Does Inflation Targeting Make a Difference?

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Abstract

Yes. Inflation targeters (ITers) have been very successful in meeting their inflation targets (ITs). Industrial output sacrifice during inflation stabilization and industrial output volatility has frequently been lowered after IT adoption. ITers have consistently reduced inflation forecast errors after IT adoption. The influence of price and output shocks on the behavior of inflation and output gaps has changed much more strongly among ITers than in non-targeting industrial countries in the course of the 1990s. IT has played a role in strengthening the effect of forward-looking expectations on inflation, hence weakening the weight of past inflation inertia. Central bankers' aversion to inflation is on average not different among ITers in comparison to NITers but has risen in emerging-country ITers. ITers have gradually reaped a credibility gain, allowing them to achieve their targets with smaller changes in interest rates in the late 1990s than the changes that were required in the early 1990s. Chile's decade-long IT experience toward low stationary inflation shows that gradual phasing in of IT helped in reducing inflation expectations and inflation gradually, and resulted in lower output sacrifice than under a counterfactual, more aggressive strategy.

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1. Introduction

Inflation targeting (IT) is the new kid on the block of monetary regimes. Since IT was first adopted by New Zealand and Chile in 1990, a growing number of industrial and developing countries followed, anchoring their monetary policy to explicit targets for inflation.

Does adoption of IT make a difference? The experience with IT is certainly very recent, and while IT countries have reduced their inflation levels, more careful evidence provides a more cautious picture. Bernanke, Laubach, Mishkin, and Posen (1999) show that adoption of IT did not make a difference regarding the cost and speed of price stabilization. Cecchetti and Ehrmann (2000) show evidence that, on average, IT countries exhibit degrees of inflation aversion that are not higher than those of non-targeters.

However a large number of questions on the results of inflation targeting remain open. First, how successful have countries been in reducing inflation? Second, how costly has been disinflation under IT? Third, does IT improve the ability to predict inflation? Fourth, does the behavior of the macroeconomy change under IT? Fifth, does IT change central bank aversion toward inflation? Sixth, does IT change central bank behavior? Seventh, what is the transmission mechanism of IT? This paper addresses the latter questions by conducting a wide empirical search of the features and effects of IT, by comparing the performance of countries with and without inflation targets and carrying out a case study of Chile, the country with the longest IT experience among emerging-market economies.

Section 2 introduces the sample of inflation targeters used in this paper and compares their performance to that of other country groups, focusing on their success in meeting inflation targets, sacrifice ratios, and output volatility. Section 3 investigates if IT improves the ability to predict inflation by studying differences in VAR structures between inflation targeters and non-targeters. Section 4 studies if the behavior of the macroeconomy changes under IT. Section 5, drawing on the methodology of Cecchetti and Ehrmann (2000), analyzes if central banks' degree of aversion toward inflation is different for targeters and non-targeters. Section 6 studies if IT changes central bank behavior. Section 7 assesses the Chilean experience with IT and section 8 summarizes the main conclusions.

2. Are inflation targeters different from non-targeters?

Recent books and articles describe the design features and general results of inflation targeting (IT) in the small but quickly growing number of countries that have adopted inflation targeting (IT) since 1990.[1] In this section we complement the preceding work by describing the sample of inflation targeters and comparing their performance to that of other country groups. We focus in particular on their inflation performance and success in meeting their targets, as well as their output sacrifice and output volatility.

2.1 Who targets?

IT started in 1990 with public announcements of inflation targets in New Zealand and Chile. According to Schaechter, Stone, and Zelmer (2000), there had been 13 "full-fledged" IT experiences in the world up to February 2000: Australia, Brazil, Canada, Chile, Czech Republic, Finland, Israel, New Zealand, Poland, South Africa, Spain, Sweden, and United Kingdom. Of the latter, Finland and Spain had abandoned IT in January 1999 when they joined the European Monetary Union (EMU). In our count there have been 15 "full-fledged" IT country experiences until August 2000, as we add Korea and Thailand to the 13 above-mentioned countries.

For our empirical analysis conducted for the 1980-1999 period, we introduce 3 country groups (Table 1). Group 1 (called ITers) is comprised by 9 countries that have had

[1] See in particular Leiderman and Svensson (1995), Mishkin and Posen (1997), Bernanke et al. (1999), Kuttner and Posen (1999), Haldane (1999), , Mishkin (2000), Mishkin and Savatano (2000), Schachter et al. (2000).

IT in place dating back at least to 1995. This group is divided into two sub-samples: two emerging countries that are inflation-transition ITers (in the sense that they started IT at inflation levels substantially above stationary levels: Chile and Israel), and seven industrial countries that are stationary ITers (in the sense that they started IT at inflation levels close to stationary levels): Australia, Canada, Finland, New Zealand, Spain, Sweden, and the United Kingdom.

Group 2 is comprised by eight emerging economies on their way to IT during the 1990s, i.e. countries that have adopted IT either recently and/or have, as of today, a partial IT framework in place. They are Brazil, Colombia, Korea, Mexico, and South Africa. From the vantagepoint of their transition toward inflation targeting during the 1990s we call them potential inflation targeters (PITers). [2]

Group 3 – a set of control countries – is comprised by 10 industrial economies countries that are not ITers: Denmark, France, Germany, Indonesia, Italy, Japan, the Netherlands, Norway, Portugal, Switzerland, and the US. These countries have no explicit inflation target in place or, in the case of EMU members, have adopted the euro after targeting their exchange rates to the deutschmark for most of the 1990s.[3] We label this control group as non-inflation targeters (NITers).

Figure 1 depicts adoption dates and inflation rates at adoption of the 14 countries that have had IT experiences – 7 (current) ITers, 2 (former) ITers, and 5 PITers as of August 2000.[4] The following stylized facts are apparent from inspection. Only 5 industrial countries have IT in place after 1998. After early adoption by Chile and Israel, 6 years passed before additional emerging economies joined the club. However 5 additional members were added since 1998.

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[2] Czech Republic and Poland were not included due to lack of information.
[3] Switzerland adopted inflation targeting in December 2000.
[4] Starting dates are defined by the first month of the first period for which inflation targets have been announced previously. For example, the starting date for Chile is January 1991 (the first month of calendar year 1991, for which the first inflation target was announced in Sep. 1990). The initial inflation level is defined as the year-on-year CPI inflation rate of the last quarter before the first month of inflation targeting.(For instance 1990.4 in the case of Chile).

One salient feature of the international IT experience is that many emerging countries have adopted IT when they were still at inflation levels well above stationary inflation rates. In Chile and Israel inflation stood at 29% and 19%, respectively, when adopting IT in the early 1990s. In the more recent cases of IT adoption, Colombia and Mexico had initial inflation rates of 10 and 18%, respectively, Korea had initial inflation close to 5%, while in Brazil and South Africa initial inflation was close to 3%.[5] The subsequent success of emerging countries in bringing inflation toward low stationary levels is prima facie evidence that IT can be successfully adopted to reduce inflation from (low) double-digit levels toward low single-digit rates.

2.2 How successful have countries been in reducing inflation and meeting their targets under IT?

We measure IT success in three simple dimensions: the reduction of inflation shortly before and after adopting IT, the speed at which inflation was brought down from the start of IT through the attainment of stationary inflation, and the average deviation of inflation outcomes from target levels.

A general feature of IT is that countries prepare in adopting IT by reducing inflation around the date of IT adoption (noted as year t in Table 2). This feature is generally observed in industrial and emerging, transition and stationary, ITers and PITers. Depending on the selected period, 14 inflation targeters have reduced inflation rates on average by measures that range from 5.4% (between years t-2 and t+1), and 8.7% (between years t-3 and t+1). Our sample of ITers has reduced inflation on average by 5.9% (3.4%) in the period that ranges from 3 (1) years before and 1 year after IT adoption. Similar results are observed in the sample of PITers, where inflation was reduced on average by 13.8% (6.9%).

[5] Inflation attained one quarter before adopting IT.

Now let's consider the speed of convergence to stationary inflation among ITers (Table 3). ITers have reached stationary inflation levels in 10 quarters on average. Among the 9 ITers, Chile and Israel had the longest transition periods (36 and 24 quarters, respectively) – not surprisingly, considering their high initial inflation rates. Australia and Sweden were on the other extreme, as they adopted IT when they had already attained stationary inflation.

ITers have been successful in meeting their targets (Table 4). On average – as measured by their average relative deviation of actual annual inflation from target inflation – ITers have missed only 12 basis points, a figure that rises to 66 basis points when considering the average absolute deviation. Among the 9 ITers, the UK, Chile, and Canada are closest on target while Israel, Sweden, and Finland score the highest deviations. Similar results are obtained when scaling relative and absolute deviations to annual inflation rates – a necessary correction to take care of large country differences in inflation levels during transition to stationary inflation. Using this alternative measurement, Israel and Spain join Canada, Chile, and the UK as the countries that were most on target, while Finland, Australia and now Sweden show the largest deviations.

2.3 How costly has been disinflation under IT?

It is straightforward to compute sacrifice ratios – i.e. percentage output losses per percentage unit of inflation reduction – as measures of the costs of disinflation under IT. For the period that ranges from 3 years before to 1 year after IT adoption – as represented in Table 2 – sacrifice ratios are computed for GDP and industrial production, and for ITers and PITers (Table 5).[6] Among the 9 ITers, the sacrifice ratio amounted to an average of 0.60 (using GDP), 6.6 (using industrial output) and 2.6 (using industrial output but excluding Chile and Spain, two large outliers). Among 5 PITers, the sacrifice ratio was on

[6] Sacrifice ratios are computed as ratios of the sum of deviations of potential from actual output divided by the reduction in CPI inflation. They were based on annual frequency for GDP-based measures and quarterly data

average a (negative) -0.4 when using GDP and -0.2 when using industrial production. Country dispersion is moderate when using GDP and high when using industrial production, ranging from –2.3 to 2.5 and –4.2 to 23.3, respectively.

An alternative way is to compare sacrifice ratios for disinflation periods under IT to sacrifice ratios before adopting IT in the same country group, and to comparable sacrifice ratios among PITers and NITers (Tables 6a and 6b). While there is large country variation, there does not seem to be a clear difference in GDP-based sacrifice ratios before and after IT adoption among the set of 9 ITers. Excluding outliers, average sacrifice ratios before and after IT adoption are are -0.22 and 0.06, respectively. These figures are compared to the average sacrifice ratio of 0.57 recorded by NITers during disinflation periods in the 1990s and are substantially larger to the average figure of –1.84 observed among PITers (Table 6a).

However using industrial production a different result emerges. On average, sacrifice ratios after IT adoption were highly negative (-1.2) among ITers, and hence much lower than those recorded by the same country group before IT adoption (0.5), and also lower to the average sacrifice ratios observed among NITers (0.8) and PITers (-0.8). This result represents preliminary evidence suggesting that IT contributed in lowering output costs of inflation stabilization, at least when considering higher-frequency measures of industrial output (Table 6b).

A related result is referred to output volatility. We compare the volatility of industrial output before and after IT adoption in 9 ITers and only 1 PITer (Table 7). Output volatility fell in 8 of the 10 countries and in 6 of them the reduction in the standard deviation of industrial output was significant at least at the 10% level. Output volatility among ITers is similar to that observed among NITers during the 1990s.

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for industrial ouput.based measures. Average sacrifice ratios based on industrial output are calculated with

3. Does inflation targeting improve the ability to predict inflation?

This section reports country VAR models, shows differences in VAR structures between ITers and non-ITers, and compares how one-step-ahead inflation forecast errors (constructed from the country VARs) have evolved over time in the three country groups.

For the three groups of countries we have put together a database of quarterly 1980-1999 variables for five relevant macroeconomic variables: industrial production (IP), [7] money (M), consumer prices (CPI), interest rates (IR), and the nominal exchange rate (NER). To avoid treating cointegration vectors in different countries, we specify all variables (excepting the interest rate) as deviations from a potentially non-stationary trend measured with a Hodrick-Prescott filter with a 1600 penalty parameter on the second derivative of the trend. Each variable is measured as the logarithmic deviation from the trend, allowing to focus on the relationships between the stationary components of the set of macroeconomic variables.

In the case of IP the resulting series is an approximation of the gap between actual and potential output. Figure 2 depicts the evolution of industrial output gaps for the economies in the sample. In the case of inflation the resulting series can be interpreted as a measure of inflation. The dotted lines in Figure 3 show the evolution during the last two decades of the 20th century of this measure of inflation (percentage deviations respect HP trend).

We assume that the structure of the economy can be adequately described by with a non-structural vector autoregressive simultaneous equation system. We run a comprehensive model, common to all economies, described by the stationary components of their mayor macroeconomic variables. The unrestricted VAR is based on five endogenous variables, ordered from more to less endogenous: CPI, IP, M, NER, IR. We

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and without two large outliers (Chile and Spain).

[7] We use industrial production to construct a measure of the production gap due to availability of quarterly data for some of our emerging market economies.

also include two exogenous variables: international interest rates and oil prices. The ordering of the variables in the VAR assumes that the movements of the short-term interest rate are the most relatively exogenous of all the set of macroeconomic variables.[8] The VAR uses four lags and is run on a moving window of seven years for most countries. The equation of inflation in the VAR is used to generate a one-period out-of-sample forecast of inflation, which is our proxy of inflation expectations. To be able to make some robust inferences we run two types of exercises: one is for a seven-year moving window, and the other is a recursive estimation of the VAR with additional information used in every recursive estimation.

In countries that have used IT to converge to steady-state levels of inflation, inflation targets carry information on the monetary stance of the central bank. The announcement of the inflation target should be news for the market and inflation expectations should be affected by the target set by the bank. The inflation target signals how aggressive the disinflation will be during the relevant period; it acts as a coordination mechanism and a commitment device. We should expect this coordination mechanism to reduce the forecast error since agents will have a larger degree of certainty about the parameters of the economy in which they are operating.

In countries close to their steady-state levels of inflation, the inflation target carries less information than in the previous case. However the credible commitment of the monetary authority to a numerical target may also contribute to better coordination among agents and markets. For example, announcing inflation targets may reduce the reaction of agents to inflation news or the dependence of specific prices on formal or informal indexation mechanisms, aligning the reaction of the economy to the desired reaction of the central bank.

The VAR results are used for generating inflation deviation forecasts for each country, reflected by the continuous lines in Figures 3a and 3b. Up to this point we are

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[8] In the following sections we assume that short-term interest rates are, over quarterly averages, closely

using a rolling (recursive) estimation of an inflation equation to generate inflation. [9] We use four lags in the estimation, which come from a rolling and recursive estimation of Akaike, Schwartz and Hannan-Quinn information criteria for each country.[10]

To assess the effect of the inflation-targeting regime on the formation of inflation expectations we generate the square of the forecast errors from the aforementioned VARs and average them across ITers and NITers. In order to control for the fact that high inflation forecast errors could be related to high inflation levels we divide by the trend level of inflation hat we have estimated before aggregating by country.

In Figures 4a and 4b we depict average quadratic inflation forecast errors for different samples of ITers and NITers. In panels I, III and V of each figure we define the group of ITers by including each ITer only in the periods in which they had IT in place; in all other periods years they are included among NITers. However in panels II, IV and VI we define the group of ITers by including every country that had IT in place during some period in 1990-1999. Panels I and II are defined for the full country sample except Brazil and Indonesia, that were found to be very clear outliers. Panels III and IV are identical to panels I and II but for Mexico and Korea, that were excluded because of high volatility during the sample period. Panels V and VI represent an even smaller sample of only industrial countries, hence excluding Israel and Chile. In all six panels the continuous lines depict ITers and the dotted lines represent NITers.

The results suggest an effect of inflation targeting on the accuracy of the forecasts. We observe consistently that countries that adopted IT have converged to levels of

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aligned with the policy interest rate of the central bank.

[9] The dynamic properties and hence the importance of characteristics such as the ordering of the endogenous variables become relevant in the following sections.

[10] The Kullback-Liebler distance is a measure of the distance from the maximum likelihood fit of the model, and is calculated as the sum (the integral) of the deviations of the maximum likelihood function evaluated at the estimated parameters from the true fit. This measure is usually used to evaluate the fit of a time-series model and is usually approximated by the Akaike Information Criteria (AIC). It can be shown that the AIC is inconsistent in the sense that it picks larger than optimal lags. There are many ways of correcting this, usually consisting in penalizing the number of lags in the statistic. We present two of these: the Schwartz (SIC) and the Hannan Quinn (HQIC) information criteria.

accuracy similar to that of non-targeters. This convergence has occurred towards 1994 and is on top of the improved accuracy observed in the group of non-targeters. The result of panel VI suggests that this convergence process has been important for non-industrial countries ITers, such as Israel, Chile, and Mexico. The results suggest that the bonus of higher accuracy (and presumably more credibility) has been reaped by countries converging to steady-state inflation levels rather than steady-state inflation targeters. Hence inflation targeters have achieved during the last decade a significant convergence of inflation expectations to their actual inflation rates over the last decade. The similarity of results reported in Figures 4a and Figure 4b supports the robustness of this conclusion.

Most of the time-series structure of the inflation errors has been removed from the VARs on which the quadratic inflation deviation forecast errors are based. However, we still find that some time-series structure remains in the inflation series for some countries, as indicated by the correlograms presented in Table 8. Since we are not able to address this problem by including more lags, we resort to filtering the resulting forecast errors by the time-series structure suggested by the correlograms, recalculating the group averages of quadratic inflation deviation forecast errors for targeters and non-targeters. The corresponding results (Figures 5a and 5b) show that the preceding result of panels I to V are maintained while the result of panel VI provides evidence of inflation expectations convergence. While in the previous panel VI (in Figures 4a and 4b) industrial-country ITers exhibited a similar reduction of forecast errors than NITers over the 1990s, now panel VI (in Figures 5a and 5b) shows a clear convergence of ITers to NITers, as the latter had already low forecast errors since the beginning of the 1990s.

4. Does the behavior of the macroeconomy change under IT?

In order to assess if IT has changed the structure of the economies and their response to shocks, we report dynamic variance decomposition results for the country

VARs that we used in the preceding section. The dynamic simulation is performed by reporting the average share of the orthogonalized innovation of one variable in the variance of another variable using the estimated VAR parameters and the orthogonalized components of each of the endogenous variables.[11]

The variance decomposition provides information about the relative importance of each random innovation to each variable in the VAR, describing the reduced-form effects and tradeoffs that are present in an economy. If the VAR model is an adequate description of the economy, it will provide the reduced-form response of the macroeconomy that combines the interplay of private and public sector actions, including monetary policy reactions of the central bank.

We simulate dynamic variance decompositions for the rolling country VARs reported in the preceding section. [12] We report some results as aggregates for samples of IT countries and non-IT countries while others we report separately for each country. The samples of ITers and NITers were defined according to those used in the even-numbered panels of Figures 4 and 5.

The results for two sample selections are reported for both the complete set of 25 countries[13] (Figure 6a) and for an alternative smaller set of industrial countries[14] (Figure 6b). The figures show the shares of orthogonalized innovations in inflation and the output gap in the variance of inflation innovations, considering both own and cross innovations. Each figure reports separately the dynamic variance decomposition effects for the four different lags included in the VARs. The results for rolling VARs are reported for fixed

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[11] A variance decomposition is a dynamic simulation of the estimated system where a shock to an endogenous variable is separated into the orthogonal component shocks to the endogenous variables of the VAR. As usual the orthogonalized errors are constructed decomposing the estimated errors according to a Cholesky decomposition of the variance-covariance matrix.

[12] Since in section 3.1 we did not find major differences between the results from rolling VARs and recursive VARs, here we perform the exercise on rolling VARs only, in order to maximize the observed changes in economic structure.

[13] United States of America, United Kingdom, Denmark, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Portugal, Spain, Australia, New Zealand, South Africa, Brazil, Chile, Colombia, Mexico, Israel, Indonesia, and Korea.

windows of 40 quarters (depending on availability of data per country VAR), starting with 1980.1 – 1989.4 (reported as the first observation in each figure) and ending with 1990.1 – 1999.4 (reported as the last observation).

The results shows revealing commonalties and differences across country groups and over time. An innovation in the first inflation lag (reflecting first-order inflation persistence) shows some increase over time but not much difference across country groups of ITers and NITers. However the role of innovations in higher-order lags in inflation on inflation on average has fallen among ITers but increased among non-ITers – for both sample definitions corresponding to Figures 6a and 6b. This is suggestive of the role of IT in partly substituting forward-looking inflation expectations (influenced by the official inflation target) for the backward-looking roots of the inflation process.

We do not find much difference between ITers and non-ITers regarding the cross-effects of inflation shocks on output gap variances. In both country groups the effects are small and tend to fall during the 1990s. Regarding the opposite cross effect – from inflation innovations to output gap variances – more significant differences emerge between both country groups. Among ITers a large reduction in the role of inflation innovations on output variance took place in the 1990s, towards levels closer to those of NITers, who also observed some reduction in the role of inflation innovations. Hence IT may have contributed to anchor inflation expectations, helping in isolating the output gap to inflation innovations.

A third and final difference among country groups is observed regarding lagged output gap innovations on the current output gap variance. On average, output persistence – at every lag – has increased by a sizable amount among ITers throughout the 1990s, toward levels comparable to those of non-ITers, whose output persistence did not change much during the decade.

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[14] Same countries as in preceding footnote 19, except African, Latin American, and Asian countries.

The effect of innovations in the nominal exchange rate on inflation variance can be interpreted as the reduced-form passthrough from devaluation to inflation. No major differences were observed at the aggregate level of country samples – nor over time – regarding the latter innovations. However some interesting results were obtained at the country level. Country-by-country variance decomposition results are reported separately for every ITer in Figure 7. We find that the effects of innovations to the exchange rate are quite different among ITers. It is interesting to note that the two transition ITers that have converged during the 1990s to steady-state inflation (Chile and Israel) show a decline in the share of exchange-rate innovations in inflation variance during the 1990s. This result supports the notion that the devaluation-inflation passthrough has declined in both countries during the 1990s, as a result of recent (Chile) or ongoing (Israel) convergence toward a flexible exchange-rate regime and achievement of stationary inflation in both countries.

No major differences between ITers and non-ITers are observed regarding the effects of innovations in or on other variables, with the exception of the effects of innovations on interest rates, that are discussed in section 6.

5. Does IT change central bank aversion towards inflation?

Cecchetti and Ehrmann (2000), henceforth CE, have developed a useful and simple model to derive and measure the aversion of central bankers to inflation variability relative to their aversion to output variability. By maximizing a standard quadratic loss function subject to linear aggregate supply and aggregate demand equations, they derive the following equation that relates the relative aversion to inflation variability (α) to the slope of the aggregate supply curve (γ) and the variance of inflation (σ^2_π) and output (σ^2_y):

(5.1) $$\frac{\sigma_y^2}{\sigma_\pi^2} = \left[\frac{\alpha}{\gamma(1-\alpha)}\right]^2$$

Using equation (5.1) and country data for inflation and output variances and estimating aggregate supply slopes from impulse response functions that derive the output effects of supply shocks, CE calculate the inflation-aversion coefficient (a). From their country-by-country results, based on quarterly data for the 1980s and 1990s for 9 ITers and 14 NITers, CE conclude that, on average, the inflation aversion of ITers is not higher than in the control group of NITers. However, by using rolling regressions for shorter sub-samples, they also find that inflation aversion has increased significantly in most ITers shortly before, during, or after adoption of IT.

Next we redo CE's calculation for our samples of ITers and NITers, departing in 4 important ways from their empirical procedures. First our sample differs from theirs in country composition and time coverage. Regarding the latter, our quarterly sample extends from 1980 through 1999, which is longer than theirs. Second, CE define the deviation of inflation (and the corresponding variance) with regard to a constant 2% annual inflation rate, while we define it as the deviation from an estimated HP trend (as discussed in section 3) (for non-ITers) or the deviation from inflation target levels (for ITers). This has important consequences for the time-varying measures of inflation variance, as discussed below. Third, we reestimate output supply slopes from impulse response functions based on the country VARs run in section 3 and add alternative estimates based on simple Phillips-curve estimations. Finally, we reestimate inflation and output variances from our country samples.

Our results of cumulative impulse responses of output to interest rate shocks at quarterly leads, ranging from 1 to 13 quarters, are reported in Table 9a. The range of period and country responses is very wide and span from large positive to large negative supply slopes. The time averages over the 13 lead responses for each country (excepting the 5% tails of the cross-country time-series distribution) are reported in one before the last column, implying slope coefficients that vary between –7.2 (France) and 10.7

(Netherlands). We rescale linearly the latter ordering to obtain a ranking of output slope coefficients in the range spanned from 0.1 to 6.0.

As an alternative to the previous results we next estimate supply slope coefficients from the two following variants of the simple Phillips curve:

(5.2) $ygap_t = d_0 + d_1(p_t - p_{t-1})$

or

(5.2') $ygap_t = d_0 + d_1(p_t - E_{t-1}p_{t-1})$

where last period's expectation of current inflation is obtained from out-of-sample inflation projections from the VARs used in section 3.

Two measures for the output gap (ygap) were applied by using the deviations from HP trend levels of GDP and industrial output, as defined in sections 3. The different combinations of equations and output measures were estimated by OLS and TSLS (using the interest rate as the instrument for the inflation deviation, to be consistent with the VAR impulse response estimates). The sample period extends from 1980 to 1999, with quarterly data frequencies. The eight slope coefficients for the corresponding combinations of equations, output measures and estimation techniques are reported for each country in Table 9b.

The results vary again widely by estimated equation and country. Averages for each country across equations (outliers were defined as the observations of the 5% tails) are reported in the one-before-last column. The last column reports again the linearly-rescaled slope coefficients in the 0.10 – 6.0 range.

The first four columns in Table 10 report supply slope coefficients according to four available measures: the original average cross-country CE measure (2.83), the original country CE measure for those countries included by CE or 2.83 for the excluded countries, our first country measure from VAR impulse responses, and our second country measure from Phillips curves. There is much output slope variation across countries. Across our three country groups, the variation is smaller. However it is interesting to note that gammas appear to be on average consistently (i.e., in columns 2 through 4) higher in ITers than in potential PITers and NITers.

Finally we report in columns 5-8 of Table 10 country inflation aversion coefficients, based on the gammas shown in the corresponding columns 1-4 and country output and inflation variances, by applying equation (5) from CE. Our estimates for alpha are much higher on average than CE's figures, reflecting the fact that our inflation variance is much lower, as discussed above. Across different measures and countries, the average alpha is close to 0.91. There are no difference in alphas between ITers, PITers, and NITers – confirming the earlier CE result.

Next we investigate if the relative aversion to inflation has changed over the 1990s. As CE, we focus on time-varying country estimates of inflation aversion coefficients from rolling windows of equal length. In addition to the country alphas for 5-year windows depicted in Figure 8a (similar to CE's five-year window), we show alternative estimates from 3-year and 7-year window in Figures 8b and 8c. In order to minimize contamination from mismeasurement of output supply coefficient, here we use a common gamma for all countries (2.83 obtained directly from CE). We also focus our discussion on the time pattern of alphas starting about 1990 (hence starting with windows 3, 5 or 7 years before 1991) as much noise characterized policies and outcomes until the mid-1980s.

In many countries – across various groups – inflation aversion rose during the 1990s. Among ITers, revealed inflation aversion rose significantly in Finland, Sweden, Chile, and Israel. Also among many NITers inflation aversion increased significantly in the 1990s, as occurred in the U.S., Denmark, France, Germany, Netherlands, Norway, and Switzerland. Among PITers such a trend is not observed – moreover, alphas declined in Brazil and Mexico during the 1990s. Many of these country results differ significantly from those reported by CE.

To better document the differences between our results and those by CE, next we compare country alphas based on inflation variances obtained from our measures of inflation as deviations from HP trends or official inflation targets (Figure 9) and from CE's measures of inflation as deviations of 2% annual long-term inflation objective (Figure 10). We also stick to CE's gammas and 5-year rolling windows. We show that in countries that have reduced inflation substantially since the 1980s – including Sweden, New Zealand, Chile, Mexico, and Israel – the results are strikingly different. While CE's measures imply, for example, declining inflation aversion in Sweden and Chile, our measures show increasing alphas in both countries.

Finally we report aggregate dynamic alphas for four country groups and our four alternative estimates for output supply coefficient gamma. The results are based on 5-year estimation windows and our inflation variances. The country group results in Figure 11 are quite robust across different gamma estimates (i.e., different panels). They show that for the sub-group of industrial-country ITers the average alpha does not exhibit any time trend during the 1990s although there are cyclical swings. However inflation aversion shows an upward trend in the two transition ITers – Chile and Israel – since 1990. While in the mid-1990s there is a temporary decline in apha – largely reflecting a strong temporary decline in Israel (see Figures 8 and 9) – the average alpha is 4 percentage points higher in the late 1990s than around 1990.

Another country group that exhibits a significant trend rise in inflation aversion during the 1990s are the NITers, also by a magnitude close to 4 percentage points. The only group that shows a trend decline in their inflation aversion are the PITers, by an average total reduction of some 2 percentage points.

Hence regarding time trends of aversion coefficients, our results are strikingly different from CE's. Only transition ITers (Chile and Israel) show a trend increase in their alphas during the 1990s. In this they behavior they are similar to industrial-country NITers, not to other ITers.

6. Does IT change central bank behavior?

In this section we analyze if ITers differ from non-ITers regarding the behavior of central banks in setting their policy instrument – the interest rate. We approach this question from two different angles. First we report the results of inflation and output innovations on the variance of interest rates, based on dynamic variance decompositions performed on the rolling VARs estimated in section 3 and already applied to other variance decompositions in section 4. Then we report econometric results for simple Taylor policy rules to infer about the weights of inflation and output gaps in the evolution of short-term interest rates.

In Figure 12 we present the dynamic variance decomposition for the gap and inflation pressure on the interest rate. The two top panels are for the whole samples of ITers and NITers and the two bottom panels are for the industrial-country sub-samples of ITers and NITers. The most interesting result is that ITers have been able to lower the reaction of the interest rate to innovations in both inflation and the gap during the 1990s. This result is robust to inclusion or exclusion of non-industrial countries in the groups of ITers and NITers. It suggests that ITers have gradually reaped a credibility gain that allows them to achieve their inflation targets with gradually smaller changes in interest rates. Among NITers, however, the impact of inflation innovations on interest rates has not declined in the 1990s while there is some decline – at the first and second lags – of the effect of output gap innovations on interest rates among NITers.

Next we estimate a simple Taylor rule consistent with a reduced-form partial-adjustment equation for the reaction of the central bank to inflation and output gaps.[15] This equation is consistent with a central bank that determines its policy rate (r) as a weighted average of the one-period lagged rate and the optimal rate, and the latter is a function of

[15] On the robustness of simple Taylor rules see Taylor (2000).

both contemporaneous gaps, giving rise to the following reduced-form equation:

$$(6.1) \quad r_t = d_0 + d_1 r_{t-1} + d_2 pgap + d_3 ygap$$

where πgap (the inflation gap) is the difference between actual and target inflation for ITers and between actual and trend inflation for non-ITers, and ygap (the output gap) is the difference between actual and trend industrial output.

Quarterly data for the 1990-1999 period are used for each country. Country-by-country OLS results for equation (6.1) are reported in Table 11. The only result that is common across most countries is that the lagged quarterly interest rate coefficient is numerically close to 1 in most countries, reflecting a high degree of monetary policy inertia. Hence there are proportionally large differences between short and long-term effects of the inflation gap and the output gap on interest rates. While most gap coefficients are positive, as expected, they exhibit large cross-country variation in their sizes and not many are significantly different from zero.

In all countries, except Chile, the interest rate is a nominal rate. In all countries with nominal interest rates (less Brazil), the coefficient of the short-term inflation gap is smaller than 1, signaling that central banks raise nominal interest rates by less than a contemporaneous increase in inflation. In the case of Chile, the smaller-than-1 estimated coefficient is consistent with a coefficient of 1 plus the estimate under nominal interest rates. These results are similra to previous findings on Taylor rule estimations for various countries (Corbo, 2000; Restrepo, 1999; Taylor, 2000).

The long-term inflation gap coefficient is positive and significantly different from zero in 3 ITers (UK, Australia, and Israel), 4 NITers (the US, Netherlands, Japan, and Portugal), and 3 PITers (Brazil, Colombia, and Korea). Country output gap coefficients are positive in most countries, and positive and significantly different from zero in 10 countries.

Simple averaging across our 3 country groups allows to obtain the group coefficients identified at the bottom of Table 11. Among the three groups, ITers exhibit the largest inflation gap coefficient relative to the output gap coefficient although both coefficients are not significantly different from zero. NITers show gap coefficients that are small and similar in size, although only their output gap coefficient is significantly different from zero.

Next we perform rolling estimations of country Taylor rules for 10-year windows. The regressions are performed for the same samples of total ITers and NITers for which the variance decompositions for interest rates were reported in Figure 12. The corresponding results in Figures 13a and 13b are very consistent with those reported in Figure 12. Both the inflation and output gap coefficients have declined consistently among ITers – and this is observed both including transition ITers Chile and Israel (in Figure 13a) and excluding them (in Figure 13b). Such reduction is not observed among NITers, where both inflation and output gap coefficients do not exhibit any trend in the 1990s. Hence these results confirm that ITers have gradually established credibility, requiring smaller changes in interest rates in response to inflation or output shocks in the late 1990s than when they started IT in the early 1990s.

7. Does the introduction of IT make a difference? A case study of Chile [16]

Chile was the first among emerging economies to start IT and is the first that has completed transition toward full-fledged inflation targeting as well as its convergence to stationary inflation. Hence Chile's experience could be of special interest. Here we study if IT contributed in reducing inflation and if it made a difference in the speed and cost of price stabilization. It is also of interest to investigate the main channels through which IT could contribute to reduce inflation.

[16] This section draws on Corbo and Schmidt-Hebbel (2000).

In our model, IT affects inflation dynamics through its effect on inflation expectations; the latter variable, in turn, affects price and wage dynamics.

The specification we use here is an extension of the model developed in Corbo (1998), where inflation expectations, measured by the comparison of nominal and real interest rates of similar instruments, enter explicitly into the wage and inflation equations. Furthermore, inflation expectations are determined by a four-quarter moving average of contemporaneous and lagged inflation, the inflation target, and an inflation expectation error.

The full model is given by the following equations:

$$(7.1)\quad p_t^S = a_0 + a_1 w_t + a_2 \hat{e}4_t + a_3 gap_{t-1} + a_4 D2 + a_5 D3 + a_6 D4 + a_7 p_t^E + a_8 p_t^*$$

$$(7.2)\quad w_t = b_0 + b_1 p_t^E + b_2 p_{t-2} + b_3 D2 + b_4 D3$$

$$(7.3)\quad gap_t = g_0 + g_1 gap_{t-1} + g_2 tot_t + g_3 prbc_{t-2} + g_4 KPIB_t \times D96$$

$$(7.4)\quad desem_t = d_0 + d_1 gap_t + d_2 desem_{t-1} + d_3 D2 + d_4 D3 + d_5 D4$$

$$(7.5)\quad gdcc_t = c_0 + c_1 gap_t + c_2 gdcc_{t-1}$$

$$(7.6)\quad \hat{e}_t = f_0 + f_1 p_{t-1} + f_2 p_{t-1}^* + f_3 \Delta RIN_t + f_4 DESV_t + f_5 KPIB_t \times D96$$

$$(7.7)\quad p_{t+1}^E = m_0 + m_1 Tar_{t+4} + m_2 \left[(p_t + p_{t-1} + p_{t-2} + p_{t-3})/4\right] + m_3 \left[(p_t + p_{t-1} + p_{t-2} + p_{t-3})/4 - p_{t-4}^E\right]$$

$$(7.8)\quad p_t = l_0 + l_1 p_t^S + l_2 D3 + l_3 D4 + l_4 A93 + l_5 A94 + l_6 A96 + l_7 A98$$

where:

p_t^S = Core inflation, quarterly rate of change.

p_t = CPI inflation, quarterly rate of change.

p_{t+1}^E = Expected rate of inflation, quarterly, for period t+1 in base of information available at period t.

w_t = Quarterly rate of change of the wage rate.

$\hat{e}_t$ = Quarterly rate of change of the nominal exchange rate, in pesos per dollar.

$\hat{e}4_t$ = 4-quarter moving average of $\hat{e}_t$.

p_t^* = External Inflation in dollars, expressed at a quarterly rate of change.

$gap_t =$ Gap between the seasonally adjusted quarterly GDP and its trend, expressed as a percentage of the trend. The trend is measured using a Hodrick-Prescott filter.
$tot_t =$ 4-quarter moving average of the log of the terms of trade.
$prbc_t =$ Real interest rate of the Central Bank's debt with 90 days of maturity (PRBC-90) expressed at an annual rate.
$KPIB_t =$ Capital inflows as a percentage of the nominal GDP.
$desem_t =$ Quarterly Unemployment Rate.
$gdcc_t =$ Current Account Deficit of the year ending in quarter t, as percentage of nominal GDP.
$\Delta RIN_t =$ Quarterly change in the foreign reserves of the Central Bank, in dollars.
$DESV_t =$ Difference between the log of the market nominal exchange rate and the log of the central parity of the band, both in period t.
$Tar_t =$ Quarterly inflation rate implicit in the inflation target announced by the Central Bank[17].
D2, D3, D4= Seasonal dummies for the second, third and fourth quarter, respectively.
D96= Dummy variable that takes the value of one from the first quarter of 1996 until the end of the sample (2000:III).
A93, A94, A96, A98= Dummies that take the value of one for 1993, 1994, 1996 and 1998, respectively.

Equation (7.1), the equation for core inflation, is specified as the weighted average of the inflation equations for tradable and non-tradable goods and services, and also includes expected inflation. Equation (7.2) is the wage inflation equation, including lagged inflation (reflecting explicit indexation schemes in wage payments) and expected inflation (reflecting forward-looking wage contracts). Equation (7.3) determines the output gap as a function of its own lag, the terms of trade, the lagged value of the real interest rate, and capital inflows. Equation (7.4) relates the unemployment rate to the output gap (Okun's law). Equation (7.5) relates the current-account deficit to GDP ratio as a function of the output gap and its lagged value. Equation (7.6) describes the evolution of the nominal exchange rate within the exchange-rate band that was in place until late 1999. Equation

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[17] Computed by the authors linearizing the target expressed as a December-to-December rate of change.

(7.7) relates expected inflation to the forward-looking inflation target, a moving average of lagged inflation levels, and an inflation forecast error term. Equation (7.8) relates actual inflation to core inflation, introducing also seasonal dummies and annual dummies for particular weather and oil-related shocks.

Estimated model coefficients are reported in Table 12. We now proceed to compare the simulated values (obtained from the model's dynamic simulation) and actual values for core inflation. In the first simulation we take the actual real interest rate as given. The comparison of simulated and actual values for core inflation is deoicted in Figure 14. The figure shows that model forecasts are quite close to actual values, except for 1997. Using these simulated values as a benchmark (BENCHMARK 1), we proceed now with the first counter-factual simulation. Here we analyze what would have happened if the target had not been made public and therefore had not affected expectations (SIMULATION 1)[18]. That is, in SIMULATION 1 we simulate the dynamic response of the Chilean economy if inflation expectations in the 1990s had been formed in the way they were formed in the 1980s.

The comparison of simulated values with model benchmark values for core inflation are shown in Figure 15. Simulated values are above benchmark values, especially since the late 1996. These results are consistent with the hypothesis that the introduction of explicit inflation targets helped in reducing inflation. The mechanism at work here is the effect of IT on inflation expectations, wage inflation, and core inflation. A clearer picture emerges when comparing the cumulative sum over four quarters of quarterly inflation simulated by SIMULATION 1 to the benchmark values (Table 13). The comparison suggests again a clear break since late 1996, showing that the effect of the target on actual inflation became important only some time after the introduction of IT. This is not surprising, since the public was probably uncertain about the Central Bank's commitment to attain the inflation

[18] For this purpose, we first estimate an equation for inflation expectations for the period before the introduction of IT, that is up to the fourth quarter of 1990, and use this equation to model inflation expectations in the 1990s.

target during the early stage of IT. It was also for 1996 that the Central Bank announced (in September 1995) a more aggressive target of 6.5%, while the target for the previous year had been set at 9% and actual inflation had been 8.2%.

A final issue that we address is regarding the likely macroeconomic effects of alternative stabilization paths. Here we run two counter-factual simulations for the speed and intensity of price stabilization in the 1990s: a more gradualist disinflation path (SIMULATION 2) and a more aggressive path (SIMULATION 3). The gradualist strategy considers a reduction in target inflation by only 0.5 percentage point per year starting in 1994. The cold-turkey stabilization assumes a target inflation of 3% for 1996 and beyond (Table 14).

When altering the targets, the policy interest rate has to be changed accordingly. Hence the structural model presented above has to be extended to include the following policy reaction function for the Central Bank:

$$(7.9)\quad prbc_t = (1 - r) \times \left(y_0 + y_1 \left(p4^S_{t+3} - Tar4_{t+3}\right) + y_2 gdcc_{t+2}\right) + r\, prbc_{t-1} + y_3 D983$$ [19]

This policy reaction function extends the simple Taylor rule (eq. 6.1) estimated in teh previous section and is consistent with Corbo (2000), that extends previous work by Taylor (1993) and Clarida et al. (1998) for countries that follow a target of a gradual inflation reduction. In this equation, the policy interest rate is specified as a function of the gap between expected and target inflation, the gap between the current-account deficit to GDP ratio and its target value (the latter set at 4.5% of GDP), and the lagged value of the policy rate[20].

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[19] In this equation, $p4^S_t$ is the four-quarter cumulative sum of quarterly core inflation rates, $Tar4_t$ is the four-quarter cumulative sum of quarterly target inflation rates, and D983 is a dummy variable (equal to 1 in the third quarter of 1998).

[20] As the right hand side variables of this equation are endogenous variables, we estimate this equation using the generalized method of moments in order to obtain consistent and efficient estimates of the coefficients.

The amended model (that now includes the policy reaction function) is run for providing a new set of benchmark results (BENCHMARK 2). The results for simulated core inflation and actual core inflation are compared in Figure 16. The simulated values from this exercise are closer now to the actual values that the ones obtained by the BENCHMARK1 model. Hence, by endogenizing the policy interest rate, the interest rate is adjusted when the inflation forecast differs from the target, helping to bring actual inflation closer to the target.

The counter-factual simulation results for core inflation under the gradualist strategy (SIMULATION 2), the cold-turkey approach (SIMULATION 3), and the benchmark case (BENCHMARK 2) are reported in Figures 17 and 18. Unsurprisingly, core inflation under the gradualist (cold-turkey) approach is well above (below) the BENCHMARK 2 path. However the differences between the gradualist and benchmark simulations start declining toward the end of the simulation period. In the case of the cold-turkey target, the convergence of simulated values toward target values is much slower, confirming that inflation exhibits substantial inertia and that the selection of a hard target could have resulted in higher unemployment and only a small gain in terms of lower inflation.

The comparison of unemployment paths for both strategies is presented in Figure 19. The latter is a result of slow adjustment of expected inflation towards the target level. To throw further light on the cost of disinflation we also compute the sacrifice ratio for the reduction of inflation, comparing the cumulative sum of the unemployment increase with the cumulative sum of the gain in inflation reduction. The computed sacrifice ratio is –1.26. By contrast, in the case of the gradualist strategy the sacrifice ratio is only –0.95, showing that alternative disinflation speeds entail different costs of employment and output.

Finally we check the robustness of our results by using an alternative definition of inflation expectations, based on Consensus Forecast data, instead of the difference between nominal and real interest rates. For this purpose, we re-estimate equations (7.1), (7.2) and (7.7), using this alternative measure of inflation expectations, and reported the new coefficient estimates in table 12b. After introducing these new equations into the model, we re-run the benchmark and the two counter-factual simulations. The results, reported in Figures 20 and 21, are fairly similar to the ones discussed above. The sacrifice ratios are –1.26 for the cold-turkey strategy and –0.99 for the gradualist approach. This confirms the robustness of our results to alternative measures of inflation expectations.

8. Conclusions

This paper has conducted a wide empirical search on the rationale and consequences of adopting IT. By comparing policies and outcomes in full-fledged IT countries to two control groups of potential targeters and non-targeters, we have identified in which ways IT makes a difference.

ITers have been very successful in meeting their targets. Output sacrifice ratios measured by industrial production were lower after IT adoption among ITers than among potential targeters and non-targeters during the 1990s. Volatility of industrial output fell in most ITers after IT adoption, to levels similar to those among non-targeters.

ITers have consistently reduced inflation forecast errors (based on country VAR models) after IT adoption, toward the low levels prevalent in non-targeting industrial countries.

Variance decomposition results from VARs show that the influence of price and output shocks on the behavior of inflation and output gaps has changed much more strongly among ITers than in non-targeting industrial countries in the course of the 1990s. Inflation persistence has declined strongly among ITers during the 1990s. This suggests that IT has played a role in strengthening the effect of forward-looking expectations on inflation, hence weakening the weight of past inflation inertia. The influence of inflation shocks on output has declined while output persistence has increased significantly during the 1990s. The influence of price and output shocks on inflation and output gaps tended to converge among ITers in the late 1990s to the patterns observed among non-targeting industrial countries.

Regarding exchange-rate innovations on inflation – evidence of reduced-form devaluation-inflation passthroughs – no differences where identified between stationary (industrial-country) ITers and non-targeting industrial countries. However both transition ITers (Chile and Israel) show a significant decline in the share of exchange-rate innovations in inflation variance during the 1990s. This suggests that the passthrough has fallen as both countries have actually converged (Chile in 1999) or are converging (Israel) toward a floating exchange regime.

Cecchetti and Ehrmann (CE) found that the aversion of central bankers towards inflation did not differ, on average between ITers and NITers. However they found that inflation aversion increased significantly in most ITers when they adopted ITs (i.e., during the 1990s), as opposed to non-targeters. We extended CE's estimates and inflation-aversion measures in various ways and confirmed their first result: inflation aversion is on average not different among ITers in comparison to NITers. However, in opposition to CE's second result, we do not find evidence that industrial-country (stationary) ITers showed increasing inflation aversion through the 1990s. In contrast, inflation aversion increased in the emerging-country (and transition) ITers: Israel and Chile. Also in opposition to CE, we find a trend increase in inflation aversion among industrial-country NITers. Among potential ITers (PITers), inflation aversion fell during the 1990s.

Does IT change central bankers' behavior in setting interest rates? First we performed variance decomposition exercises from country VARs to test for changes in the response of interest rates to inflation and output innovations. In fact, the reaction of interest rates to both inflation and output shocks has declined significantly among ITers throughout the 1990s. Among industrial-country NITers, however, these reductions were either nil or much weaker in the 1990s. Next we estimated Phillips curves that confirmed the latter result: the coefficients of inflation and output gaps have monotonically declined in both emerging and industrial ITers during the 1990s – as opposed to unchanged parameters among NITers. This result suggests that ITers have gradually reaped a credibility gain, allowing them to achieve their ITs with smaller changes in interest rates in the late 1990s than the changes that were necessary to adopt in the early 1990s.

Chile is the emerging country that has used IT for the longest period and where inflation has already converged to the steady-state long-term target. Hence it is of much interest to draw lessons from this experience. Three main conclusions emerge. First, the initial progress in reducing inflation toward the target is slow as the public is learning about the true commitment of the central bank to attain the target. Second, the gradual phasing in of IT helped in reducing inflation expectations, contributing to reduce inflation directly by lowering inflation expectations and indirectly by changing wage and price dynamics. Third, with respect to the speed of inflation reduction, a cold–turkey approach would have resulted in a larger sacrifice ratio stemming from higher unemployment during the early years of IT when credibility was gradually built up.

References

Agénor, P.R. (2000). "Monetary Policy under Flexible Exchange Rates: An Introduction to Inflation Targeting", *manuscript*, World Bank, August.

Bernanke, B. S., Laubach, T., Mishkin, F. S. and A. S. Posen (1999). *Inflation Targeting: Lessons from the International Experience*. Princeton University Press: Princeton.

Cecchetti, S. and M. Ehrmann (2000). "Does Inflation Targeting Increase Output Volatility? An International Comparison of Policimakers preferences and Outcomes". *Central Bank of Chile Working Papers* 69, April.
http://www.bcentral.cl/Estudios/DTBC/69/dtbc69.pdf

Clarida, Richard, Jordi Gali, and Mark Gertler, (1999), "Monetary Policy Rules in Practice: Some International Evidence." *European Economic Review* 42(6), June 1998, pages 1033-67.

Corbo, V. (2000). “Monetary Policy in Latin America in the 90s”. *Central Bank of Chile Working Papers* 78. http://www.bcentral.cl/Estudios/DTBC/78/dtbc78.pdf

Corbo, V. (1998). “Reaching One-Digit Inflation: The Chilean Experience”. *Journal of Applied Economic*s 1 (1), November.

Corbo, V., A. Elberg and J. A. Tessada (1999). “Monetary Policy in Latin America: Underpinnings and Procedures”. *Cuadernos de Economia*; 36(109), December, pages 897-927.

Corbo, V. and K. Schmidt-Hebbel (2000). “Inflation Targeting in Latin America”. Paper presented at the Latin American Conference on Fiscal and Financial Reforms, Stanford University, November 2000.

Haldane, A. (1999). *Targeting Inflation*. London, England: Bank of England.

Kuttner, K. N. and A. S. Posen (1999) “Does Talk Matter After All? Inflation Targeting and Central Bank Behavior.” *Federal Reserve Bank of New York Staff Report* #88, October.

Landerretche, O., F. Morandé, and K. Schmidt-Hebbel. “Inflation Targets and Stabilization in Chile”, in L. Mahadeva and G. Sterne (editors): *Monetary Policy Frameworks in a Global Context*, Routledge, London, October 2000.

Leiderman, L. and L. Svensson (1995). *Inflation Targeting*, London, England: CEPR.

Mishkin, F. S. 2000b. "Inflation Targeting in Emerging Market Countries," *American Economic Review*, May, 90, #2, forthcoming.

Mishkin, F. and A. Posen (1997). “Inflation Targeting: Lessons from four Countries”, *Federal Reserve Bank of New York Economic Policy Review* 3: 9-117.

Mishkin, F. S. and M. Savastano, 2000. "Monetary Policy Strategies for Latin America," *NBER Working Paper* No. 7617.

Morandé, F. (2000) “A Decade of Inflation Targeting in Chile: Main Developments and Lessons”, Central Bank of Chile, *maniscript*, July.

Morandé, F. and K. Schmidt-Hebbel (2000). “Monetary Policy and Inflation Targeting in Chile”, in M. I. Blejer, A. Ize, A. M. Leone, and S. Werlang (editors): *Inflation Targeting in Practice: Strategic and Operational Issues and Application to Emerging Market Economies*. International Monetary Fund, Washington, DC, June 2000.

Restrepo (1998). “Reglas monetarias en Colombia y Chile”. *Coyuntura Económica, Fedesarrollo,* Vol. XXVIII, No. 4 diciembre de 1998.

Schaechter, A., M.R. Stone, and M. Zelmer (2000). “Practical Issues in the Adoption of Inflation Targeting by Emerging Market Countries”. M*anuscript*, IMF, July.

Taylor, John B. (2000). *Monetary Policy Rules*. The University of Chicago Press, Chicago and London.

Taylor, John B. (1993), "Discretion Versus Policy Rules in Practice" *Carnegie-Rochester Conference Series on Public Policy*, 39, pp 195-214.

Data Appendix

Inflation Targeting periods

Consider countries as inflation targeters in the following periods: United Kingdom from the fourth quarter of 1992 onwards, Sweden from the first quarter of 1993 onwards, Canada from the first quarter of 1991 onwards, Finland from the first quarter of 1993 to prresent, Spain form the third quarter of 1996 to the fourth quarter of 1998, Australia from the fourth quarter of 1994 onwards, New Zealand from the second quarter of 1990 onwards, Chile from the fourth quarter of 1990 onwards and Israel from the first quarter of 1991 onwards.

Industrial Production

For all countries, except for the following, the Seasonally Adjusted Industrial Production Index, code 66.. czf of the IFS catalogue, for Switzerland, the Seasonally Adjusted Industrial Production Index (90=100) , code 66.. izf of the IFS catalogue, for Turkey, the Industrial Production Index, code 66.. zf of the IFS catalogue, for New Zealand, the Seasonally Adjusted Manufacturing Production Index, code 66ey.czf of the IFS catalogue, for Chile, Colombia and Mexico, the Manufacturing Production Index, code 66ey.czf of the IFS catalogue.

Money

For all countries, except for the following, Money , code 34..zf of the IFS catalogue + Quasi-Money, code 35..zf of the IFS catalogue, Germany, Italy, Finland and Spain, Currency in Circulation + Demand Deposits, code 34a.nzf + 34b.nzf of the IFS catalogue.

Inflation

For all counties, Consumer Prices, code 60..zf of the IFS catalogue.

Interest Rate

1 For Norway, Denmark, Sweden and Spain, the Call Money rate, code 60 b..zf of the IFS catalogue, for Switzerland, Italy, Korea and Japan, the Money Market rate, code 60 b..zf and 60 p..zf of the IFS catalogue, for the USA, the Federal Funds rate, code 60 b..zf of the IFS catalogue, for the United Kingdom, the Overnight Interbank rate, code 60 b..zf of the IFS catalogue, for Canada, the Overnight Money Market rate, code 60 b..zf of the IFS catalogue, for Finland, the Average Bank Lending rate, code 60 p..zf of the IFS catalogue, for Turkey, the Interbank Money Market rate, code 60 b..zf of the IFS catalogue, for Austria, the New Issue rate -3 Months T-Bills, code 60 c..zf of the IFS catalogue, for New Zealand, Comm. Bill Rate (90 Day Max), code 60 b..zf of the IFS catalogue, for Chile, the Monthly Average rate of 90-D Deposit Certificates, source BRC, for Mexico, the Treasury Bill rate, code 60 b..zf of the IFS catalogue, for Israel, the Overall Cost of Unindexed Credit, code 60 p..zf of the IFS catalogue, for Colombia, the Lending rate, code 60 b..zf of the IFS catalogue.

Nominal Exchange Rate

For all countries, except for the following, the Market rate, code ..rf..zf of the IFS catalogue, Norway, Sweden, Switzerland and Finland, the Official rate, code ..rf..zf of the IFS catalogue, Chile and Mexico, the Principal rate, code ..rf..zf of the IIFS catalogue.

For any variable x, we construct log(x)-log(hpx). In this measure of deviations from trend we compare each moments observation with the trend, ignoring the position of the variable with respect to the trend in the previous period. With this variable we are measuring the position of the variable with respect to the trend and not the change of the variable from period to period.

Table 1

Country Sample of Inflation Targeters (ITers), Potential Inflation Targeters (PITers), and Non-Inflation Targeters (NITers) during the 1990s

ITers		Potential ITers	Non-ITers
Transition ITers	**Stationary ITers**		
Chile	Australia	Brazil	Denmark
Israel	Canada	Colombia	France
	Finland	Mexico	Germany
	New Zealand	Korea	Indonesia
	Spain	South Africa	Italy
	Sweden		Japan
	United Kingdom		Netherlands
			Norway
			Portugal
			Switzerland
			United States

Table 2

Alternative Measures of Initial Disinflation in Inflation Targeting Countries

	(t-1 ; t+1)	(t-2 ; t+1)	(t-3 ; t+1)
Australia	0.9	-1.3	-5.4
Brazil	-3.2	-6.9	-15.8
Canada	-3.3	-3.5	-2.5
Colombia	-17.5	-16.0	-17.3
Chile	-10.6	-1.6	0.8
Finland	-1.5	-3.0	-5.0
Israel	-8.1	-6.2	-9.3
Korea	-3.6	-4.1	-3.7
Mexico	-8.7	-13.4	-27.2
New Zealand	-5.8	-4.7	-14.1
Spain	-1.2	-1.0	-2.4
Sweden	-0.1	-7.1	-8.3
South Africa	-1.4	-3.1	-4.8
United Kingdom	-1.3	-3.9	-7.0
Average	**-4.4**	**-5.4**	**-8.7**

Note: Projected inflation was used for South Africa, Brazil, Colombia, and Mexico.
Source: Authors´ calculations based on data from IFS and JP Morgan.

Table 3

Convergence to Stationary Inflation under Inflation Targeting in 14 Countries: 1989-2000(1)

	Initial Inflation	(Date)	Final Inflation	(Date)	Quarters of Convergence	Inflation Change	Average Inflation per Quarter
ITers							
Australia	1.2	(1993.1)	1.2	(1993.1)	0	0.0	-
Canada	4.9	(1990.4)	1.6	(1992.1)	5	-3.3	-0.7
Chile	29.0	(1990.4)	2.5	(1999.4)	36	-26.5	-0.7
Finland	2.5	(1992.4)	2.0	(1993.3)	3	-0.5	-0.2
Israel	18.5	(1991.4)	1.9	(1999.4)	24	-16.7	-0.7
New Zealand	4.4	(1989.2)	2.8	(1991.2)	8	-1.6	-0.2
Spain	4.7	(1994.3)	1.6	(1997.2)	11	-3.1	-0.3
Sweden	1.8	(1992.4)	1.8	(1992.4)	0	0.0	-
United Kingdom	3.6	(1992.3)	1.8	(1993.1)	2	-1.8	-0.9
Average	**7.8**		**1.9**		**9.9**	**-5.9**	**-0.5**
Potential ITers							
Brazil(2)	8.3	(1999.4)	7.9	(2000.1)	1	-0.4	-0.4
Colombia	10.0	(1999.2)	10.6	(2000.2)	4	0.6	0.2
Korea	5.1	(1997.4)	0.7	(1999.1)	5	-2.4	-0.5
Mexico	17.6	(1998.4)	10.6	(2000.1)	5	-7.0	-1.4
South Africa	2.0	(1999.4)	2.0	(1999.4)	0	0.0	-
Average	**8.6**		**6.4**		**3.0**	**-1.8**	**-0.5**
Overall Average	**8.1**		**3.5**		**7.4**	**-4.4**	**-0.5**

(1) Convergence refers to most recent available observation. Stationary inflation for countries that do not explicitly annouce a long - term inflation target is calculated as inflation attained by industrial countries (2-3%).

(2) Initial Inflation is calculated 2 quarters ahead, in order to adjust for the extraordinarily low inflation in 1999:1.

Source: Authors´ calculations based on data from IFS, country sources, and Schaechter, et al.

Table 4

Annual Average Deviation of Actual from Target Inflation under Inflation Targeting in 12 Countries: 1989-2000 (various subperiods)[1]

	(Percentage points)		(As a ratio to current inflation)	
	Relative	**Absolute**	**Relative**	**Absolute**
ITers				
Australia	-0.18	1.13	1.25	1.44
Canada	-0.15	0.20	-0.60	0.67
Chile	-0.12	0.40	-0.08	0.12
Finland	-0.69	0.69	-2.12	2.12
Israel	0.46	1.62	0.02	0.14
New Zealand	0.06	0.40	-0.08	0.25
Spain	0.15	0.45	-0.01	0.21
Sweden	-0.71	0.71	1.05	1.05
United Kingdom	0.09	0.31	0.00	0.12
Average	**-0.12**	**0.66**	**-0.06**	**0.68**
Potential ITers				
Brazil	n.a.	n.a.	n.a.	n.a.
Colombia	-5.23	5.23	-0.54	0.54
Korea	-2.30	2.30	-0.71	0.71
Mexico	-0.68	0.68	-0.06	0.06
South Africa	n.a.	n.a.	n.a.	n.a.
Average	**-2.74**	**2.74**	**-0.44**	**0.44**
Overall Average	**-0.78**	**1.18**	**-0.16**	**0.62**

[1] Relative (absolute) deviation: sum of relative deviations divided by number of periods. Relative (absolute) deviation as a ratio to current inflation: sum of relative (absolute) deviations as ratios to inflation divided by number of periods. Depending on the IT framework. inflation target is defined as a range or as a point.
Source: Authors´calculations based on data from IFS. country sources. and Schaechter. et al.

Table 5

Sacrifice Ratios during Inflation Stabilization with Inflation Targeting in 14 Countries: 1980-2000
(based on annual GDP, and quarterly industrial production data, various subperiods)[1]

ITers	GDP	Ind. Output	PITers	GDP	Ind. Output
Australia	1.1	3.3	Brazil	-0.2	-0.2
Canada	-2.3	-4.2	Colombia	0.2	1.8
Chile	-0.4	23.3	Korea	0.4	1.7
Finland	2.4	6.2	Mexico	-0.0	-2.7
Israel	0.6	4.6	South Africa	-2.3	-1.5
New Zealand	0.2	-2.1			
Spain	2.5	18.2			
Sweden	0.6	6.6			
United Kingdom	0.9	3.8			
Average	**0.6**	**6.6**		**-0.4**	**-0.2**

(1) Sacrifice ratios calculated as cumulative GDP variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change between 3 years before and 1 year after IT adoption year.
Source: Authors´calculations based on data from IFS and country sources.

Table 6a

Sacrifice Ratios during Inflation Stabilization in 14 IT Countries and 11 Non-IT Countries: 1980(1990)-2000 (based on annual GDP data, various subperiods)[(1)]

ITers			**PITers**		**Non-ITers**	
	Before	**After**	During 1990s			During 1990s
Australia	-1.41	0.01	Brazil	-0.58	Denmark	0.90
Canada	-6.84	0.64	Colombia	0.00	France	-0.45
Chile	0.37	-0.7	Korea	0.15	Germany	-0.12
Finland	0.03	-4.74	Mexico	-3.06	Indonesia	2.36
Israel	0.17	-0.14	South Africa	-5.69	Italy	0.25
New Zealand	-0.67	0.22			Japan	1.46
Spain	-0.85	0.82			Netherlands	1.47
Sweden	0.08	0.22			Norway	-0.87
United Kingdom	0.75	0.02			Portugal	-0.39
					Switzerland	0.87
					United States	0.78
Average	**-0.22**[(2)]	**0.06**[(2)]		**-1.84**		**0.57**

[(1)] Sacrifice ratios calculated as the cumulative GDP variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change in any disinflation period. ITers´ sacrifice ratios are calculated before (since 1980) and after adopting IT framework. Outlier observations are excluded.
[(2)] Excluding Canada and Finland.
Source: Authors´calculations based on data from IFS and country sources.

Table 6b

Sacrifice Ratios during Inflation Stabilization in 14 IT Countries and 11 Non-IT Countries: 1986(1990)-2000 (based on quarterly industrial production data. Various subperiods)[1]

ITers			**PITers**		**Non-ITers**	
	Before	**After**		During 1990s		During 1990s
Australia	-1.3	0.1	Brazil	0.0	Denmark	-0.8
Canada	-1.2	1.4	Colombia	-0.1	France	-1.2
Chile	-0.5	-0.6	Korea	-0.4	Germany	3.0
Finland	3.2	-4.5	Mexico	-0.6	Indonesia	-3.3
Israel	3.5	0.0	South Africa	-2.9	Italy	3.7
New Zealand	-0.2	-0.2			Japan	2.8
Spain	1.8	-4.9			Netherlands	3.7
Sweden	0.0	-2.2			Norway	-0.7
United Kingdom	-0.8	0.3			Portugal	-0.1
					Switzerland	2.0
					United States	-0.7
Average	**0.5**	**-1.2**		**-0.8**		**0.8**

[1] *Sacrifice ratios calculated as the cumulative Industrial Production variation (to a trend calculated by a Hodrick-Prescott filter) divided by inflation change in any disinflation period. ITers´ sacrifice ratios are calculated before (since 1986) and after adopting IT framework. Outlier observations are excluded.*
Source: Authors´calculations based on data from IFS and country sources.

Table 7

Output Volatility in 14 IT Countries and 11 Non – IT Countries: 1980-2000

(based on quarterly industrial production data, various subperiods)[1]

ITers			**Potential ITers**			**Non ITers**	
	Before	**After**		**Before**	**After**		**During 1990s**
Australia	2.8	1.2	Brazil	4.8	-	Denmark	2.8
Canada	4.4	2.2	Colombia	4.5	-	France	1.6
Chile	6.2	3.1	Korea	3.6	9.4	Germany	2.4
Finland	3.1	2.5	Mexico	4.0	-	Italy	2.3
Israel	2.9	1.7	South Africa	3.2	-	Japan	3.3
New Zealand	3.4	3.1				Indonesia	1.4
Spain	2.4	1.7				Netherlands	2.2
Sweden	3.1	3.4				Norway	2.8
United Kingdom	2.4	1.3				Portugal	10.8
						Switzerland	2.8
						United States	2.3
Average	**3.4**	**2.2**		**4.2**	**9.4**		**3.2**

[1] Volatility calculated as standard deviation of industrial production variation (to a trend calculated by a Hodrick-Prescott filter).
Source: Authors´calculations based on data from IFS and country sources.

Table 8: P-Value for a Ljung-Box Q-Statistic on Rolling and Recursive Residuals of VARs (Test for 6 lags) and Time Series Structure of the Forecast Errors Implied from Autocorrelation and Partial Autocorrelation Functions

Rolling

US	**UK**	**Den**	**Fra**	**Ger**	**Ita**	**Neth**	**Nor**	**Swe**	**Swi**	**Can**	**Jap**	**Fin**	**Por**	**Spa**	**Aus**	**NZ**	**SA**	**Bra**	**Chi**	**Col**	**Mex**	**Isr**	**Ina**	**Kor**
0%	0%	2%	2%	50%	4%	82%	58%	57%	4%	74%	4%	3%	1%	0%	91%	16%	2%	24%	6%	29%	57%	26%	80%	0%
0%	0%	3%	1%	12%	7%	88%	77%	50%	12%	77%	6%	7%	1%	0%	78%	37%	1%	22%	9%	14%	69%	49%	3%	0%
0%	0%	3%	0%	24%	10%	61%	30%	17%	23%	78%	10%	7%	1%	0%	91%	15%	1%	27%	13%	20%	58%	28%	6%	0%
0%	0%	6%	0%	37%	19%	67%	35%	17%	35%	83%	18%	6%	2%	0%	45%	18%	2%	39%	17%	28%	47%	27%	10%	0%
0%	0%	6%	1%	5%	28%	75%	40%	6%	43%	82%	27%	10%	2%	0%	56%	27%	4%	34%	23%	31%	60%	23%	17%	1%
0%	0%	9%	1%	3%	36%	84%	29%	10%	54%	90%	38%	15%	2%	0%	68%	38%	7%	44%	32%	28%	72%	12%	25%	2%
AR(1)	AR(1)	MA(1)	AR(1)	AR(5)	AR(1)				AR(1)		AR(1)	MA(1)	AR(1)	MA(1)			AR(1)						MA(2)	MA(2)

Recursive

US	**UK**	**Den**	**Fra**	**Ger**	**Ita**	**Neth**	**Nor**	**Swe**	**Swi**	**Can**	**Jap**	**Fin**	**Por**	**Spa**	**Aus**	**NZ**	**SA**	**Bra**	**Chi**	**Col**	**Mex**	**Isr**	**Ina**	**Kor**
1%	0%	54%	1%	42%	1%	48%	6%	34%	0%	26%	6%	2%	0%	0%	21%	23%	3%	22%	59%	14%	48%	68%	5%	2%
2%	0%	81%	1%	5%	1%	68%	11%	19%	0%	52%	12%	1%	0%	0%	45%	49%	4%	20%	60%	9%	1%	50%	0%	2%
2%	0%	53%	0%	10%	2%	20%	11%	7%	0%	69%	15%	3%	0%	0%	39%	20%	7%	23%	63%	6%	2%	53%	0%	2%
0%	0%	61%	0%	16%	4%	29%	16%	10%	0%	83%	25%	5%	1%	0%	7%	30%	11%	34%	75%	10%	2%	70%	0%	2%
0%	0%	74%	0%	1%	8%	40%	17%	9%	1%	82%	20%	6%	2%	0%	12%	43%	15%	29%	84%	7%	3%	55%	0%	4%
1%	0%	75%	0%	1%	13%	52%	11%	14%	1%	90%	13%	9%	2%	0%	17%	56%	23%	39%	57%	10%	5%	67%	0%	8%
AR(1)	AR(1)		AR(3)	AR(5)	AR(1)				AR(1)			AR(1)	AR(1)	MA(1)			AR(1)				MA(2)		AR(1)	AR(1)

Table 9a: Aggregate Supply Estimations and Average Estimations used for Ranking of Gammas: OLS and IV

Dependent variable	inf-inf(-1)	inf-exp(-1)	inf-inf(-1)	inf-exp(-1)	inf-inf(-1)	inf-exp(-1)	inf-inf(-1)	inf-exp(-1)	Average	Relative
Independente variable	GDP Gap		Industrial Prod. Gap		GDP Gap		Industrial Prod. Gap		without	with gammas
Method	TSLS with lagged interest rate as IV				OLS				outliers	0.0 -6.0
Chile	7.06	38.83	0.79	4.32	-0.18	0.01	0.04	0.61	1.81	6.00
Spain	0.68	73.56	0.10	11.07	0.00	0.00	0.00	-0.02	0.86	4.59
Israel	-0.25	-124.91	0.05	24.81	-0.04	1.30	0.15	1.84	0.51	4.07
Australia	-0.08	1.48	-0.05	0.89	0.01	-0.16	0.00	0.04	0.27	3.71
United Kingdom	-0.07	0.97	-0.21	3.04	0.06	-0.97	0.04	-0.80	0.26	3.70
Colombia			-0.07	0.46			0.10	-0.18	0.08	3.43
Korea	0.48	-0.02	0.14	-0.01	0.08	-0.14	0.03	-0.10	0.06	3.40
Sweden	0.19	-0.10	-0.06	0.03	0.07	0.03	0.03	-0.13	0.01	3.33
Denmark	-0.01	-0.28	0.00	-0.11	0.19	0.12	-0.01	-0.02	-0.01	3.29
New Zealand	-0.15	0.82	0.24	-1.34	-0.03	0.12	0.03	-0.02	-0.04	3.25
Japan	-0.04	-0.12	-0.03	-0.08	-0.09	-0.32	-0.01	-0.15	-0.10	3.16
Finland	0.13	-0.69	0.04	-0.20	0.00	-0.12	0.01	-0.13	-0.12	3.14
United States of America	-0.02	-0.46	-0.01	-0.26	0.06	-0.36	0.04	-0.05	-0.13	3.12
Norway	-0.02	-0.41	-0.02	-0.47	0.01	-0.10	0.02	-0.14	-0.14	3.10
Netherland	0.03	-0.55	0.03	-0.67	-0.04	-0.66	0.03	-0.11	-0.24	2.96
Canada	0.05	-0.83	0.10	-1.61	0.03	-0.71	0.02	-0.31	-0.41	2.71
Francia	0.00	-1.86	0.00	-1.45	0.00	-0.36	-0.02	-0.18	-0.48	2.59
Germany			0.02	-1.65			-0.02	-0.34	-0.50	2.57
Sudáfrica	-0.14	-2.08	-0.12	-1.78	0.03	-0.83	-0.01	-0.32	-0.66	2.34
Italy	-0.15	-3.50	-0.08	-1.77	0.00	-0.20	0.00	-0.04	-0.72	2.25
Portugal	-0.04	-2.22	-0.03	-1.82	0.05	-1.19	-0.03	-0.78	-0.76	2.19
Mexico	1.49	-5.88	1.47	-5.78	0.05	-0.67	0.21	1.50	-0.95	1.90
Switzerland	-0.04	-0.97	-0.27	-7.39	0.05	-1.21	0.01	-0.39	-1.28	1.42
Indonesia			-1.30	-4.73			0.07	-0.17	-1.53	1.04
Brazil			-26.44	2873.96			-2.16	695.17	-2.16	0.10

Table 9b: Aggregate Supply Estimations and Average Estimations used for Ranking of Gammas: Relative Impulse Responses

	Ratios of Current Effects: Relative Responce at t+i (a)												
	t+1	**t+2**	**t+3**	**t+4**	**t+5**	**t+6**	**t+7**	**t+8**	**t+9**	**t+10**	**t+11**	**t+12**	**t+13**
Netherland	8.8	-1.5	-9.5	-13.5	1.8	9.3	11.5	14.9	-102.5	-342.1	255.1	298.4	-25.1
Spain	0.0	0.1	6.6	-1.4	-0.8	0.1	-0.6	-1.2	-1.7	-1.1	-5.1	1.7	2.4
Israel	19.4	-5.2	-3.6	-2.7	-1.4	-5.1	-0.4	3.6	-2.0	-17.2	-3.5	-9.3	-14.1
Sudáfrica	-26.5	-16.2	13.3	-18.6	-3.6	-2.2	-7.8	-11.2	-5.3	-2.4	-6.0	-8.8	-6.4
Italy	-6.1	-2.1	4.5	0.5	0.5	2.8	2.3	7.6	-76.6	-296.7	-8.4	-17.6	3.8
Portugal	-1.4	10.5	9.6	2.7	2.2	3.5	0.3	-2.5	-13.7	10.9	3.8	1.6	0.4
Australia	2.7	6.6	15.1	55.9	11.6	10.0	9.9	27.7	7.4	21.7	7.2	20.7	7.8
Chile	2.6	9390.5	-12.3	-0.7	-1.4	-1.9	-3.1	-13.0	4.1	-25.8	-51.8	-85.4	914.7
Norway	-1.8	-33.4	-4.2	-1.0	-0.6	-1.5	-2.2	-1.0	-0.6	-0.8	-1.3	-1.1	-0.6
Canada	-3.0	-2.9	2.7	10.2	1.4	-8.5	-7.1	-0.2	1.5	0.2	26.6	-5.3	0.7
Mexico	22.6	-0.2	3.5	2.2	0.0	-1.0	7.3	3.2	-4.9	-2.3	-1.4	-0.5	-0.2
Indonesia	-0.7	-0.7	1.8	4.3	-3.1	-0.9	12.9	8.2	-24.6	-3.5	521.9	-0.9	-1.6
Switzerland	-0.7	-7.6	-1.7	-0.7	-2.7	-128.4	-3.2	-2.4	-6.1	11.5	-16.3	-10.3	170.9
Brazil	32.0	-2.6	3.6	2.6	34.1	-2.0	0.0	-2.8	-0.3	-3.7	0.2	-0.5	2.1
Japan	45.9	17.3	28.8	13.9	11.0	9.5	6.5	5.2	1.0	-3.2	23.1	-38.4	-16.3
United Kingdom	-0.5	0.4	3.4	1.4	2.1	-5.4	8.7	6.3	1.3	7.2	5.1	394.2	-2.6
Denmark	-7.4	4.8	-5.5	4.5	28.2	31.0	-3.4	-9.9	-365.1	-1.8	-11.9	17.1	-0.8
Sweden	2.0	1.1	-0.4	0.5	0.6	1.2	0.9	1.2	1.1	1.4	3.8	-7.9	10.8
United States of America	0.1	0.1	0.0	0.0	0.0	-0.1	0.1	-0.2	0.2	0.1	0.0	-0.5	0.1
Korea	0.7	0.5	0.1	-0.2	0.7	0.9	1.0	0.9	0.9	0.8	0.9	1.0	1.0
Finland	-2.9	-74.6	-12.7	4.5	-0.9	-3.4	-9.2	-12.0	-5.6	-2.7	-0.9	-0.2	-0.1
Germany	-1.0	-0.4	0.2	-44.9	3.5	-0.5	0.1	-132.5	1.2	-0.2	-2.7	-1.5	13.1
Colombia	2.0	1.8	-0.2	1.0	0.3	1.6	2.5	56.0	1.6	1.7	3.2	1.1	0.9
New Zealand	-0.7	0.1	-1.1	-0.5	1.5	0.9	1.3	-6.0	-2.3	-2.6	0.1	0.2	14.6
Francia	285.0	6.9	-12.1	-8.5	1.3	-5.4	4.5	4.6	9.5	6.2	2.1	-0.3	-3.0

	Ratios of Accumulated Effects: Relative Responce up to t+i (b)													**Average without 5% tails**	**Relative with gammas 0.0 -6.0**
	t+1	**t+2**	**t+3**	**t+4**	**t+5**	**t+6**	**t+7**	**t+8**	**t+9**	**t+10**	**t+11**	**t+12**	**t+13**		
Netherland	-16.6	-9.6	-9.6	-9.7	-8.2	-6.5	-4.5	-2.9	-1.5	0.2	2.0	3.7	5.4	10.7	6.00
Spain	-0.2	-0.1	-0.7	-0.8	-0.8	-0.6	-0.6	-0.6	-0.7	-0.7	-0.8	-0.9	-0.9	9.7	5.65
Israel	6.9	5.6	3.3	2.4	2.0	1.8	1.5	1.7	1.5	1.2	1.0	0.8	0.6	2.3	3.23
Sudáfrica	97.4	-64.2	134.0	-104.5	-20.8	-12.1	-11.6	-11.5	-10.3	-8.7	-8.5	-8.5	-8.2	1.9	3.07
Italy	-4.0	-3.3	-4.1	-7.2	-8.8	-4.9	-2.3	-1.5	-1.6	-2.2	-2.7	-3.2	-3.9	1.3	2.90
Portugal	-5.2	-0.5	1.2	1.5	1.7	1.9	1.8	1.5	1.1	0.8	0.5	0.3	0.3	1.3	2.89
Australia	37.5	19.0	25.0	31.7	52.4	17.1	23.0	24.6	-72.4	79.3	-13.6	-84.9	-8.2	1.0	2.80
Chile	-0.6	5.0	7.9	5.3	3.6	2.7	2.1	1.6	1.6	1.9	2.9	4.1	4.8	0.8	2.73
Norway	-2.4	-2.8	-2.9	-2.5	-2.0	-1.9	-1.9	-1.8	-1.6	-1.5	-1.5	-1.4	-1.3	0.8	2.73
Canada	-2.6	-3.3	0.8	3.0	3.3	4.7	1.7	1.0	1.1	1.0	1.5	1.5	1.4	0.8	2.72
Mexico	4.9	6.7	-6.8	-0.1	0.0	-0.3	-0.8	-1.6	-2.1	-2.2	-2.0	-1.6	-1.5	0.7	2.70
Indonesia	-2.8	-2.1	-1.2	-0.1	-0.7	-0.8	-1.2	-1.6	-2.1	-2.2	-2.4	-2.3	-2.3	0.5	2.61
Switzerland	0.7	-0.1	-0.5	-0.5	-0.8	-1.1	-1.3	-1.4	-1.7	-2.1	-2.4	-2.5	-2.7	0.2	2.52
Brazil	5.2	3.8	3.7	3.6	4.2	3.3	2.5	1.8	1.7	1.4	1.2	1.0	1.1	0.0	2.46
Japan	-13.4	-115.4	106.1	37.1	24.6	19.9	17.1	15.7	15.0	14.4	14.5	15.4	17.2	-0.3	2.38
United Kingdom	-1.1	-0.8	-0.4	-0.2	-0.1	-0.2	-0.2	-0.1	-0.1	0.1	0.2	0.3	0.4	-0.4	2.34
Denmark	-4.9	-6.3	-6.4	-8.5	-11.8	-14.1	-19.1	-28.5	-21.5	-12.6	-12.5	-15.5	-25.5	-0.4	2.32
Sweden	0.6	0.8	0.5	0.5	0.3	2.4	1.7	1.8	15.8	0.5	1.5	2.6	2.9	-1.7	1.91
United States of America	0.2	0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	1.90
Korea	1.9	1.4	1.1	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	-2.1	1.75
Finland	-14.3	-10.2	-7.4	-0.2	-0.6	-1.4	-2.1	-2.7	-3.1	-3.0	-2.4	-1.8	-1.4	-2.4	1.68
Germany	0.9	-0.1	0.0	0.3	0.6	0.4	0.3	0.4	0.5	0.4	0.5	0.7	0.7	-2.6	1.61
Colombia	-6.2	-16.7	9.2	5.5	3.8	3.3	3.3	2.9	3.1	3.3	3.3	4.8	21.1	-3.9	1.19
New Zealand	-0.8	-0.5	-0.5	-0.5	-2.5	-22.9	7.2	2.9	1.0	-0.3	-0.2	-0.1	0.3	-5.6	0.60
Francia	-36.8	91.4	-237.5	-75.6	61.9	31.1	177.1	-31.9	-17.7	-10.4	-6.0	-4.3	-4.0	-7.2	0.10

(a) Impact of a period-t innovation in monetary policy on the ratio of period t+i (i=1,...,13) inflation to industrial output.

(b) Impact of a period-t innovation in monetary policy on the ratio of cumulative t+1 to t+i (i=1, ...,13) inflation to industrial output.

Table 10: Estimates of Central Bank Inflation Aversion: Robustness Exercise

	Gammas				Alphas			
	Average of Cecchetti and Ehrmann	Cecchetti and Ehrmann or Average	Ranking of Aggregate Supplies	Ranking of Impulse Responses	Average of Cecchetti and Ehrmann	Cecchetti and Ehrmann or Average	Ranking of Aggregate Supplies	Ranking of Impulse Responses
Inflation Targeters	**2.83**	**3.39**	**3.83**	**2.63**	**0.92**	**0.89**	**0.94**	**0.89**
Australia	2.83	4.65	3.71	2.80	0.88	0.92	0.90	0.88
Canada	2.83	1.80	2.71	2.72	0.93	0.90	0.93	0.93
Chile	2.83	0.84	6.00	2.73	0.95	0.85	0.98	0.95
Finland	2.83	3.76	3.14	1.68	0.94	0.95	0.94	0.90
Israel	2.83	1.42	4.07	3.23	0.88	0.79	0.92	0.90
New Zealand	2.83	0.67	3.25	0.60	0.92	0.74	0.93	0.72
Spain	2.83	1.22	4.59	5.65	0.96	0.90	0.97	0.98
Sweden	2.83	2.35	3.33	1.91	0.94	0.93	0.95	0.92
United Kingdom	2.83	13.76	3.70	2.34	0.89	0.97	0.91	0.87
Potential Targeters	**2.83**	**2.83**	**2.36**	**2.36**	**0.92***	**0.92***	**0.91***	**0.90***
Brazil	2.83	2.83	0.10	2.46	0.93	0.93	0.35	0.92
Czech Republic**	2.83	2.83	3.00	3.00	0.84	0.84	0.84	0.84
Colombia	2.83	2.83	3.43	1.19	0.97	0.97	0.98	0.94
Korea	2.83	2.83	3.40	1.75	0.92	0.92	0.93	0.87
Mexico	2.83	2.83	1.90	2.70	0.91	0.91	0.88	0.91
Sudáfrica	2.83	2.83	2.34	3.07	0.97	0.97	0.97	0.98
Non Targeters	**2.83**	**3.20**	**2.52**	**2.54**	**0.93**	**0.91**	**0.92**	**0.88**
Denmark	2.83	0.70	3.29	2.32	0.94	0.80	0.95	0.93
Francia	2.83	6.15	2.59	0.10	0.94	0.97	0.93	0.41
Germany	2.83	5.72	2.57	1.61	0.91	0.95	0.90	0.85
Indonesia	2.83	2.83	1.04	2.61	0.94	0.94	0.86	0.94
Italy	2.83	4.89	2.25	2.90	0.94	0.97	0.93	0.95
Japan	2.83	1.09	3.16	2.38	0.94	0.87	0.95	0.93
Netherland	2.83	2.03	2.96	6.00	0.91	0.88	0.91	0.95
Norway	2.83	2.83	3.10	2.73	0.93	0.93	0.94	0.93
Portugal	2.83	2.83	2.19	2.89	0.95	0.95	0.94	0.95
Switzerland	2.83	5.08	1.42	2.52	0.92	0.95	0.86	0.91
United States of America	2.83	1.10	3.12	1.90	0.92	0.83	0.93	0.89

*Without Brazil in average

**We assume Czech Republic's gamma to be average in all four rankings, alphas based on data from 1993 onwards

Table 11: Estimation Results of Simple Taylor Rules for Inflation Targeters and Non-Targeters (1990.1 - 1999.4)

	Lagged Interest Rates	Inflation Gap (1)	Activity Gap (2)	Adjusted R-Squared
United States of America	0.78**	0.21**	0.22**	0.97
	0.04	0.08	0.03	
United Kingdom	0.87**	0.27**	0.04	0.97
	0.04	0.11	0.08	
Denmark	0.94**	0.06	0.12	0.81
	0.09	0.95	0.13	
France	0.97**	-0.12	0.07**	0.98
	0.02	0.11	0.02	
Germany	0.98**	0.04	0.10**	0.99
	0.01	0.03	0.01	
Italy	0.94**	0.27	0.02	0.85
	0.08	0.32	0.09	
Netherlands	0.97**	0.34*	0.08*	0.97
	0.03	0.21	0.05	
Norway	0.82**	-0.51	0.09	0.67
	0.10	0.69	0.14	
Sweden	0.54**	0.26	0.04	0.26
	0.16	0.38	0.24	
Switzerland	0.95**	0.12	0.07*	0.96
	0.04	0.12	0.04	
Canada	0.97**	-0.14	0.17**	0.92
	0.05	0.12	0.06	
Japan	0.98**	0.09*	0.02	0.99
	0.02	0.06	0.01	
Finland	0.97**	0.17	0.01	0.98
	0.04	0.11	0.03	
Portugal	0.98**	0.36**	0.02	0.98
	0.03	0.14	0.06	
Spain	0.99**	0.27	0.05	0.97
	0.03	0.25	0.05	
Australia	0.79**	0.17**	0.09**	0.98
	0.03	0.06	0.04	
New Zealand	0.92**	-0.07	0.17**	0.86
	0.08	0.17	0.08	
South Africa	0.80**	0.12	0.13*	0.81
	0.08	0.14	0.08	
Brazil	-0.07	3.69**	73.59	0.12
	0.21	1.81	315.53	
Chile	0.65**	0.68	0.00	0.40
	0.13	1.05	0.41	
Colombia	0.85**	0.62**	0.26*	0.76
	0.09	0.19	0.15	
Mexico	0.59**	-0.07	-0.94	0.57
	0.14	0.16	0.51	
Israel	0.71**	0.23**	-0.19	0.80
	0.08	0.08	0.13	
Indonesia	1.02**	-0.22	0.17	0.81
	0.11	0.15	0.15	
Korea	0.68**	0.56**	0.09	0.60
	0.15	0.28	0.09	
Inflation Targeters	0.82**	0.21	0.04	
	0.03	0.13	0.06	
Recent Targeters (less Brazil)	0.73**	0.31	-0.11	
	0.06	0.37	0.14	
Non Targeters	0.94**	0.06	0.09**	
	0.02	0.12	0.03	

(1) As deviations from an HP1600 trend

(2) Anualized deviations from inflation target or an HP1600 trend

Note: standard errors are noted in parenthesis. Coefficient with one (two) asteriscs denote significance level 10% (5%).

Table 12 a

Estimated Model Coefficients for Chile (based on inflation expectations estimated from nominal – real interest rate differences)

Parameter	Estimated Value	Standard Error	Equation	Estimated Value	Standard Error
Equation 7.1			Equation 7.6		
α_0	-0.632	0.363	ϕ_0	-0.326	1.059
α_1	0.432	0.119	ϕ_1	0.379	0.191
α_2	0.141	0.041	ϕ_2	-0.070	0.116
α_3	0.105	0.048	ϕ_3	-0.002	0.0005
α_4	1.394	0.325	ϕ_4	-0.245	0.097
α_5	0.686	0.344	ϕ_5	-0.079	0.060
α_6	0.517	0.307	Equation 7.7		
α_7	0.285	0.135	μ_0	0.426	0.082
α_8	0.141	0.041	μ_1	1	-
Equation 7.2			μ_2	0	-
β_0	1.378	0.186	μ_3	0.125	0.074
β_1	0.826	0.099	Equation 7.8		
β_2	0.174	-	λ_0	-0.347	0.249
β_3	-1.221	0.347	λ_1	1.078	0.123
β_4	-1.249	0.326	λ_2	0.982	0.212
Equation 7.3			λ_3	1.093	0.214
γ_0	1.621	1.074	λ_4	-0.711	0.355
γ_1	0.675	0.093	λ_5	-0.762	0.300
γ_2	0.059	0.022	λ_6	-0.617	0.276
γ_3	-0.427	0.149	λ_7	-0.702	0.271
γ_4	0.055	0.041	Equation 7.9		
Equation 7.4			ψ_0	6.718	0.281
δ_0	1.292	0.314	ψ_1	0.628	0.140
δ_1	-0.126	0.032	ψ_2	0.361	0.097
δ_2	0.843	0.038	ψ_3	5.055	0.119
δ_3	0.604	0.197	ρ	0.563	0.048
δ_4	0.207	0.204			
δ_5	-1.214	0.205			
Equation 7.5					
χ_0	-0.278	0.133			
χ_1	0.219	0.043			
χ_2	0.850	0.033			

This is the version used for the simulations and the counterfactuals. All the restrictions over the coefficients were tested before they were imposed, including the homogeneity of degree one for the price and wage equations, equation (7.1) and (7.2).
Source: Authors' estimation.

Table 12 b

Estimated Model Coefficients for Chile
(based on inflation expectations from Consensus Forecast)

Parameter	Estimated Value	Standard Error
Equation 7.1		
α_0	-0.341	0.213
α_1	0.171	0.043
α_2	0.069	0.025
α_3	0.062	0.034
α_4	0.590	0.223
α_5	0.039	0.252
α_6	0.039	0.202
α_7	0.760	0.093
α_8	0.005	0.055
Equation 7.2		
β_0	0.836	0.378
β_1	1.325	0.373
β_2	-0.004	0.298
β_3	-1.352	0.350
β_4	-1.137	0.418
Equation 7.7		
μ_0	-0.001	0.049
μ_1	0.306	0.076
μ_2	0.677	0.059
μ_3	-0.175	0.052

Table 13
Core Inflation in Chile: Benchmark and Simulation 1
(4-quarter accumulated sum of quarterly rates)

	Benchmark	Simulation 1
Dec-93	11,6	12,9
Jun-94	10,3	11,5
Dec-94	10,2	10,9
Jun-95	9,6	10,0
Dec-95	7,6	8,6
Jun-96	7,7	9,2
Dec-96	8,6	10,4
Jun-97	7,5	9,5
Dec-97	6,4	8,9
Jun-98	6,6	9,4
Dec-98	7,3	10,0
Jun-99	5,9	8,5

Source: Authors' calculations based on the estimated model.

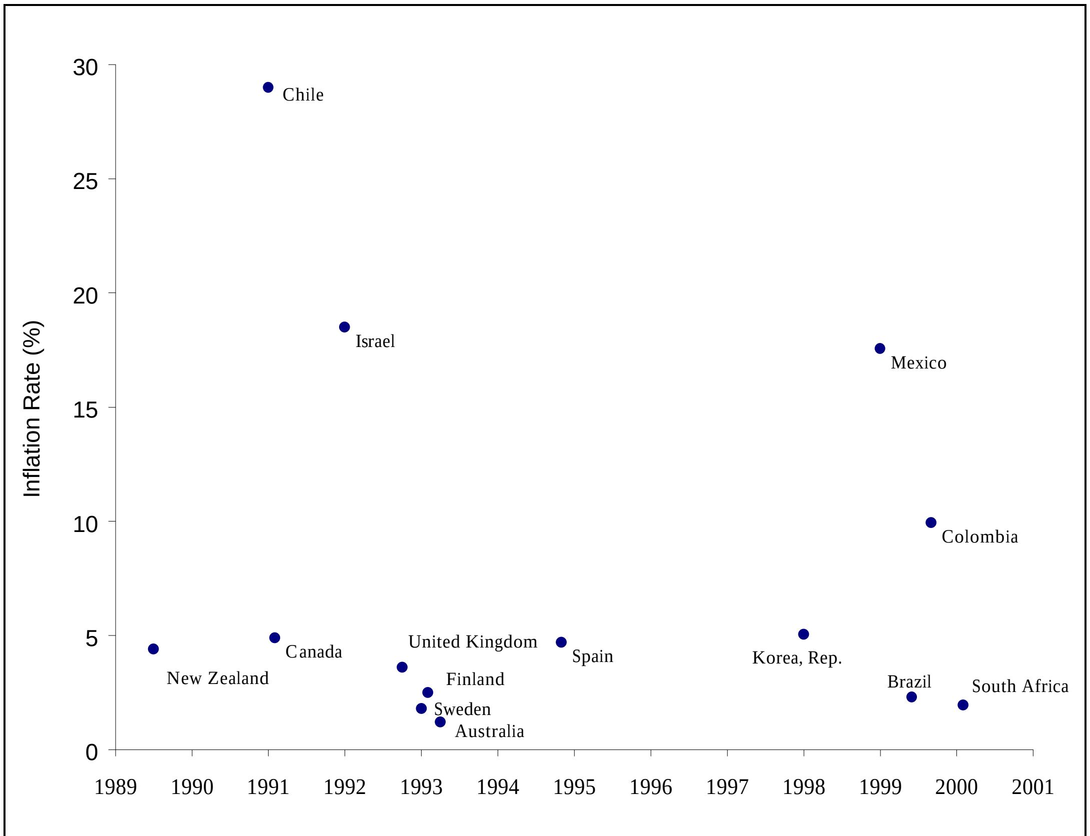
Table 14
Alternative Paths for the Inflation Targets in Chile
(Dec. to Dec. rate of change)

	Effective	Soft	Aggressive
Dec-91	17,5	17,5	17,5
Dec-92	15,0	15,0	15,0
Dec-93	11,0	11,0	11,0
Dec-94	10,0	8,0	10,5
Dec-95	9,0	5,0	10,0
Dec-96	6,5	3,0	9,5
Dec-97	5,5	3,0	9,0
Dec-98	4,5	3,0	8,5
Dec-99	4,3	3,0	8,0
Dec-00	3,5	3,0	7,5

Source: Authors' elaboration.

Figure 1

Inflation at Adoption of Inflation Targeting Framework in 18 Countries: 1988-2000 (1)



(1) Inflation attained one quarter before adopting IT.
Source: Authors´calculations based on data from IFS, country sources, and Schaechter et al.

Figure 2:
Measures of Production GAP (logarithmic deviations from a Hodrick-Prescott 1600 trend): 1980-1999, quarterly data

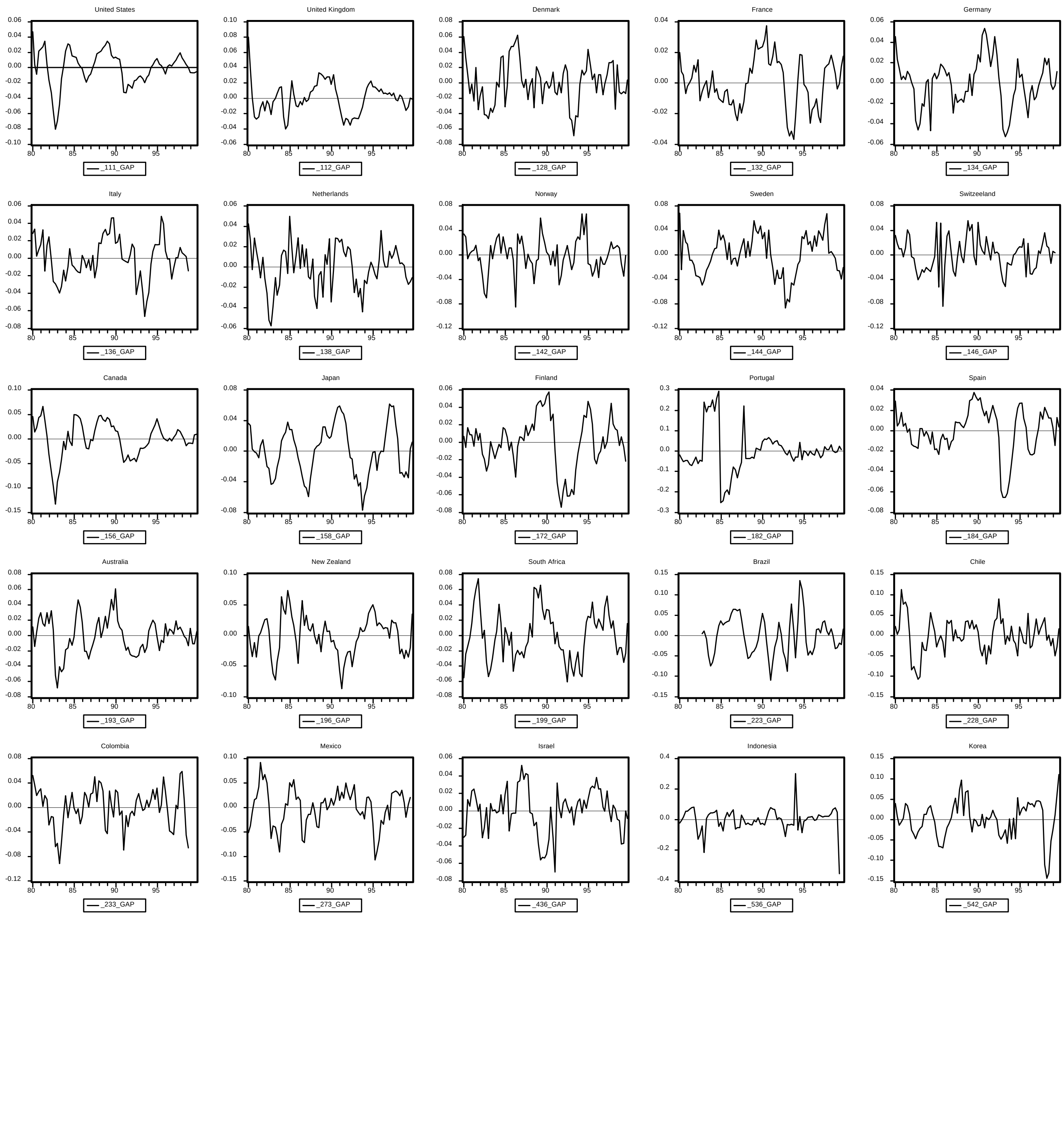


Figure 3a:
Measures of Inflation Deviation and Inflation Deviation Forecasts with a Rolling Window (obtained from out of sample forecasts of a VAR): 1980-1999, quarterly data

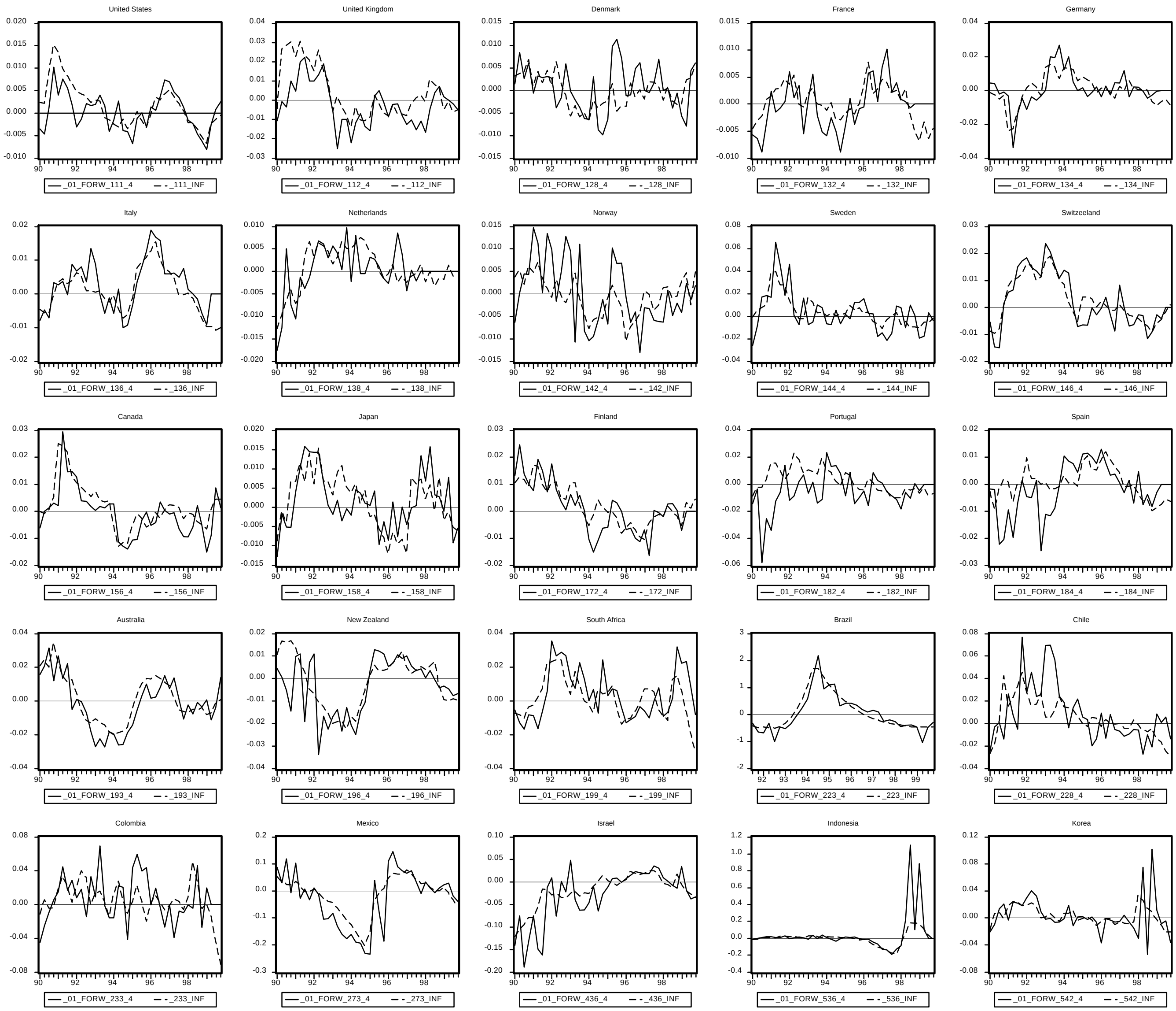


Figure 3b:
Measures of Inflation Deviation and Inflation Deviation Forecasts with Recursive Estimation (obtained from out of sample forecasts of a VAR): 1980-1999, quarterly data

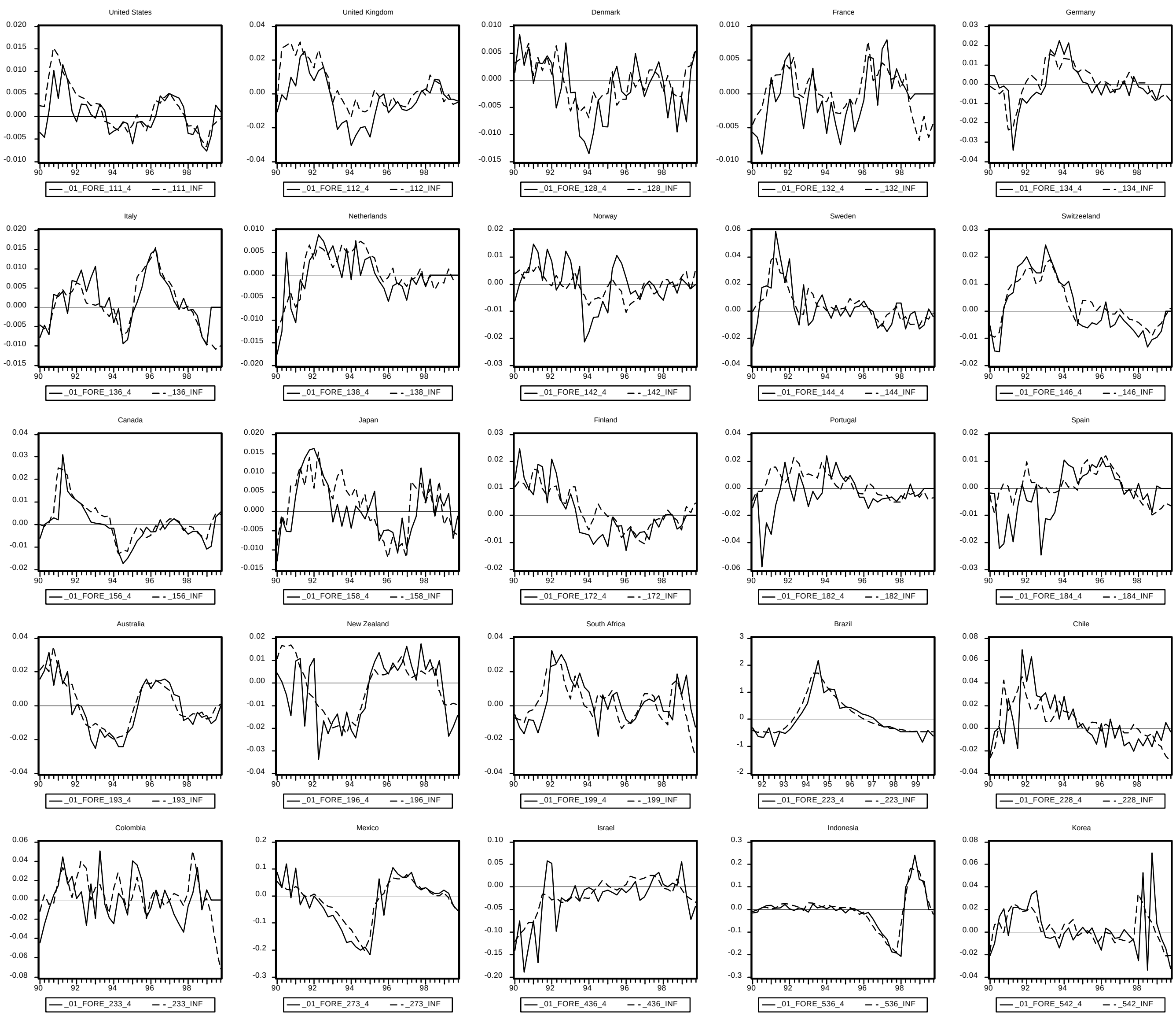


Figure 4a:
Average Quadratic Errors of Inflation Deviation Forecasts for Inflation Targeting and Non-Targeting Countries (obtained from out of sample forecasts of a rolling VAR and divided by the level of trend inflation): 1980-1999, quarterly data

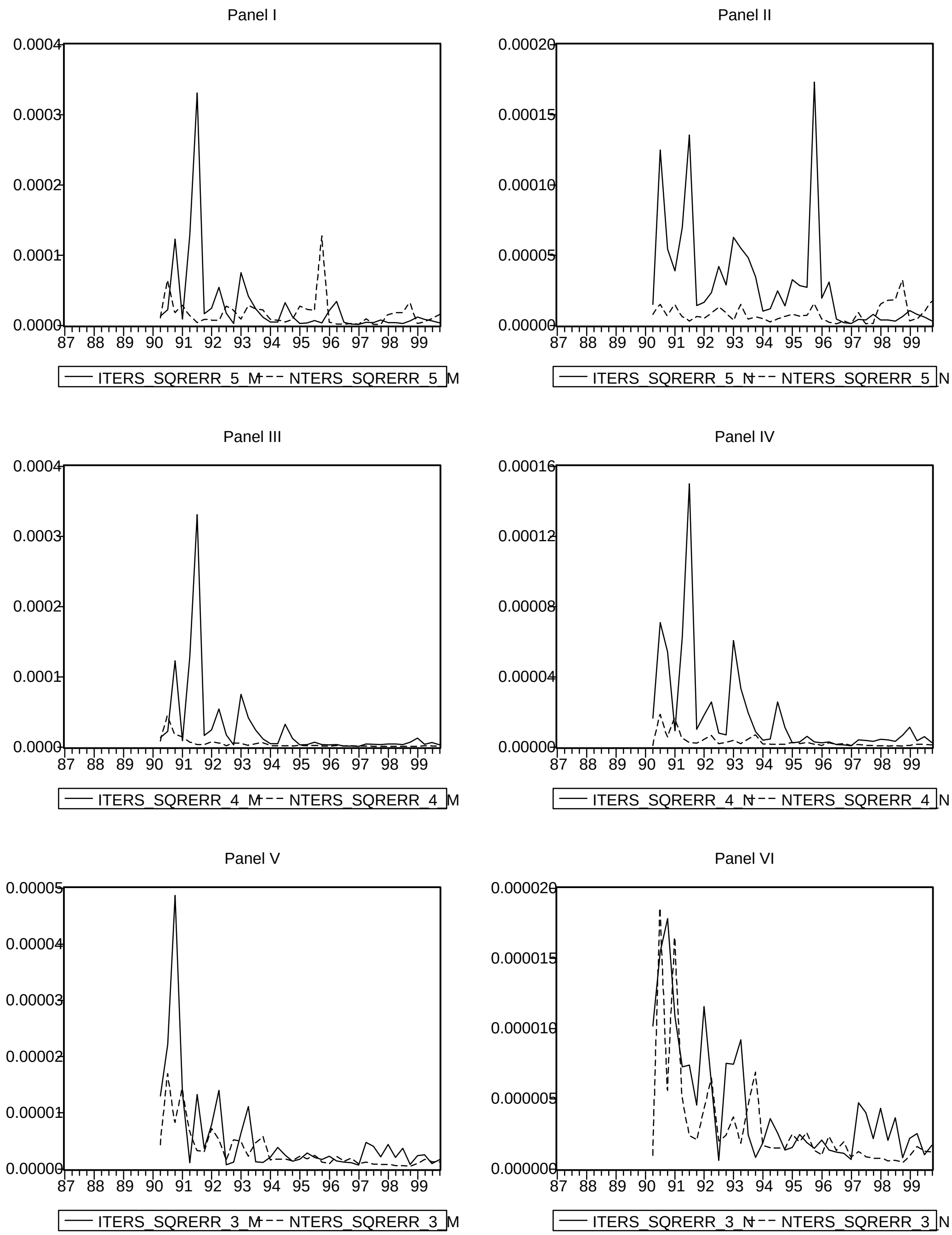


Figure 4b:
Average Quadratic Errors of Inflation Deviation Forecasts for Inflation Targeting and Non Targeting Countries (obtained from out of sample forecasts of a recursive VAR and divided by the level of trend inflation): 1980-1999, quarterly data

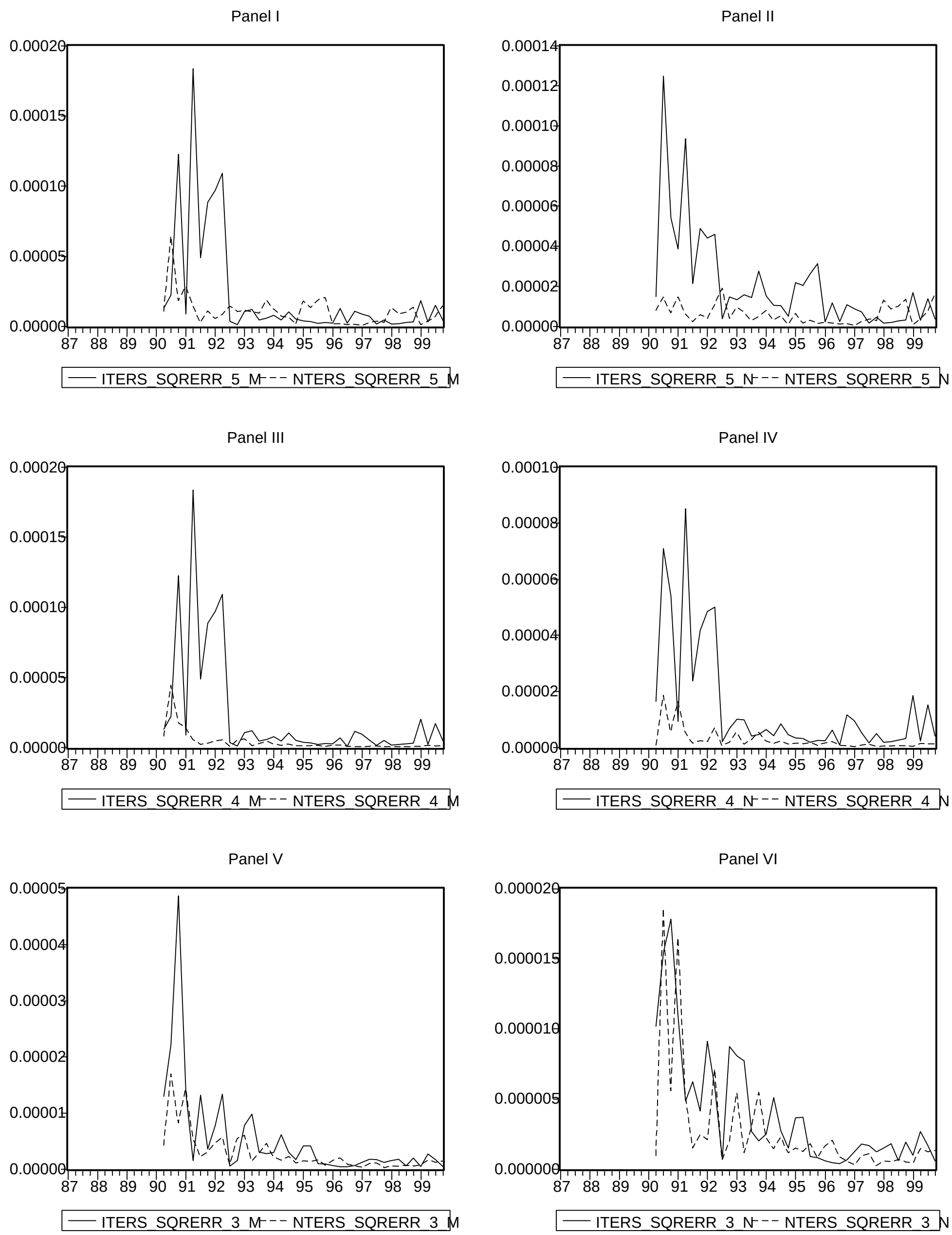


Figure 5a:

Average Quadratic Errors of Inflation Deviation Forecasts for Inflation Targeting and Non Targeting Countries (obtained from out of sample forecasts of a Rolling VAR with errors filtered for remaining structure and divided by the level of trend inflation): 1980-1999, quarterly data

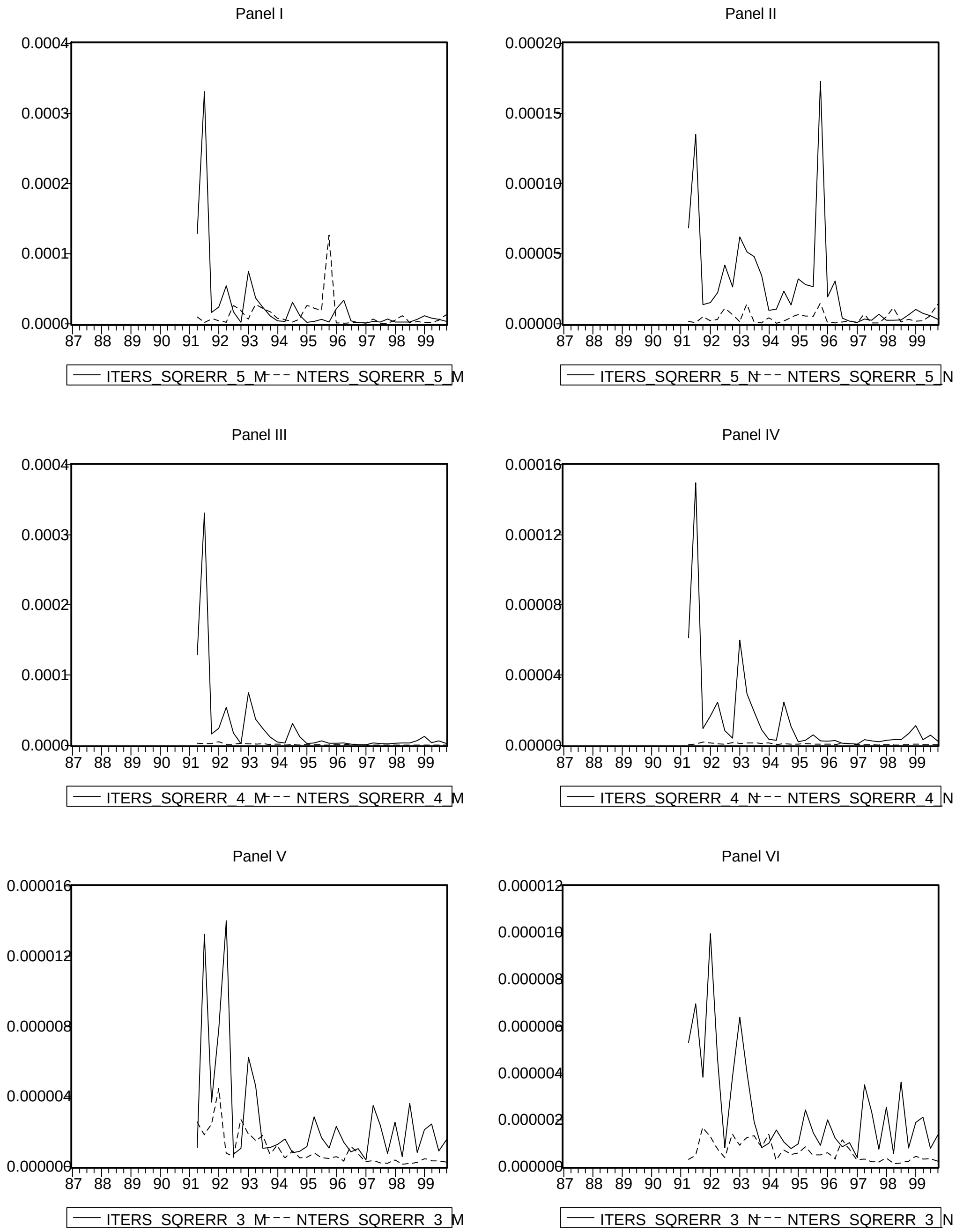


Figure 5b:
Average Quadratic Errors of Inflation Deviation Forecasts for Inflation Targeting and Non Targeting Countries (obtained from out of sample forecasts of a Recursive VAR with errors filtered for remaining structure and divided by the level of trend inflation): 1980-1999, quarterly data

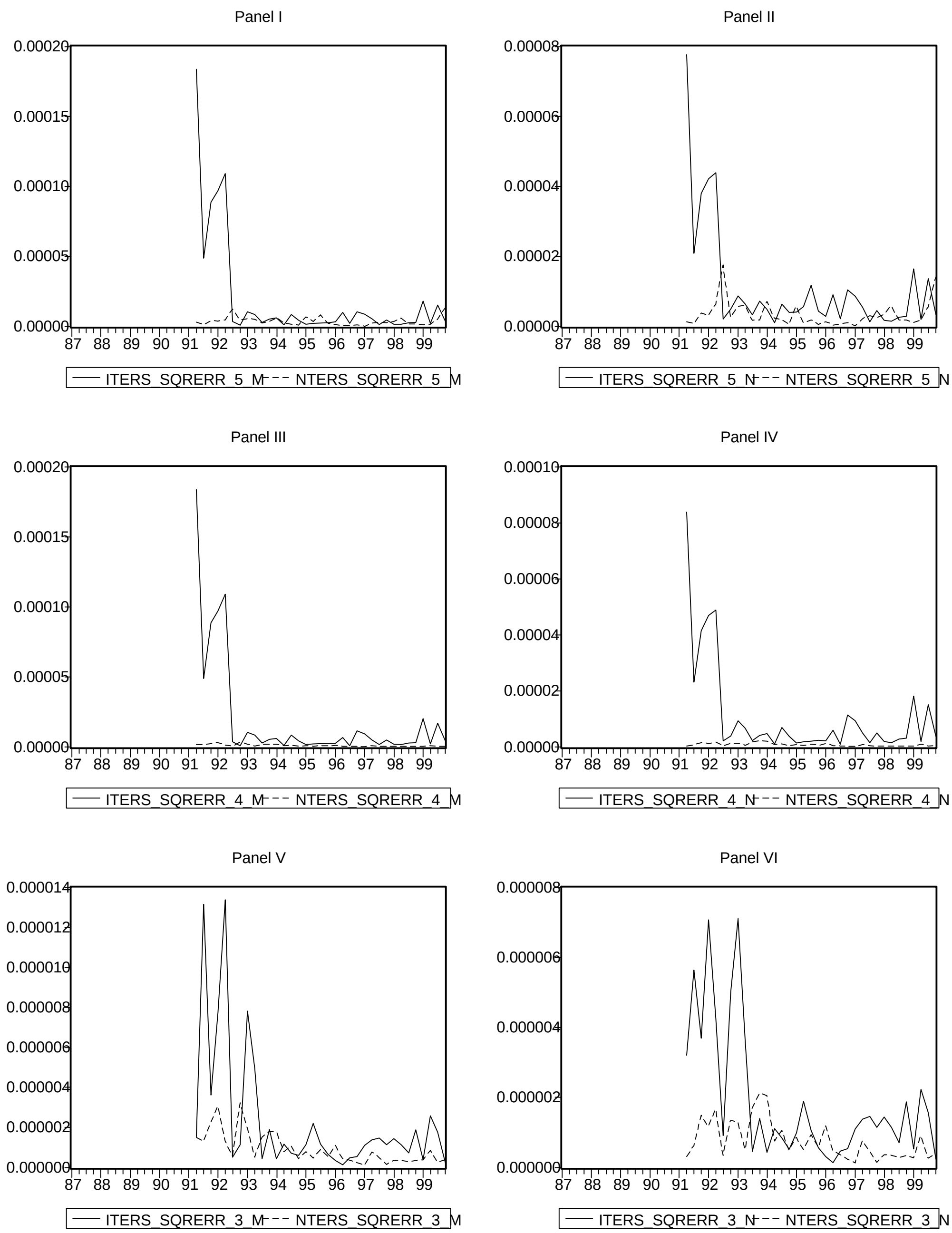


Figure 6a:
Dynamic Variance Decomposition for Inflation and Output Gaps, Full Country Sample (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

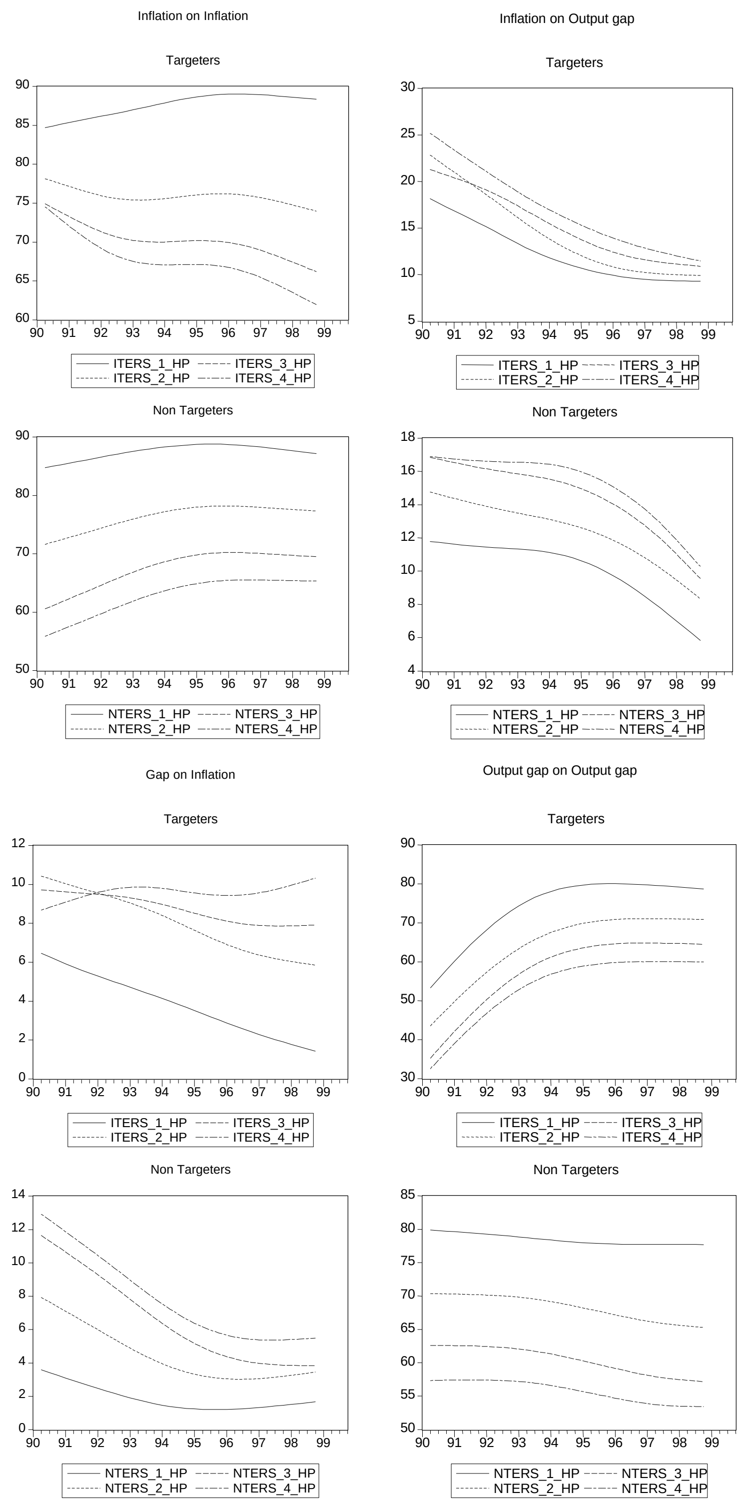


Figure 6b:
Dynamic Variance Decomposition for Inflation and Output Gaps, Industrial-Country Sample (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

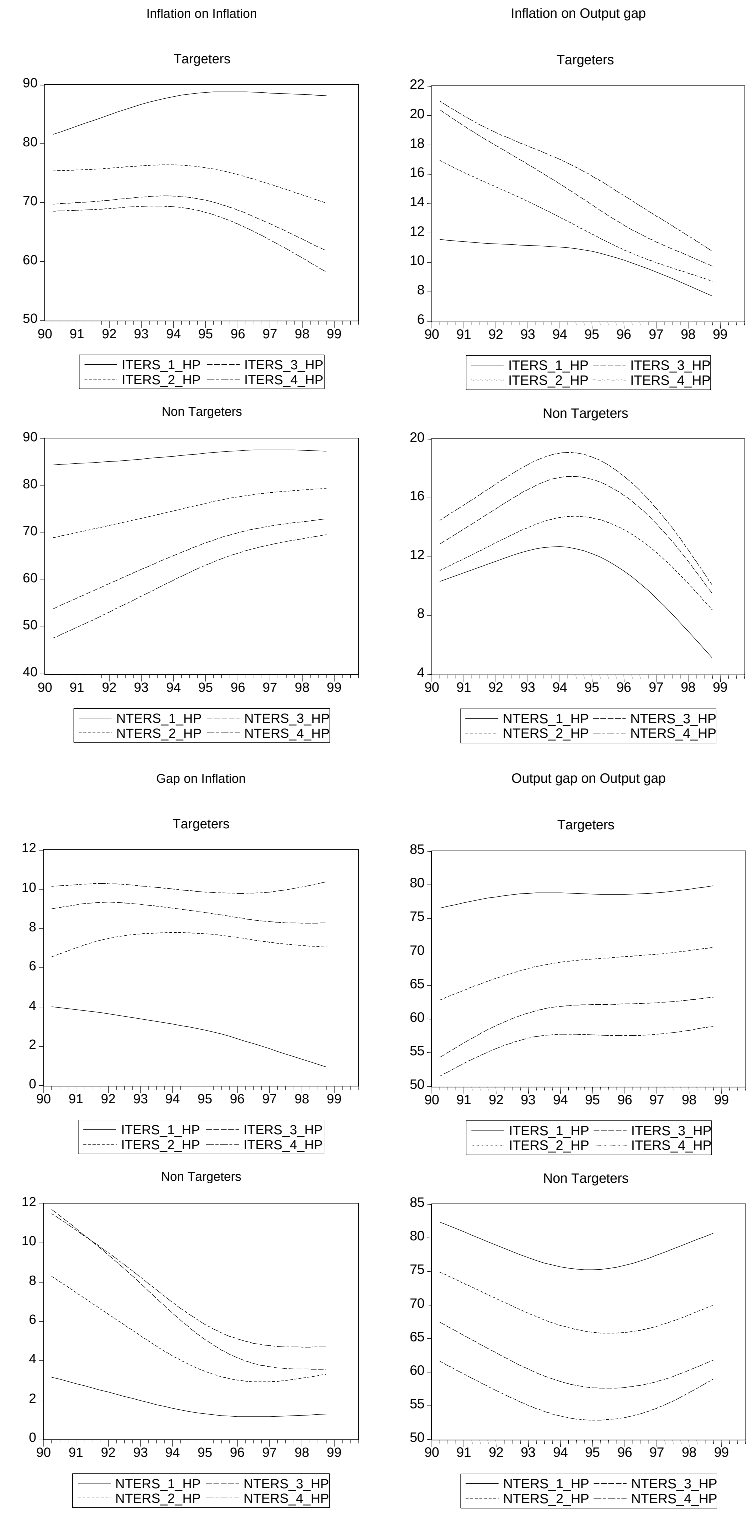


Figure 7:
Dynamic Variance Decomposition, Inflation Targeters (obtained from out of sample forecasts of a Rolling VAR): 1990-1998, quarterly data

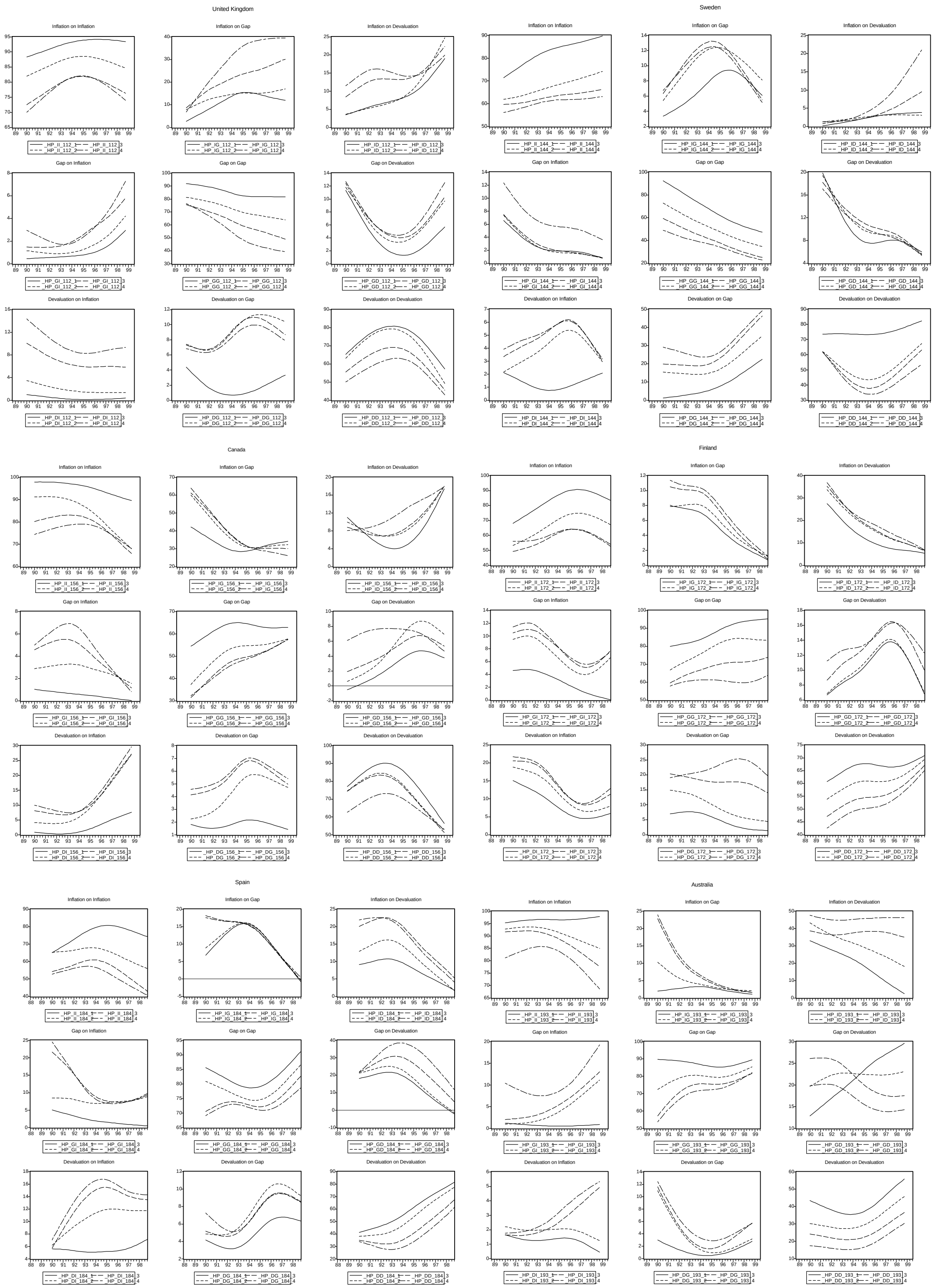


Figure 7 (continued):
Dynamic Variance Decomposition, Inflation Targeters (obtained from out of sample forecasts of a Rolling VAR): 1990-1998, quarterly data

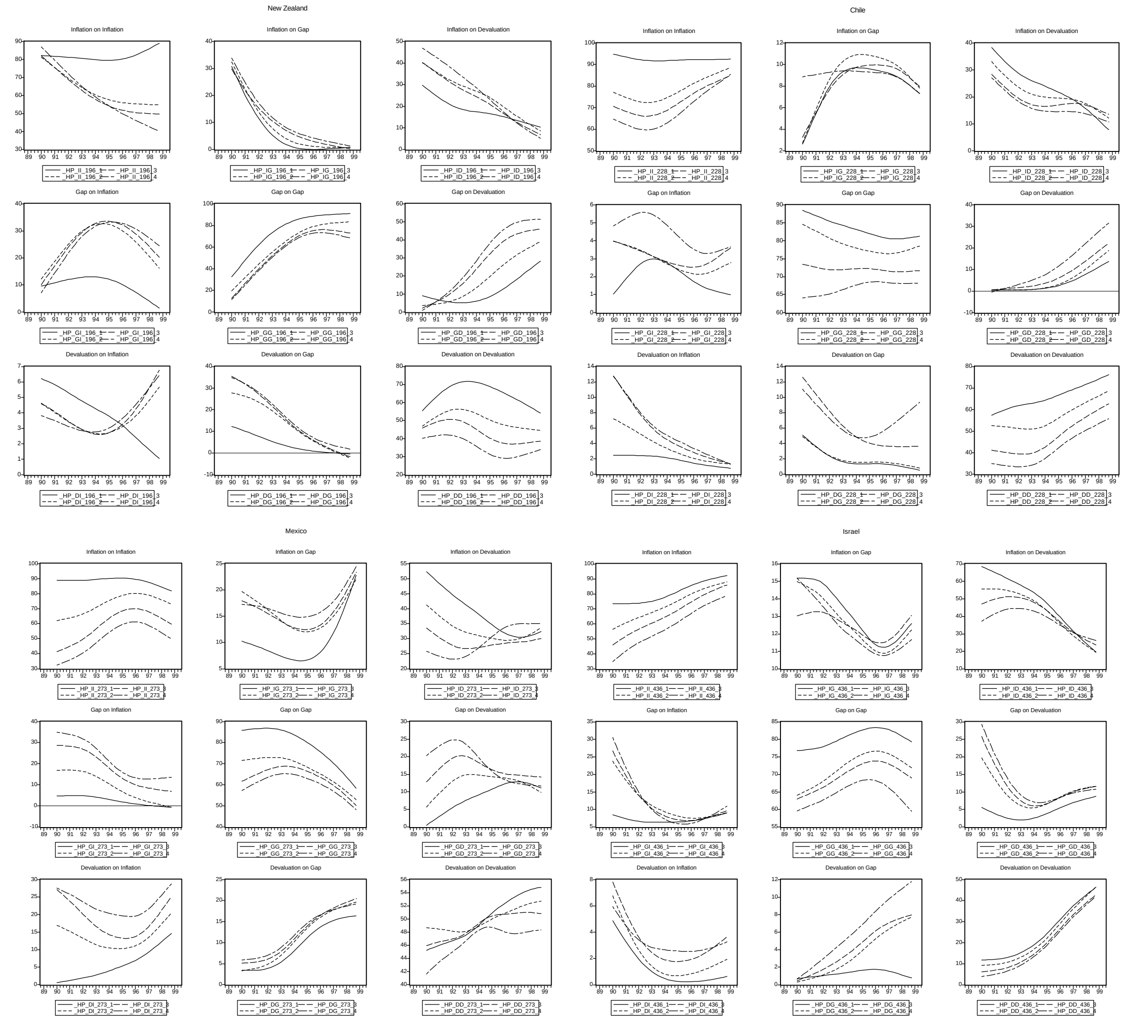


Figure 8a:
Estimated Inflation Aversion: Five-Year Window, Same Gamma for all Countries, Variance Measured over the Deviations from the Trend of Quarterly Inflation

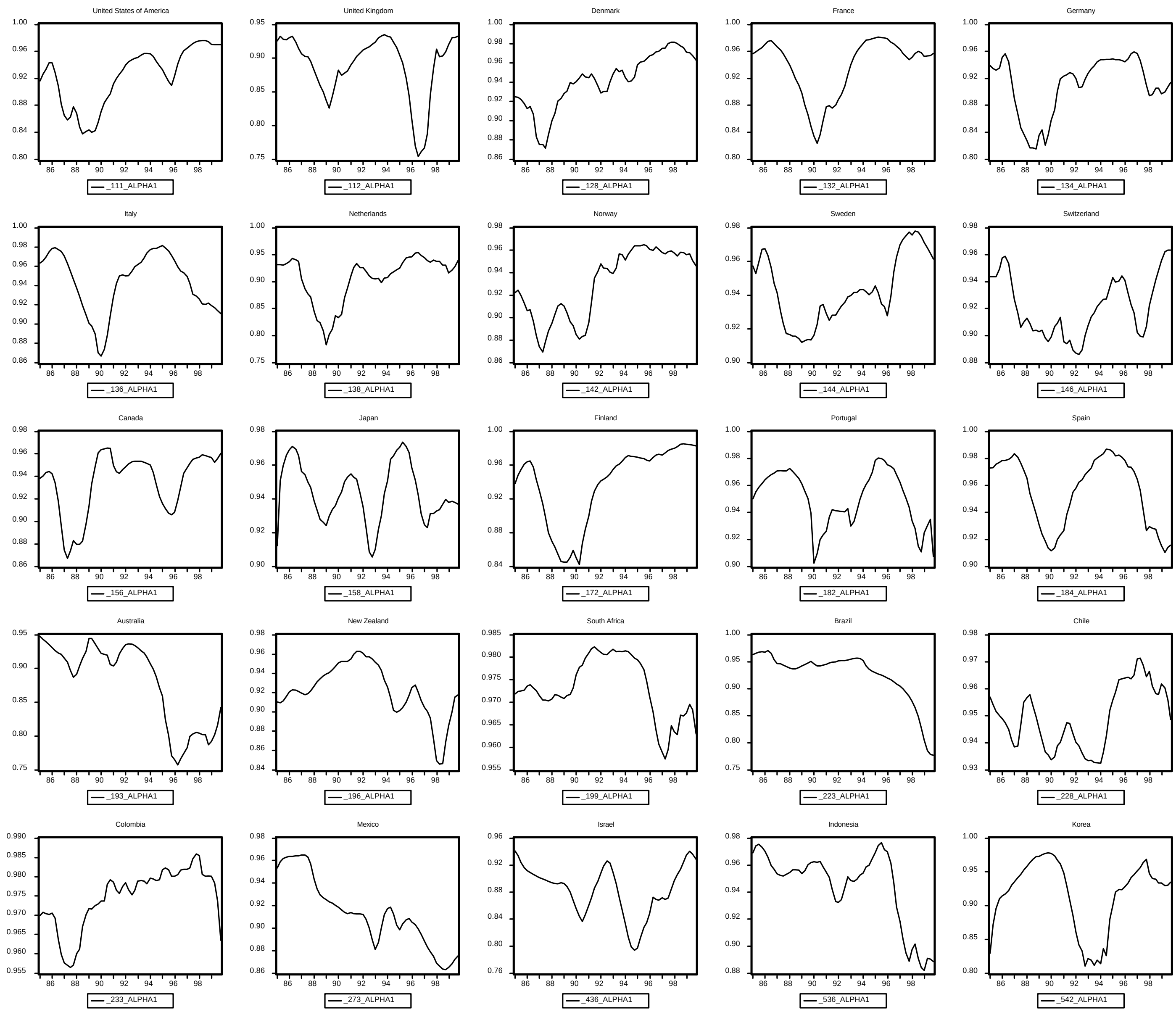


Figure 8b:
Estimated Inflation Aversion: Three-Year Window, Same Gamma for all Countries, Variance Measured over the Deviations from the Trend of Quarterly Inflation

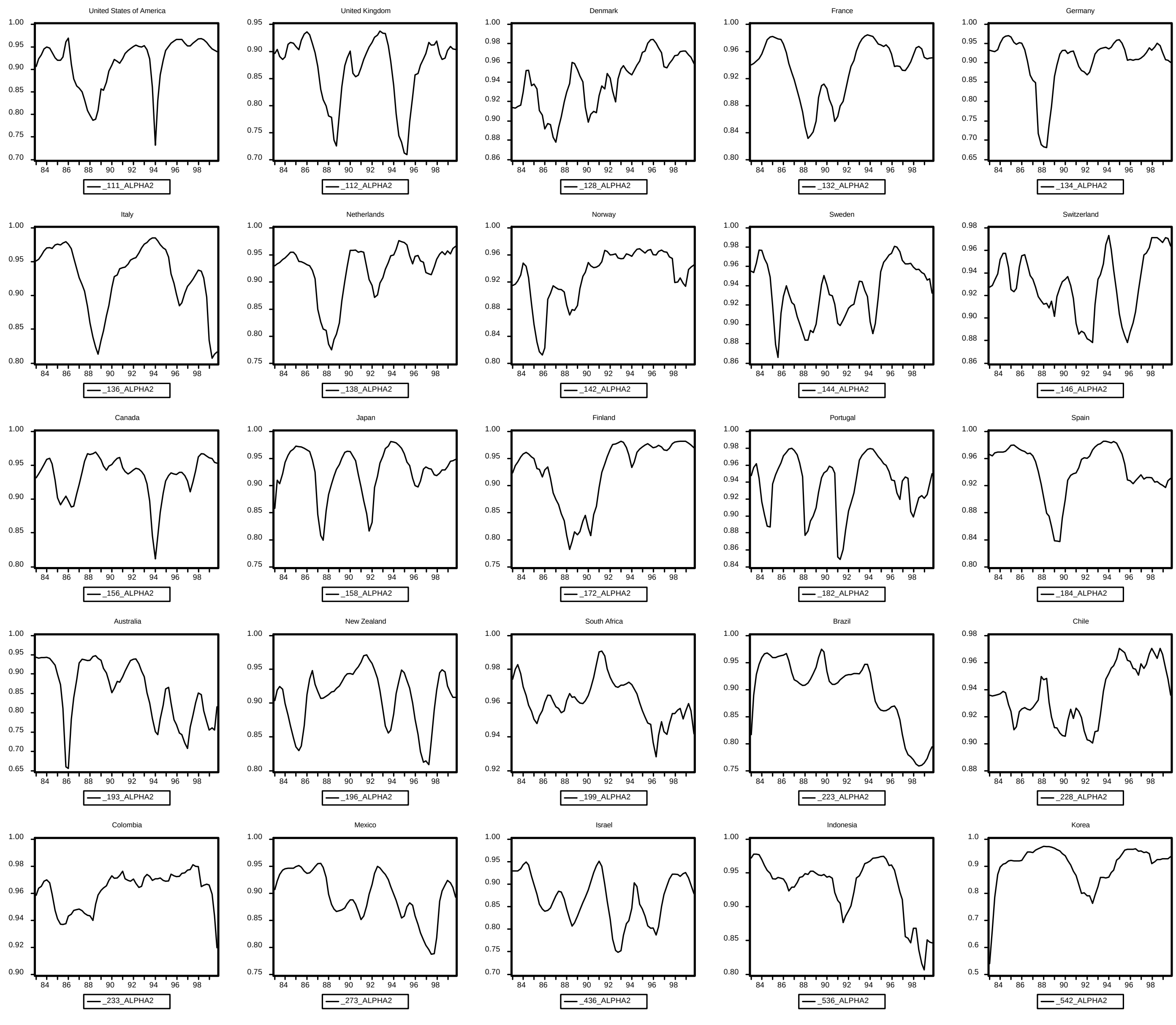


Figure 8c:
Estimated Inflation Aversion: Seven-Year Window, Same Gamma for all Countries, Variance Measured over the Deviations from the Trend of Quarterly Inflation

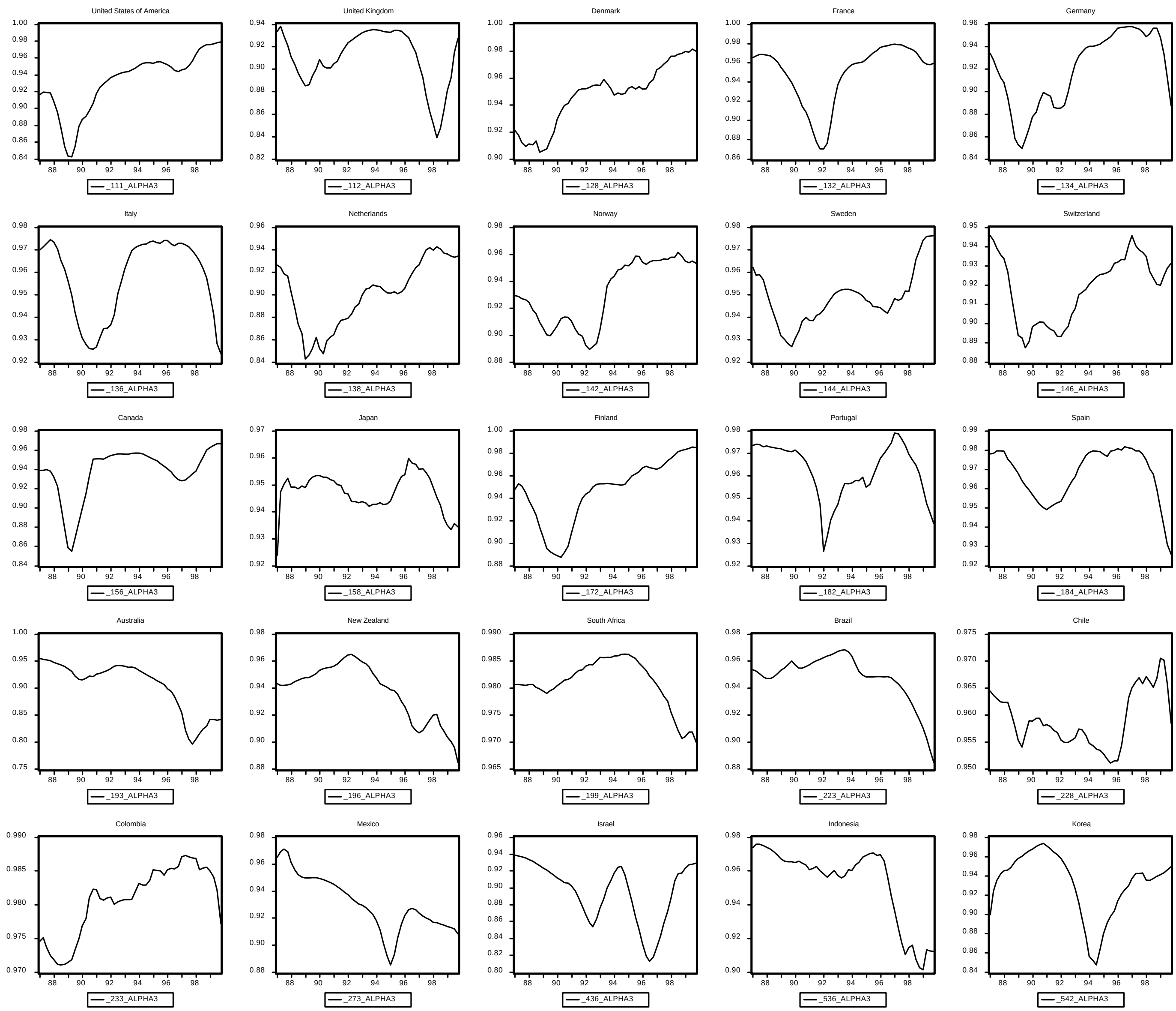


Figure 9:
Estimated Inflation Aversion: Five-Year Window, Gamma for all Countries from Cecchetti and Ehrmann, Variance Measured over the Deviations from the Trend of Quarterly Inflation or from Official Inflation Targets

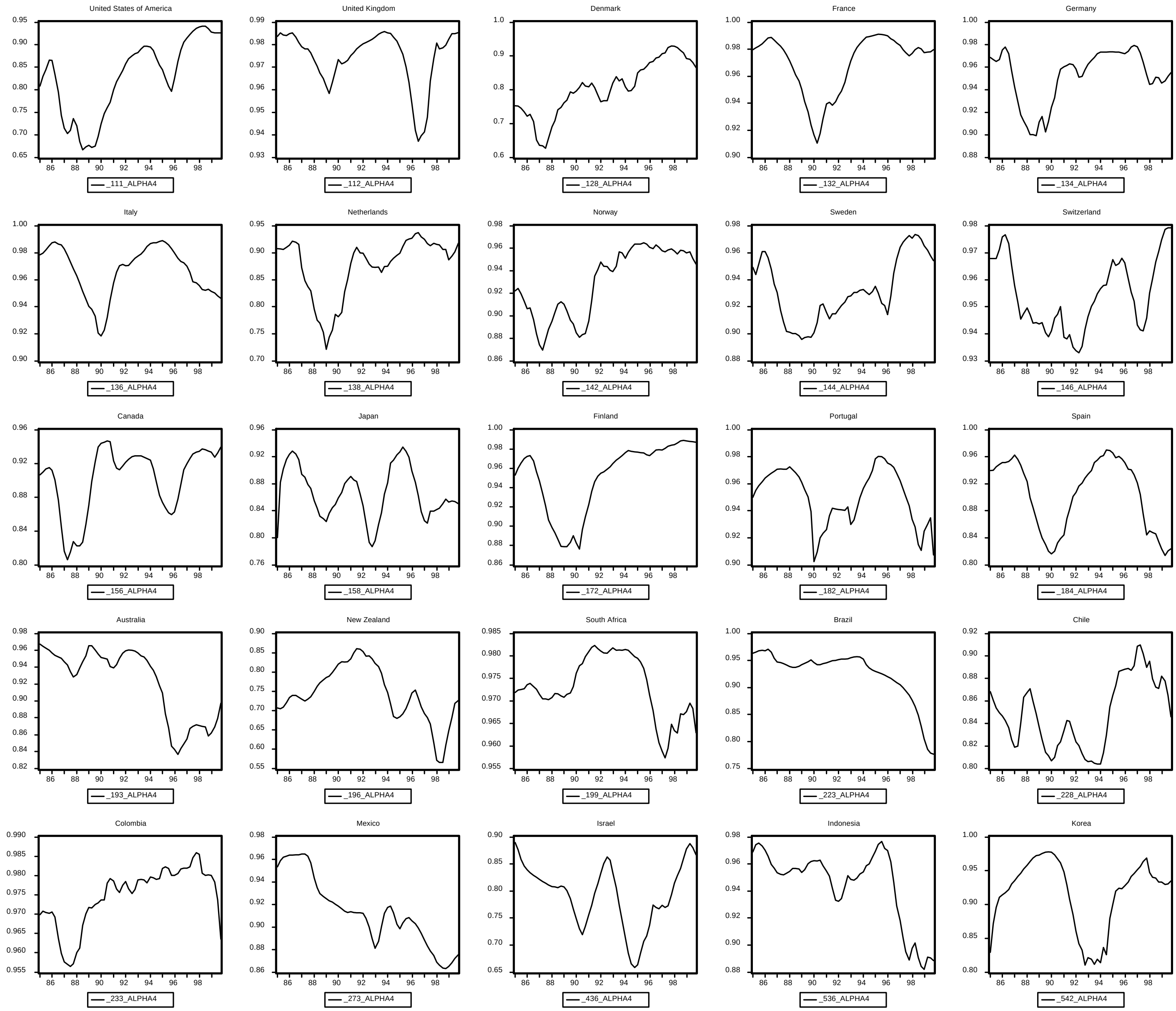


Figure 10:
Estimated Inflation Aversion: Five-Year Window, Gamma for all Countries from Cecchetti and Ehrmann, Variance Measured over the Deviations from an Idealized Objective of 2% Annual Inflation

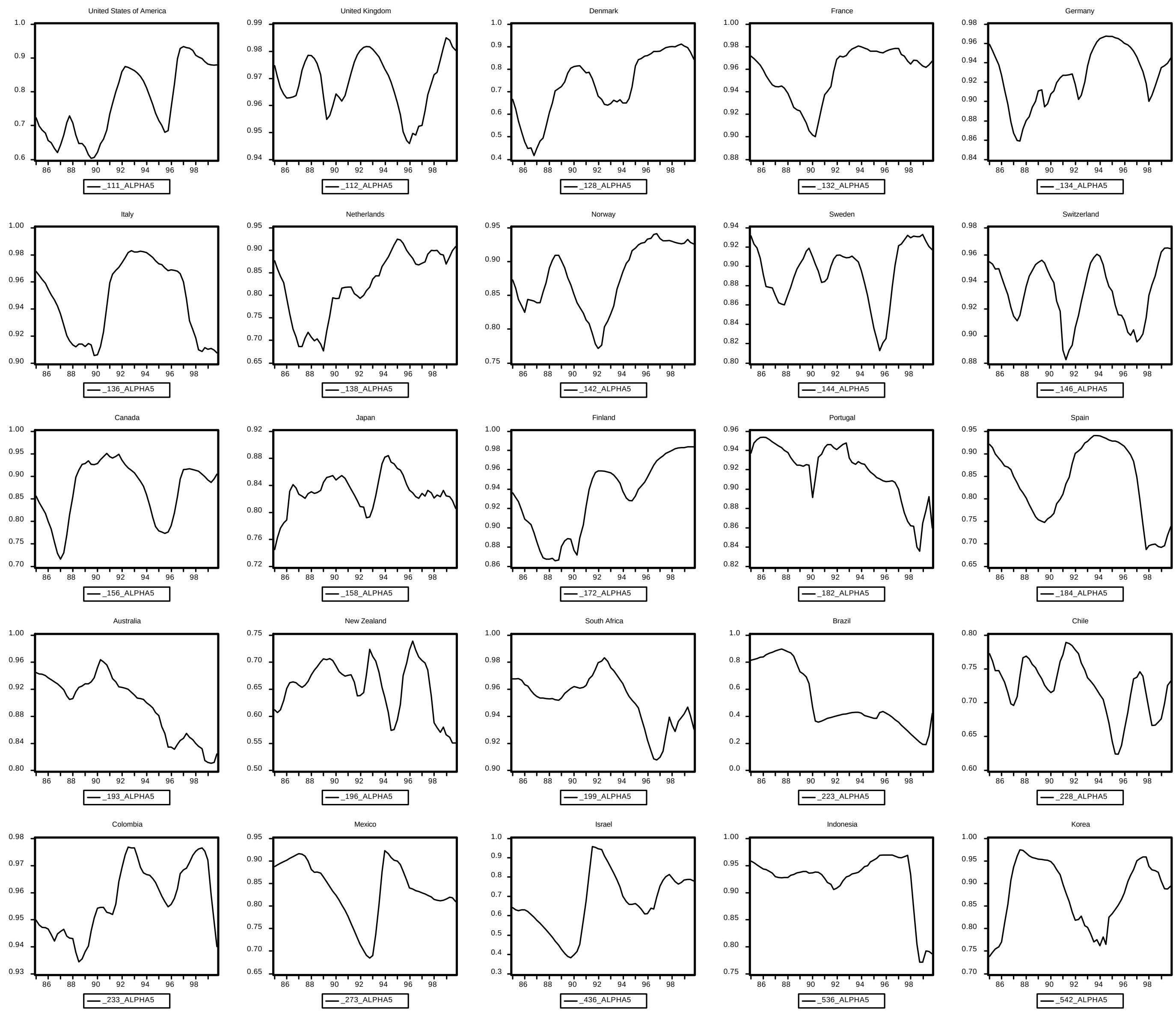


Figure 11:
Dynamic Inflation Aversion, Coefficients of OECD Inflation Targeters (ITERS_OECD), Israel and Chile (ITERS_ISCH), Potential Targeters (PITERS) and Non-Targeters (NTERS)

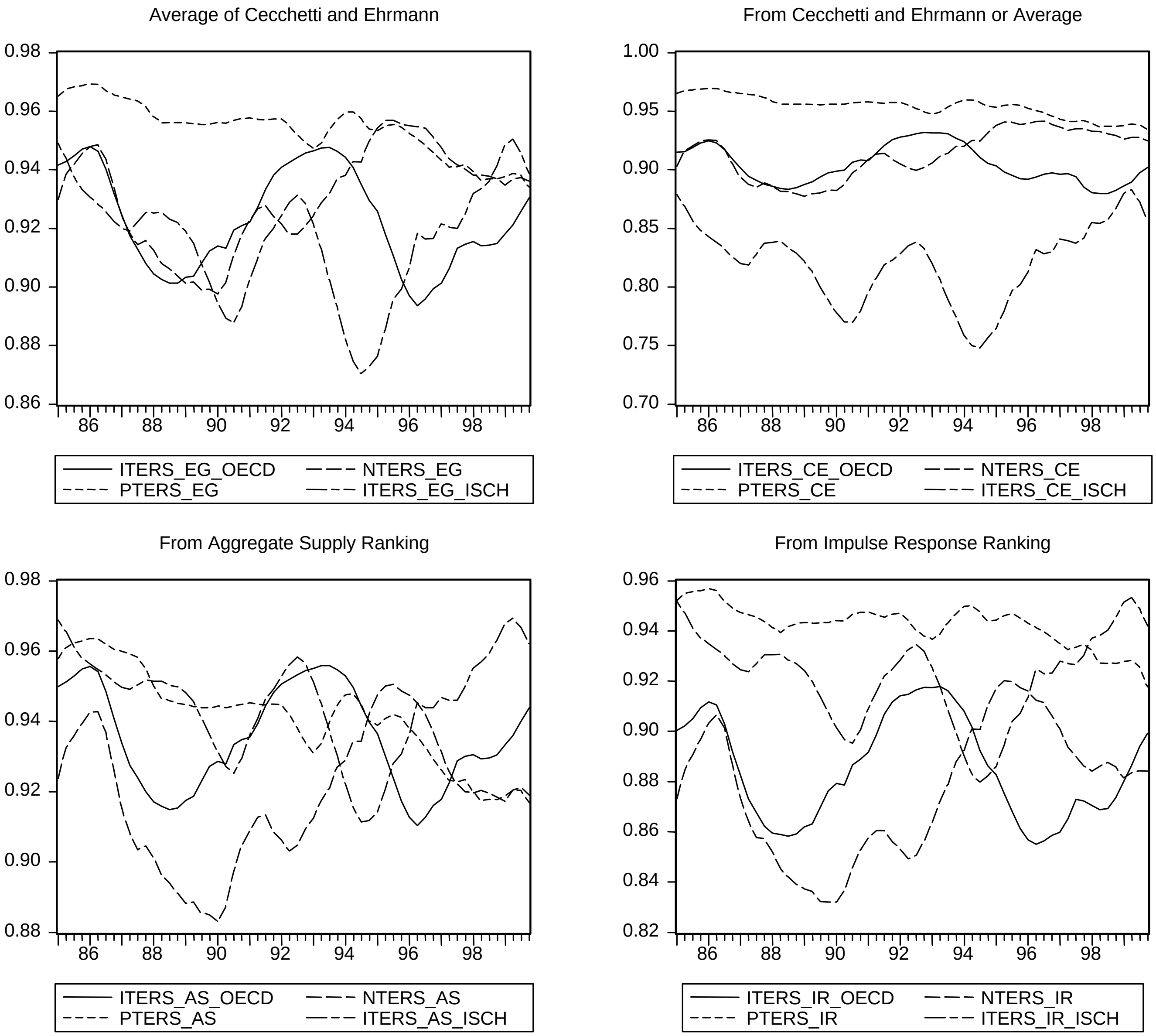


Figure 12:
Dynamic Variance Decomposition for Interest Rates, ITers and Non-ITers (obtained from out-of-sample forecasts of a Rolling VAR): 1990-1998, quarterly data

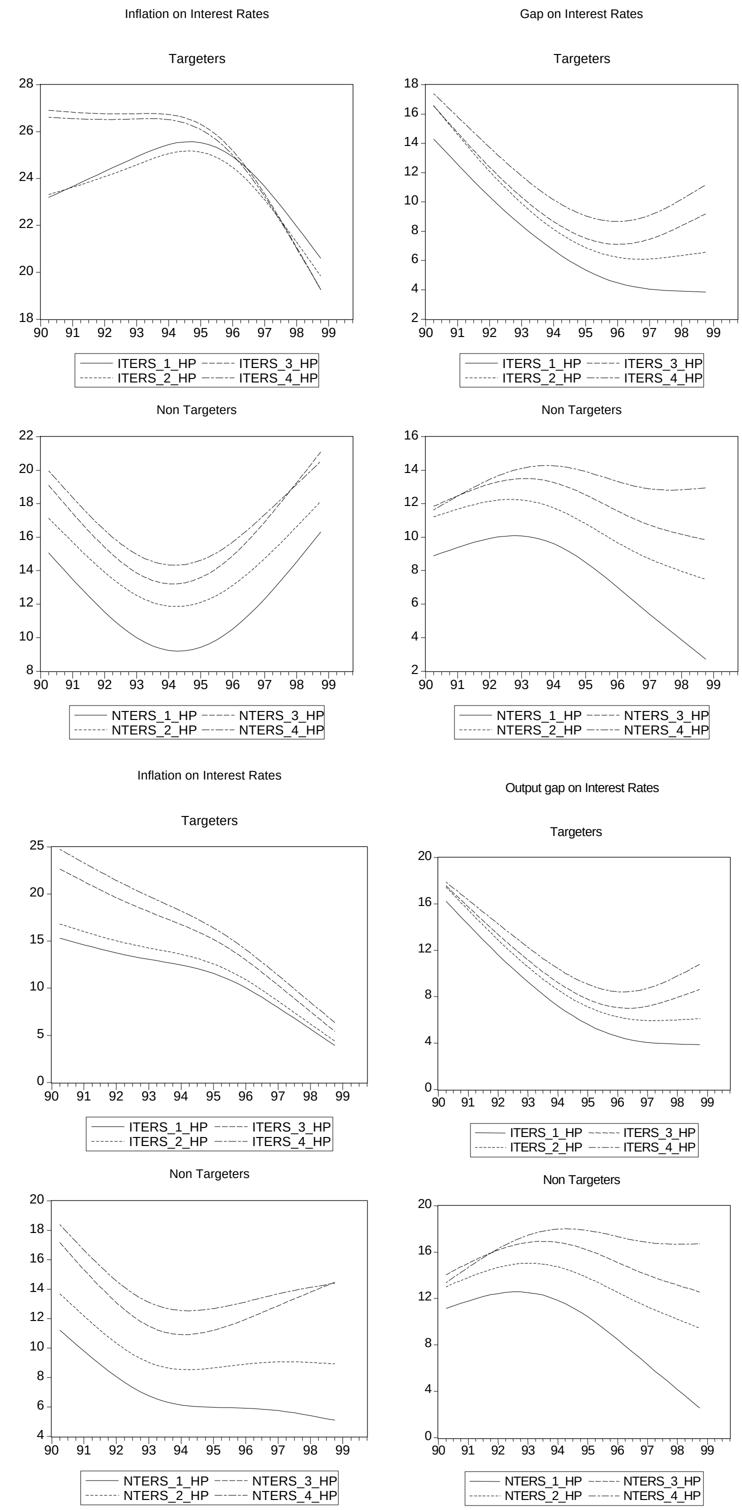


Figure 13a:
Rolling Taylor Rule Coefficients for Industrial ITers plus Chile and Israel and Industrial NITers (Taylor Rule Estimated with Contemporary Inflation and Activity as Independent Variables)

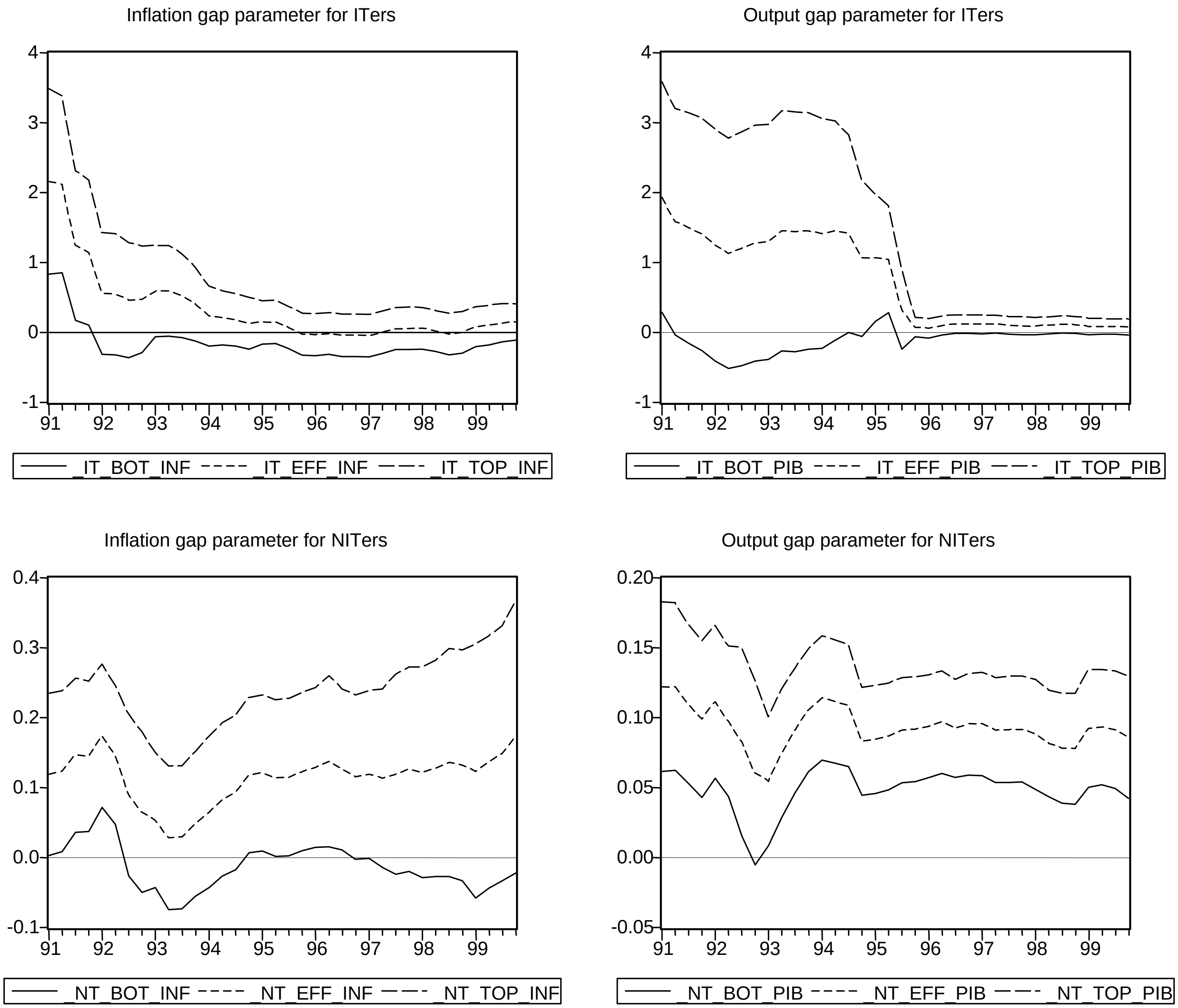


Figure 13b:
Rolling Taylor Rule Coefficients for Industrial ITers and Industrial NITers (Taylor Rule Estimated with Contemporary Inflation and Activity as Independent Variables)

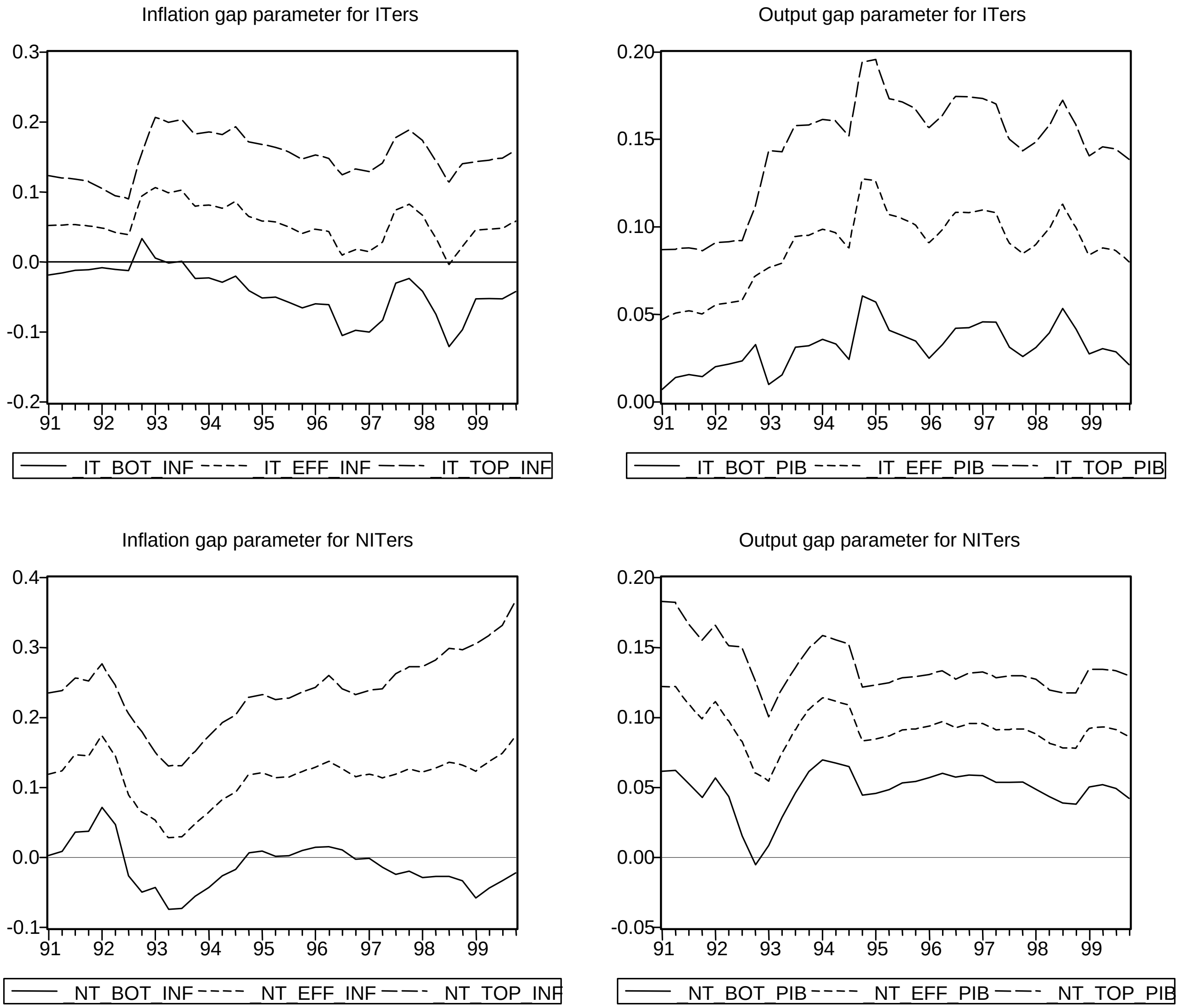


Figure 14
Observed and Benchmark values of the Core Inflation
(Quarterly rate of change)

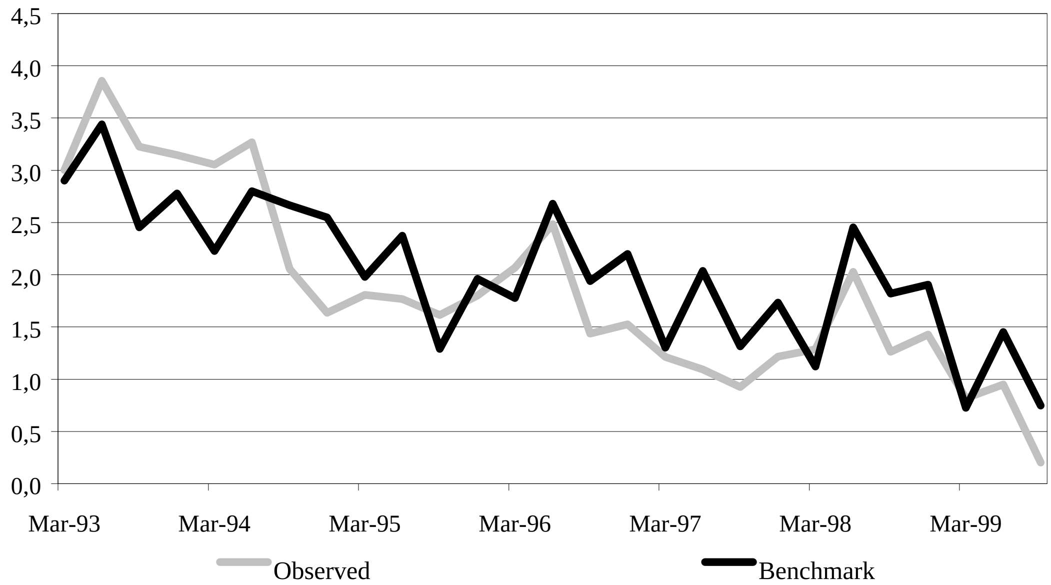


Figure 15
Core Inflation: Counterfactual 1
(Quarterly rate of change)

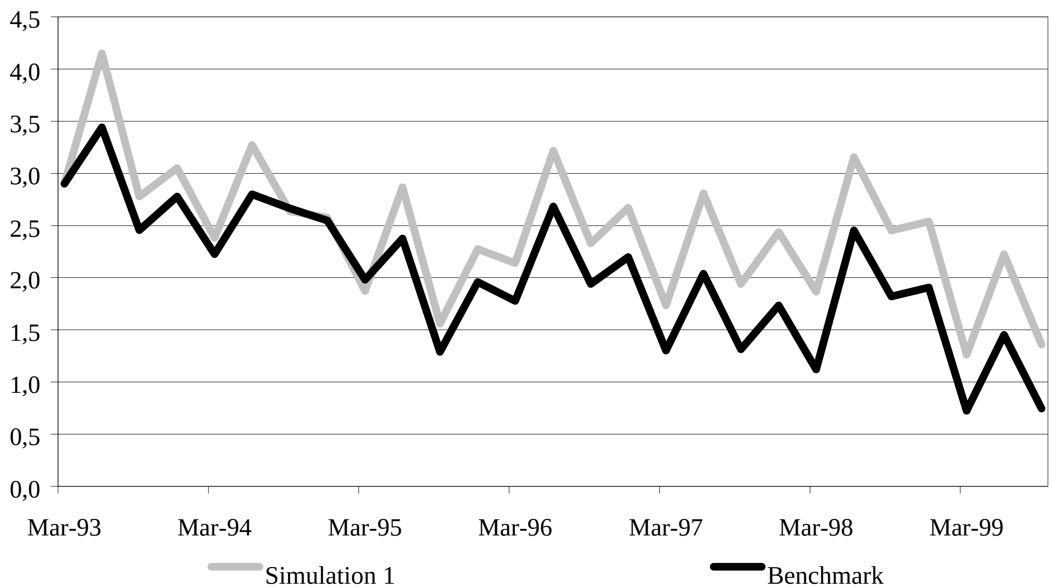


Figure 16
Observed and Benchmark 2 values of the Core Inflation
(Quarterly rate of change)

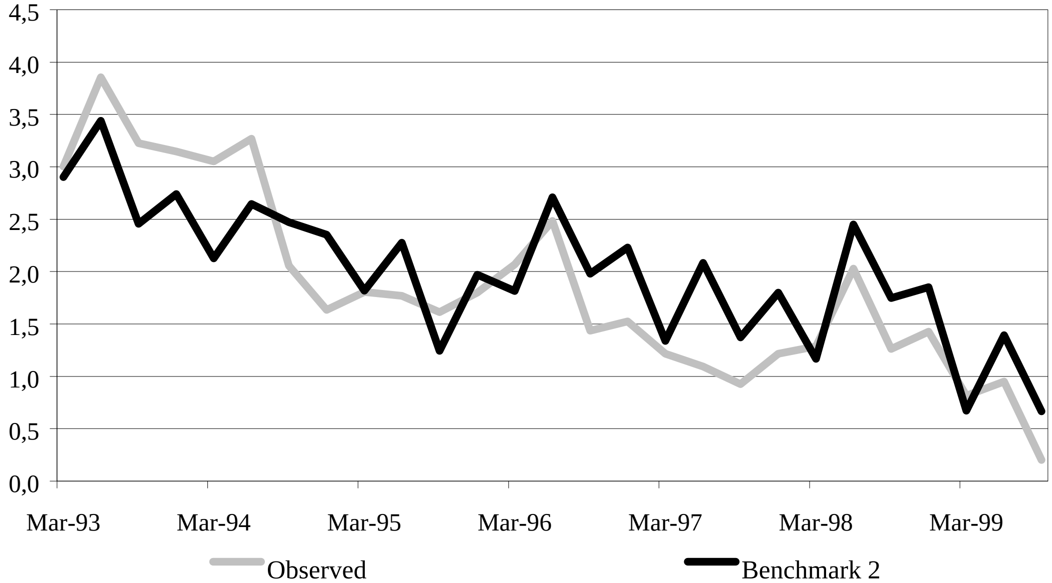


Figure 17
Core Inflation: Benchmark 2 and Soft Targets.
(Quarterly rate of change)

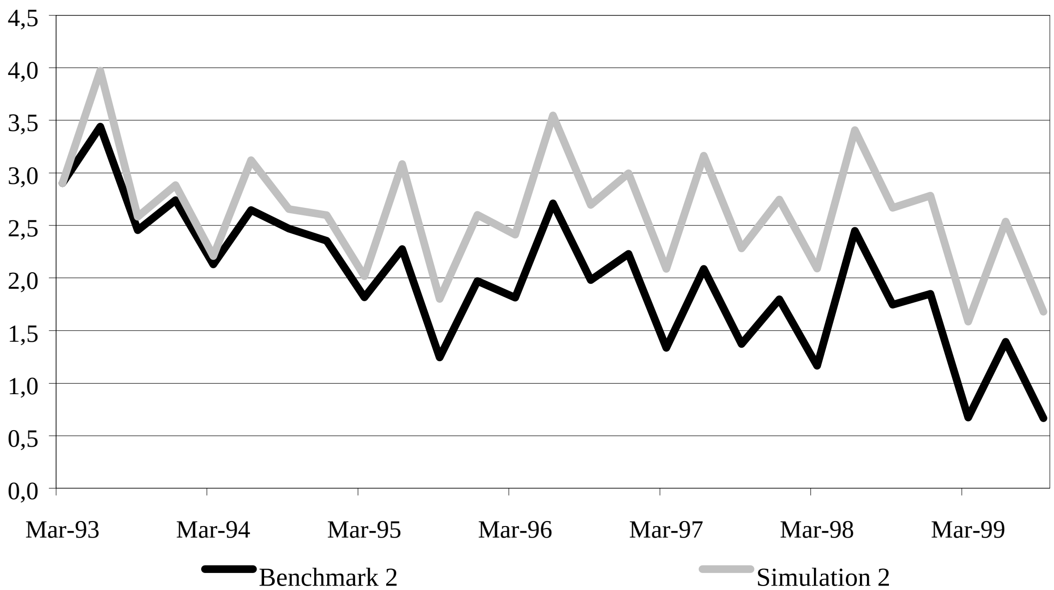


Figure 18
Core Inflation: Benchmark 2 and Aggressive Targets.
(Quarterly rate of change)

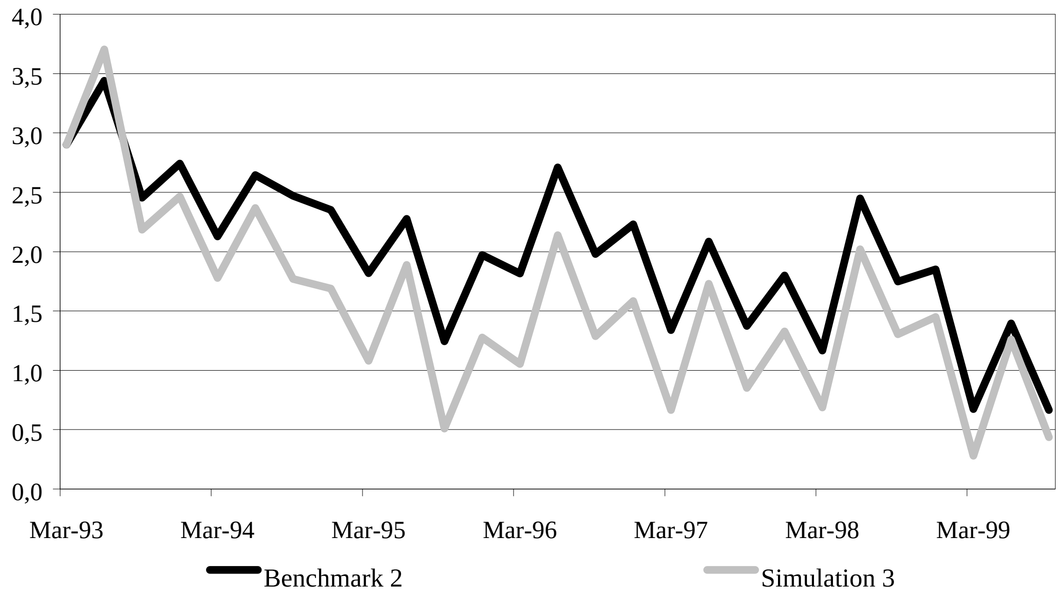


Figure 19
Unemployment: Benchmark 2, Soft Targets and Aggressive Targets.
(Quarterly rate)

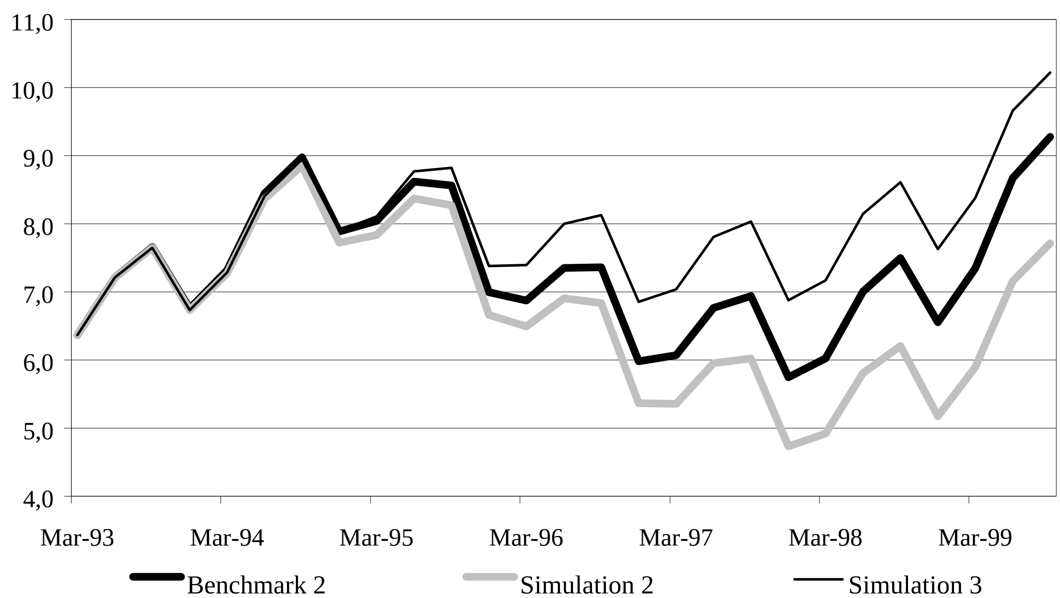


Figure 20
Core Inflation: Benchmark 2, Soft Targets and Aggressive Targets using CF.
(Quarterly rate of change)

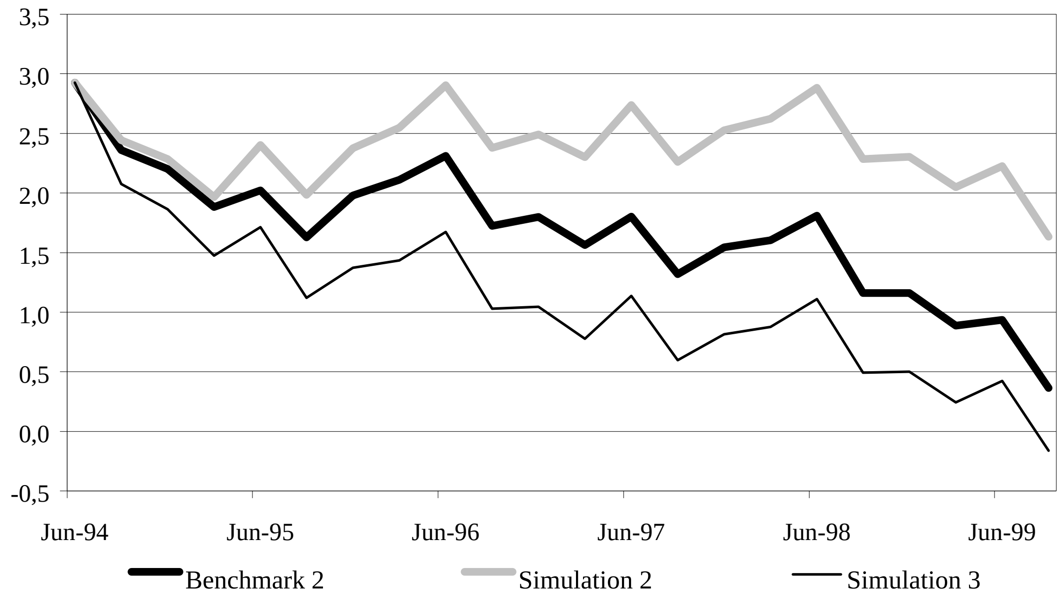


Figure 21
Unemployment: Benchmark 2, Soft Targets and Aggressive Targets using CF.
(Quarterly Rate)