discount rate of New Zealand), Federal Reserve Board of Governors ("official" rates for Canada, the United Kingdom, Sweden, and the United States), New Zealand Department of Statistics (New Zealand's CPI), Statistics Canada (Canadian CPI), British Central Statistical Office (British Retail Price Index), Swedish Official Statistics Office (Swedish CPI), and U.S. Department of Labor (U.S. CPI).

tighter monetary policy has been associated with inflation targets. Alternatively, real rates may have been higher in the inflation targeting period because, for most countries, the period has been characterized by cyclical expansion.[18] At the same time, real rates have been less volatile in the 1990s in both the inflation targeting countries and in the United States. The decline in the standard deviation of the real official rate could reflect a more muted response of monetary policy to economic shocks or simply a more stable economic environment. In any event, the period

of inflation targeting has been universally associated with relatively high and stable real rates.

Policy reaction functions. To the extent high real interest rates are associated with tight monetary policy, they indicate a desire by central banks to lower inflation. They do not necessarily indicate that inflation targets have led to a change in the response of policy to near-term economic conditions. One way to estimate how policymakers respond to incoming economic information is to estimate a "policy reaction function." A policy reaction function is a relationship between the level of the nominal official rate and key economic indicators that policymakers use as information variables in adjusting policy. Possible information variables include recent data on inflation, unemployment, and exchange rates. Policymakers may use variables such as these in an implicit reaction function because they care about them directly or because the variables are reliably related to other variables they care about—such as future inflation.

While no central bank uses an explicit policy reaction function in setting the short-run stance of policy, analysts have estimated such functions as a way to summarize the decision making process of monetary policymakers. Estimating a policy reaction function before and after a fundamental shift in the monetary policy regime can provide insight about how the regime shift affected the short-run conduct of policy. If, for example, the introduction of inflation targets affected short-run policy decisions, one would expect a change in the nature of an estimated reaction function.

Estimated reaction functions for the four inflation targeting countries show some indications of changes in the short-run conduct of monetary policy resulting from the introduction of inflation targets (Table 3). These reaction functions were estimated as a linear regression of the nominal "official" rate on a constant, seasonal dummies (not reported), and lagged values of the official rate, the inflation rate (as measured by the operationally relevant price index), the unemployment rate, and the trade-weighted exchange rate. The same number of lags was included for each explanatory variable, but varied from country to country based on goodness of fit criteria. The regressions were estimated using monthly data for all countries except New Zealand, where quarterly data were used because of the unavailability of monthly statistics on inflation.

For all of the inflation targeting countries except New Zealand, at least one of the variables that was statistically significant in explaining the official rate before the introduction of inflation targets lost its significance after the introduction of targets. In Canada, lagged unemployment and the lagged exchange rate lost explanatory power. In the UK, lagged inflation and the lagged exchange rate lost explanatory power.[19] And in Sweden, the lagged exchange rate lost explanatory power.[20] In contrast, in the United States, where the sample period was arbitrarily split in January 1991, the significance of coefficients in the policy reaction function remained fairly similar across the two periods.

While the overall deterioration in the significance of explanatory variables in the policy reaction functions of the inflation targeting countries may indicate changes in the conduct of policy, the deterioration may also reflect the smaller sample size in the post-inflation targeting period. In addition, some coefficients in the reaction function were likely less precisely estimated because of less variation in the nominal official rate and the explanatory variables in the inflation targeting period than in the earlier period.

Another approach to evaluating whether the policy reaction function changed fundamentally in response to the introduction of inflation targets is to test the equation's overall statistical stability (Table 3, "breakpoint test"). The hypothesis that all of the coefficients jointly are the same in the

Table 3
"OFFICIAL" RATE EQUATIONS

		New Zealand		Canada		United Kingdom		Sweden	
		Before	After	Before	After	Before	After	Before	After
Explanatory variables									
Constant	Coefficient	5.075	8.170**	2.100***	.712	.922***	2.153***	.348	.279
	Standard error	3.247	3.107	.605	.658	.335	.691	.294	.579
Lagged official rate	Sum of coefficients	.839***	.325	.912***	.955***	.983***	.782***	.970***	.974***
	Standard error	.104	.291	.031	.031	.019	.068	.016	.021
	F-statistic	17.113***	5.495***	464.777***	463.393***	1494.078***	65.797***	3513.525***	2056.632***
Lagged inflation	Sum of coefficients	-.224	.786**	.000	-.030	-.018***	-.020	.003	.004
	Standard error	.186	.327	.031	.024	.009	.033	.008	.010
	F-statistic	2.055	2.403	.000	.786	1.916	.515	.123	.161
Lagged unemployment	Sum of coefficients	-.035	-.453**	-.105**	-.027	-.053**	-.092***	-.031	-.029
	Standard error	.562	.153	.042	.063	.022	.031	.071	.070
	F-statistic	5.949***	2.550*	3.296**	.106	5.893***	4.879**	.187	.171
Lagged exchange rate	Sum of coefficients	-.158***	-.062*	.009**	-.004	-.012***	.002	.009**	.001
	Standard error	.047	.034	.003	.003	.003	.003	.004	.002
	F-statistic	4.810***	1.657	3.294**	1.269	15.408***	.371	6.035**	.457
Summary Statistics									
Adjusted R-squared		.905	.931	.917	.941	.943	.861	.932	.974
Standard error of estimate		1.401	.666	.793	.463	.644	.313	.905	.311
Number of lags		4		2		2		1	
Breakpoint test	F-statistic	2.207**		1.067		2.032***		.233	
	Significance	(.022)		(.387)		(.007)		(.999)	
Sample period		1979:2-1989:4	1990:1-1997:4	1977:10-1991:1	1991:2-1998:2	1975:2-1992:9	1992:10-1998:5	1971:1-1992:12	1993:1-1998:4

* Significant at 10 percent level.
** Significant at 5 percent level.
*** Significant at 1 percent level.

Note: Observations are monthly for all countries except New Zealand. For New Zealand, the regressions were run with quarterly data. For each country, all explanatory variables were constrained to have the same number of lags. The optimal lag length was determined using the Akaike criterion and the Schwarz criterion on the sample before the introduction of inflation targets. All regressions included seasonal dummy variables.

Sources: Federal Reserve Board of Governors, IMF, Statistics Canada, UK Central Statistical Office, UK Department of Employment, Swedish Official Statistics Office, Swedish Central Bank, New Zealand Department of Statistics, Reserve Bank of New Zealand, Reuters, and the U.S. Department of Labor.

two sample periods is rejected at the 5 percent significance level in New Zealand and at the 1 percent level in the United Kingdom—indicating the possibility of a structural shift in the policy reaction function in those two countries.[21]

The strong rejection of stability in the UK likely reflects the changing role of the exchange rate in the policy reaction function after the UK broke away from the ERM. After leaving the ERM, monetary policy in the UK was freed up to pur-

Table 3 - continued

"OFFICIAL" RATE EQUATIONS

		United States	
		"Before"	"After"
Explanatory variables			
Constant	Coefficient	.382	.627**
	Standard error	.329	.273
Lagged official rate	Sum of coefficients	.973***	.940***
	Standard error	.020	.025
	F-statistic	1253.486***	761.478***
Lagged inflation	Sum of coefficients	.005	-.026
	Standard error	.020	.026
	F-statistic	.067	.521
Lagged unemployment	Sum of coefficients	-.014	-.062*
	Standard error	.036	.034
	F-statistic	6.003***	3.052*
Lagged exchange rate	Sum of coefficients	-.003	.000
	Standard error	.003	.001
	F-statistic	1.253	.345
Summary Statistics			
Adjusted R-squared		.948	.982
Standard error of estimate		.746	.148
Number of lags		2	
Breakpoint test	F-statistic	.401	
	Significance	(.991)	
Sample period		1971:1-1990:12†	1991:1-†1998:5

†Sample split arbitrarily at 1990:12.

sue domestic goals such as employment growth and low inflation as opposed to maintaining the foreign exchange value of the pound against the mark.[22] It is by no means clear whether the instability in the UK policy reaction function is attributable to a shift in focus of monetary policy away from exchange rate stability or to the accompanying shift to inflation targets.

In contrast, the hypothesis of no structural shift could not be rejected for Canada and Sweden, indicating no change in the policy reaction function. Similarly, in the United States, where the sample was split arbitrarily and inflation targets were not introduced, there is no evidence of a structural shift in the policy reaction function.

To get a sense of the economic importance of possible structural changes—whether statistically significant or not—the policy reaction functions estimated for the pre-inflation targeting period were simulated over the post-inflation targeting period. A "static" forecast of the equation—in which actual values of the lagged official rate and other explanatory variables were fed into the policy reaction function estimated for the pre-inflation targeting regime—shows a relatively good performance (Chart 3). Although in New Zealand, Canada, and the United Kingdom predicted official rates were consistently above the actual rate for prolonged periods of time, the equations in all countries except New Zealand picked up most of the turning points in the actual official rates. In New Zealand, the predicted official rate is much more volatile than the actual rate—suggesting the possibility of a reduced sensitivity of official rates to economic information in the post-inflation targeting period.

A more challenging test of forecast performance comes from a "dynamic" simulation of the policy reaction function estimated from the pre-inflation targeting regime (Chart 4). In the dynamic simulation, forecasts of the official rate from the estimated reaction function are plugged into the right-hand-side instead of actual rates. The results clearly show a persistent overestimation of the level of official rates in New Zealand, Canada, and the United Kingdom based on the policy reaction function from the pre-inflation targeting regime.[23] In the UK, the overprediction is the result of the sharp decline in the value of the pound at the beginning of the post-inflation targeting regime. While the "before" policy reaction function predicts official rates would rise in response to such an exchange rate depreciation (in accordance with a policy that targeted the exchange rate), this reaction did not occur in the

Chart 3
PROJECTED AND ACTUAL "OFFICIAL" RATES
Static forecasts

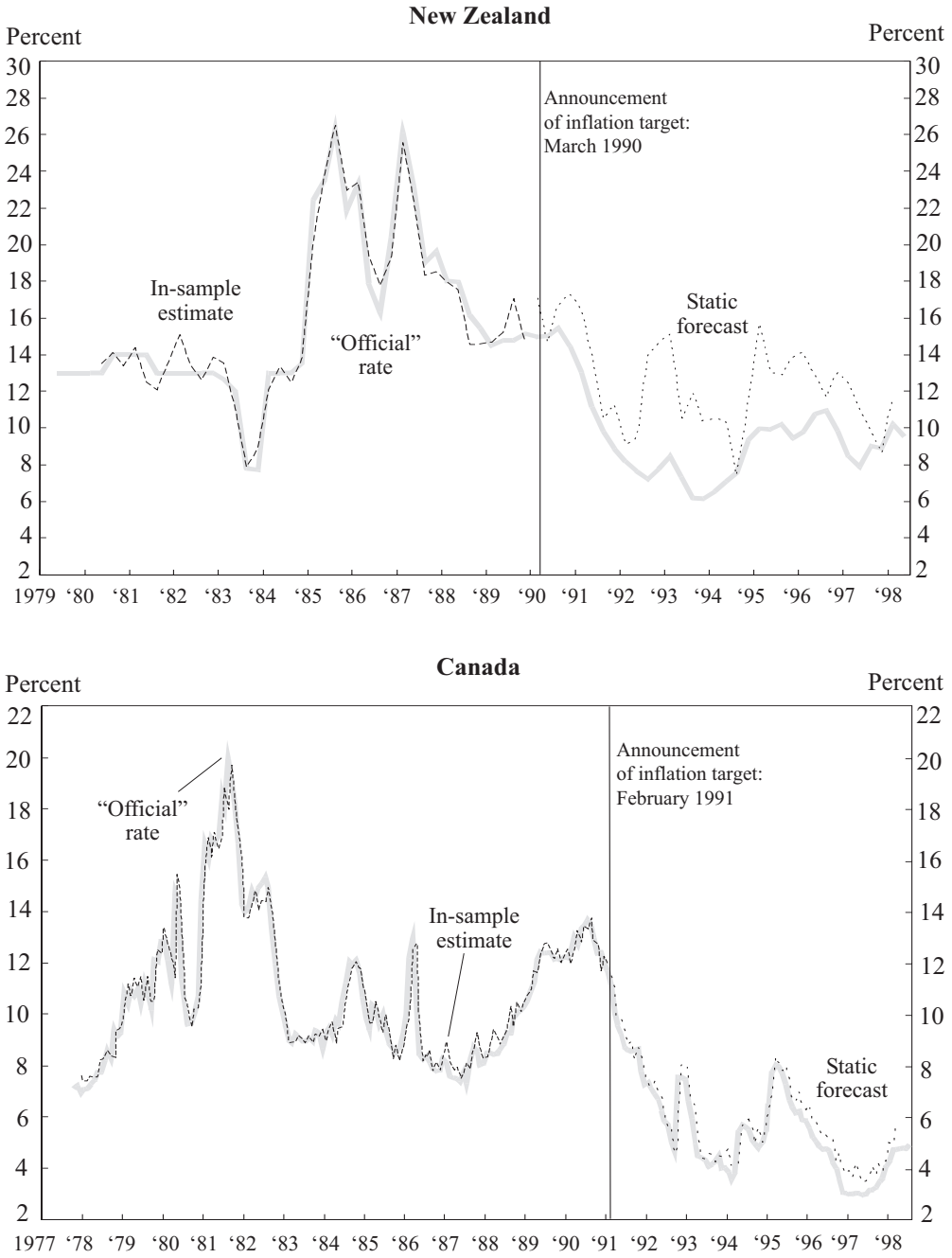
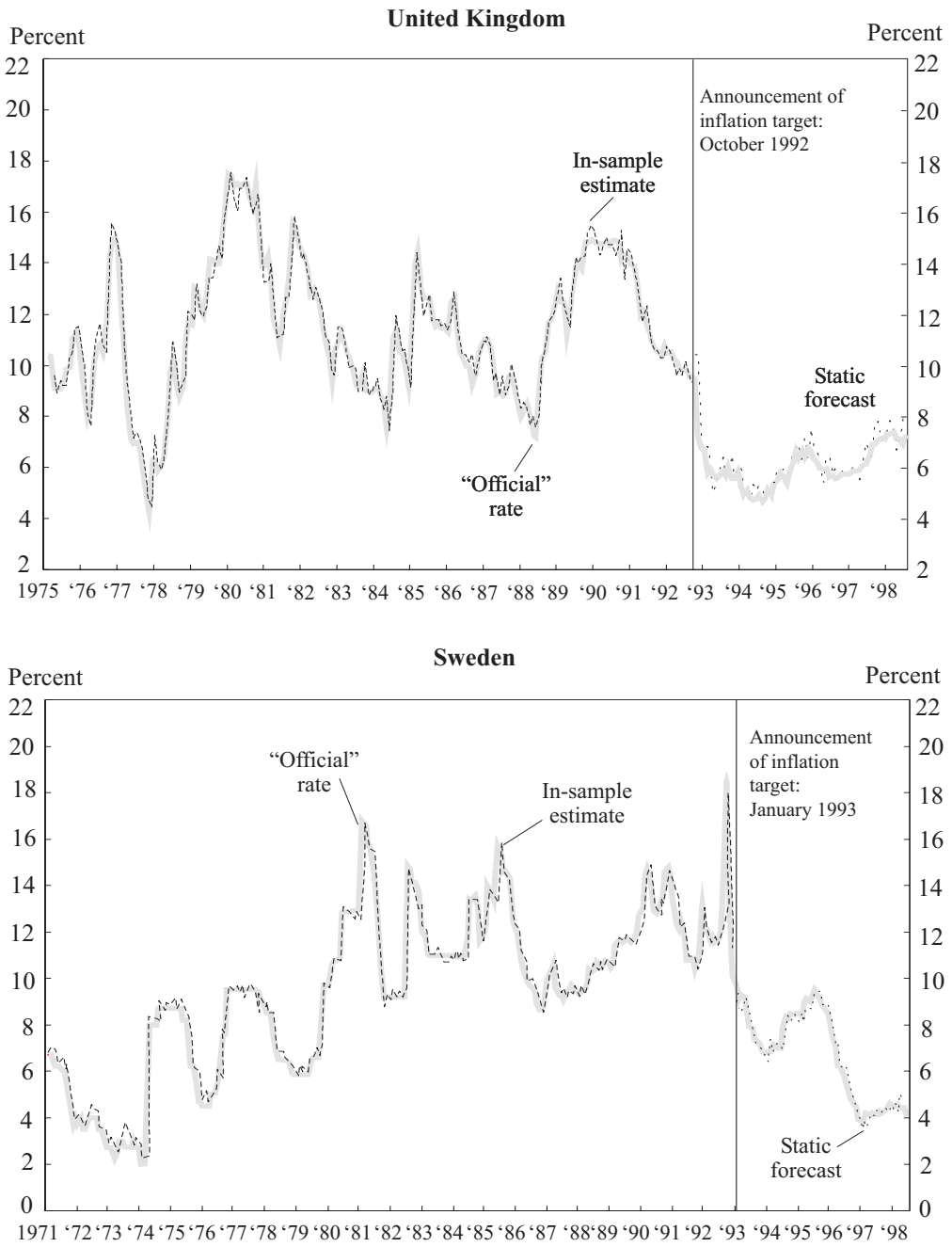


Chart 3 - continued
PROJECTED AND ACTUAL "OFFICIAL" RATES
Static forecasts



Note: Observations are monthly for Canada, the United Kingdom, and Sweden, and quarterly for New Zealand.
Source: See Table 2 for actual official rate. Projections based on authors' calculations using "before" regression from Table 3.

Chart 4
PROJECTED AND ACTUAL "OFFICIAL" RATES
Dynamic forecasts

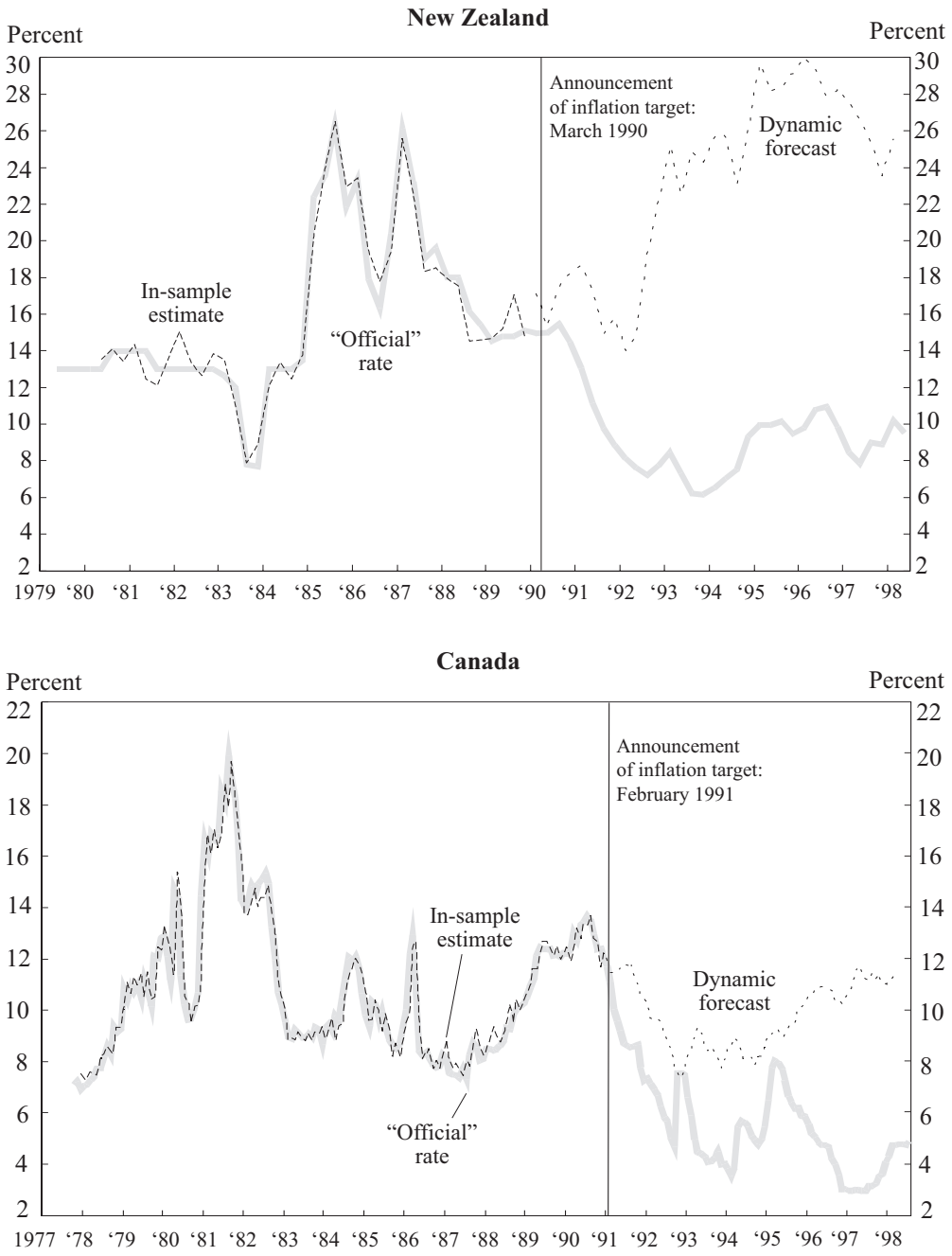
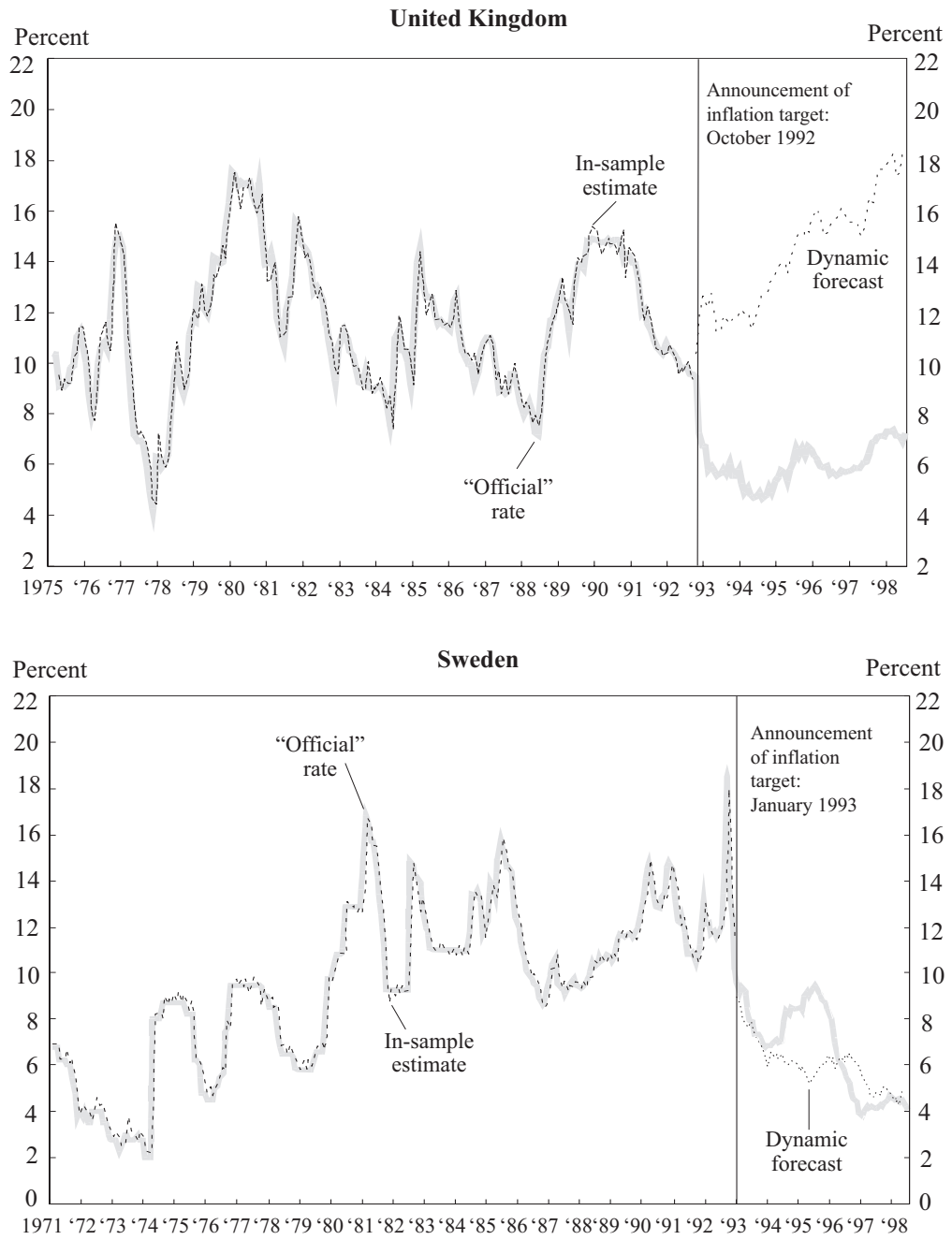


Chart 4 - continued
PROJECTED AND ACTUAL "OFFICIAL" RATES
Dynamic forecasts



Note: Observations are monthly for Canada, the United Kingdom, and Sweden, and quarterly for New Zealand.
Source: See Table 2 for actual official rate. Projections based on authors' calculations using "before" regression from Table 3.

period after the introduction of inflation targets. In Canada, the overpredicition is also due to exchange rates, but for the opposite reason. While the Canadian dollar appreciated sharply after the introduction of inflation targets, the "before" reaction function predicted official rates would rise in response.[24]

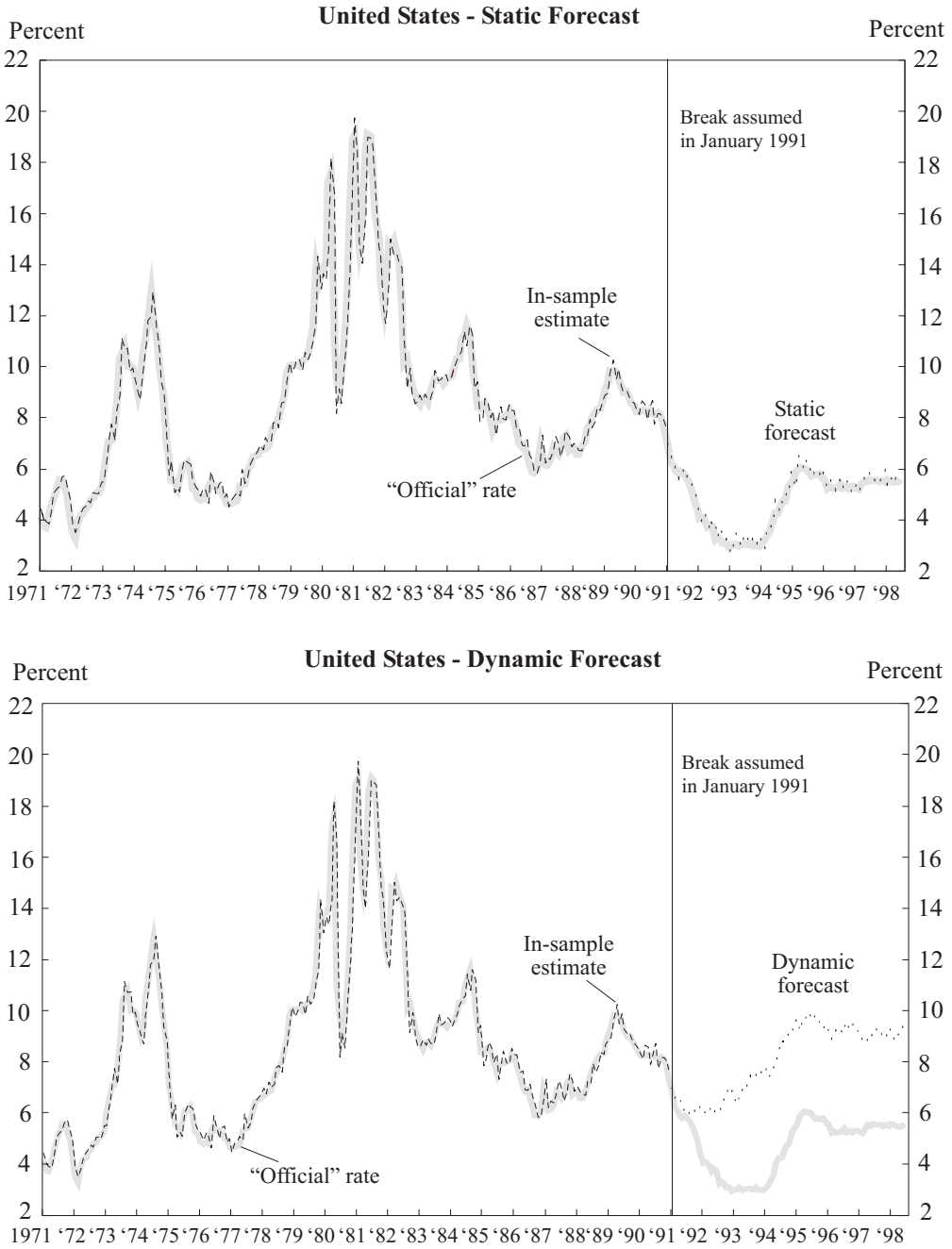
To put these results in perspective, the same experiment was carried out for the United States (Chart 5). Although the United States did not adopt explicit inflation targets, a dynamic simulation of the policy reaction function estimated over the period from 1971 to 1990 shows the same characteristic overprediction of official rates after 1990 as did the simulations for New Zealand, Canada, and the United Kingdom. The implication is that policy reaction functions may be a poor way to characterize policy or that they shift in response to a variety of circumstances instead of or in addition to the establishment of inflation targets.

IV. CONCLUSION

The introduction of explicit numerical targets for inflation has led to a number of highly visible changes in the procedures central banks follow in conducting monetary policy. These procedural changes have arguably increased the transparency and accountability of monetary policy. Through this channel, policymakers have possibly improved their inflation fighting credibility.

Evidence is mixed, however, as to whether inflation targets have led to changes in the way central banks conduct monetary policy in the short run. The lack of firm evidence may be due to the relative scarcity of data from inflation targeting regimes, which have been in place for less than a decade. Alternatively, inflation targets may simply formalize a monetary policy strategy that, in many cases, was already implicitly in place.

Chart 5
PROJECTED AND ACTUAL "OFFICIAL" RATES



Note: Observations are monthly.
Source: See Table 2 for actual official rate. Projections based on authors' calculations using "before" regression from Table 3.

ENDNOTES

[1] For a comprehensive discussion of the rationale for and features of inflation targets, see Bernanke, Laubach, Mishkin, and Posen.

[2] See Kahn for a summary of views about how central bankers should define price stability for monetary policy purposes.

[3] Proponents counter that inflation targets merely keep discretionary policy actions consistent with long-run goals and therefore do not prevent policymakers from countering short-run disturbances (Bernanke and Mishkin, 1997).

[4] This does not imply that central banks that do not have inflation targets are not accountable. For example, in the United States, the Federal Reserve Board of Governors is required to submit a report on the economy and the conduct of monetary policy twice a year to Congress. In addition, the Chairman of the Federal Reserve Board of Governors is called to testify on the report before the Senate Committee on Banking, Housing, and Urban Affairs, and the House Committee on Banking and Financial Services.

[5] For a discussion of the effects of oil prices on inflation see Kahn and Hampton.

[6] Evidence on whether inflation targets have increased credibility and therefore reduced the cost of disinflation is inconclusive (Johnson).

[7] Some countries, such as Sweden, set an initial target that remains in place today.

[8] Credit services represent the consumer cost of repaying debt and therefore fluctuate with interest rates.

[9] The bank monitors a variety of indicators to help its policy decisions. The main focus is on estimates of excess demand or supply in goods and labor markets. Other variables, such as the growth rates of monetary aggregates, credit, total spending, and wage settlements, are used as additional guides for policy decisions (Freedman 1995a).

[10] The Chancellor has changed the interpretation of targets three times: In October 1992 (range between 1 percent and 4 percent), June 1995 (at or below 2.5 percent, acknowledging that shocks can make inflation move between 1 percent and 4 percent), and June 1997 (2.5 percent, acknowledging that shocks can make inflation move plus or minus 1 percent). The targets are valid from the announcement date onward.

[11] The bank typically publishes a short-term forecast and an approximately two-year-ahead forecast. The forecasting horizon has been extended some recently.

[12] Prior to the bank's operational independence in May 1997, the Governor met with the Chancellor on a monthly basis.

[13] The bank uses several measures of underlying inflation in its analysis. They are used as indicators of inflationary pressures, not as official targets. The "headline" CPI is regarded as the most transparent and unambiguous measure of inflation, which gives it a more objective appeal than other measures, and makes it more suitable for a target (Andersson and Berg; Sveriges Riksbank, March 1998).

[14] The output gap measures the divergence of actual production from what is considered its potential level.

[15] The Riksbank uses the repo rate (rate at which it agrees to repurchase securities), the lending rate, and the deposit rate for monetary policy purposes (Sveriges Riksbank 1997).

[16] The Bank introduced the inflation report initially in October 1993 under the title "Inflation and Inflation Expectations in Sweden," which was published three rather than four times a year (Almeida and Goodhart, Andersson and Berg).

[17] For Canada and the UK, the interest rate used as the "official" rate is the rate monitored or controlled by the central bank. For Sweden, the 3-month interest rate was used as a proxy for an official rate because data on official rates were not available. In New Zealand, the discount rate—which moved closely with the 3-month rate over the part of the sample that the 3-month rate was available—was used as a proxy for the official rate because it was the only short-term rate available for the entire sample.

[18] In addition, to the extent inflation rose in the period before the introduction of inflation targets, real rates may have been kept too low.

[19] This result might be explained by a forward looking monetary policy focused on inflation targets if the unemployment rate helped predict future inflation but other variables did not. Surprisingly, in all countries except New Zealand, the coefficients on lagged inflation were insignificant (and sometimes negative) in the inflation targeting period.

[20] Because in Sweden there appears to be a break in the unemployment series in the early 1990s, the regressions were also run using industrial production in place of unemployment. However, in these alternative regressions, industrial production also came in insignificant in both the before and after periods.

[21] In New Zealand, the breakpoint also corresponds to the granting of operational independence to the Bank of New Zealand.

[22] The UK targeted exchange rates during only part of the sample period before the introduction of inflation targets. Prior to the use of exchange rate targets, the Bank of England targeted various monetary aggregates.

[23] When industrial production is substituted for unemployment in the Swedish "before" regression, the Swedish official rate is also persistenly over-predicted.

[24] It is not clear why the policy reaction function indicates that policy was tightened in Canada in the before period in response to an exchange rate appreciation.

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