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Inflation Targeting and Communication: Should the Public Read Inflation Reports or Tea Leaves?

Aleš Bulíř, Kateřina Šmídková, Viktor Kotlán and David Navrátil [*]

Abstract

Inflation-targeting central banks have a respectable track record at explaining their policy actions and corresponding inflation outturns. Using a simple forward-looking policy rule and an assessment of inflation reports, we provide a new methodology for the empirical evaluation of consistency in central bank communication. We find that the three communication tools—inflation targets, inflation forecasts, and verbal assessments of inflation factors contained in quarterly inflation reports—provided a consistent message in five out of six observations in our 2000–05 sample of Chile, the Czech Republic, Hungary, Poland, Thailand, and Sweden.

JEL Codes: E31, E43, E47, E58.
Keywords: Emerging markets, forecasting, inflation targeting, monetary policy, transparency.

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Nontechnical Summary

The case for inflation targeting (IT) rests on inflation targets, forecasts, and inflation reports providing a dependable and efficient instrument for the central bank's communication with the public, thus anchoring consumer expectations. Our analysis confirms that the public should be able to understand the central bank's decision-making process from inflation reports, even in situations where such an understanding is difficult to obtain from observing policy actions, inflation targets, and forecasts only. To this end, we perused the quarterly inflation reports and extracted all verbal assessments and the presumed direction of their impact on inflation. Each verbal comment was catalogued into a supply, demand or external environment category, further divided into subcategories, and assigned either an inflationary or a deflationary effect. Individual quarterly inflation factors were then aggregated into an index-like measure that is a fairly good leading predictor of turning points in inflation in our sample countries. While the broad trends in these inflation factors seem common to all six countries, we found large idiosyncratic shocks driving inflation developments in individual countries.

Depending on the combination of past developments, inflation forecasts, and unanticipated shocks, three sets of events could occur. First, the central bank consistently communicated economic developments and its own policy response. As a result, the public correctly anticipated the eventual inflation outturn. Second, the central bank provided a consistent explanation of its policies. However, unanticipated shocks pushed inflation above/below the forecast and the public was surprised by the eventual inflation outcome. Nevertheless, the public accepted the unanticipated nature of the shocks against the background of otherwise consistent communication. Third, the central bank's inflation forecasts, policy rate moves, and verbal explanations were mutually inconsistent and the public was confused about monetary policy.

Our results confirm that central bank communication was broadly consistent across our sample countries, with remarkably similar results among advanced inflation targeters as well as among "lite" targeters. First, while we found policy rates moving in a direction opposite to what was implied by the inflation forecast in one-half of all the observations, the majority of these policy actions could be understood from verbal assessments of inflation factors. Second, inflation surprises were relatively infrequent, affecting only about one-third of all inflation outcomes and leading mostly to lower-than-expected inflation. These results make us believe that some countries may have missed their targets intentionally to take advantage of favorable macroeconomic conditions in order to disinflate or may have been subject to sizeable unanticipated shocks. Third, confusion in central bank communication was rare.

"[…] major element of best-practice inflation targeting is the communications strategy."
Ben S. Bernanke (2003), Fed Chairman

"It is important for the public to understand the central bank's actions, to the greatest extent possible […] in order for monetary policy to be most effective. For not only do expectations about policy matter, but, at least under current conditions, very little else matters."
Michael Woodford (2005)

Given the constraints on their scarce time, observation suggests that people follow simple rules of thumb.
Mervyn King (2005)

1. Why Inflation Targeting?

The proliferation of inflation targeting has been attributed to the regime's superior management of inflation expectations, either because inflation has stayed close to targets or because central banks have efficiently communicated why it has deviated from these targets. The case for inflation targeting rests on inflation forecasts providing a dependable and efficient instrument for the central bank's communication with the public, thus anchoring consumer expectations (see Svensson, 1997; Woodford, 2005; for a general theory see Morris and Shin, 2007).[1] Indeed, central banks have referred to inflation targets, forecasts, and inflation reports as their communication tools. It has been argued that if the central bank communicates its commitment to a targeting rule well, the public will take up the published inflation forecasts as its own expectations of inflation, in turn making disinflation costs lower as compared with other, less credible regimes (Eusepi and Preston, 2007). Can we square these arguments with the introduction of inflation targeting in emerging market countries?

Despite the lip service paid to its importance, empirical assessments of the consistency and clarity of central bank communication have been rare and do not provide a unified, replicable framework. Understanding monetary policy decisions from the outside of the central bank has been always a difficult task, but inflation reports, the key communication tool under inflation targeting, should make the process of understanding monetary policy a good deal easier. Our analysis of central bank communication tools vis-à-vis the public confirms that inflation targeting permits a fine

[1] The other argument in favor of inflation targeting, namely, explicit accountability of central bank governors for inflation developments, was never embraced by emerging-market countries. Inflation outturns were specified initially in governors' contracts in New Zealand and other countries. However, this approach has weakened over time and explicit inflation contracts have been quietly dropped (Roger and Stone, 2005). Central bankers in emerging market countries are at best required to explain publicly deviations of inflation from targets, and most of them are not even required to do that, invoking so-called escape clauses if they deem that pursuing the inflation target too aggressively would affect output and employment adversely.

appreciation of monetary policy decisions.[2] We find that while inflation targets have been missed frequently, the majority of these misses can be understood from scrutinizing the publicly available communication tools: policy actions, inflation targets, inflation forecasts, and verbal assessments of inflation factors in inflation reports. Nevertheless, in about one-sixth of all monetary policy decisions the individual communication tools contradict each other and these decisions remain confusing.

We test the hypothesis of efficient communication under inflation targeting using published inflation reports. The testable implication of "inflation targeting as a communication device" is that anyone reading these reports should be able to understand the central bank's decision-making process, especially in situations where such an understanding is difficult to obtain from observing policy actions, inflation targets, and forecasts only. The quality of monetary policy understanding is likely to have two components: (i) the formal quality of inflation reports, and (ii) the track record of connecting monetary policy decisions with inflation developments, both actual and expected. The formal quality of inflation reports has been scrutinized in detail and, predictably, some central banks communicate and write better than others (Blinder and others, 2001, Fracasso, Genberg, and Wyplosz, 2003; Roger and Stone, 2005). The attention paid to the inflation-targeting track record and the consistency of inflation reports with other communication tools has, however, been only skin deep.

The papers to date assessing inflation performance under inflation targeting have focused mostly on comparing inflation targets with inflation outcomes, with the predictable result of rather poor performance (Jonáš and Mishkin, 2003; Roger and Stone, 2005). We replicate this finding—in our sample inflation was more than one percentage point[3] higher/lower than the target in more than one-half of all the annual observations (20 misses in 35 observations). The available evidence suggests that inflation has deviated from the target mostly because the economy was hit by an unexpectedly large supply or demand shock that the authorities either could not or decided not to correct, thus severely limiting the usefulness of this indicator (Mishkin and Schmidt-Hebbel, 2007; Filáček, forthcoming; Banco Central do Brasil, 2003). Nevertheless, the target-to-outturn indicator cannot be dismissed entirely—the central bank's seriousness about its proclaimed targets can be ensured only by checking whether they are met, presumably over a sufficiently long period.

Our main contribution is to extend the analysis of communication under inflation targeting to include information obtained from published inflation reports, namely, inflation forecasts in the policy horizon, and verbal assessments of inflation factors. Regarding the former, by presenting an inflation forecast—conditional on a preset path of interest rates—below/above target, the central bank effectively signals its commitment to change the policy rate at some point. (Under unconditional forecasts, both inflation and interest rates are determined in the model and communicated.) We note that conditional forecasts were used initially by all six countries in our sample and that the Czech National Bank switched to unconditional forecasts only in late 2002. Regarding the latter, the signal sent through the forecast is augmented and modified by

[2] Our sample covers five emerging-market countries—Chile, the Czech Republic, Hungary, Poland, and Thailand—and the control country of Sweden. We use quarterly data from 2000 to 2005, with the exception of Hungary, which started with inflation targeting only in 2001.

[3] We use one percentage point as an intuitive threshold that corresponds either to the usual width of inflation-interval targets or to the confidence band around point targets.

communicating various inflation factors, some of which may already be incorporated into the inflation forecast and some of which may not. For example, regarding the latter, the policymakers may conclude that the domestic currency will appreciate/depreciate vis-à-vis its trading partners by more than assumed by the staff forecast, thus offsetting the need for a higher/lower policy rate indicated by the staff.

We interpret both inflation forecasts and verbal assessments of inflation factors in the context of a simple forward-looking rule. This simple rule is our approximation of how the public expects the policymakers to react and can therefore differ from the policy rule used by the staff to give a policy recommendation to the policymakers. The inflation forecasts are often seen as staff forecasts "only" and policymakers may or may not feel constrained by these projections and the policy recommendations therein. In our sample, we have indeed found policy rates moving in a direction opposite to what was implied by the inflation forecast in one-half of all the observations. These "monetary policy surprises" are communicated to the public primarily through the inflation reports. Verbal assessments of inflation factors are, however, labor-intensive to collect and their incorporation into an empirical analysis poses special problems. They are difficult to quantify and compare over time, as inflation reports generally do not provide explicit numerical estimates of their impact. (We can certainly say that after reading, categorizing, and tabulating verbal assessments from some 140 inflation reports.) Thus, rather than attempting to quantify the inflation effects of individual verbal assessments, we assign an equal weight to each of them.

We admit potential measurement errors with this approach. For example, if some shock is mentioned repeatedly, such as fiscal concerns in Poland, would it necessarily have a more serious or longer-lasting impact on inflation than a one-off increase in international oil prices? Moreover, the primary readers of inflation reports—central bank board members—are known to suffer from reporting fatigue and typically ask staff not to repeat the same risk quarter after quarter.

Our analysis suggests that central bank communication— inflation targets, forecasts, and verbal assessments of inflation factors—worked reasonably well in our sample. Irrespective of missed inflation targets and forecasts, the majority of policy actions could be understood from the publicly available information. Only about one in six policy decisions was confusing in the sense that the inflation forecast, policy action, and verbal assessment were not aligned. About one-third of all monetary policy decisions were surprising in the sense that period-end inflation differed from the forecast by more than 1 percentage point despite overall consistent communication. Of course, these results are conditional on the following assumptions: (i) inflation reports contain all relevant information, (ii) this information was interpreted without systematic measurement errors, and (iii) policymakers did not have a disinflation bias, that is, they indeed targeted the rate of inflation they said they would target.

The paper is organized as follows. First, we outline the methodological issues involved in the assessment of inflation targeting communication and describe our sample. Second, we discuss our results. Finally, we conclude and present the policy implications of our findings. Country notes are presented in the Annex.

2. Inflation Targeting and Communication

Inflation targeting and central bank communication with the public have commonly been explained in the context of Svensson's (1997) "inflation-forecast targeting." Little testing has been done, however, on how comprehensible the individual components of central bank communication are. Are all the components, most notably the inflation forecast and verbal assessments, consistently written? Overall, does central bank communication leave the public well-informed or mystified about the future path of monetary policy? We answer these two questions by applying a simple forward-looking policy rule in the spirit of Batini and Haldane (1999) to our sample countries. This rule is a representation of how the public reconciles observed policy actions with inflation targets and official inflation forecasts. If reconciliation is difficult, the public then searches for additional explanations.

2.1 Central Bank Communication under Conditional and Unconditional Forecasts

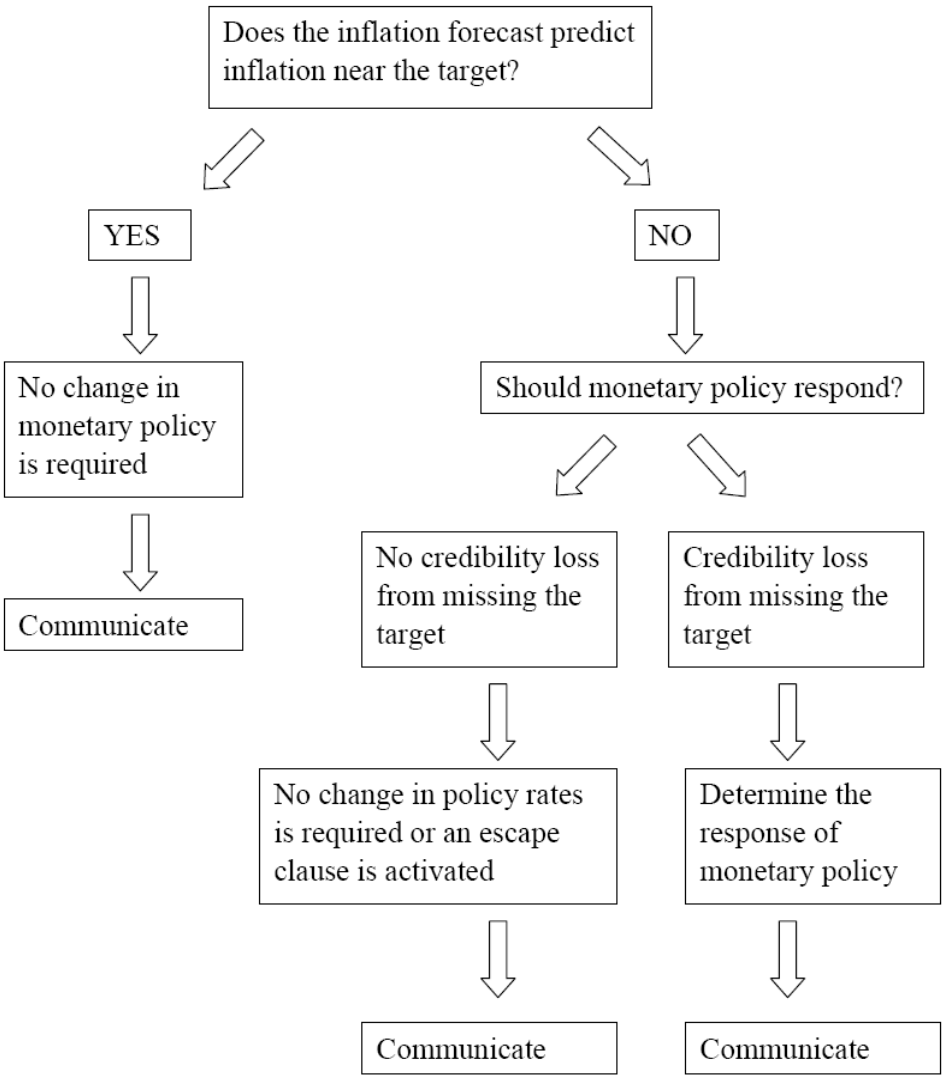
When central banks base their inflation forecasts on preset paths of interest rates, they communicate the steps taken to keep inflation on target along the diagram shown in Figure 1.[4] They do so with the objective of stabilizing the public's inflation expectations around the inflation target.[5] The diagram makes operational a rule stipulating that if the inflation forecast—conditional on unchanged rates—is outside of the target zone, the central bank is expected either to adjust its policy rate in order to bring inflation closer to the target, or to explain its inactivity.

One would think that the diagram would need to be amended for unconditional forecasts, as these forecasts will always project inflation on target simply on account of expected, rule-based policy adjustments during the forecast period. (Exceptions to the rule are escape clauses, which permit the inflation target to be missed in the event of large supply shocks that would require an excessive monetary stance adjustment or indirect tax changes.) These expected policy adjustments are indicated directly, either as a published direction of change ("consistent with the macroeconomic forecast is growth in nominal interest rates") or as a disclosed numeric path for policy rates. Hence, the public should not be able to derive much indication of future policy changes from the inflation forecast as such. This is a practical issue for our analysis—one central bank in our sample, the Czech National Bank (CNB), switched from conditional to unconditional forecast in 2002/03, roughly in the middle of our 2000–05 sample. However, it turns out that the CNB headline inflation forecasts were rarely on target during the period under consideration—the inflation forecast was more than 1 percentage point away from the target in 2002–04—and we argue that these deviations were most likely interpreted by the public as an indication of future policy changes. Consequently, we do not modify our diagram for unconditional forecasts.

[4] We do not take a stance on the relative merits of conditional and unconditional forecasts, which were first discussed by Bernanke and Woodford (1997) and recently reviewed by Blinder (2006). Skořepa and Kotlán (2003) laid out practical considerations for the switch from conditional to unconditional forecasts.

[5] It would go beyond the scope of the paper to assess the success of individual central banks in anchoring inflation expectations. Although inflation reports typically provide survey-based charts of inflation expectations, cross-country comparisons are complicated by the fact that these surveys ask different questions to different respondents. See Holub and Hurník (forthcoming) for an analysis of the Czech data.

Figure 1: Inflation Forecasts, Policymaking, and Communication Under Conditional Forecasts



We see two explanations of why the Czech unconditional forecasts deviated from the target. First, we focus on 4-quarter inflation forecasts, that is, a period shorter than the CNB's transmission period of 4 to 6 quarters. It is thus likely that the unconditional forecasts converged to the target in a longer horizon, after the appropriate policy rate changes had time to work through the system. Second, the Czech economy was affected by sizable shocks during the sample period (for additional detail see the Czech country note in the Annex). For example, a series of indirect tax shocks and administrative price adjustments blurred the distinction between the headline inflation forecasts, which include the first-round effects of changes in indirect taxes and administrative prices, and the "monetary-policy relevant inflation" forecasts, which exclude them. However, we assume that the public was most likely following CPI inflation, not the policy-relevant one, when deducing the next policy moves. In summary, we argue that our results are significant even though we make a simplifying assumption on the conditionality of the forecast for the CNB for one half of the sample. We are aware that the reasons given are an artifact of a volatile, emerging-market environment and may not be replicated in a stable, industrial country

environment.[6] The methodology would have to be augmented for a set of countries using solely unconditional inflation forecasts.

2.2 The Public

The inflation forecast directly affects public behavior as long as the central bank is expected to act on this forecast according to a strategy it laid out earlier. For example, if the central bank lets it be known that it follows a forward-looking strategy, such as inflation forecast targeting, the public—that is, financial market analysts or specialist journalists, who disseminate their analysis through the usual channels—will try to reconcile the published forecasts with monetary policy decisions using a policy rule that approximates such a strategy (Fels, 2003). If they do not understand policy decisions from looking at the inflation forecast and targets, they will open the inflation reports and try to find out which inflation factors may have been considered. To this end, it should suffice to make use of information contained in the inflation reports and to use it in the following order: (i) the inflation forecasts and targets, (ii) the monetary policy decisions, and (iii) the verbal descriptions of various current and expected inflation factors. We hasten to stress that the rules used by the public to understand the policymakers need not be identical to the rules used by the policymakers; indeed, the former are likely to be much simpler than the latter (King, 2005).

Three-step reconciliation

Reconciliation of policy decisions with a rule from the perspective of the public can be divided into three steps, in the end verifying either that the central bank communicated its decisions clearly or that it did not. First, the public scrutinizes the inflation forecast and target for the suggested direction of monetary policy, anticipating that forecasts projecting inflation above/below target signal monetary tightening/loosening in the period ahead. Second, actual policy rate changes either validate or contradict the understanding of monetary policy provided in the first-step communication of the inflation forecast. If the observed policy decisions correspond to the suggested direction of monetary policy, the public's expectations about the rule-based policymaking are validated, and the public's expectations of inflation are likely to converge toward the inflation target (King, 2005). If, however, the observed policy changes contradict the direction suggested by the forecast, the public will look for clarification of the monetary policy surprise.

Third, verbal assessments of current and future developments, which we call *inflation factors* in this paper, contained in the inflation reports provide precisely such clarification. Unlike forecasts and policy rate adjustments, which are in a numerical format, verbal assessments are necessarily vaguer than policy actions. On the one hand, verbal assessments describe quantifiable information that may not be explicitly modeled in the forecasting framework, say, labor market conditions or global financial conditions. The policymaker envisions some impact of these shocks on domestic inflation, but their impact may be difficult to quantify or even include in the existing modeling framework. On the other hand, verbal assessments reflect unquantifiable factors associated with the published forecast and the policymaker may reflect his uneasiness with the forecast by verbal qualifications (Šmídková, 2003). The policymaker's qualifications thus mirror uncertainty about the data, forecast model, or both. Most central banks employ a diverse group of policymakers, typically as a result of staggered nominations and time-limited contracts. Almost by construction

[6] We are indebted to Jan Filáček and Jaromír Hurník for pointing out this issue to us.

individual policymakers tend to emphasize different models or inflation factors in their deliberations.

In practice, three sets of events can occur. First, the central bank consistently communicates economic developments and its policy response. As a result, the public correctly anticipates the eventual inflation outturn and this is obviously the most favorable outturn. Second, the central bank provides a consistent explanation of its policies, but unanticipated shock(s) push inflation above/below the forecast and the public is surprised by the eventual inflation outcome. This is obviously a less favorable outturn. However, the public is likely to understand—owing to the central bank's consistent communication—that the unanticipated shocks were the cause of the temporary deviation from the target and credibility will not be damaged. Third, the least favorable outturn is when the central bank's inflation forecasts, policy moves, and verbal explanations are mutually inconsistent and the public is confused throughout the whole process. In the last case, one does not have to ask whether the public is surprised or not by the eventual inflation outturn—with inconsistent communication it cannot establish meaningful expectations of future inflation developments.

We distinguish between inflation outcome surprise and confusion in our framework. The public is surprised if the central bank made an inflation forecast in January for December of the same year and the inflation outturn deviated from that forecast despite appropriate policy rate changes. Surprises relate the eventual inflation outcome to otherwise consistent central bank communication about the inflation forecast and inflation factors. The public knows that shocks happen and that monetary policy can correct these shocks with long lags only. The 4-quarter period between the forecast and outturn reflects the announcements by the central banks in our sample that it takes anywhere between 2 and 8 quarters for a monetary policy change to get transmitted into domestic prices, depending on the particular transmission channel. As a robustness check, we assess the 8-quarter period between the forecast and the outturn as well. In contrast, confusion results from inconsistent communication, which does not allow the public to reconcile the policy actions, forecasts, and verbal assessments of inflation factors. Strictly speaking, confusion may happen at any point of time between the initial forecast and the eventual inflation outturn. However, we look at the full 4-quarter and 8-quarter periods.

The distinction between surprise and confusion is important. It could be argued that the public does not worry about inflation outcome surprises, as long as they remain infrequent and distributed on both sides of the inflation forecast. In addition, surprises are explainable ex post, using the various communication tools discussed earlier. The public is most definitely concerned about confusing communication, because such communication prevents it from forming meaningful inflation expectations. Long-lasting confusing communication will force the public to read tea leaves instead of inflation reports, eventually decoupling the public's inflation expectations from the inflation target. It is likely to damage the public's belief that the central bank follows a simple and predictable policy rule, and consequently it is likely to reduce the success of inflation targeting.

Reading tea leaves

The public in our framework monitors the central bank's communication in a predictable way that can be expressed in a decision tree, Figure 2, incorporating in turn inflation forecasts, policy rate changes, and verbal assessments. Whenever a branch of the tree ends, the node is indicated in bold.

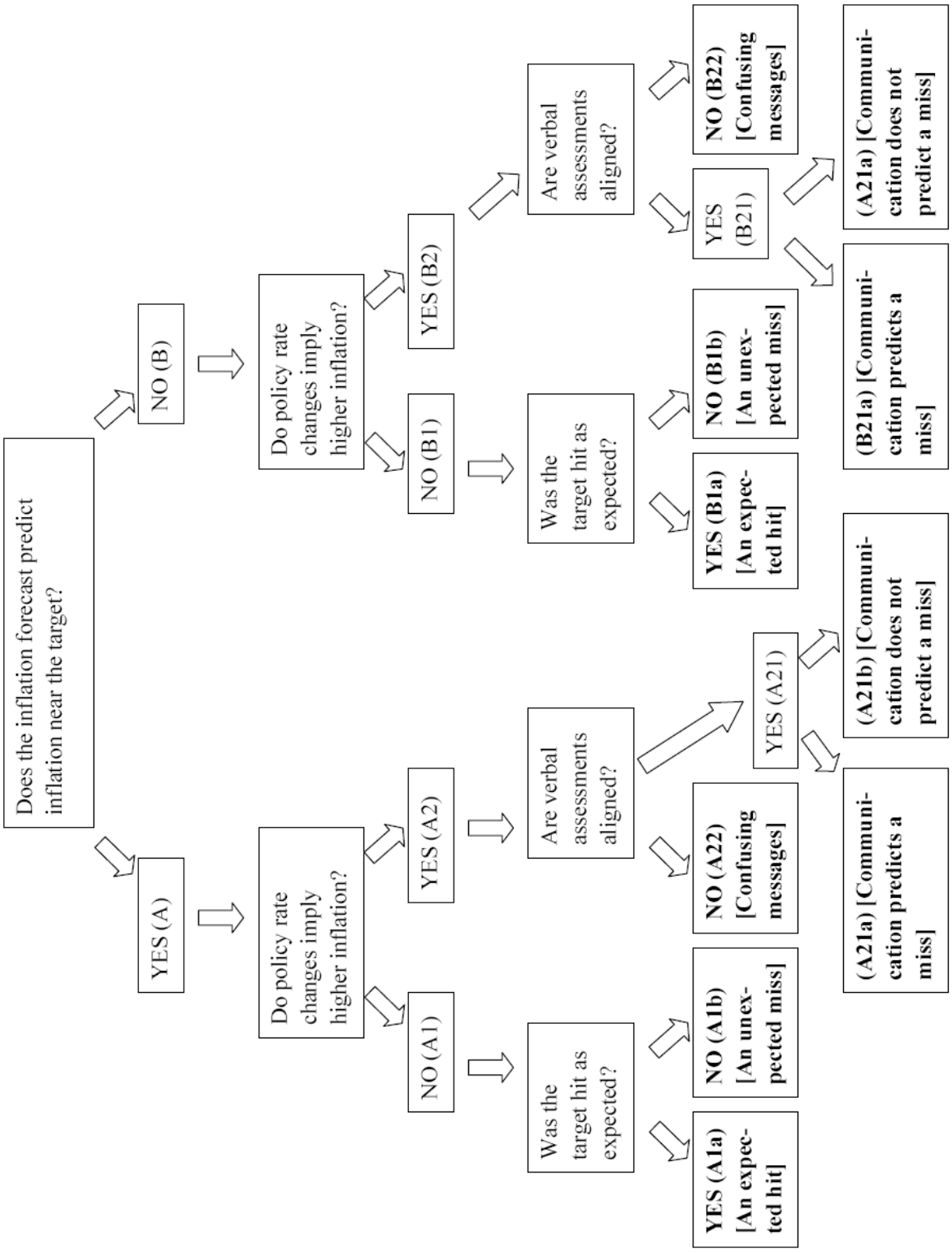
First, let us explore some of the no-confusion outcomes, starting along the left side of the tree. The inflation forecast predicts inflation in the target range (node A) and the policymaker then keeps the policy rate unchanged (node A1). The branch of the tree then ends either with inflation on target/forecast (node A1a) or missing the target (node A1b). Along this branch the public never gets confused. However, in the latter case (node A1b) it gets surprised by inflation being above/below the forecast. Node A1a is the idyllic situation: the economy was in equilibrium, there were no significant inflation factors, the central bank did not have to move policy rates, no shocks happened, and inflation was predicted well.

Second, the policymaker may decide to change the policy rate despite the inflation forecast signaling near-target inflation (node A2), thus indicating the presence of inflation factors outside of the forecasting model or a different weight attached to these factors. In other words, the policymaker implicitly updated the staff forecast prior to the actual decision. Policymakers update the forecast not only because they have a larger information set, but also because this set is more up-to-date. They meet several (sometimes 6–8) weeks after the forecasting round started and so they consider newer data than the forecast. The public is keen to understand this update and so it studies the accompanying verbal assessments in order to detect key current and future inflation factors. Let us assume that these verbal assessments correspond to the inflation factors implied by the forecast update done by the policymaker (node A21) and the eventual inflation outturn is predicted either correctly (a no-surprise node A21a) or incorrectly due to an unexpected shock (a surprise node A21b). Whereas node A21a provides another idyllic situation of consistent communication, the public is surprised in node A21b.

Third, the least favorable outcome in this tree is the confusing signal when the forecast predicts on-target inflation, yet the policy rate is increased/decreased, while the verbal assessment indicates downward/upward inflation factors (node A22). At this point it does not matter what the period-end inflation was, because the public cannot interpret the three confusing signals (forecasts, policy rates, and verbal assessments). If inflation stays somehow within the target range, the public will see this outcome as a fluke.

The right side of the tree is symmetrical, starting this time from the situation of the forecast predicting inflation outside of the target range, and resulting again in five end-nodes. As in the left side, the public understands the decision and is not surprised by the eventual inflation outturn (nodes B1a and B21a), understands the decision and is surprised (nodes B1b and B21b), or is confused (node B22).

Figure 2: The Public's Scrutiny of Central Bank Communication



3. Methodology and Sample Selection

In this section we (i) detail our methodology of linking inflation forecasts with verbal assessments, and (ii) describe the sample data that we use in the estimation of the public's decision tree described earlier. Individual country data and results are provided in the Annex.

3.1 Methodology

What policy rule is the public likely to use to assess the actions of the central bank? The theoretical literature offers a plethora of alternative policy rules, from the original, backward-looking Taylor rule (Taylor, 1993) to complex, forward-looking rules based on adaptive learning (Evans, Guse, and Honkapohja, 2007).[7] Following the suggestion by King (2005) that the public uses simple, "heuristic" policy rules we decided to start with a policy rule that is (i) simple, (ii) forward-looking, and (iii) enables subsequent inclusion of ad hoc, verbal information. To this end, we chose a rule suggested by Batini and Haldane (1999), in which the policy rate reacts only to the inflation forecast deviating from the target, because this is the most straightforward representation of the inflation forecast targeting strategy. We do not believe that the public is capable of "estimating" a more complex rule, say, with unobservable variables such as an output gap measure or an equilibrium exchange rate indicator.

A forward-looking policy rule

Let us assume that if the inflation forecast deviates from the target, the public expects the policymaker to adjust short-term interest rates based on the following rule:

$$i_t = \gamma i_{t-1} + (1-\gamma)\left(\delta\left(\pi_{t+j}^{F,CB} - \pi^*\right) + i^n\right), \qquad (1)$$

where i_t is the policy instrument (the short-term nominal interest rate); $\pi_{t+j}^{F,CB}$ denotes the inflation forecast formulated at time t at quarterly frequency (we use j=4, that is, 1-year-ahead expectations, and for robustness purposes also j=8, that is, 2-year-ahead expectations); π^* is the inflation target; and i^n is a policy-neutral interest rate equal to the sum of an equilibrium real interest rate and the inflation target. The policy-neutral real rate is assumed to be either 3 percent, a typical number used in emerging market countries, or 2 percent, a typical number used in industrial countries. Parameters γ and δ, an interest rate-smoothing coefficient and the weight put on deviations of inflation from the target, respectively, are—the public believes—some positive constants chosen by the policymaker. Following Batini and Haldane (1999), in the benchmark version of the rule we set these parameters equal to 0.3 and 2.0, respectively, and for robustness checks we test the rule also with values of 0.5 and 3.0, respectively. Thus, if the inflation forecast is above/below the target, the public expects the policy rates to be increased/lowered to offset the gap between expected inflation and the inflation target. As usual in the policy-rule literature, forecast deviations from the target require more than proportional policy rate adjustments, and thus in the benchmark Batini-Haldane calibration: $(1-\gamma)\delta = 1.4$.

[7] For an early survey of the burgeoning literature on policy rules, see John Taylor's website at http://www.stanford.edu/~johntayl/PolRulLink.htm.

Implied forecast update

The public knows, of course, that the policymakers do not follow the forecast produced by staff blindly and that they may consider other information in their deliberations. After all, it is central banks' job to dissect the relevant data and, hence, policymaking has been delegated to these institutions and their managers. While all this information is neither confidential nor private, the public almost certainly has a less comprehensive information set than the policymakers. So, the public would be keen to extract this additional information in order to see how policymakers amended the staff inflation forecasts by incorporating additional information into their decisions. The public can derive what the implied forecast update was by comparing the forecast implied by the policy-rate changes and a simple policy rule $\left(\pi^{F,P}\right)$ to the officially published, model-based inflation forecast $\left(\pi^{F,CB}\right)$. The rule-based inflation forecast can be obtained by rearranging (1):

$$\pi_{t+j}^{F,P} = \frac{\Delta i_t}{(1-\gamma)\delta} + \frac{i_{t-1} - i^n}{\delta} + \pi^* \tag{2}$$

Thus, $\pi^{F,P}$ measures what the public thinks inflation will be, given the structure of the rule and the policy rate changes effected by the central bank during the period under consideration. By subtracting $\pi^{F,CB}$ from both sides we obtain our measure of the implied forecast update:

$$\pi_{t+j}^{F,P} - \pi_{t+j}^{F,CB} = \frac{\Delta i_t}{(1-\gamma)\delta} + \frac{i_{t-1} - i^n}{\delta} - \left(\pi_{t+j}^{F,CB} - \pi^*\right) \tag{3}$$

A non-zero difference between the simple rule-based forecast $\left(\pi^{F,P}\right)$ and the central bank's official, model-based forecast $\left(\pi^{F,CB}\right)$ indicates that the policymakers found some additional information modifying the policy implications of the published, model-based forecast and their policy rate decision deviated from that suggested by the staff. Formally, in Figure 2 this situation corresponds to the second-level forks in the tree: A2 and B3. The public would try to understand what information should be considered in addition to the model-based forecast, scrutinizing inflation reports for clues. For example, a positive, that is, "inflationary," forecast update $\pi_{t+j}^{F,P} - \pi_{t+j}^{F,CB}$ could be supported by, say, mentioning an unexpected depreciation of the domestic currency. A negative, "deflationary," forecast update could be supported by, say, a detailed discussion of historically low wage settlements. In both cases, a non-zero forecast update may imply that policymakers attached greater weight to these inflation factors than the model-based inflation forecast.

Plowing through the verbal assessments

It is unlikely that the public would find ready answers to why the staff forecast was amended by the policymakers. Nevertheless, we see no other way of explaining the implied forecast update than to open inflation reports, which are, from the point of view of the public, the most prominent documents published by inflation targeting central banks, and try to extract information from verbal assessments of current and future economic developments.

To this end, we perused the quarterly inflation reports and extracted all verbal assessments and the presumed direction of their impact on inflation. Each verbal comment was catalogued into a supply, demand or external environment category, further divided into subcategories, and classified as pushing the rate of inflation either higher or lower. Each factor was given an equal

weight, because inflation reports do not provide information on the factors' quantitative importance. To this end, we denote factors that put upward pressure on the inflation rate as 1, and factors that put downward pressure on the inflation rate as –1. All factors were then aggregated across categories to obtain an index-like measure of what the policymaker thought of the inflation factors in any given quarter. This index can then be directly compared with the implied inflation factors obtained from the comparison of the two forecasts. For example, the verbal assessments contained in the 2005 Czech National Bank inflation reports yielded eight demand factors (six of which indicating upward pressure on the rate of inflation), six supply factors (two of which indicating upward pressure), and ten external environment factors (four of which indicating upward pressure), with a net result of –2. Thus, we concluded that the 2005 verbal assessments provided by the CNB were slanted toward downward pressure on the rate of inflation.

The framework described above hinges on the superior information content of the inflation reports as compared to other communication devices, and on the public's ability to extract it. There are two potential criticisms of this approach, although neither stands up to serious scrutiny. First, it has been argued that the inflation report is primarily a "staff" document and that policymakers' views are better found in other documents, such as central bank press releases or ex post interviews. In our view, the staff-to-policymaker distinction is largely superficial, even though the policymakers and staff may disagree on the relative importance of various inflation factors. The policymaker is unlikely to come up with an issue that was not mentioned in the inflation report, which is clearly the most comprehensive document prepared, and, at the same time, the staff are unlikely to omit an issue that policymakers are known to care about. The public can naturally decide to use other sources of information such as press releases or minutes of the meeting. For the purposes of our study, we rely on inflation reports because they are the only document published by all central banks in our sample. We leave it to future research to establish whether a significantly different set of information could be extracted by analyzing additional communication tools. An extension of our analysis from the inflation reports to the voting record, published in Minutes of the Board meeting, in the Czech Republic in Šmídková and Bulíř (2007) did not result in materially different results.

Second, it could be argued that the bipolar grading of inflation factors (-1;1) does not capture their magnitude. We argue that the public does not scrutinize a 60-page document for the pleasure of it, but that it searches for a general message in the text and for the implications that the verbal assessments have for downward/upward pressures on inflation. This implies that the public will only scrutinize reports if the implied forecast update is large enough to justify the time-consuming, and hence costly, report scrutiny.

To summarize, the communication timeline in our analysis is as follows. First, the inflation target is announced for the next 2 years or more. Second, the central bank publishes official inflation forecasts $\left(\pi_{t+j}^{F,CB}\right)$ on a quarterly basis. Third, the public observes the evolution of policy interest rates, computes rule-based inflation forecasts $\left(\pi_{t+j}^{F,P}\right)$, and derives an estimate of the implied forecast update. Fourth, the public scrutinizes the published inflation reports for verbal assessments and tries to match them with the implied update if this update is large enough. Regarding the former, we simply sum up all policy-rate changes within each year, and regarding the latter, we average the quarterly announced factors. Finally, the public observes inflation at the end of each horizon and concludes that the central bank communicated (i) well and that there were

no surprises, (ii) well, but there were surprises, or (iii) in a confusing manner, so that inflation expectations could not be formed.

3.2 Sample Selection and Data

The primary motivation for the paper was to explore communication under inflation targeting in European emerging market countries, comparing it with a few non-European emerging market countries, as well as with one industrial country. Given the time-consuming nature of this exercise, we eliminated from the potential sample of 24 current inflation targeters (Heenan, Marcel, and Scott, 2006) large industrial and low-income countries, countries that started inflation targeting after 2001, and countries that do not publish detailed enough inflation reports. This left us with three European emerging-market countries (the Czech Republic, Hungary, and Poland); two non-European emerging-market countries (Chile and Thailand); and an industrial control country (Sweden), see Table 1.

The sample countries differ considerably in their approach to inflation targeting. First, whereas four countries (Chile, the Czech Republic, Sweden, and Thailand) are classified as "fully-fledged inflation targeters" (Stone, 2003), Hungary and Poland are seen as inflation targeters "lite", meaning that these central banks have been unable to maintain the inflation target as their foremost policy objective and the regime has served mostly as a disinflation device. Second, whereas five countries used conditional, model-based forecasts under the assumption of a constant policy rate during the forecast period, with the Czech Republic switching to an unconditional, model-based forecast in 2002, the last country, Poland, based its inflation forecasts on expert appraisals. Third, one should also not underestimate the formal differences, such as the definition of the inflation target (point versus range) and alternative widths of target ranges. All information was based on the 2000–05 inflation reports downloaded from the national central bank websites.

Table 1: Inflation Targeters: Sample Characteristics

Country	Inflation targeting introduced	"Fully-fledged IT" or "IT lite"?[1]	Frequency and availability of Inflation Reports	Type of inflation forecast	Inflation[2] and type of price index	Openness (exports and imports as a percentage of GDP)[2]	GDP per capita in constant US $[2]
Chile	1991	Fully-fledged	Three times a year; www.bcentral.cl	Conditional on unchanged policy rates	2.6 CPI	69.1	9,859
Czech Republic	1998	Fully-fledged	Four times a year; www.cnb.cz	Conditional on unchanged policy rates until mid-2002, unconditional thereafter	2.3 CPI	133.1	16,759
Hungary	2001	Lite	Four times a year; www.mnb.hu	Conditional on unchanged policy rates and exchange rates	5.9 CPI	131.9	14,597
Poland	1999	Lite	Four times a year; www.nbp.pl	No reference to quantitative forecasts	2.8 CPI	67.9	11,428
Sweden	1993	Fully-fledged	Four times a year; www.riksbank.com	Conditional on unchanged policy rates	1.5 CPI	84.2	27,630
Thailand	2000	Fully-fledged	Four times a year; www.bot.or.th	Conditional on unchanged policy rates	2.3 CPI and "core" inflation	131.4	7,065

Source: National central bank websites; Carare and Stone (2003) and Stone (2003); *World Economic Outlook*.

[1] See Stone (2003) for definitions.

[2] The average for 2001–05.

4. Empirical Findings

We present the results for the 4-quarter (one-year) forecast horizon in Tables 2–4, both as country averages and disaggregated. The robustness tests include results for the 8-quarter forecast horizon, alternative calibrations of the policy rule used by the public to extract information on the implied forecast update, a lower assumption about the real equilibrium interest rate, and a larger threshold for the verbal assessment of inflation factors.

4.1 Country Averages

First, central banks missed their inflation targets in more than one-half of all the observations. Poland missed all six end-year inflation targets by 1 percentage point or more, while Sweden, our control country, missed the target three times (and also recorded two misses by 0.7 percentage points). We argue that this metric says very little about the quality of communication or indeed about the inflation targeting regime. The reasons for missing the targets varied across countries: some countries may have missed their targets intentionally to take advantage of favorable macroeconomic conditions to pursue so-called opportunistic disinflation (Orphanides and Wilcox,

2002), while others may have been subject to sizable exogenous shocks. The former explanation is supported by the fact that three out of four target misses were the result of below-target inflation.

Second, the central banks signaled interest rate moves through their inflation forecasts (node B in Figure 2), see Table 2. The one-year inflation forecasts differed—by at least 1 percentage point—from the target in 12 cases (one-third of all available observations). Of all the off-target forecasts, nine (or three-quarters) were associated with below-target forecasts and three (one-quarter) with above-target forecasts.

Table 2: Breakdown of Communication Results, Sample Average, 2000–05

Node description	Implication for the public	Obs.	In percent	Node
On-target forecast	Little need for additional information	24	66.7	A
Off-target forecast	Need for additional information	12	33.3	B
Total observations		36	100.0	A+B
Of which:				
No significant implied forecast update signaled through policy rates	No need for additional information	12	33.3	A1
Significant implied forecast update	Need for additional information	12	33.3	A2
No significant implied forecast update signaled through policy rates	No need for additional information	5	13.9	B1
Significant implied forecast update	Need for additional information	7	19.4	B2
Verbal assessments correspond to implied forecast update	No need for additional information	11	30.6	A21
Verbal assessments do not correspond to implied forecast update	Confusion	1	2.8	**A22**
Verbal assessments correspond to implied forecast update	No need for additional information	3	8.3	B21
Verbal assessments do not correspond to implied forecast update	Confusion	4	11.1	**B22**
On-target inflation, as expected	No inflation outcome surprise	9	25.0	**A1a**
Off-target inflation, unexpected	Inflation outcome surprise	3	8.3	**A1b**
On-target inflation, as expected	No inflation outcome surprise	1	2.8	**B1a**
Off-target inflation, unexpected	Inflation outcome surprise	4	11.1	**B1b**
Implied forecast update and verbal assessment point to off-target inflation	No inflation outcome surprise	7	19.4	**A21a**
Implied forecast update and verbal assessment point to on-target inflation	Inflation outcome surprise	4	11.1	**A21b**
Implied forecast update and verbal assessment point to off-target inflation	No inflation outcome surprise	3	8.3	**B21a**
Implied forecast update and verbal assessment point to on-target inflation	Inflation outcome surprise	0	0.0	**B21b**

Source: Authors' calculations.

Notes: All calculations are based on 4-quarter ahead inflation forecasts and the benchmark calibration of γ, δ, and the real equilibrium rate set equal to 0.3, 2.0, and 3 percent, respectively. Implied inflation factors are used if the indicator is 1 percentage point or more and verbal assessments of inflation factors are used if the annual average is larger than 0.5. The nodes and their codes correspond to those in Figure 2.

Third, we found sizable implied forecast updates in all countries. Of all 12 off-target forecasts five were followed by model-consistent movements in policy rates (node B1), whereas seven were not (node B2). Policy decisions suggested implied forecast updates also in situations of on-target forecasts (node A2). Of the 24 on-target forecasts our policy rule identified 12 observations when policy rates changed even though inflation was forecasted to be on target. The overall direction of the implied forecast update was skewed toward deflation factors, especially in the longer forecast horizon. The high proportion of deflation factors is probably related to the first half of our sample period, when the inflation indexes unexpectedly dropped to zero or below in all countries, sparking temporary worries of a Japan-type deflationary spiral. See the country notes in the Annex.

Fourth, confusion in central bank communication was rare—inflation-report verbal assessments were in most cases consistent with the implied forecast updates (Table 3). Of all the 19 cases with implied forecast updates, that is, nodes A2 and B2, in 14 cases, or three-quarters, we found

supporting verbal explanations (nodes A21 and B21).[8] Conversely, the explanation was confusing in five observations, or one-quarter of the implied-factor subsample (nodes A22 and B22). Perhaps a better metric is to compare the cases of confusion to all available observations: one out of seven observations.

Fifth, surprises were also relatively infrequent—taking into account both the implied forecast updates and verbal assessments, the sample central banks failed to anticipate 11, or one-third, of all inflation outcomes (nodes A1b, B1b, A21b, and B21b). While all the information given to the public during the period was consistent, the end-period inflation was unexpectedly different from the forecast. Conversely, the sample central banks forecasted inflation correctly while setting policy rates and explaining all other considerations in more than one-half of all observations (nodes A1a, B1a, A21a, and B21a).

Table 3: Clarity of Communication, Sample Averages, 2000–05 (1-Year Forecast Horizon)

	Observations	Percent of total	Nodes
Consistent communication No inflation outcome surprise	20	55.6	A1a, B1a , A21a, B21a
Consistent communication Inflation outcome surprise	11	30.6	A1b, B1b, A21b, B21b
Inconsistent communication	5	13.9	A22, B22
Total	36	100	

Source: Authors' calculations.

Note: All calculations are based on 4-quarter ahead inflation forecasts and the benchmark calibration of γ, δ, and the real equilibrium rate set equal to 0.3, 2.0, and 3 percent, respectively. Implied inflation factors are used if the indicator is 1 percentage point or more and verbal assessments of inflation factors are used if the annual average is larger than 0.5. The nodes and their codes correspond to those in Figure 2.

4.2 Were Some Central Banks "Crying Wolf"?

No country stands out as an exceptionally good forecaster/communicator and we can only speculate about the reasons. Perhaps the relatively more advanced inflation targeters in terms of modeling techniques—the Riksbank, Banco Central de Chile, Bank of Thailand, and Czech National Bank—have struggled to communicate forecasts based on their more sophisticated models as compared to the comparatively simpler forecasting and communication techniques employed by the remaining central banks in our sample. Or perhaps the more sophisticated models provided—at least during our sample period—negligible forecasting and communication gains as compared to the simpler techniques.

No country comes out as an overall bad communicator. However, the detailed results reveal some interesting communication strategies. The sample average for consistent, no-surprise communication is bested by the Czech Republic and, somewhat surprisingly, also by Poland

[8] The public can also be confused when the inflation report mentions inflation factors that are not reflected in the implied forecast update. We expect the public to delve deep into inflation reports only if they are seeking an explanation for the sizable implied forecast updates. There is a time dimension to this argument as well: while the inflation forecast and policy instrument are available instantly after the policy meeting, the report comes out with a lag. While some banks, such as the CNB, publish their inflation reports eight days after the meeting, the lag is longer for most other inflation targeting banks (Šmídková and Bulíř, 2007).

(Table 4). Poland and Sweden are two countries without a single case of inconsistent communication; both countries record a one-half chance of an inflation surprise. Hungary is the only country with two instances of inconsistent communication (one-third of the sample). What exactly is going on?

Table 4: Clarity of Communication, Individual Countries, 2000–05 (1-Year Forecast Horizon)

	Chile	Czech Republic	Hungary	Poland	Sweden	Thailand	Average
	In percent of total observations						
Consistent communication No inflation outcome surprise	50.0	66.7	50.0	66.7	50.0	50.0	55.6
Consistent communication Inflation outcome surprise	33.3	16.7	16.7	33.3	50.0	33.3	30.6
Inconsistent communication	16.7	16.7	33.3	0.0	0.0	16.7	13.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations.

Note: All calculations are based on 4-quarter ahead inflation forecasts and the benchmark calibration of γ, δ, and the real equilibrium rate set equal to 0.3, 2.0, and 3 percent, respectively. Implied inflation factors are used if the indicator is 1 percentage point or more and verbal assessments of inflation factors are used if the annual average is larger than 0.5.

Table 5: Breakdown of Communication Results for the Individual Countries, in Percent of Total Country-Specific Observations, 2000–05

Node description	Chile	Czech Republic	Hungary	Poland	Sweden	Thailand	Average	Node
On-target forecast	83.3	50.0	50.0	66.7	66.7	83.3	66.7	A
Off-target forecast	16.7	50.0	50.0	33.3	33.3	16.7	33.3	B
Total observations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	A+B
Of which:								
No significant implied forecast update signaled through policy rates	33.3	16.7	33.3	33.3	66.7	16.7	33.3	A1
Significant implied forecast update	50.0	33.3	16.7	33.3	0.0	66.7	33.3	A2
No significant implied forecast update signaled through policy rates	0.0	33.3	0.0	0.0	33.3	16.7	13.9	B1
Significant implied forecast update	16.7	16.7	50.0	33.3	0.0	0.0	19.4	B2
Verbal assessments correspond to implied forecast update	50.0	33.3	16.7	33.3	0.0	50.0	30.6	A21
Verbal assessments do not correspond to implied forecast update	0.0	0.0	0.0	0.0	0.0	16.7	2.8	**A22**
Verbal assessments correspond to implied forecast update	0.0	0.0	16.7	33.3	0.0	0.0	8.3	B21
Verbal assessments do not correspond to implied forecast update	16.7	16.7	33.3	0.0	0.0	0.0	11.1	**B22**
On-target inflation, as expected	33.3	16.7	33.3	0.0	50.0	16.7	25.0	**A1a**
Off-target inflation, unexpected	0.0	0.0	0.0	33.3	16.7	0.0	8.3	**A1b**
On-target inflation, as expected	0.0	16.7	0.0	0.0	0.0	0.0	2.8	**B1a**
Off-target inflation, unexpected	0.0	16.7	0.0	0.0	33.3	16.7	11.1	**B1b**
Implied forecast update and verbal assessment point to off-target inflation	16.7	33.3	0.0	33.3	0.0	33.3	19.4	**A21a**
Implied forecast update and verbal assessment point to on-target inflation	33.3	0.0	16.7	0.0	0.0	16.7	11.1	**A21b**
Implied forecast update and verbal assessment point to off-target inflation	0.0	0.0	16.7	33.3	0.0	0.0	8.3	**B21a**
Implied forecast update and verbal assessment point to on-target inflation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**B21b**

Source: Authors' calculations.

Notes: All calculations are based on 4-quarter ahead inflation forecasts and the benchmark calibration of γ, δ, and the real equilibrium rate set equal to 0.3, 2.0, and 3 percent, respectively. Implied inflation factors are used if the indicator is 1 percentage point or more and verbal assessments of inflation factors are used if the annual average is larger than 0.5. The nodes and their codes correspond to those in Figure 2.

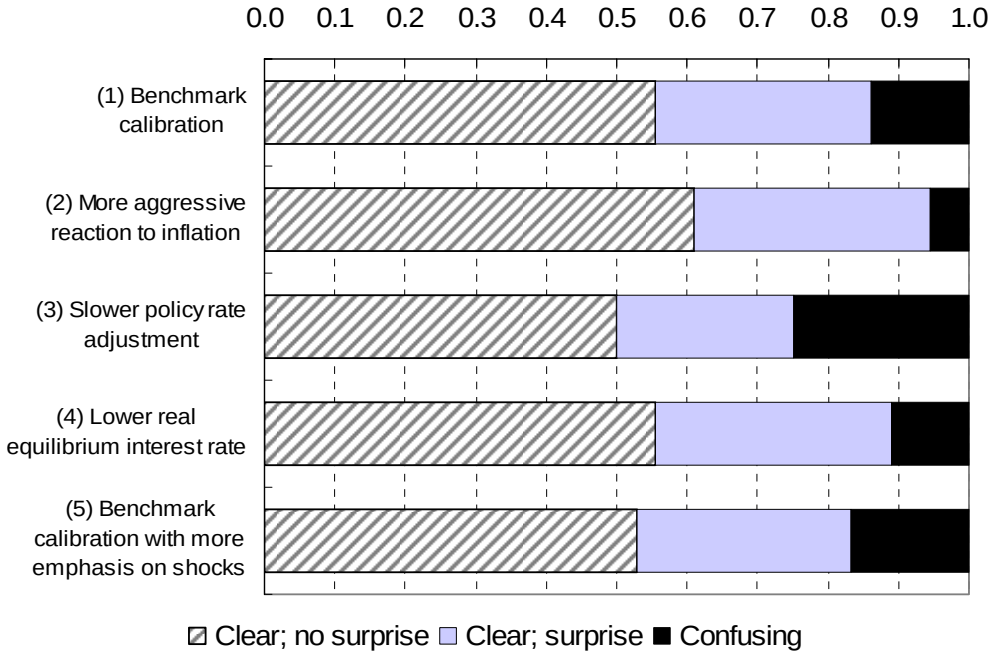
We see this as confirmation of these countries running a "lite" inflation targeting regime. What separates both Hungary and Poland from the rest of the sample in Table 5 is not the relatively frequent prediction of inflation away from the target (node B), but the frequent updating of the forecast (node B2). Whereas we found only one instance of such signaling in each of Chile and the Czech Republic, we found three and two in Hungary and Poland, respectively. Moreover, the magnitude of the update $\left(\pi_{t+j}^{F,P} - \pi_{t+j}^{F,CB}\right)$ was larger in these countries than the average update—in

the case of Poland almost twice as large. In other words, these results suggest that the two central banks in question were unable to maintain the inflation target as their foremost policy objective and the regime served mostly as a disinflation device. In Hungary the inflation target was compromised by parallel exchange rate targets and in Poland by the absence of an explicit modeling framework—the inflation forecast were based on expert appraisals.

4.3 Robustness Checks

The above results are robust to changes in the rule, data transformations, and sample adjustments. First, our results are unaffected by any reasonable change in the policy-rule parameters (Figure 3).[9] Second, our results do not change materially by changing the definition of observed inflation from period-end to period-average. Third, when we extend the forecast horizon to 8 quarters (Table 5), we obtain a marginally higher share of confusing communication on average, but it is almost exclusively concentrated in countries with comparatively weak modeling frameworks (Hungary and Poland).

Figure 3: Clarity of Communication: Robustness Checks



Source: Authors' calculations.

Notes: This chart summarizes the distribution of communication outcomes across alternative calibrations of the policy rule, $i_t = \gamma i_{t-1} + (1-\gamma)\left(\delta\left(\pi^{F,CB}_{t+j} - \pi^*\right) + i^n\right)$. In the benchmark calibration γ, δ, and the real equilibrium rate are set equal to 0.3, 2.0, and 3 percent, respectively. The verbal assessment inflation factors are 0.5 percentage point or more. In calibrations (2), (3), and (4) γ, δ, and the real equilibrium rate are set equal to 0.5, 3.0, and 3 percent, respectively. In calibration (5) the verbal assessment inflation factors are 1.0 percentage point or more.

[9] A much more aggressive policy rule than commonly used in the literature—a higher parameter δ—is needed to generate materially different results. For example, setting δ equal to 5, as opposed to 2, halves the number of "confusing" observations. Such aggressiveness is hardly reasonable, however. It implies that the central bank should increase the policy rate by 3½ percentage points for every 1 percentage point differential between the inflation target and the forecast.

Table 5: Clarity of Communication, Individual Countries, 2000–05 (2-Year Forecast Horizon, 24 Observations)

	Chile	Czech Republic	Hungary	Poland	Sweden	Thailand	Average
	In percent of total observations						
Consistent communication No inflation outcome surprise	75.0	25.0	0.0	50.0	75.0	50.0	45.8
Consistent communication Inflation outcome surprise	25.0	50.0	75.0	0.0	0.0	25.0	29.2
Inconsistent communication	0.0	25.0	25.0	50.0	25.0	25.0	25.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations.

Note: All calculations are based on 4-quarter ahead inflation forecasts and the benchmark calibration of γ, δ, and the real equilibrium rate set equal to 0.3, 2.0, and 3 percent, respectively. Implied inflation factors are used if the indicator is 1 percentage point or more and verbal assessments of inflation factors are used if the annual average is larger than 0.5.

5. Conclusions: Is the Glass Half Empty or Half Full?

Our analysis suggests that the inflation targeting central banks in our sample communicated consistently, helped by a variety of communication tools (inflation targets, forecasts, policy actions, and verbal assessments of current and expected developments). While both inflation targets and forecasts were missed frequently, the majority of these misses could be understood from scrutinizing publicly available information. About one-seventh of all monetary policy decisions remained confusing in the one-year horizon, as the implied inflation factors were contradicted by the verbal assessments contained in inflation reports. About one-third of all monetary policy decisions were found to be surprising—end-period inflation differed from the forecast by more than 1 percentage point despite overall consistent communication. We also found that more advanced inflation targeters signaled smaller implied inflation factors through their policy rate changes, presumably as these factors were already captured in their forecasting models.[10] Of course, our estimate of confusion may be due to our misinterpretation of inflation reports. But if we did not understand them, the public is unlikely to understand them much better.

While the share of inflation outcome surprises and inconsistent communication may seem high to some readers, we find it hard to argue that the central banks in our sample could have achieved a success rate of 100 percent during the period under consideration. Supply shocks were large in all sample countries and so was the uncertainty regarding their impact on the economy, thus introducing uncertainty into central bank communication. As suggested by Dennis and Williams (2007), an environment of large and uncertain supply shocks is precisely one in which high monetary policy transparency is not necessarily beneficial.

The possibilities for extending our research are ample. Our categorization of communication tools can be further expanded to include the results of policymakers' voting to provide information about the uncertainty surrounding the inflation forecast or additional communication devices. Our sample of six countries can be expanded to include both industrial countries and recent newcomers to inflation targeting. One could also explore alternative policy rules, including asymmetric ones, under which central banks would react differently to inflation forecasts above and below the target.

[10] Rozkrut and others (2007) make a similar argument.

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Appendix

Chile: Country Note

Basic information about the IT regime. Chile started its transition toward inflation targeting in 1990, in the context of a crawling exchange rate regime, with inflation of about 20 percent. The currency, the *peso*, was floated in 1999 and the central bank moved toward a full-fledged IT regime during 2000. The mandate of the central bank covers price stability only. The CBC sets its own inflation target and maintains instrument independence. Despite "fear of floating," foreign exchange interventions have been rare. Four-monthly Monetary Policy Reports provide information on inflation forecasts.

Inflation targets and forecasts. The CBC targets headline inflation. Throughout the period, the continuous target was set as a range from 2 percent to 4 percent, with a midpoint of 3 percent and a policy horizon of 12–24 months. The CBC's inflation forecasts are based on a publicly available model and its inflation reports closely follow the model structure. The decision-making process relies on conditional forecasts based on unchanged interest rates. The central bank has published three-, seven-, and eight-quarter-ahead projections.

Inflation record and monetary policy. For most of the period inflation was rarely outside of the target range. At end-2000 inflation peaked at 4.6 percent and in early 2004 it briefly dipped below 0 percent. The policy rate was on downward sloping path until 2004, with the exception of a technical increase in 2000.[11] Since 2004 rates have been increasing gradually, returning to their 2000 level. The peso has been comparatively stable in real effective terms, with the exception of 2002–2003, when the currency weakened. Whereas external shocks dominated the beginning of the sample period, domestic demand shocks dominated in the second half of the period.

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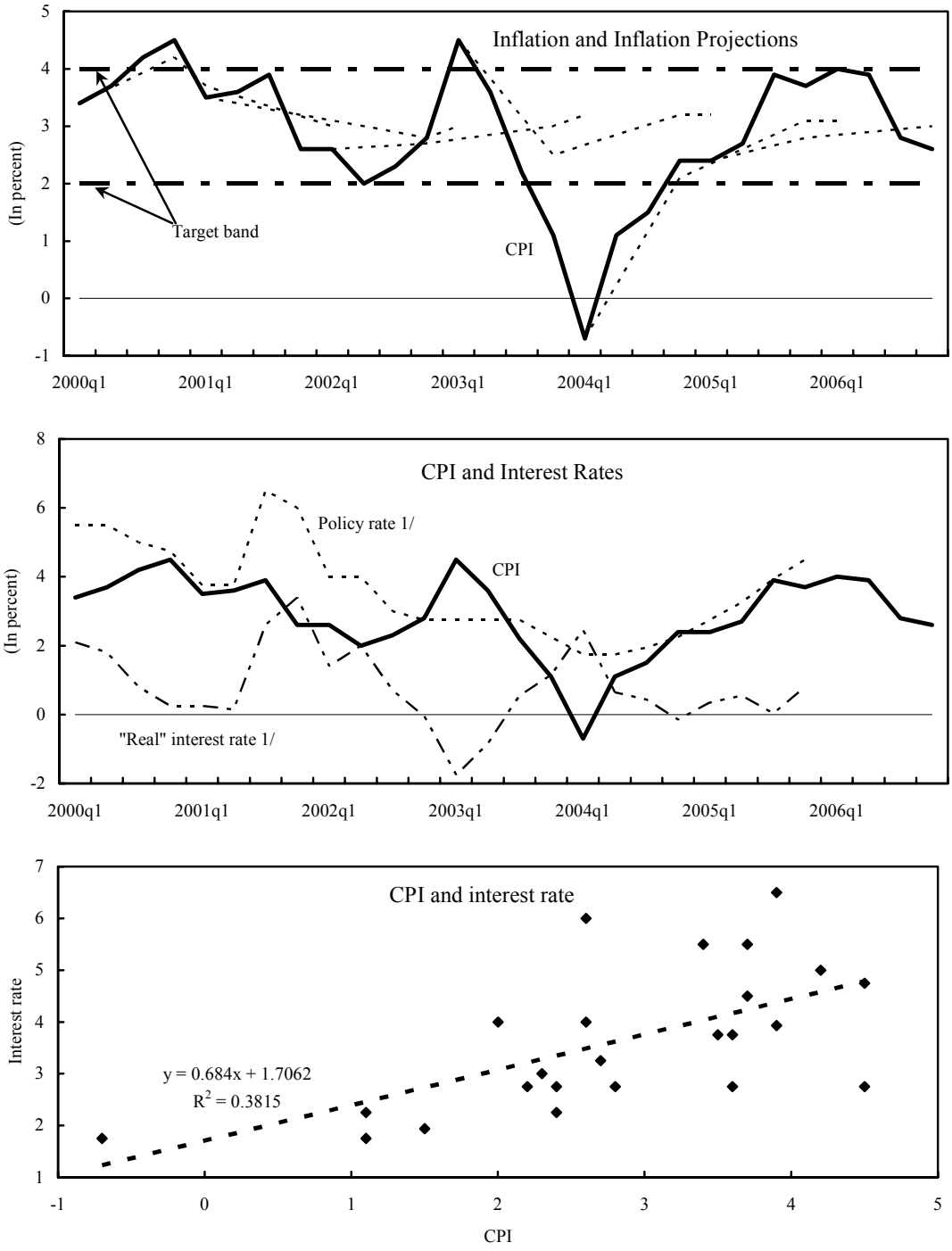
[11] In mid-2000 the central bank changed its policy instrument, resulting in a technical increase of about 300 basis points. Effectively, the policy stance remained unchanged at that time.

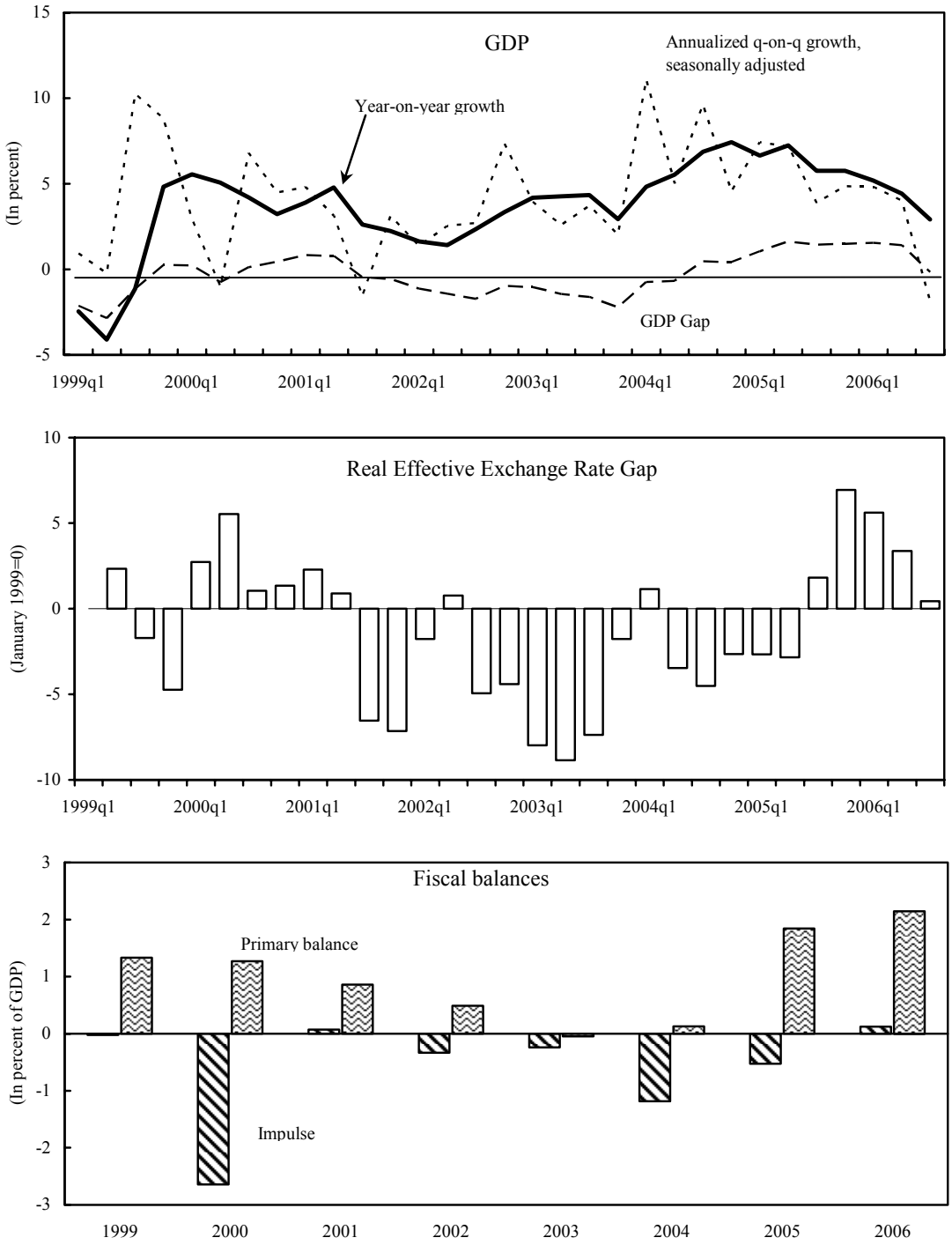
Figure 1: Chile: Inflation Developments, 2000-2006



Source: Central Bank of Chile; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year.
Real interest rate(t) = Interest rate(t) - CPI(t).
1/ In August 2001 the MP instrument was changed and the resulting 300 basis point increase is purely technical. Hence, the increase in the real rate is a mirage as well.

Figure 2: Chile: Inflation Factors, 1999 - 2006



Source: Central Bank of Chile; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Chile: Verbal Assessments, 2000-2005

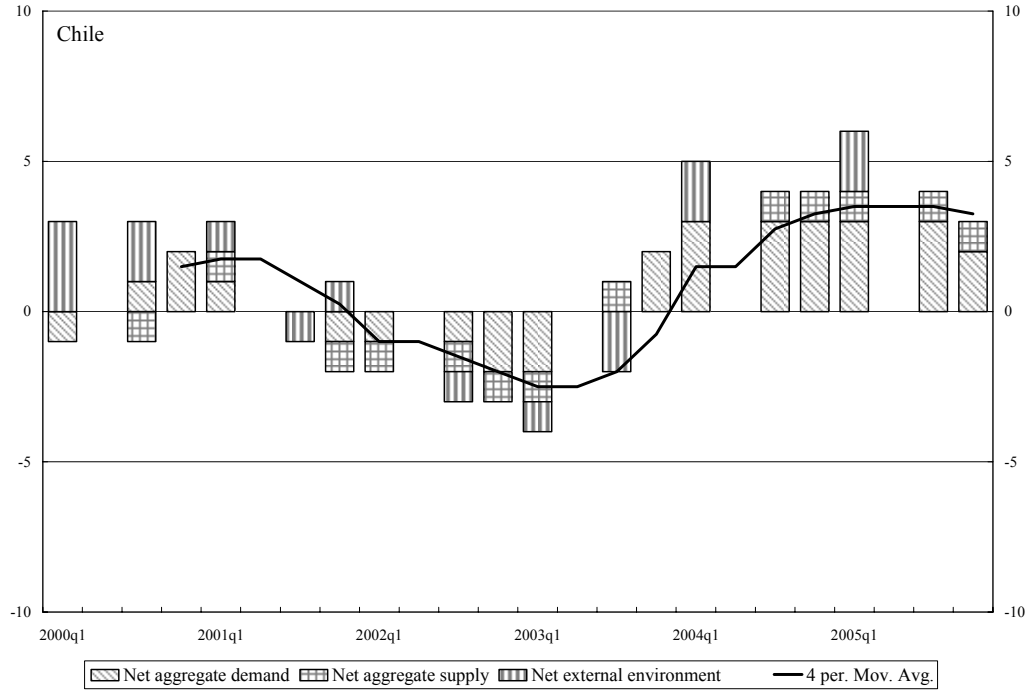
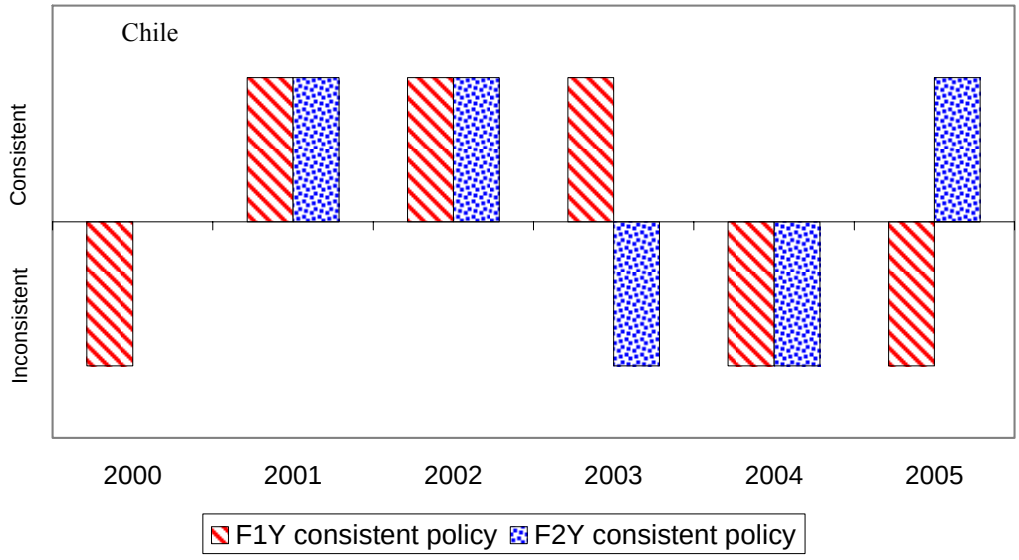


Figure 4: Chile: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

The Czech Republic: Country Note

Basic information about the IT regime. The Czech National Bank (CNB) introduced inflation targeting in December 1997 following the collapse of the koruna peg earlier in the year. The mandate of the CNB covers price stability only. The CNB sets its own inflation target, maintains instrument independence, and is not allowed to finance government deficits. The currency is freely floating, with foreign exchange interventions occasionally used. Model-based inflation forecasts provide a basis for monetary policy decisions and communication.

Inflation targets and forecasts. The CNB initially targeted so-called "net inflation" (CPI *minus* regulated prices and the impact of indirect taxes and subsidies), but switched to headline inflation (CPI) in 2002. The originally heuristic Inflation Reports steadily became more model-based, relying initially on conditional forecasts based on unchanged interest rates. It took the CNB approximately four years after IT adoption to develop a full-fledged forecasting system, and in mid-2002 the CNB switched to an advanced forecasting system underpinned by a calibrated output-gap model that originated from the Reserve Bank of New Zealand model. Consequently, the CNB moved toward using an unconditional forecast, in which future interest rate changes are modeled through a reaction function. Starting in mid-1999, the CNB published in each quarterly inflation report a set of six-quarter-ahead quarterly projections of inflation. It extended the forecast period to eight quarters in 2001.

Inflation record and monetary policy. For most of the period inflation was below target and outside of the target band. In this regard, the CNB referred to external and/or exogenous shocks and explained that offsetting them would result in undesired macroeconomic fluctuations. In addition, some of the shock factors were classified as *exemptions*, which were part of the ex ante announced list of escape clauses. The policy interest rate (the two-week repo rate) was mostly on a downward sloping path during the analyzed period. The koruna recovered quickly from its 1997–98 low and the real exchange rate mostly fluctuated narrowly around its long-term trend, the one exception being a period of fast appreciation in 2002.

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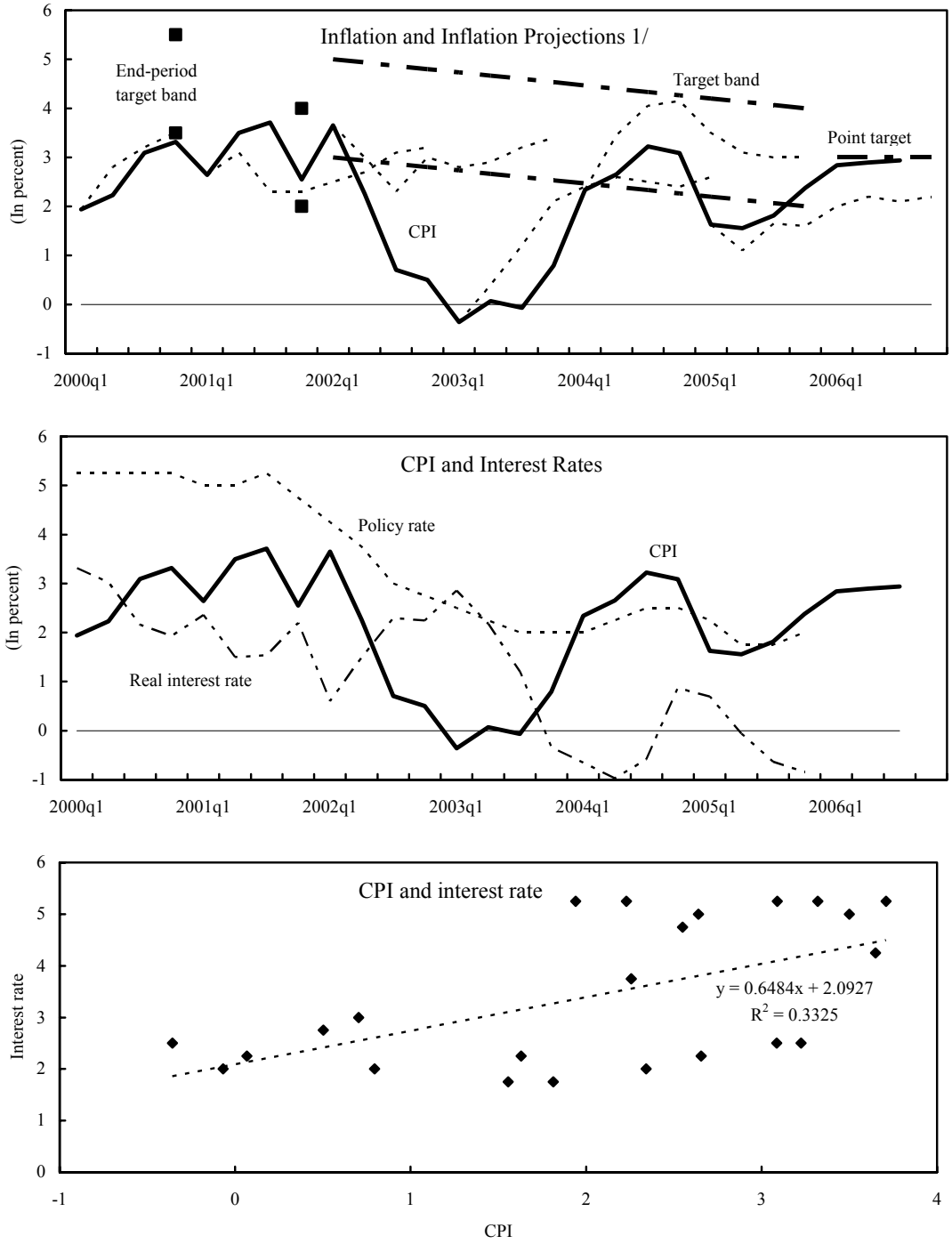
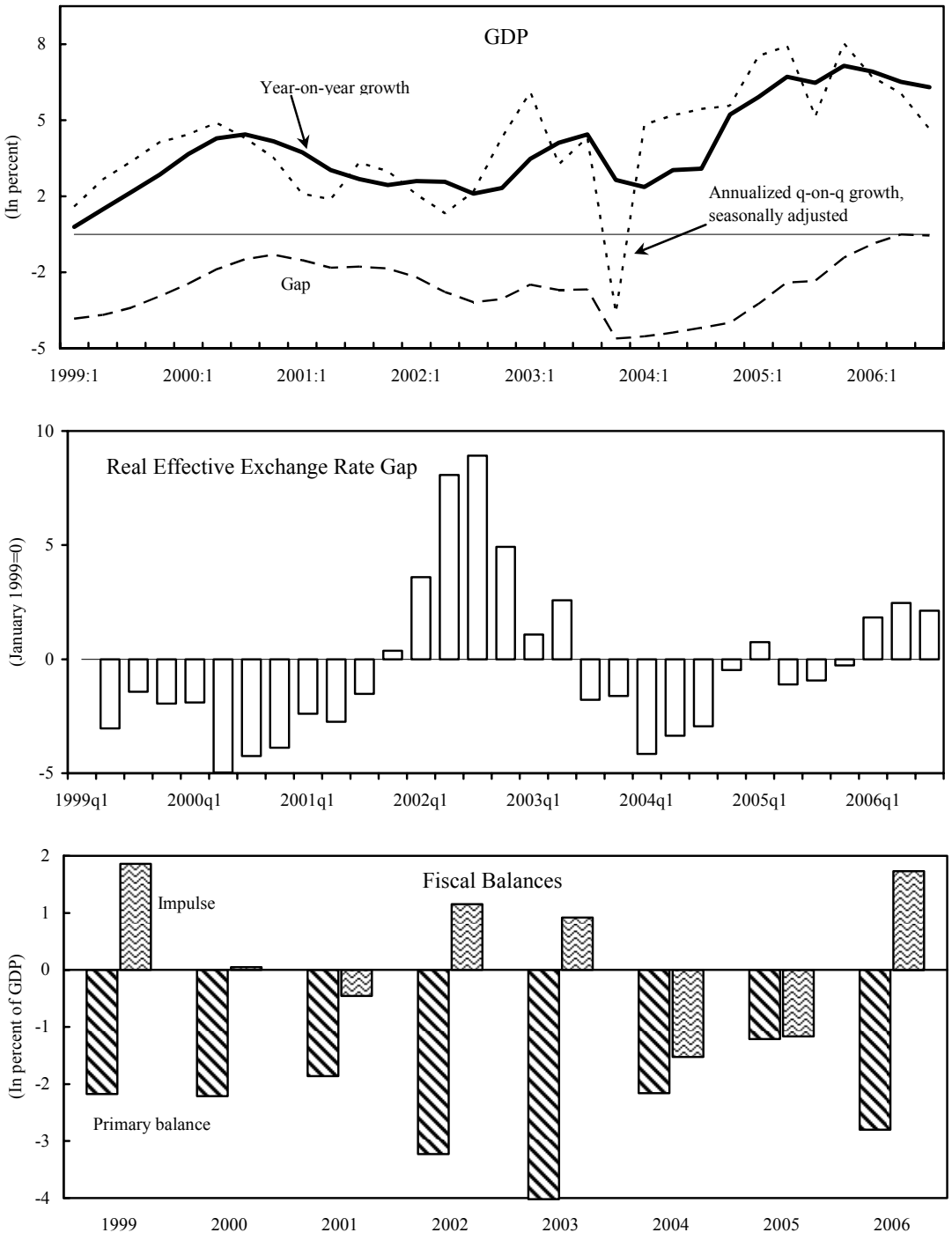
Figure 1: The Czech Republic: Inflation Developments, 2000-2006



Source: Czech National Bank; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year. End-year inflation targets for 2001 and 2002 were set for net inflation that is not directly comparable to headline inflation. Real interest rate(t) = Interest rate(t) - CPI(t).

Figure 2: The Czech Republic: Inflation Factors, 1999 - 2006



Source: Czech National Bank; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Czech Republic: Verbal Assessments, 2000–2005

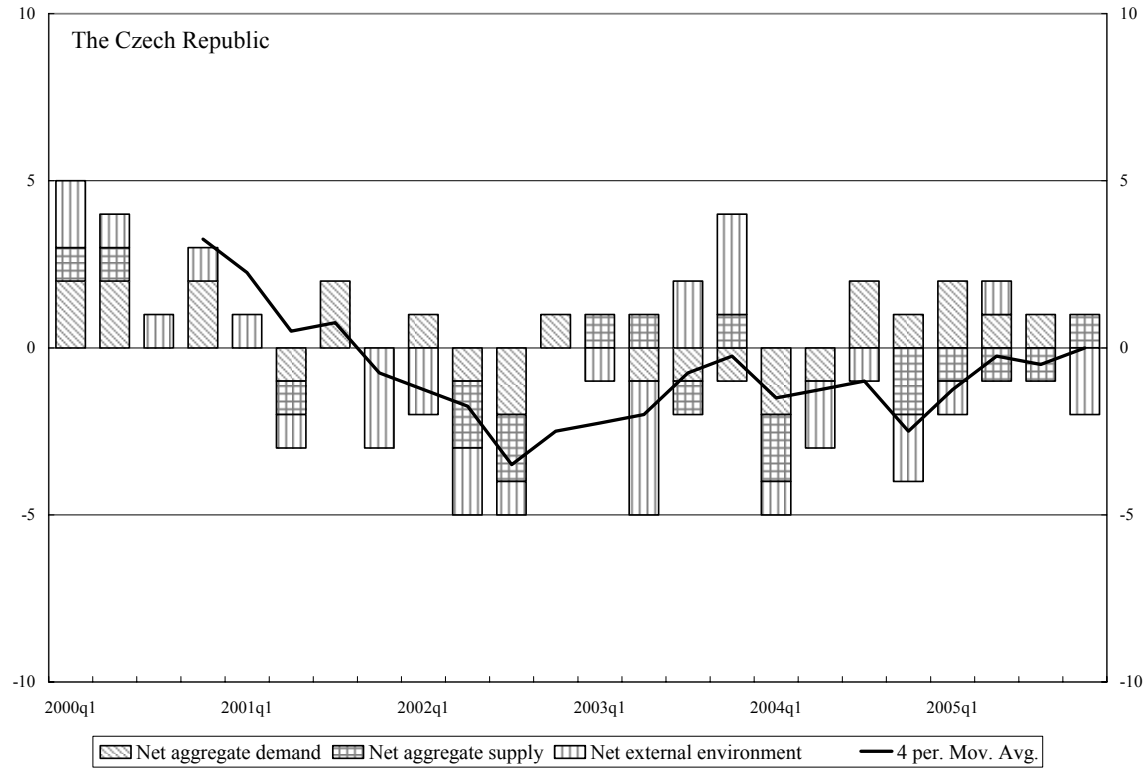
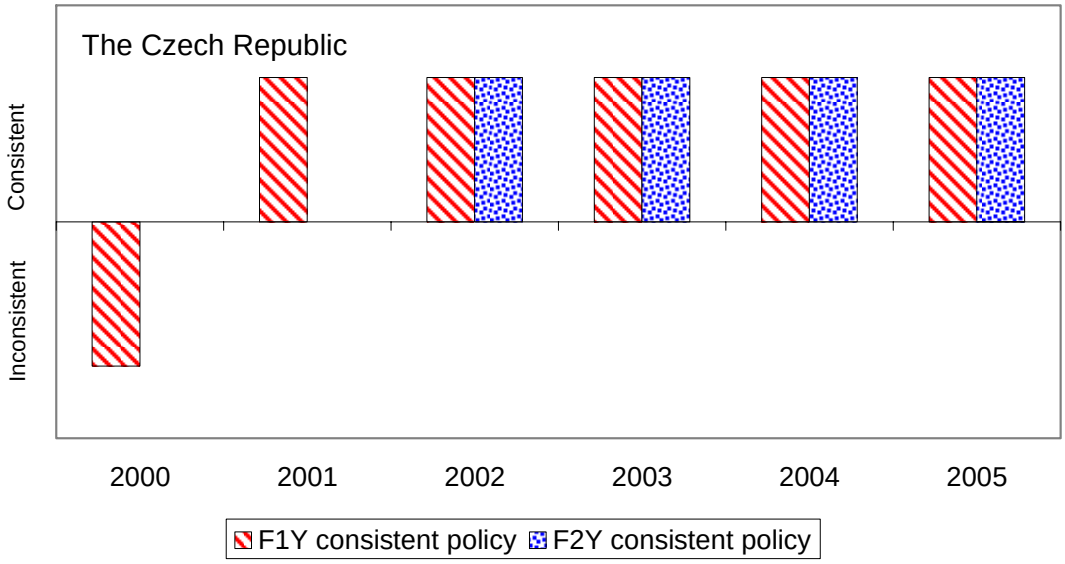


Figure 4: Czech Republic: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

Hungary: Country Note

Basic information about the IT regime. The Magyar Nemzeti Bank (MNB) introduced inflation targeting in mid-2001 following the collapse of the forint crawling peg earlier in the year. Price stability is the prime objective of the MNB and inflation targets are decided jointly between the Bank and the government. The MNB maintains instrument independence. The MNB appears to be focused more on exchange rate stability than other inflation targeters in our sample, because the fast pass-through of the exchange rate is seen as the most efficient instrument for influencing domestic prices. The forint exchange rate fluctuates within a ± 15 percent, ERM2-like band, with a pre-announced central parity, defended, if necessary, by interventions. Inflation fan charts form a basis for monetary policy debate and communication.

Inflation targets and forecasts. The MNB targets headline inflation with no pre-announced exemptions. The targets are set for the year-end only, with a ± 1-percent band. They initially demarcated a disinflation path, and then stabilized around 3 percent. Inflation Reports are based on fan charts that show eight-quarter inflation forecasts with model-based estimates of uncertainty. The forecasts are conditional on unchanged interest and exchange rates during the forecasting period.

Inflation record and monetary policy. In the first half of the period under consideration, the MNB met the targets comfortably. Later on, inflation became volatile, exceeding the end-period targets in half of the remaining observations. The policy interest rate (the two-week central bank deposit rate) declined in line with inflation during 1999–2002 and, analogously, became volatile thereafter. According to the inflation reports, policy deliberations were dominated by domestic demand considerations, public wage growth in particular, and exchange rate volatility. The forint was comparatively strong vis-à-vis its trend, but more volatile than in other countries.

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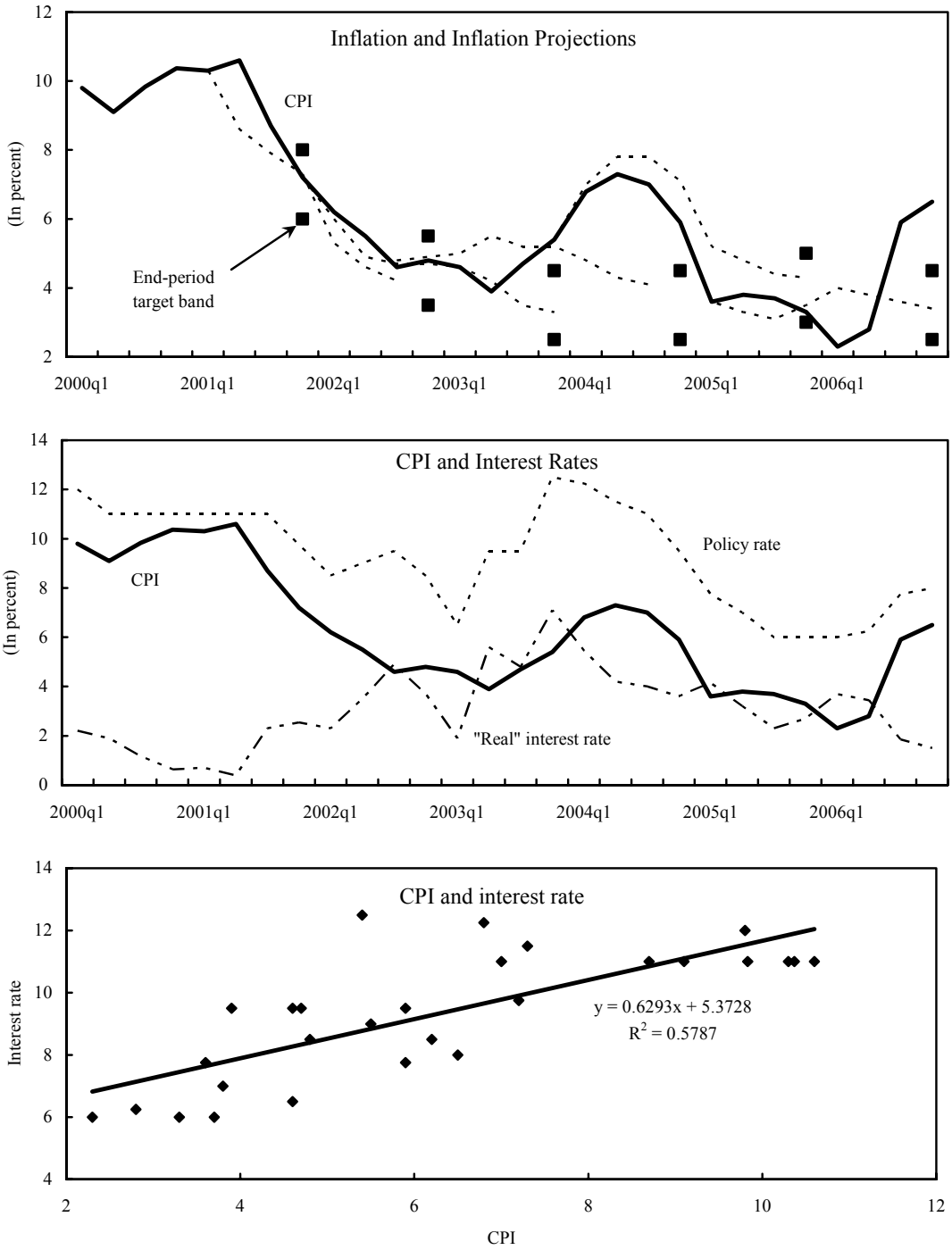
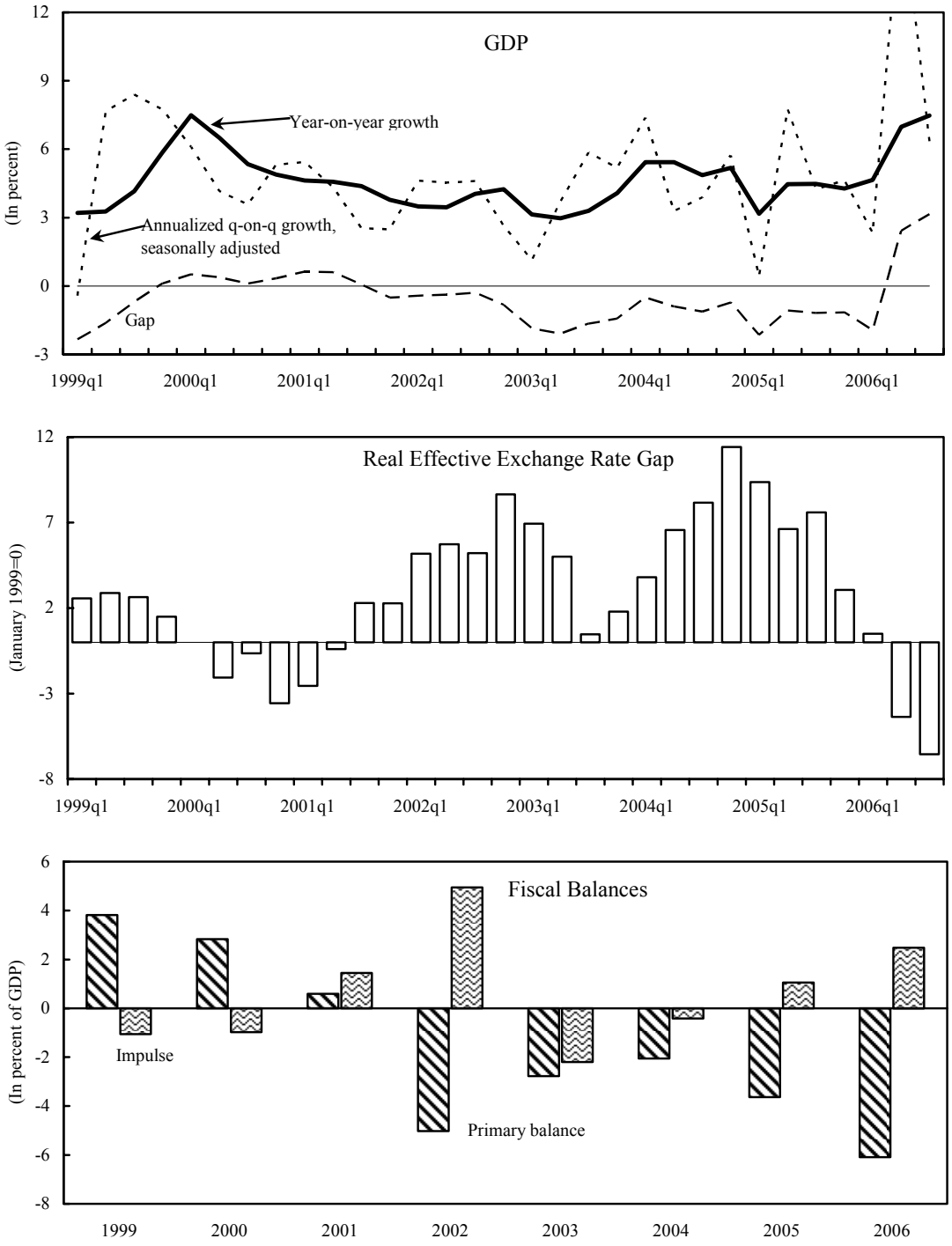
Figure 1: Hungary: Inflation Developments, 2000-2006



Source: Magyar Nemzeti Bank; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year.
Real interest rate(t) = Interest rate(t) - CPI(t).

Figure 2: Hungary: Inflation Factors, 1999 - 2006



Source: Magyar Nemzeti Bank; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Hungary: Verbal Assessments, 2000–2005

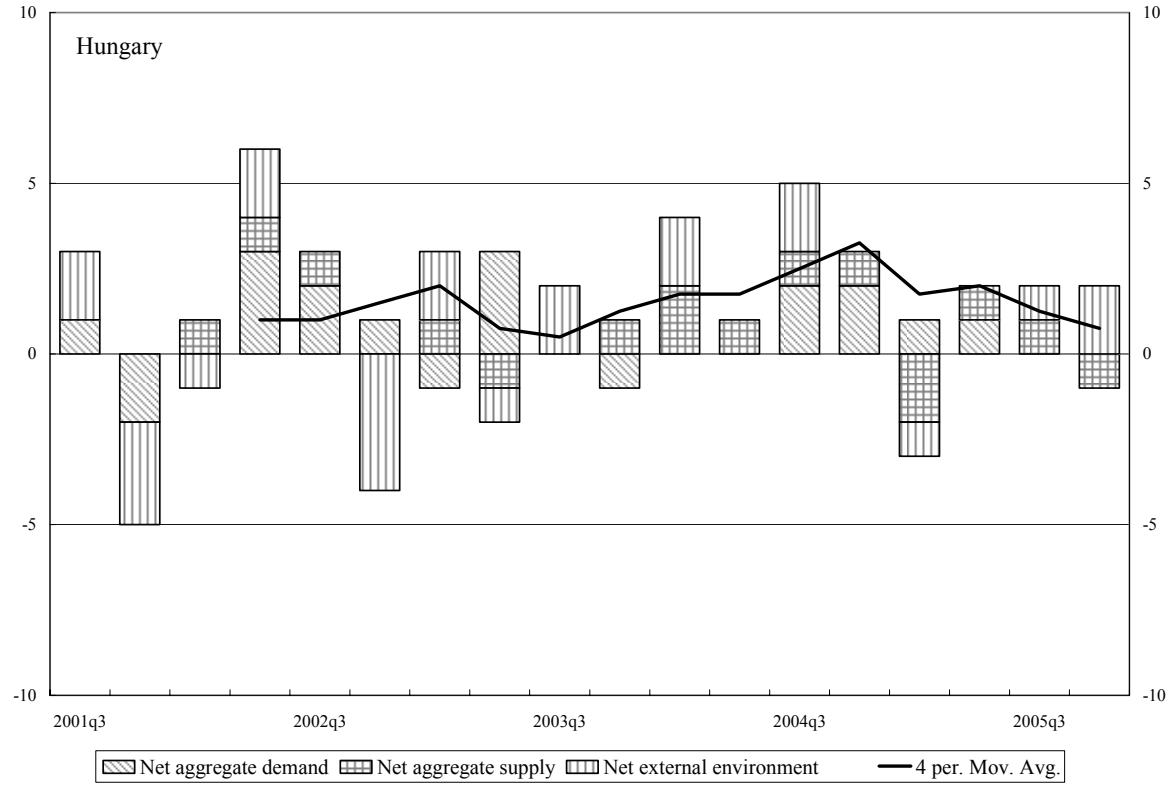
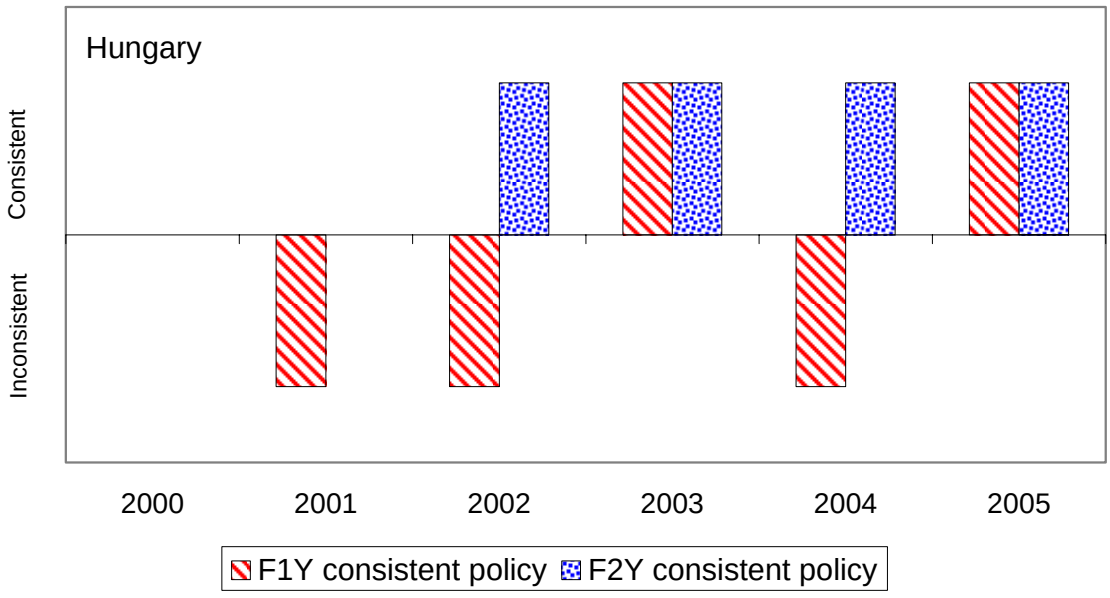


Figure 4: Hungary: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

Poland: Country Note

Basic information about the IT regime. Poland introduced inflation targeting in 1999 and has operated an inflation targeting *lite* regime ever since. The mandate of the Narodowy Bank Polski (NBP) covers price stability only. The NBP sets its own inflation target and maintains instrument independence. A pure floating exchange rate regime was introduced in April 2000, following a 10-year period during which the exchange rate served as a nominal anchor. Unlike the other sample central banks, the NBP does not emphasize the forecasting framework in its inflation reports.

Inflation targets and forecasts. Initially, end-period inflation targets signaled the NBP's disinflation goals, and from 2004 the NBP began targeting a horizontal band. All targets have been defined for the broad consumer price index (CPI). The NBP has published comparatively little information about the formalities of its inflation forecasting regime and inflation forecasts *per se*. Poland's inflation forecast is only partly model-based—it appears to rely on conditional forecasts based on unchanged interest rates. The forecasting process is supported by expert forecasts of key macroeconomic variables, which are subsequently used in single-equation models. The publicly announced forecast was initially for five quarters only, but in 2002 it was extended to seven quarters.

Inflation record and monetary policy. The disinflation process was faster than signaled by the inflation targets and inflation was below the targeted path in the first half of the sample period. In the second half of the sample, inflation was more volatile, fluctuating above and below the target band. Verbally described shocks were both inflationary and deflationary, and external and supply side shocks were used to explain target undershooting. Policy interest rates (the 28-day NBP bill rate) remained relatively high in the 2000–01 period and declined to about 5 percent thereafter. The real exchange rate fluctuated wildly around its trend.

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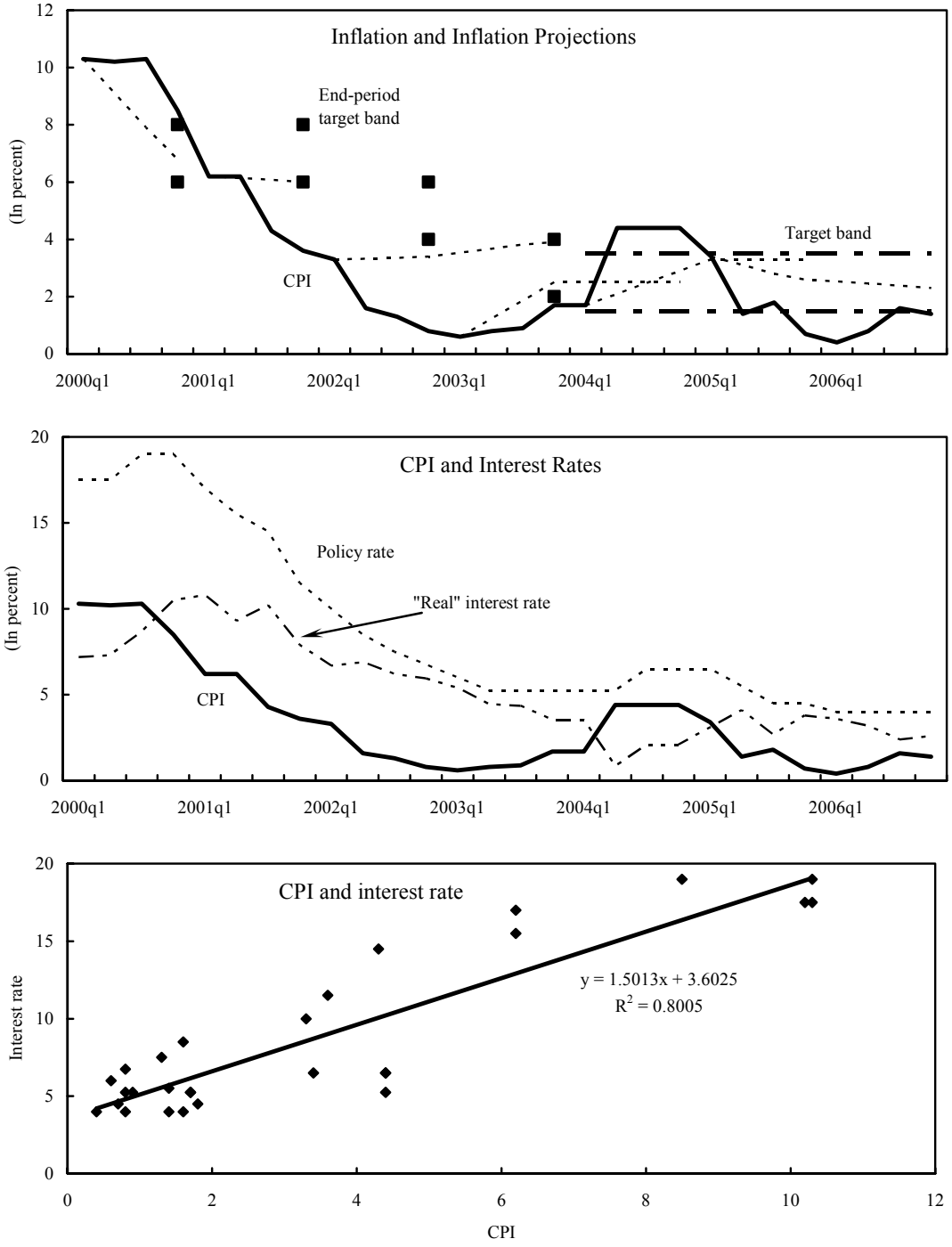
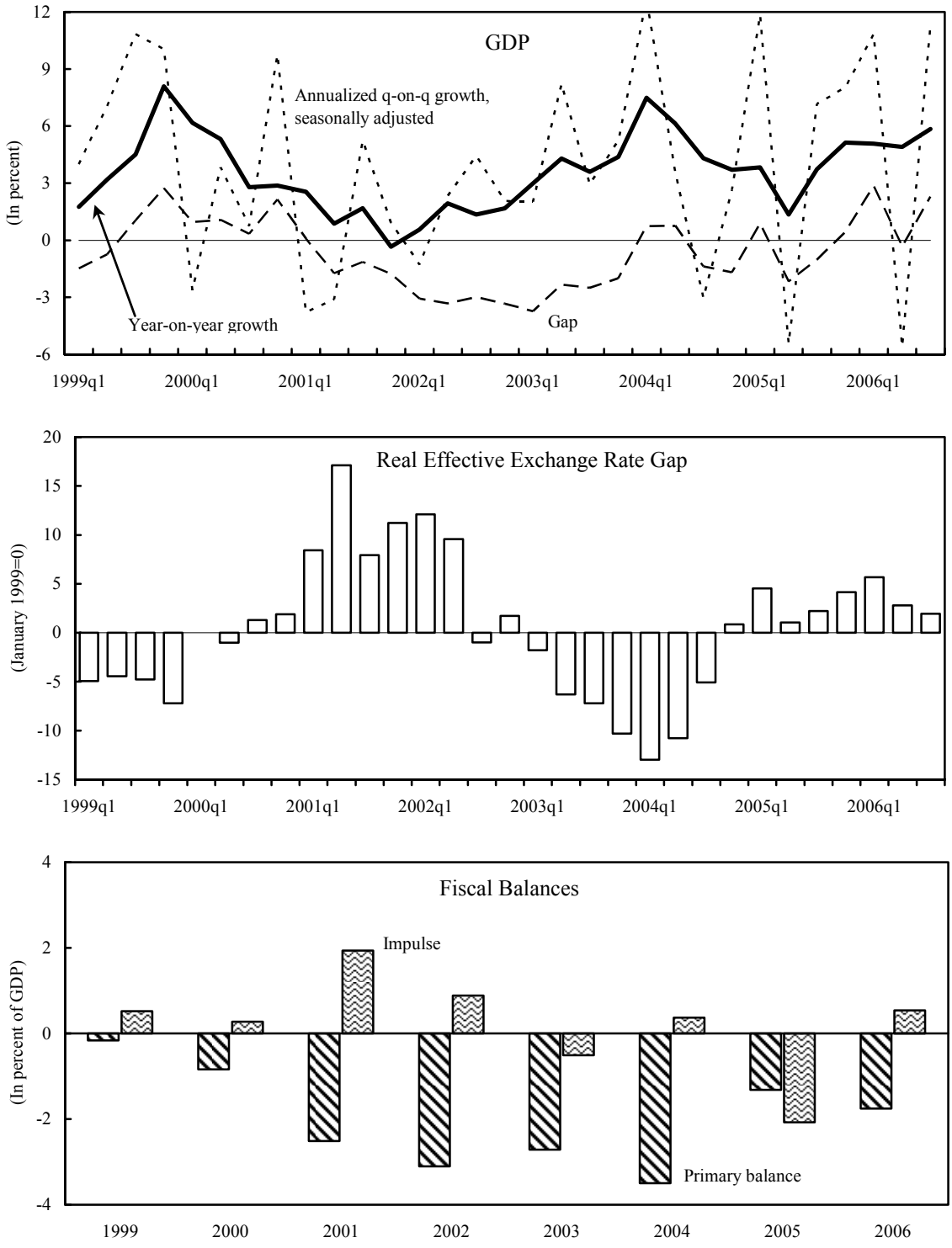
Figure 1: Poland: Inflation Developments, 2000-2006



Source: Bank Narodowy Polski; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year. Real interest rate(t) = Interest rate(t) - CPI(t).

Figure 2: Poland: Inflation Factors, 1999 – 2006



Source: Bank Narodowy Polski; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Poland: Verbal Assessments, 2000–2005

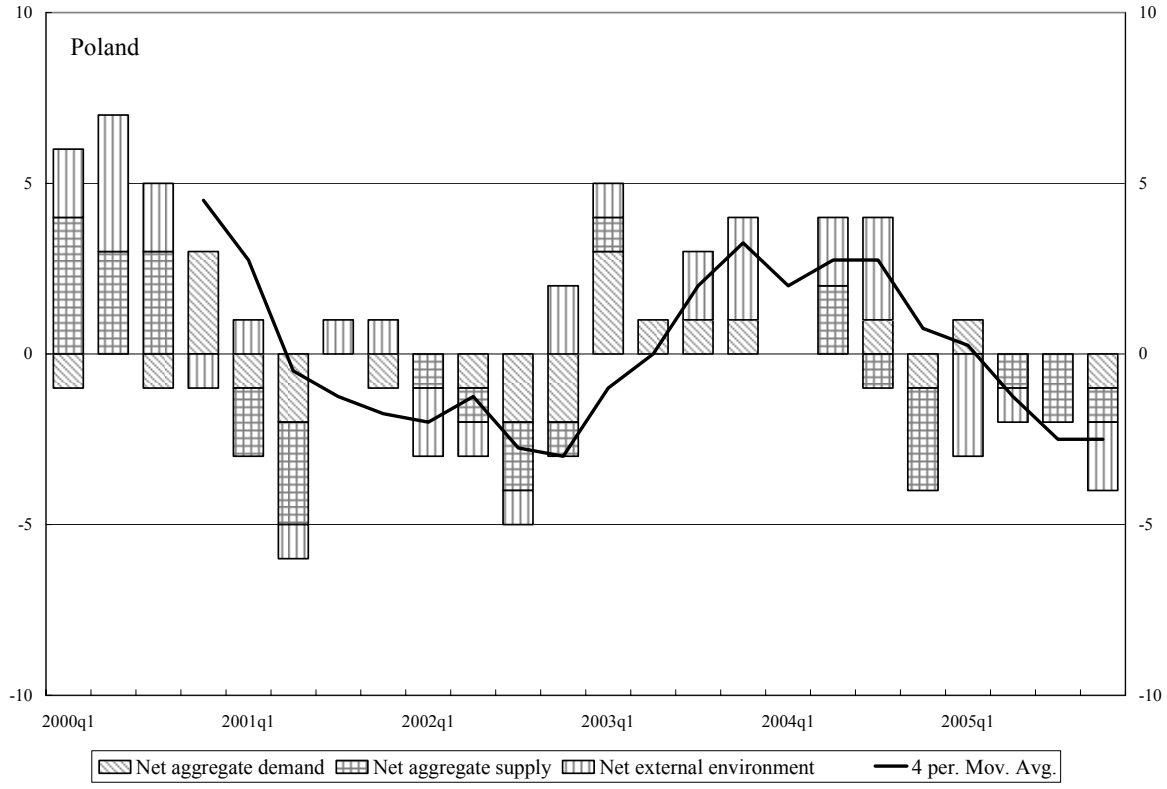
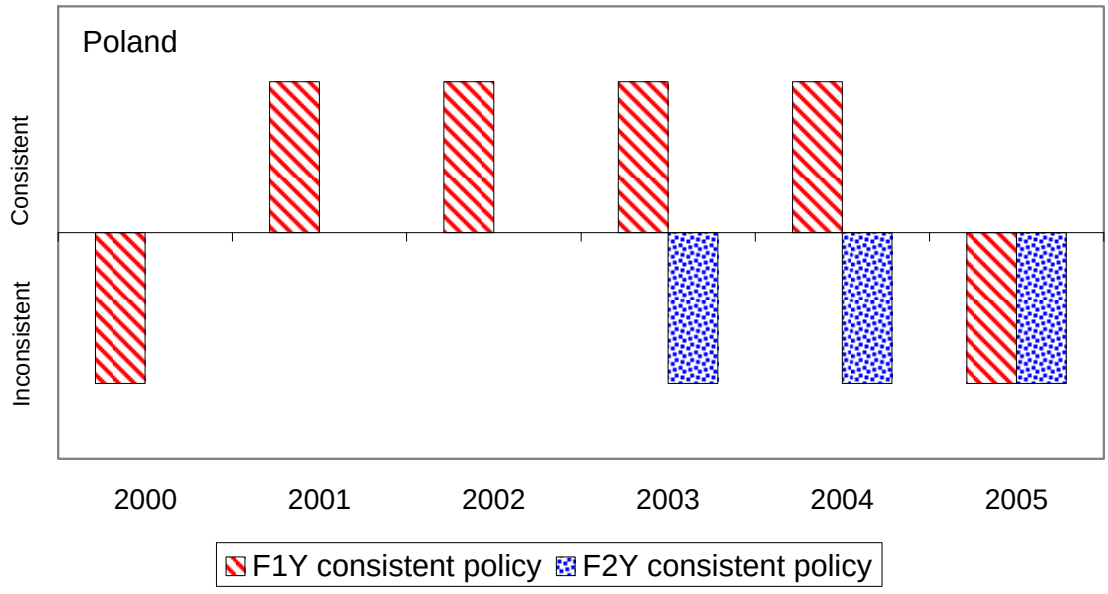


Figure 4: Poland: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

Sweden: Country Note

Basic information about the IT regime. Sweden is one of the original, full-fledged inflation targeters—the Riksbank introduced inflation targeting in 1993. The mandate of the Riksbank covers price stability only. It sets its own target for CPI, maintains instrument independence, and is not allowed to finance government deficits. The currency is floating and foreign exchange interventions have been rare. One of the explicit goals of inflation targeting is to make the Riksbank's deliberations known to a wider public, so that monetary policy is easier to follow and understand.

Inflation targets and forecasts. Throughout the period, the headline CPI target was set at 2 percent, with no band specified. During the sample period, inflation forecasts and reports were based on and followed the publicly available model. The decision-making process relied on conditional forecasts of unchanged interest rates. Starting in 2005, forecasts incorporated market expectations about policy interest rates.[12] The Riksbank published a complete set of two-year-ahead quarterly projections.

Inflation record and monetary policy. During the period under consideration, the CPI index first grew steadily—from nil to 3 percent in the third quarter of 2001. It remained above the target until mid-2003, but moved below the target afterward. The Riksbank initially saw the long-term inflation outlook as broadly balanced, with a lot of uncertainty and a volatile external environment. Deflationary external and supply-side shocks later outweighed domestic demand inflationary pressures, except for the last couple of quarters, when overall inflationary pressures revived. The Riksbank repeatedly applied escape clauses, for example to account for the decline in oil prices in early 2003. The policy interest rates were stable around 4 percent until 2002 and declining afterward. The krona was relatively weak in real terms compared to the long-term trend, the only exception being a brief period in 2002–03.

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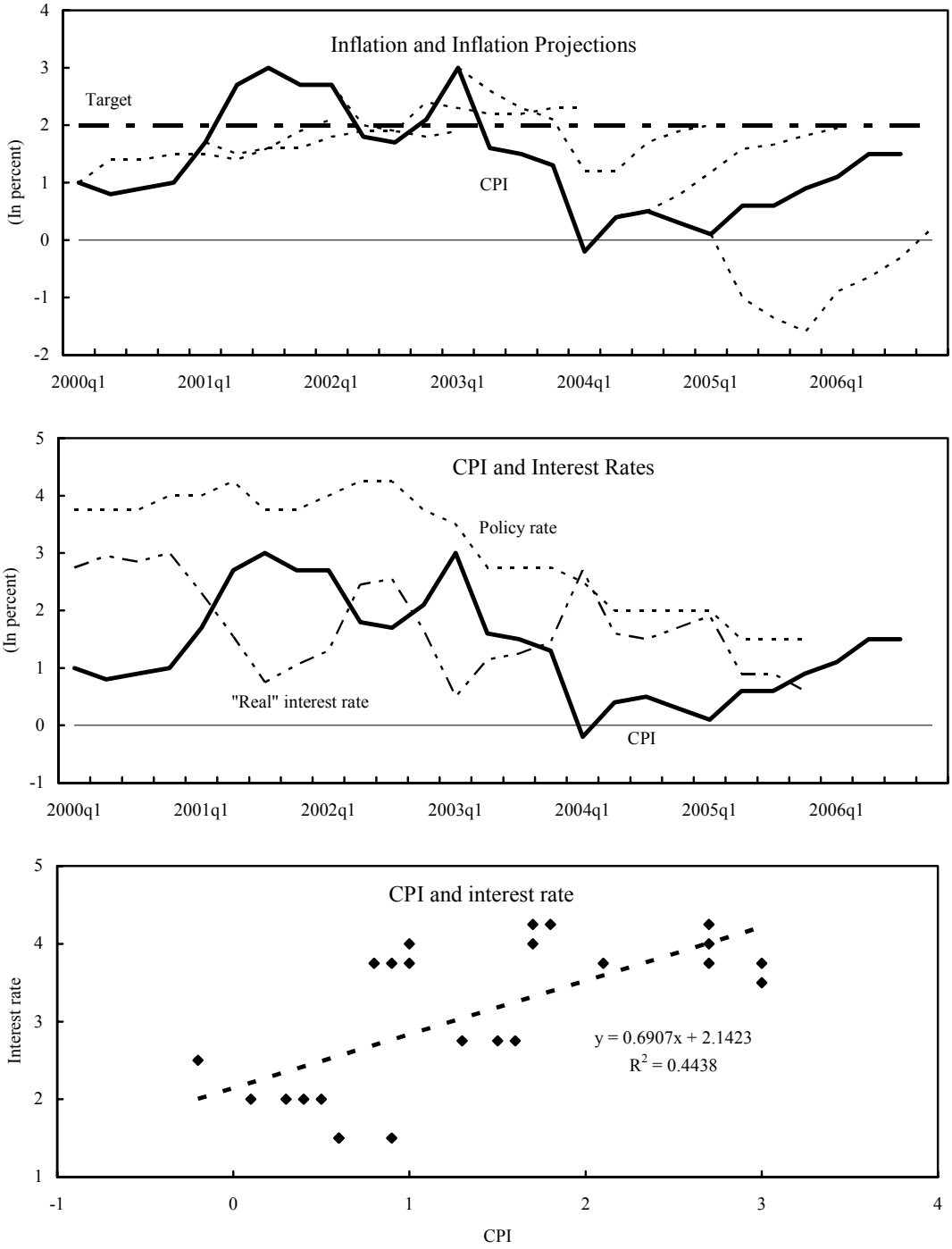
[12] In 2007, after our sample ended, the Riksbank switched from conditional to unconditional forecasts.

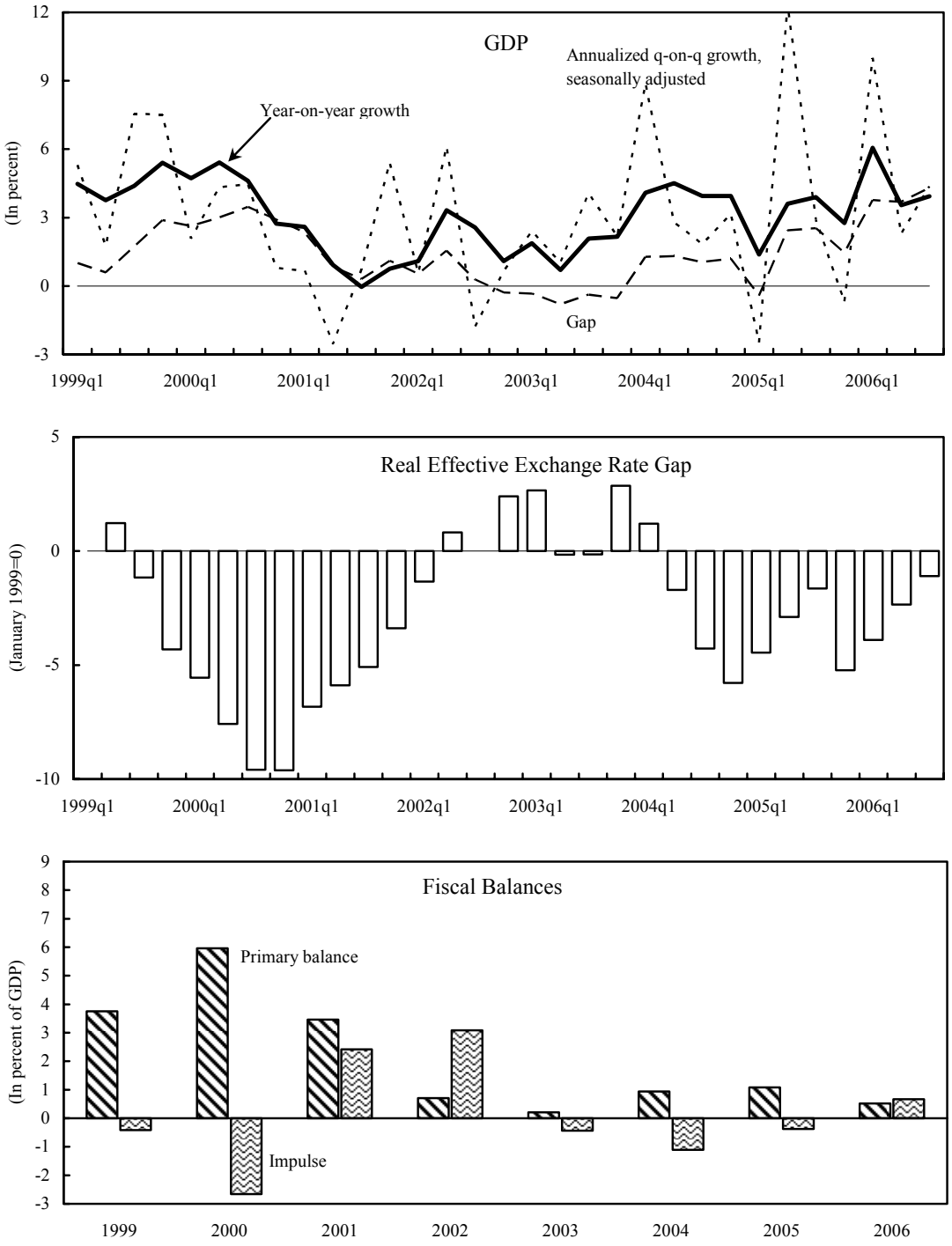
Figure 1: Sweden: Inflation Developments, 2000-2006



Source: Riksbank; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year.
Real interest rate(t) = Interest rate(t) - CPI(t).

Figure 2: Sweden: Inflation Factors, 1999 – 2006



Source: Riksbank; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Sweden: Verbal Assessments, 2000–2005

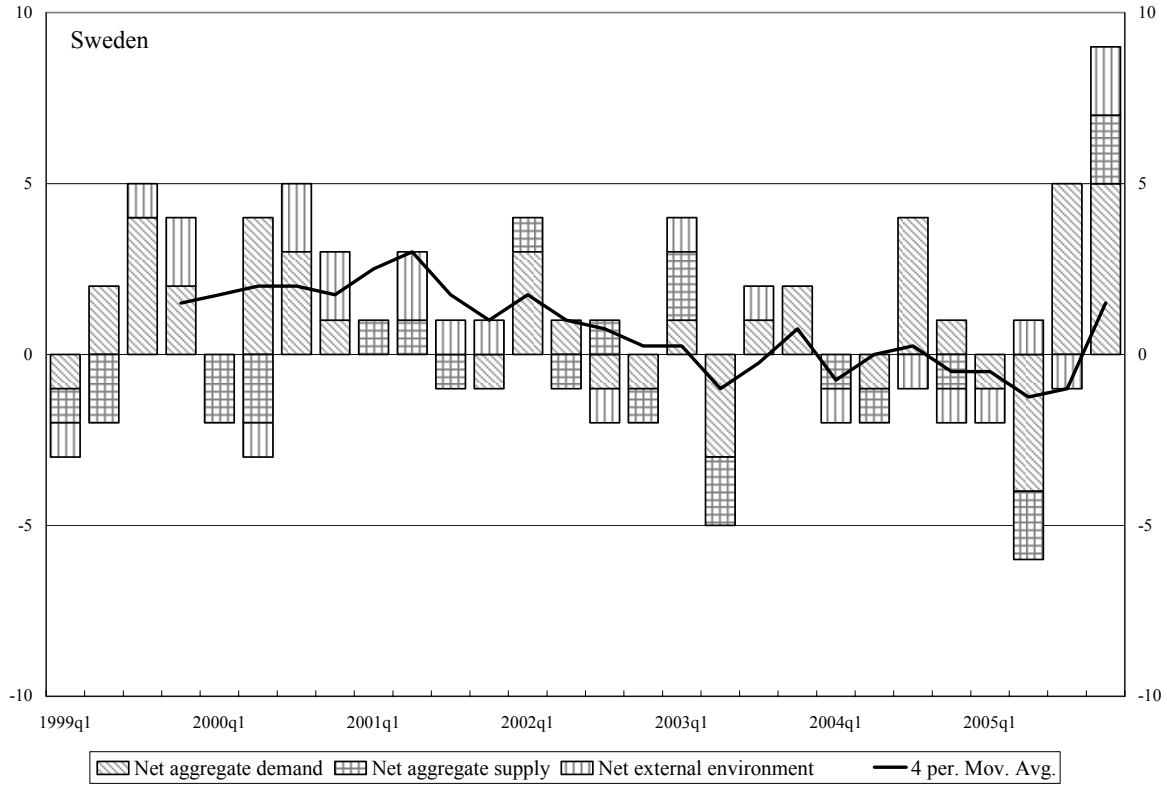
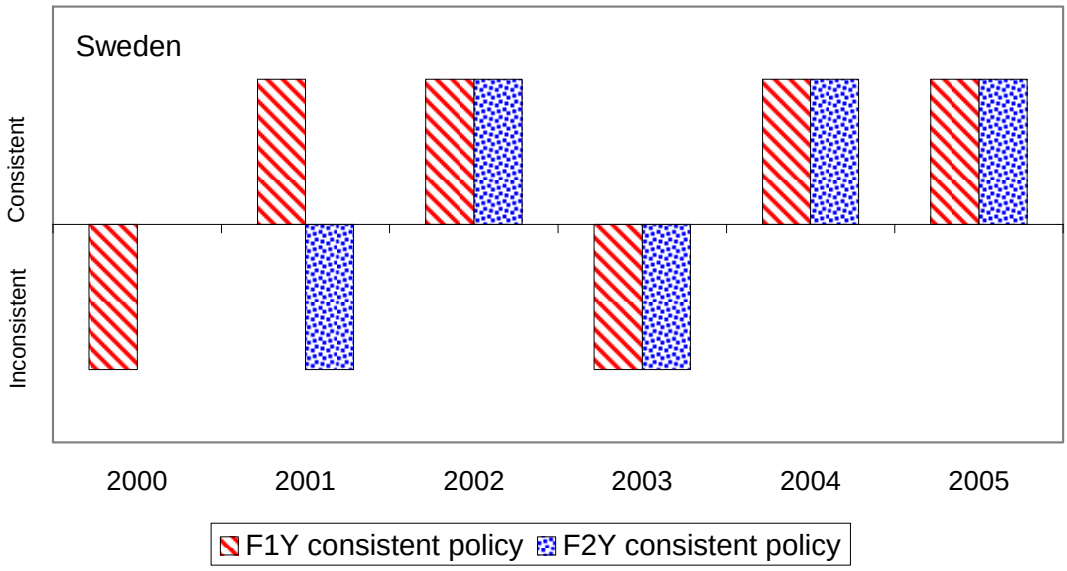


Figure 4: Sweden: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

Thailand: Country Note

Basic information about the IT regime. The Bank of Thailand (BOT) introduced inflation targeting in 2000. The mandate of the BOT is to maintain domestic and external stability. The BOT sets its own inflation target and maintains instrument independence. Thailand maintains a managed-float exchange rate regime, adopted in 1997, under inflation targeting. The BOT intervenes when necessary in order to prevent excessive volatility. Model-based inflation forecasts provide a basis for monetary policy decisions and inflation, and GDP fan charts are used as communication tools.

Inflation targets and forecasts. The BOT targets core inflation, which excludes highly volatile items such as such as rice and gasoline. The target is a horizontal 0–3.5 percent range—the widest band in our sample of inflation targeting countries. The inflation reports are model-based and information about forecast assumptions, outcomes, and the forecasting model are all made public. The forecasts cover eight quarters.

Inflation record and monetary policy. For most of the period t inflation was below the mid-point of the target range. Toward the end of the sample, core inflation picked up, but it remained inside the range. The pickup in inflation was explained mostly by external and supply-side factors. The policy interest rates (the 1-day repurchase rate) were stable until 2004 and increased sharply thereafter in response to inflationary pressures. The increase—300 basis points—was among the highest in our sample of countries. The Thai currency remained below its long-term real trend during the whole period, presumably as a result of the managed-float strategy.

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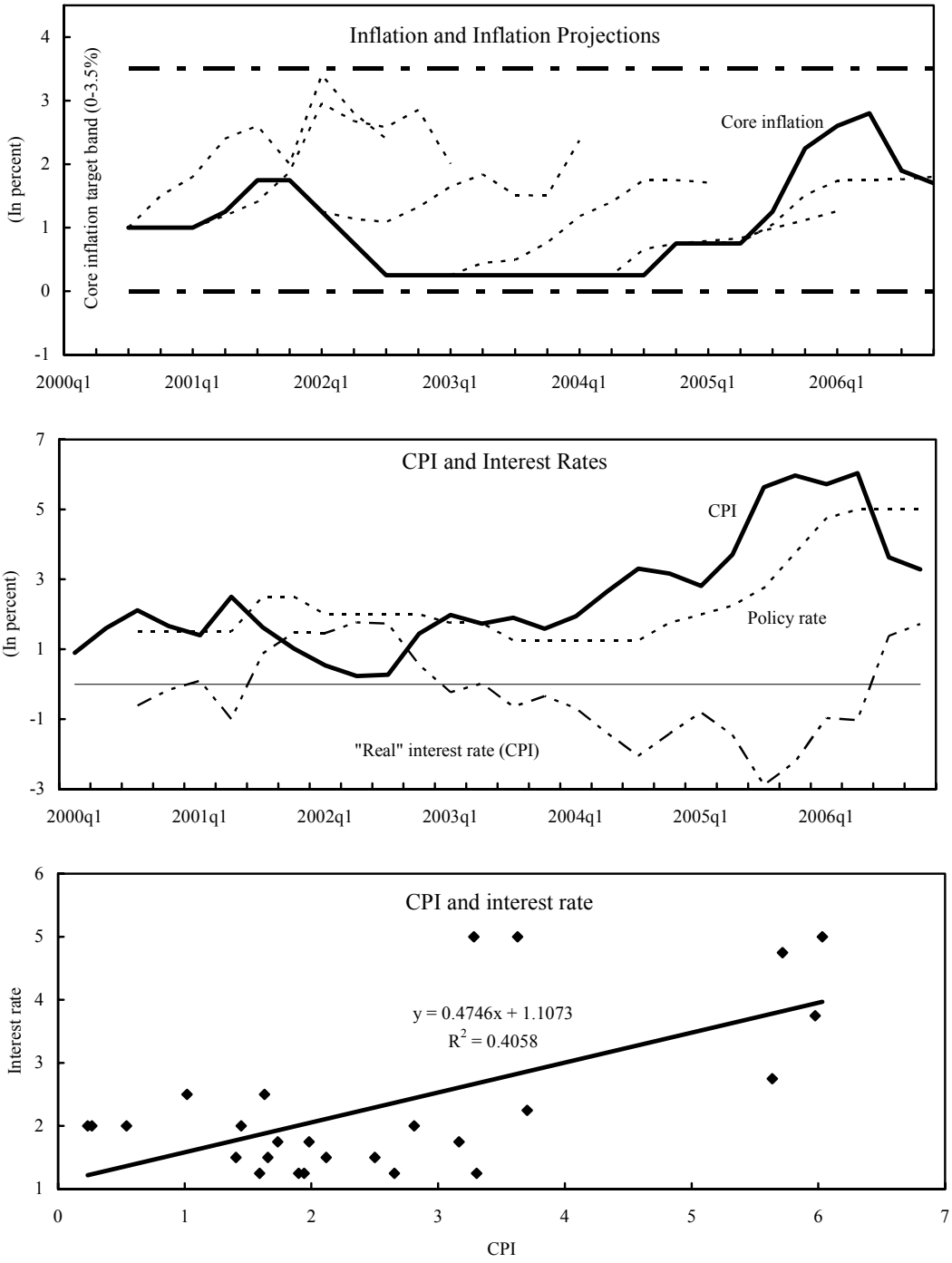
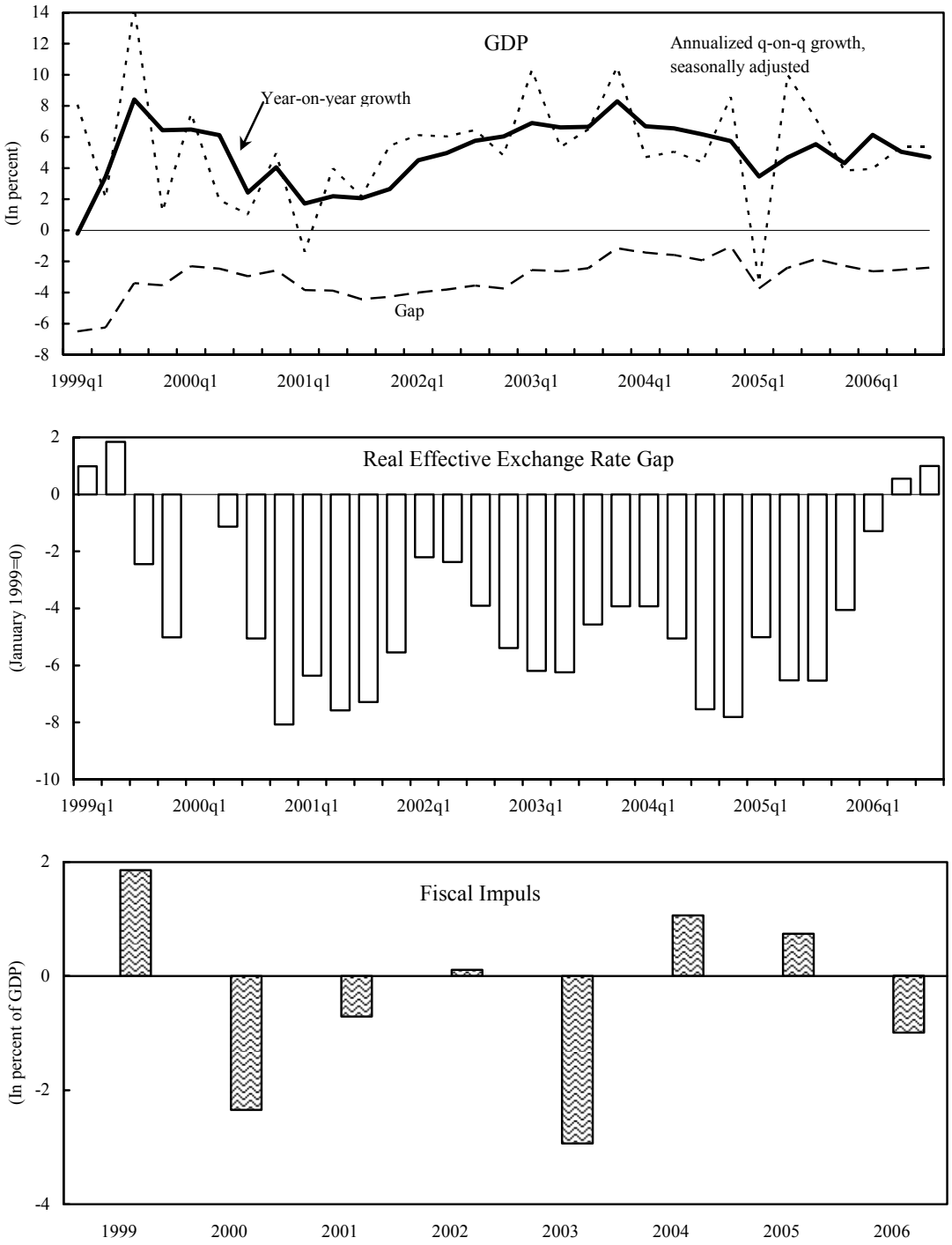
Figure 1: Thailand: Inflation Developments, 2000-2006



Source: Bank of Thailand; World Economic Outlook and International Financial Statistics.

Definitions: Inflation projections are those announced in the first quarterly IT report of each year. Real interest rate(t) = Policy rate(t) - CPI(t).

Figure 2: Thailand: Inflation Factors, 1999 – 2006



Source: Bank of Thailand; World Economic Outlook and International Financial Statistics.
Definitions: Gap = seasonally adjusted GDP - Hodrick-Prescott filtered GDP; REER gap = REER (1999=100)- Hodrick-Prescott filtered REER; Impulse = overall balance (t) - overall balance (t-1). Seasonal adjustment is done using the X-12 procedure.

Figure 3: Thailand: Verbal Assessments, 2000–2005

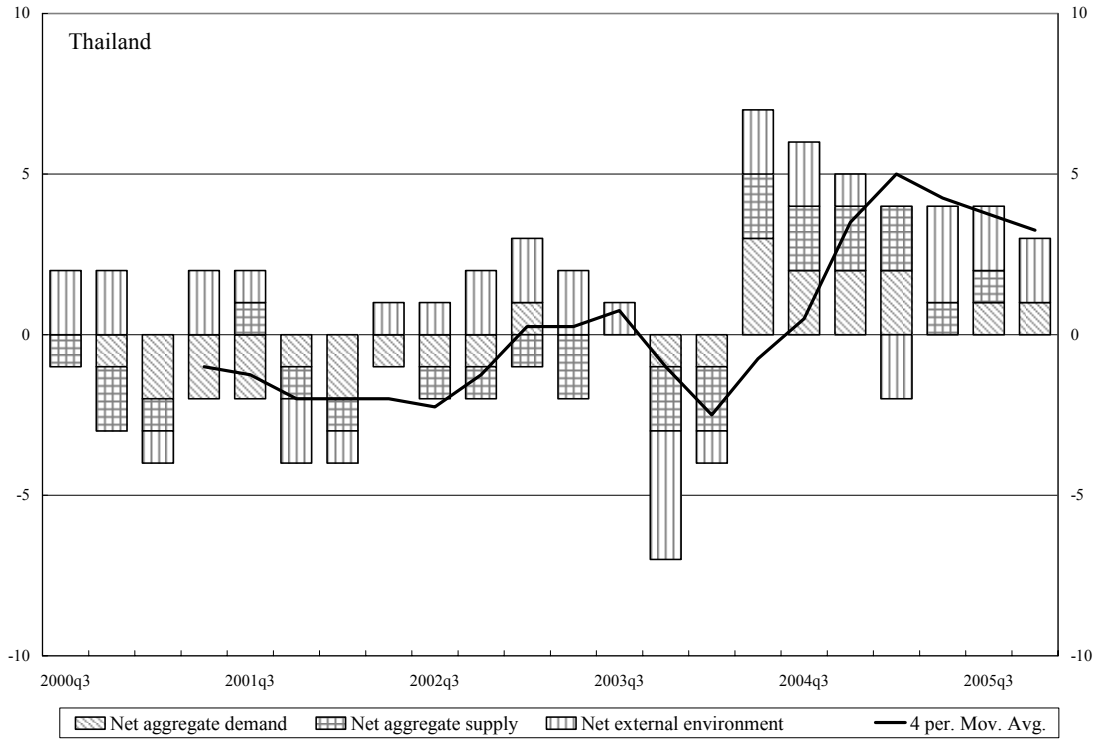
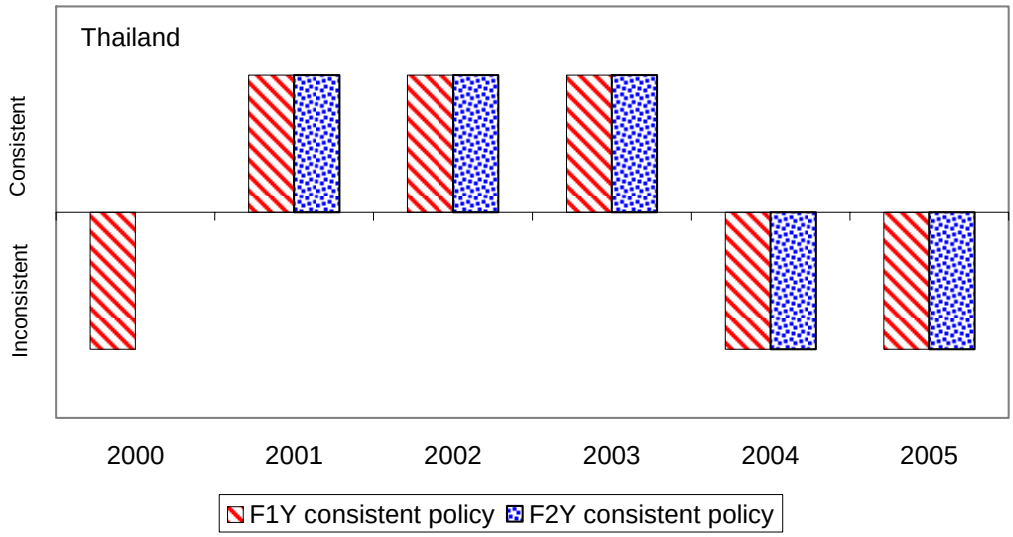


Figure 4: Thailand: Forecasts, Targets, and Policies, 2000–2005 1/



1/ "Consistent policy" implies that policy rates move in line with the difference between the inflation forecast and the target.

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