What does South Korean inflation targeting target? Evidence from a small open economy model*

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This paper attempts at characterising South Korean monetary policy in the period of explicit inflation targeting started in 1999. We explain Korean interest rates in relation to an estimated macro-model, assuming that monetary policy is set optimally. This allows us to obtain the central bank's parameters in the policy objective function. We show that the Bank of Korea appears to have pursued optimal policy geared towards achieving price stability, while displaying a considerable degree of interest rate smoothing. In addition, the central bank loss function is estimated to include negligible weights on output and exchange rate variability.

Keywords: inflation targeting, optimal monetary policy, small open economies, South Korea

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1 Introduction

In recent years, many countries around the globe have adopted inflation targeting (IT) regimes with an explicit goal. This has been the case in advanced economies for over a decade, as in the experiences of Australia, Canada, Great Britain, Israel, New Zealand and Sweden. A large number of countries, including other developed and emerging market economies (EME), have more recently recently introduced IT frameworks which operate under officially flexible exchange rate regimes.[1] South Korea (henceforth Korea) adopted IT in 1998, completing its transition to a full-fledged regime by 2001.

Considerable research has been devoted to uncovering central bank preferences. The empirical literature on optimal monetary policy has largely focused on the US, which is not an IT country. We extend this literature by examining the case of Korea, which is not only an IT country but also a very open economy and an EME. Our paper uses economic outcomes and an empirical macro-model to estimate the Bank of Korea's (BOK) loss function in the IT period. The objective function parameters indicate how different goals are traded off in response to shocks. They are estimated under the assumption that the BOK sets monetary policy optimally, while trying to reach its pre-announced inflation target. It has become customary to use empirical policy rules to summarise short-term interest rate movements. In the case of Korea, the literature includes both estimates of standard Taylor rules (see *e.g.* Kim and Park, 2006) and those extended to incorporate the role of the exchange rate (see *e.g.* Eichengreen, 2004). Estimated policy rules are appealing because they capture the systematic relationship between interest rates and macroeconomic variables. The main drawback of estimated policy rules is that they are unable to address questions about the policy formulation process, as they fail to uncover central bank preferences. The identification of optimal

[1] For the international experience on IT, see *e.g.* Carare and Stone (2006) and IMF (2005). Concerning IT in Asian countries, see Sánchez (2006).

policy weights offers the advantage of unveiling the monetary authority's objectives.

From a technical point of view, Ozlale (2003) comes closest to the present study. This author uses a maximum-likelihood approach to estimate policy weights conditional on private sector behaviour. He sets up a closed-economy macro-model for US inflation and output (drawing on Rudebusch and Svensson, 1999) along with a infinite horizon quadratic loss function to summarise policy objectives. A different approach, consisting in the joint estimation of the macro-model and central bank preferences, is undertaken in Dennis (2006). Otherwise, the latter study, like Ozlale (2003), employs the Rudebusch-Svensson model to describe the macroeconomy and uses an infinite horizon quadratic objective function. We deviate from these studies by incorporating small-open-economy features. Regarding the macro-model, these features refer to the inclusion of the exchange rate and its implications for domestic macroeconomic developments (in line with Collins and Siklos, 2004), as well as the use of external variables that impact the Korean economy. Among the latter variables are economic activity and interest rates in major advanced economies, as well as world commodity prices. We also allow the BOK to have a concern for exchange rate stability, in light of Korea's status as a small-open-economy EME.[2]

Another feature of the present paper is that it studies the implications of two types of loss functions. First, we consider rule-of-thumb benchmarks such as strict IT (or "inflation nutter", as labelled in King, 1997) and "flexible" IT (incorporating a role for output stability), supplemented with loss functions attaching roles to one- and two-period interest rate smoothing, as well as the

[2] Our framework is also different from that advanced by Favero and Rovelli (2003). In their study of the Fed's behaviour, these authors employ a GMM estimation approach and assume a finite horizon for policymaking - in contrast with our use of an infinite horizon. In their study for 32 industrialised and developing countries, Ceccheti and Ehrmann (2002) pursue yet another method to characterise monetary policy intentions. More concretely, they employ a vector autoregressive setup to model macroeconomic dynamics, while using an output-inflation variability frontier to disentangle central bank preferences.

exchange rate.[3] Second, we turn our attention to optimisation-based objective functions. This includes both the analysis of optimal objective function parameters for the BOK and the assessment of each relevant goal's contribution to the determination of observed interest rate paths.[4] The present paper also differs from the related literature in the treatment of the inflation target. We use the values for such target that are actually pre-announced by the BOK. Previous analyses postulate a fixed inflation target to be estimated (Dennis, 2006), take annual average inflation as the inflation objective (Ozlale, 2003), or treat inflation targets as Hodrick-Prescott trends (Collins and Siklos, 2004).

We examine in the Korean context one issue that is particularly relevant for EMEs, namely, whether monetary policy is geared towards stabilising the exchange rate. While exchange rate variability has in recent years risen among this group of countries, the extent of such fluctuations is still a matter of debate. Calvo and Reinhart (2002) find that these specificities of EMEs are responsible for a relatively small degree of exchange-rate flexibility in these economies - what the authors label "fear of floating".[5] One reason for this is that a weaker currency could lead to adverse balance sheet effects by raising the domestic-currency real value of external liabilities, thereby causing economic activity to fall.[6] The evidence on limited exchange rate flexibility raises the question whether the desire to stabilise the exchange rate (for financial stability or other considerations) has created a conflict with other monetary policy goals. Alternatively, one could expect the improvement on balance sheet of banks in the post-Asian-crisis years to imply that financial stability

[3] The former two scenarios have also been investigated by Collins and Siklos (2004).

[4] Our use of a two-step method (first estimating the macro-model, then, conditional upon the latter, obtaining the policy coefficients) allows us to consistently compare the optimal central bank's loss function with rule-of-thumb benchmarks for the policy weights, conditional on the same empirical macro-model.

[5] This means that, despite the recently proclaimed switch to floating exchange rates, the evidence seems to suggest a reversion to some degree of exchange rate management, albeit one which seems to be less tight than before the crisis (see *e.g.* Reinhart and Rogoff, 2004).

[6] Eichengreen (2005), and Sánchez (2008b, 2008c) discuss the implications of contractionary depreciations for monetary policy.

considerations were less of an issue for Korea.

Our analysis of Korean IT begins in 1999, the first full year of the regime's implementation. Among the class of EME countries, the choice of Korea appears to be appropriate. Even if Chile implemented an IT scheme in the early 1990s, the country only adopted such regime in a context of enhanced exchange rate flexibility only in 1999. We decide to employ a monthly sample to allow enough data for the estimation. Going further back in time would imply mixing data from the new regime with that of the previous monetary targeting period, while also involving a likely structural break at the time of Asian crisis of 1997-1998.

Our characterisation of BOK intentions does not directly address the important question whether Korea's IT regime had an effect on the country's macroeconomic performance. For countries that target inflation explicitly, the international evidence on this issue is mixed. Analysts often conclude that countries that adopt IT manage to reduce inflation to low levels and curb inflation and interest rate volatility (see *e.g.* Corbo et al., 2001, and Neumann and von Hagen, 2002). By way of contrast, Ball and Sheridan (2005) and Pétursson (2004) question whether this is the case among advanced countries.[7] In the case of EMEs, the literature is not as comprehensive and detailed as in the case of developed countries. The evidence appears to be somewhat more supportive of the experience of IT among EMEs (see *e.g.* IMF, 2005, and Gonçalves and Salles, 2008). Levin et al. (2004) however show that adopting an explicit inflation objective helps anchor long-run inflation expectations and reduce inflation persistence in industrial economies, but not so among EMEs.

The main results of this paper are as follows. During the IT regime, the BOK appears to have pursued optimal policy geared towards achieving price stability, while displaying a considerable degree of interest rate smoothing. In

[7] The lack of a consensus is also apparent concerning other important effects of IT regimes, such as policy credibility, the predictability of inflation, and the sacrifice ratio (that is, the output cost of lowering inflation).

addition, the central bank loss function is estimated to include a negligible weight on output variability. This type of results are also found in related studies for advanced economies, including inflation targeters and the US. Our estimate of a much bigger weight on inflation than output in the loss function is broadly in line with the Korean monetary authority's mandate. Moreover, the BOK does not appear to evince a detectable concern for exchange rate variability. The latter however does not prevent the Korean central bank from responding to fluctuations in the value of the won in light of their possible impact on inflation developments. The absence of a direct concern for exchange rate variability is consistent with the won's higher flexibility observed in the IT era.

The structure of the paper is as follows. Section 2 briefly reviews the institutional arrangements for IT in Korea. Section 3 outlines the paper's theoretical approach and empirical methodology. Results and policy implications are discussed in section 4. Section 5 offers concluding remarks.

2 Inflation targeting in Korea

The primary objective of the BOK is to pursue price stability, as stated in the revised Bank of Korea Act that came into effect in April 1998. The BOK has also referred to economic and financial stability as secondary objectives. In particular, the latter's absence is deemed to have the potential to trigger serious economic crises, as well as impeding the normal operation of monetary policy's transmission mechanism.[8]

The central bank decides the inflation target in consultation with the government. The target was set for an annual period until 2003. In this year, a shift to a medium-term policy focus was introduced. Since then, inflation targets have been set for two medium-term periods, namely, 2004-2006 and

[8] See BOK's 2003 document *Monetary Policy in Korea* (available at http://www.bok.or.kr).

the current one, 2007-2009. Initially, BOK's inflation target was framed in terms of headline CPI inflation. The target changed to core CPI inflation in 2000. Moreover, starting from the medium-term period 2007-2009 the inflation target no longer corresponds to the core CPI measure but to headline CPI (see BOK's 2006 *Annual Report*). Given that our sample ends in 2006, it seems reasonable to refer here to core CPI inflation as the relevant target variable. The BOK chooses a range as opposed to a point inflation target, which may provide some flexibility, for instance with regard to output stabilisation or financial stability considerations.[9]

The decision maker is the Monetary Policy Committee (MPC), who uses the call money market rate as the monetary policy operational target in order to achieve its objectives. In particular, the call rate is raised if inflation is expected to be above target over the relevant time horizon. The MPC uses an inflation forecast but also relevant indicators to gauge the existence of inflationary pressures and other key ingredients to its strategy (Kim and Park, 2006). Concerning communicational aspects, the BOK announces its monetary policy decisions immediately, transmits its general intentions to the public, and submits an annual report on monetary policy to the National Assembly. Monetary policy decisions are communicated in a press conference, providing detailed background to them. Discussions among MPC members have started to be released with a six-week lag. At least once a year, the BOK submits a Monetary Policy Report to the National Assembly, specifying whether the inflation target has been achieved, the reasons for success or failure, the monetary policy actions taken and the future policy direction.

Given that Korea's shift IT took place in the aftermath of the Asian crisis of 1997-1998, the launch of the regime was preceded and initially surrounded by significant macroeconomic and financial instability. The difficulties facing

[9]The band around the central target was of $\pm 1\%$ until 2002, thereafter being somewhat narrower at $\pm 0.5\%$. In particular, for both 2004-2006 and 2007-2009, the target was set at $2.5 \pm 0.5\%$.

Korea's IT did not completely disappear in the period 1999-2000, which can be best seen as a transition phase. For some time after IT's launch, the BOK continued to set targets for M3, thus continuing with its previous monetary targeting experience (see *e.g.* Dueker and Kim, 1999). The period 1999-2000 can be seen as a transition phase, in which the BOK decided to maintain some features of the previous monetary targeting regime as the new IT scheme was put in place.[10] It is however worth indicating that, as of 1999, Korea did no longer need to consult the adequate level of M3 with the IMF in the context of the then ongoing economic programme with the latter institution.

Concerning consumer price developments, the post-crisis period (including IT transition years 1999 and 2000) was marked by large swings in both headline and core inflation measures. This can be gauged by looking at Figure 1, which shows key consumer inflation series since 1999 alongside the inflation target bands from 1999.[11] Inflation has displayed some variability even after the initial transition years, including an undershooting of the core inflation target in 2005-2006. However, fluctuations appear to have been much more moderate in the period preceding the launch of the IT regime. This is further examined in Table 1, which reports summary statistics for key domestic and external variables. We focus on the description of the changes observed in the volatility of the main domestic and external variables, as measured by their standard deviations within each period.[12] Two periods are examined, namely, 1991H1-1997H1 and 2000H1-2006H1. This means that we exclude the crisis period

[10] The period in question witnessed other adverse circumstances, such as financial turmoil associated with difficulties facing the Daewoo and Hyundai business groups. These bad news from the early phase of Korean IT should however not be overemphasised, given that the following years were also subjected to unfavourable shocks, including Hynix group's financial problems and the 9/11 terror attacks (in 2001), the Iraqi war and geopolitical risks related to North Korea (in 2002), and the credit card boom and bust (in 2003).

[11] Before 1999, core inflation is defined as the rate of change in the series for non-food non-energy CPI, obtained from OECD's *Main Economic Indicators*. See section 4 for a description of the remaining data series used in Figure 1.

[12] The external variables included here are a subset of all those considered in our analysis (for the full list, see section 4). More precisely, those considered in Table 1 are the ones found to enter our macro-model significantly (see Appendix for details).

extending from mid-1997 to 1999. We start in 1991 because this is the first year for which data on call rates are available.

Table 1 shows that there was a drop in the volatility of call interest rates between the two periods. This variable became the instrument of monetary policy only in the IT period. A more predictable behaviour in call interest rates has been accompanied by a marked reduction in inflation volatility (for both the core and headline definitions) and a mild rise in output volatility (for both industrial production and overall GDP). Notwithstanding, when looking at the corresponding output gap measures, there appears to have been a moderate reduction in their volatility. This suggests that fluctuations in real economic activity have been driven to a larger extent by developments in potential output in the IT era.

With regard to the persistence of domestic variables, there is evidence of an extremely high autoregressive component for call interest rates. For the IT period, this is indicative of a pronounced interest rate smoothing motive. The persistence of inflation remained relatively high during the IT period, while that of output measures (be it actual output or the output gap) has declined considerably. Continued high inflation persistence raises the question whether the Korean IT's regime has enjoyed low degree of credibility, with the BOK not appearing to have contributed to weaken the inflation propagation mechanisms. Whatever the explanation behind high inflation persistence, it is worth recalling that the Korean IT era has been characterised by lower volatility in inflation and the output gap.

Exchange rate fluctuations appear to have become somewhat more volatile in the IT era, judging from the summary measure given by the nominal effective exchange rate (NEER). The enhanced flexibility of the won against the US dollar has largely contributed to that outcome, despite the well-known fact that foreign exchange intervention in this market has been considerable in recent years. Higher won/USD variability has been accompanied by more muted movements in the won vis-à-vis the yen, while still being consistent with the above-mentioned result of larger overall nominal exchange rate flexibility. Concerning the real effective exchange rate (REER), it has exhibited lower variability in the IT period. Given enhanced nominal exchange rate flexibility, the latter result cannot be attributed to foreign exchange intervention, but more likely to dampened fluctuations in prices - in line with the evolution of Korean CPI data developments referred to in the previous paragraph.

Finally, we present some evidence that the decline in variability in key macroeconomic variables in the IT period was overall helped by the lower variability observed in some of the external variables used in our macro-model. This is not the case of G7 variables (industrial production and short-term interest rates), whose volatility has remained relatively stable between the two periods. Instead, there has been some reduction in the volatility of oil and non-oil commodity prices, which has helped make terms of trade somewhat more stable as well.

On balance, the evidence presented here points to an improved macroeconomic performance in Korea in the IT period compared to the pre-Asian-crisis 1990s. Indeed, there is evidence of a reduced variability in inflation and output gaps, even if other features of the data could be interpreted in a less positive light (such as the mild increase in actual output volatility or the continued high degree of inflation persistence in the more recent period). Moreover, we observe lower volatility in call interest rates - the policy instrument under the IT scheme - alongside more predictable developments in external variables such as world commodity prices and Korea's terms of trade. This raises the important question as to whether the improvement in Korean macroeconomic performance during the 2000s has been driven by policy or external factors beyond the authorities' control. The present paper does not provide an answer to this question, focusing instead on a different aspect of Korean IT: the characterisation of BOK's objective function in the period since 1999. This will allow us to address the main issues concerning IT, namely, the role of inflation and output stability in central bank preferences, as well as the degree of interest rate smoothing. In addition, we will examine whether, in the period following Korea's move to formal IT, exchange rate fluctuations have been a direct concern for monetary policy.

3 The model specification

Our setup follows that of Rudebusch and Svensson (1999). The monetary authority sets its instrument so as to minimise the following loss function:[13]

$$E_t \sum_{s=t}^{\infty} \beta^{s-t} \left[\omega_\pi \left(\pi_s^Q\right)^2 + \omega_y \left(y_s^Q\right)^2 + \omega_{di}(i_s - i_{s-1})^2 + \omega_{d^2i}(i_s - i_{s-2})^2 + \omega_e \left(e_s^Q\right)^2 \right] \tag{1}$$

where $\beta \in (0,1)$ is a subjective discount factor, π_t^Q is the inflation rate π_t (in deviation from its pre-announced target),[14] y_t^Q the three-month moving average of the output gap y_t, i_t the call rate (in deviation from a time-varying trend), and e_t^Q the three-month moving average of REER, e_t, also measured in deviation from a time-varying trend.[15] The (non-negative) weights the central bank places on these various goals are given by ω_π, ω_y , ω_{di}, ω_{d^2i} and ω_e. The first three weights are rather standard, reflecting a desire for price stability, output stability and interest rate smoothing, respectively. Smoothing refers to the notion that central banks tend to adjust their policy interest rates in sequences of relatively small steps over several years with only rare reversals of direction. The use of moving averages for the policy goals is motivated by our

[13] Modern research in macroeconomics shows that quadratic loss functions such as (1) here can be, under certain conditions, interpreted as a second order approximation to the welfare of the representative agent (see *e.g.* Woodford, 2003b). Here we make the standard simplifying assumption that the marginal rate of substitution between goals is independent of the economic structure.

[14] Moreover, the inflation objective will be measured here in annual terms, while using data that is available on a monthly basis.

[15] More specifically, in the case of three-month moving averages a given such average is defined as $z_t^Q \equiv (1/3) \sum_{k=0}^{2} z_{t t-k}$, where $z = y; e$.

use of high frequency (monthly) data. This is also the rationale behind the inclusion of weight ω_{d^2i}, whose economic interpretation is that of capturing acceleration or deceleration concerns regarding the path of interest rates. It can also be interpreted as a smoothing interest rate motive but extended over an extra period of time. Weight ω_e captures the notion that the central bank may want to stabilise the value of the exchange rate.

The rest of the economy is represented by an estimated macro-model. The latter draws from Rudebusch and Svensson (1999) and is extended to include small-open-economy features. These include: a) modelling the exchange rate and its implications for inflation and output fluctuations; and b) controlling for external variables that influence Korea's macroeconomic developments. More precisely, our macro-model consists of the following equations:

$$y_t = \delta(L)y_{t-1} + \theta(L)\left(i_{t-1} - \pi_{t-1}\right) + \alpha(L)e_{t-1} + \tau(L)x_{t-1} + \varepsilon_{yi} \quad (2)$$

$$\pi_t = \gamma(L)\pi_{t-1} + \nu(L)y_{t-1} + \kappa(L)e_{t-1} + \xi(L)x_{t-1} + \varepsilon_{\pi i} \quad (3)$$

$$e_t = \rho(L)e_{t-1} + \mu(L)\left(i_{t-1} - \pi_{t-1}\right) + \phi(L)y_{t-1} + \psi(L)x_{t-1} + \varepsilon_{ei} \quad (4)$$

where $\delta(L)$, $\theta(L)$, etc., are polynomials in the lag operator L. Equation (2) states that aggregate demand reacts to its own lags, the interest rate, the exchange rate and exogenous variables x_t (such as commodity prices, and foreign output, interest rates and inflation). Equation (3) is the Phillips curve, with inflation determined by its lags, the output gap, the exchange rate, and exogenous variables. Equation (4) is an exchange rate equation, where this variable (in real effective terms) depends on its recent past, as well as on interest rates and output both at home and abroad (alongside other exogenous variables).

The macro-model is estimated using a seemingly unrelated regression (SUR) methodology, which allows the error terms to be correlated across equations (see Appendix for details). We employ monthly data ranging from 1999:1 to

2006:12. Data on real output, measured as an industrial production index, are from the IMF's *International Financial Statistics* (henceforth IFS). The series for the call rate as well as the actual and targeted core CPI inflation data are obtained from the BOK. REER ("broad" measure for 52 countries) is taken from BIS.[16] In Table 1, we have used "narrow" NEER and REER measures (for 26 and 27 countries, respectively; from BIS) which are available over a longer time span. Concerning x_t, we consider the following set of global variables - not all of them being found to be statistically significant, and thus used, in the model's final specification. World economic activity is measured in terms of either US or G7 countries' industrial production indicators (from IFS) - the latter weighted according to an average over the entire sample of their quarterly national accounts (from the OECD database) expressed in US dollars. The same weights are used to: a) construct a G7 CPI index from individual countries' respective indices (data from IFS); and b) build a measure of G7 interest rate levels from short-term interest rates (from IFS). Alternatively, US series for CPI inflation and short-term rates (from IFS) were used. Korea's terms of trade are computed from IFS data. Brent oil prices in US dollars are from IFS. Non-oil commodity prices in US dollars are from the Hamburg Institute of International Economics (HWWA), and are computed using OECD countries' weights. Finally, global equity prices are measured in terms of the MSCI index (from Morgan Stanley Capital International). Trend values for the different variables other than inflation are estimated by means of the Hodrick-Prescott filter.

The central bank's problem is to minimise (1) subject to (2), (3), and (4). The solution yields the central bank's optimal reaction function. Because the

[16] While the use of REER keeps our analysis close to related theoretical models, some authors have emphasised the relevance of the yen/dollar rate for Korean macroeconomic dynamics. For instance, McKinnon and Schnabl (2003) investigate the role of the yen/dollar rate in East Asian economies, providing evidence that a major yen devaluation has a negative impact on their real economic activity. Kang, Kim and Wang (2005) qualify this conclusion by showing that the effects of the weakening of the yen against the US dollar exchange rate on the Korean economy are statistically significant only since the Asian crisis.

loss function is quadratic, the optimal reaction function is linear in the forcing variables:

$$i_t = r_t + \pi_t + \varphi_i(L)i_{t-1} + \varphi_y(L)y_t^Q + \varphi_\pi(L)\pi_t^Q + \varphi_e(L)e_t + \varphi_x(L)x_t \qquad (5)$$

where r_t is the time-varying trend real interest rate, and $\varphi_i(L)$, $\varphi_y(L)$, etc., are polynomials in the lag operator. Given the parameter estimates for equations (2), (3), and (4), and values for β and the weights ω_π, ω_y, ω_{di}, ω_{d^2i} and ω_e, one can use numerical methods to obtain the parameters in $\varphi_i(L)$, $\varphi_y(L)$, etc. The parameter β is set to 0.997, which amounts to 0.99 in quarterly terms.

We employ a maximum-likelihood approach to estimate policy parameters conditional on private sector behaviour.[17] The solution to the optimisation problem determines the decision rule that the BOK uses to set the call rate. On the basis that Korean monetary policy is set optimally, we estimate the parameters in the policy regime parameters, which are also conditional on the macro-model elasticities. The estimation process thus involves backing out the objective function parameters that best describe the data from the way macroeconomic variables evolve over time. This approach avoids the need to estimate an unconstrained reduced form policy rule.

As mentioned earlier, in order to best characterise BOK intentions we consider two types of loss functions. Let us describe each type in turn. We first look at rule-of-thumb benchmarks, then turning our attention to optimisation-based objective functions. In the case of benchmark objective functions (see panel A in Table 2), we normalise the weights by setting $\omega_\pi = 1$. Thus, in all benchmarks analysed here the weights for the four remaining goals should be interpreted as relative to ω_π. The first set of policy weights considered (in

[17] We solve for the constrained optimal reaction functions in (5) using the methods described in Söderlind (1999), and Rudebusch and Svensson (1999). The problem has the structure of the optimal linear regulator. The macro-model is backward looking, and there is therefore no difference between the discretionary and commitment solutions. For details, see Appendix A in the working paper version of the present study (Sánchez, 2008a).

line 1) is that of a “strict” inflation targeter, namely a central bank that focuses exclusively on inflation. Following King (1997), this type of policymaker can be labelled an "inflation nutter". Line 2 shows the second set, which we call “flexible” IT. This case assumes that central bank cares about both inflation and output, while also smoothing interest rates slightly. Rudebusch and Svensson (1999) argue that these assumptions fit the US data well for the years 1961 to 1996.[18] The third set of weights (Benchmark 3) allows for a considerable degree of smoothing ($\omega_{di} = 5$), while also permitting output to be a concern for the BOK ($w_y = 1$). The fourth and fifth sixth sets, labelled Benchmarks 4 and 5, respectively, involve the other two weights used here, namely, ω_e and ω_{d^2i}. Neither set of weights assumes any concern for output stability. The fourth set mixes heavy smoothing and a concern for exchange rates ($w_e = 1$), while the fifth set combines high degree of smoothing over both one- and two-month periods ($\omega_{d^2i} = 5$).

We now turn to the second type of central bank preferences, namely, those based on optimisation considerations (see panel B in Table 2). This includes both the set of optimal policy weights and those resulting from switching off one given optimal weight estimate at a time to assess its relative contribution to the observed interest rate path. Given that ω_π is one of the weights set to zero in one specific scenario, this time we decide not to normalise the weights by setting $\omega_\pi = 1$, but instead by making all included weights add up to one at the optimum.[19] Moreover, we do not consider the joint possibility of one- and two-period smoothing; we instead set $\omega_{d^2i} = 0$ from the outset.[20] As will be made clear in the next section, ω_y and ω_e are both estimated to

[18] In their characterisations of optimal policy, Collins and Siklos (2004) also consider our first two benchmarks.

[19] Which specific type of normalisation we adopt is inconsequential. The only thing that matters for representing central bank preferences are the relative weights between all possible objectives. The two types of normalisation used here simply fulfil the aim of helping clarify the meaning behind the loss function in question.

[20] The reason for this is that, as we shall see later, a positive value for ω_{d^2i} does not appear to improve much the fit of policy rules to actual call rates.

be small and positive, but not different from zero statistically. We thus set $\omega_y = \omega_e = 0$ in all optimisation-based scenarios. We are thus left with only ω_π and ω_{di} as non-zero weights to be switched off alternatively. Switching off ω_{di} amounts to benchmark 1 above (strict IT). Therefore, the only new scenario to consider is that where the BOK focuses exclusively on (one-period) interest rate smoothing, which obtains by setting $\omega_\pi = 0$. It is worth saying that we do not rescale the non-zero ω_{di} weight to add up to one as this would make no difference for the implied interest rate path. Table 2 (panel B) reports our two new sets of optimisation-based policy weights: optimal weights in line 6, followed by those obtained by switching ω_π off in line 7.

4 Empirical results

Our estimation methodology backs up BOK's objective function parameters conditional on private sector behaviour, assuming that policy is set optimally. As explained in section 3, in addition to optimisation-based objective functions we consider rule-of-thumb benchmarks. In all cases, we present the results from our approach in terms of a comparison between actual policy interest rates and paths obtained by simulating the optimal reaction functions. Along the way, we report correlation coefficients between simulated interest rate paths and actual call rates (see Table 3).

We start by comparing actual (nominal) call rates (dark blue lines in all Figures 2 through 5) with the scenarios given by all of our rule-of-thumb benchmarks under study. Figure 2 contrasts the levels of call interest rates that a strict inflation targeter would have selected (pink solid line) with the corresponding actual call rates. It is clear that Korea does not pursue strict IT. Under strict targeting, policy interest rates would have varied wildly, often hitting double-digits, and sometimes turning negative (unless we were to impose a zero bound on nominal interest rates).

Figure 3 presents actual call rates alongside two different cases: i) Benchmark 2, which corresponds to "flexible" IT (light blue solid line) in the definition of Rudebusch and Svensson (1999) ($w_y = 1$, $\omega_{di} = 0.5$); and ii) Benchmark 3 (purple dashed line), which is a variation of the latter case where the central bank displays a considerable degree of (one-period) smoothing ($\omega_{di} = 5$). Consistent with the findings of Rudebusch and Svensson (1999), "flexible" IT lies much closer to actual call interest rates than strict IT (improving the correlation with actual call rates from 0.380 to 0.925; see Table 3). However, this type of flexible targeting still appears to be an inaccurate representation of IT in Korea. In particular, the simulations indicate that a Benchmark 2-type inflation targeter would have at times deviated considerably from actual behaviour, especially over the period 1999-2002. In any case, our finding that Korea has not focused exclusively on inflation since 1999 implies that the BOK pursues "flexible" policies of some type, even if they do not exactly correspond to Benchmark 2. Benchmark 3, also shown in Figure 3, appears to fit observed call rates better than both strict IT and Benchmark 2 (correlation with actual call rates at 0.979; see Table 3). The distinctive feature of Benchmark 3 relative to Benchmark 2 is that the former involves a higher value for ω_{di}. The better performance of Benchmark 3 thus implies that the BOK's objective function evinces a considerable degree of smoothing.

Figure 4 compares actual policy interest rates with two paths obtained from simulations that include both a concern for inflation ($\omega_\pi = 1$) and considerable degree of smoothing ($\omega_{di} = 5$). Here, we rule out the possibility that output stabilisation plays a direct role ($w_y = 0$). Unlike the previous cases, we consider alternatively the remaining two candidate policy goals. Concretely, Benchmark 4 (light green solid line) permits exchange rate stability to be a concern for the BOK ($w_e = 1$), while Benchmark 5 (dark green dashed line) instead allows for a considerable role for smoothing over a two-month period ($\omega_{d^2i} = 5$). Benchmark 4 is largely at odds with actual interest rate fluctuations, especially between 1999 and 2002. It is thus apparent that exchange rates do not enter policymaker's considerations, at least no more than output does (compare Benchmark 5 with Benchmark 3 in Figure 3).[21] Turning to two-period smoothing, consideration of this goal is encouraging in that the corresponding interest rate path fits actual call rates rather well (correlation with actual call rates at 0.991; see Table 3). However, it does not appear to add much to what was already explained by a role for output (see Benchmark 3 in Figure 3). For this reason, we do not consider weight ω_{d^2i} when deriving our optimal weights for the central bank objective function.

Table 4 reports the weights estimated to be attached by the BOK to its candidate objectives at the optimum. The weights on output and the exchange rate are found to small and positive, but statistically insignificant.[22] The lack of output and exchange rate stabilisation goals suggests that, if the latter two variables were to enter the estimated policy rule for Korea, this would be the case only because it contains information about future inflation. We identify a concern for price stability, with $\omega_\pi = 0.309$, implying a considerable emphasis put by the BOK on interest rate smoothing ($\omega_{di} = 0.691$). Our estimate of a much bigger weight on inflation than output in the loss function is broadly in line with the Korea's IT framework, which has price stability as the central bank's primary objective. The interest rate path consistent with optimal weights (Benchmark 6, grey solid line in Figure 5) matches actual call rates rather closely, with correlation with actual call rates at 0.984 (Table 3). This is supportive of the notion that the BOK behaved optimally adjusting the policy interest rate very gradually in its pursuit of price stability. The important role played by price stability can be assessed by switching off ω_π, which leaves us with a pure concern for interest rate smoothing (Benchmark 7, orange dashed line in Figure 5). The path implied by the latter configuration lies far away

[21] The correlation between path i_t^4 and actual call rates equals 0.881 (Table 3).

[22] For the Fed, Favero and Rovelli (2003), Castelnuovo and Surico (2004), Collins and Siklos (2004) and Dennis (2006) all estimate the weight attached to output stability be close to zero. In contrast, Ozlale (2003) reports a significant, non-negligible (full sample) output coefficient but still smaller than that for inflation. Collins and Siklos (2004) report negligible output weights for Australia, Canada and New Zealand.

from observed call rates (correlation with actual call rates at 0.697; see Table 3), providing a positive consistency check for our result that ω_π is positive and statistically significant. Switching off ω_{di} amounts to Benchmark 1, which is the strict IT case already described. Under this scenario, simulated interest rates are found to move wildly around the path registered by actual call rates. This situation reflects a considerable interest rate smoothing motive, in line with the high optimal value estimated for ω_{di}.

While we find that the BOK places a negligible emphasis on both output and the exchange rate, the latter two variables play indirect roles in the determination of inflation, and thus of monetary policy itself. Indeed, inspection of our estimated macro-model allows us to see that inflation is directly affected by both output and REER (see equation (A.11) in the Appendix). Output also enters the exchange rate equation (A.12), thereby contributing to also affect inflation via the exchange rate pass-through channel.[23] All these considerations point to the conclusion that, even if they are not monetary policy objectives, output and exchange rates indicators are worth being monitored on a regular basis by the BOK.

Summarising the results from this section thus far, we find that the Korean IT regime can be reasonably well characterised in terms of optimal policy geared towards achieving price stability, coupled with a considerable degree of interest rate smoothing. In addition, monetary policy is estimated to have placed negligible weights on output and exchange rate variability in setting monetary policy. These results deserve further discussion, to which we devote the remainder of this section.

Analysts very often report that interest rate smoothing is an important feature of central banks. Despite extensive research devoted to the subject, the

[23] Instead, the demand for output does not appear to react to the exchange rate (see equation A.10 in the Appendix). This can be rationalised under the assumption that the favourable effect of the exchange rate on competitiveness (owing to incomplete pass-through) is by and large offset by adverse balance-sheet effects. Alternatively, the absence of the exchange rate as a regressor in the IS curve has sometimes been interpreted as indicating that a flexible exchange rate completely insulates the economy from global shocks.

literature has not reached a consensus about the connection between interest rate smoothing and concerns about output stability. In the literature, monetary policy inertia is sometimes linked to the notion that large movements in interest rates can lead to lost reputation, or credibility, if a policy intervention subsequently needs to be reversed. Moreover, parameter uncertainty makes it optimal for policymakers to be cautious when changing interest rates. More specifically, the explanations that have attracted recent research attention include the presence of forward-looking expectations (Woodford, 2003a), data uncertainty (Orphanides, 2003), and parameter uncertainty (Sack, 2000). Many of the approaches to smoothing implicitly or explicitly assume that there is no such connection. In the absence of such link, our results for Korea should be interpreted as reflecting a gradualist approach to inflation without any further output stabilisation goal. In this sense, our estimate of a much bigger weight on inflation than output in the loss function is deemed in line with Korean monetary authority's mandate, which has price stability as its primary objective. Even within this interpretation, the pursuit of inflation stabilisation is estimated to be gradual. Moreover, the Korean monetary authority would benefit from responding to output fluctuations in light of their expected effect on consumer price developments.

A different reading of our findings is possible in light of some literature that explains interest rate smoothing in connection with output variability. Collins and Siklos (2004) interpret their result that central banks evince strong interest rate smoothing as indirect evidence of concerns for output stability. This interpretation draws from Svensson's (1999) assertion that IT central banks adopt a more gradualist (that is, flexible) policy under three scenarios: concerns about output stability, model uncertainty and interest rate smoothing. By dampening fluctuations in interest rates the central bank would contribute to reducing volatility in economic activity via this specific channel.[24] In this

[24]Judging from the set of optimal weights reported here, an output stabilisation goal appears to be redundant after enabling the BOK to have considerable concerns about the

light, failure to uncover a weight on output would not preclude the BOK from having an indirect concern for output stability relating to an interest rate smoothing motive. Our result that Korea follows a gradualist approach toward inflation could thus be seen as compatible with an implicit - as opposed to an explicit - output stabilisation goal. This interpretation is roughly in line with Korea's monetary policy framework, as long as it is not meant to imply a too pressing concern for output stability. Indeed, while price stability is BOK's primary objective, this institution is also expected to look after economic and financial stability - the latter in particular being deemed instrumental to avoid major crises. In sum, both of the views about smoothing described here are broadly consistent with BOK's mandate, but they involve somewhat different interpretations as to the importance that the BOK attaches to output stability under the IT scheme.

As mentioned above, one of our important results is that the Korean monetary authority does not appear to put any weight on the exchange rate. This finding is in line with the notion that the BOK may use the realisations of the exchange rate as a leading indicator for relevant macroeconomic developments. The absence of a direct concern for exchange rate variability is also consistent with the evidence about the won's higher flexibility during the IT period. After all, IT regimes have spread among EMEs partly as a result of these countries' disenchantment with exchange rate pegs.[25] The experience with pegs showed that EMEs were vulnerable to speculative attacks, thereby leading to difficult choices such as a drawdown of international reserves and costly real adjustments. Recent studies have stated the case for enhanced

variability in inflation and interest rates. However, it is worth recalling that modelling Korea's gradualist approach to pursuing price stability in terms of smoothing and output stability objectives (see Benchmarks 2 and 3 above) helped better characterise the observed call interest rate path, compared with the strict IT scenario. This was the case even for the Benchmark 2, which allows for only a moderate degree of interest rate smoothing (ω_{di} = 0.5).

[25] Regarding other arrangements, monetary targeting proved to be unreliable in light of financial innovation and other forces behind the instability of money demand.

exchange rate flexibility of the type envisaged in IT schemes. For instance, Céspedes et al. (2004) find that, for reasonable parameter values, a float should dominate a fixed exchange rate scheme, even in the presence of liability dollarisation which makes the exchange rate adjustment more burdensome. Using an estimated DSGE for Korea, Chung et al. (2007) report that an IT rule with a floating exchange rate is superior to an exchange rate peg. Elekdag and Tchakarov (2007) show that, except for cases of relatively high external debt ratios (in particular above Korean standards), a flexible exchange rate regime dominates a peg. The key mechanism involved here is the presence of a financial accelerator coupled with liability dollarisation, which appears to be a relevant feature of the Korean economy according to the estimates reported in Elekdag, Justiniano and Tchakarov (2006). While Korea has intervened heavily in the foreign exchange market, this has not precluded the value of the won from fluctuating over time, with no signs of heightened inflation and interest rate variability. Therefore, there is no clear evidence that such interventions have interfered with BOK's pursuit of price stability.[26]

5 Concluding remarks

Korea's experience since IT implementation in 1999 has been broadly satisfactory, with inflation in particular being relatively low and stable. In this sense, the BOK's primary goal of price stability appears to have been achieved. According to our characterisation of Korea's IT regime, the monetary authority cares about price stability, while also exhibiting a high degree of interest rate smoothing. Moreover, the BOK is estimated to put a negligible weight on output variability. The much higher weight put on inflation relative to output suggests that the BOK is interested in increasing the odds that it will reach the

[26] Our analysis relates to Korea's actual experience with IT. Were the sterilisation of capital flows to become a destabilising force in the future, a change of course in monetary policy would be needed in order to restablish macroeconomic stability. An assessment of this pessimistic scenario is beyond the scope of the present paper.

inflation target. In obtaining these results, we shed light on the general issues concerning IT, such as the weights attached by the central bank to inflation stability versus output stability, as well as the role of interest rate smoothing. These results are broadly consistent with previous studies for the US as well as explicit IT advanced economies.

In line with the existing literature, we have provided two different explanations for our results. According to one of them, interest rate smoothing is seen as independent from central bank concerns for output variability. This view is embedded in standard contributions that focus on characterising smoothing rather than establishing possible links with an output stabilisation goal. From this perspective, our results are to be interpreted as capturing a gradualist approach to inflation targeting, coupled with a neglect for output stability. Our estimate of a much bigger weight on inflation than output would thus be compatible with Korea's IT framework, which has price stability as the main goal of monetary policy. Our results could also be rationalised in a second way, along the lines of Collins and Siklos (2004). Drawing on Svensson (1999), these authors interpret the result that central banks evince strong interest rate smoothing as indirectly reflecting some concern for output stability. In this view, the BOK would adopt a flexible policy in which monetary policy inertia aims at dampening output volatility. Therefore, our finding of a negligible weight on output could still be consistent with the existence of a (secondary) output stabilisation goal. Despite the contrast between the two explanations given here, the second one could also be reconciled with Korea's monetary policy setup. As we have seen, price stability is Korea's monetary policy main goal, but the BOK is also supposed to care for economic and financial stability. In conclusion, the two interpretations given here for the link between interest rate smoothing and output stabilisation are broadly in line with Korean monetary scheme. It is however worth noting that these two views convey somewhat different implications for the role that output stability plays in BOK policy moves.

Our results also allow for a better understanding of the role of exchange rate variability in monetary policymaking, in connection with Korea's status as both a very open economy and an EME country. We find that the Korean monetary authority does not put any noticeable emphasis on the exchange rate. This is consistent with the notion that the BOK would benefit from monitoring the exchange rate for IT considerations. In connection with this, estimated reaction functions may involve an exchange rate term even if the policymaker does not have a specific concern for exchange rate fluctuations. In particular, our finding does not contradict Eichengreen's (2004) result that the value of the won enters his estimated monetary policy reaction function for Korea. This author argues that the communication of the country's monetary policymaking could be more transparent about the role played by the exchange rate.[27] Judging from our findings, this variable is a leading indicator of inflation that is worth monitoring. Communication of such role in relation to targeted objectives could only contribute to enhancing monetary policy credibility. The finding that the BOK does not put emphasis on the exchange rate is also in line with the won's higher flexibility observed during the IT period, which has ocurred despite considerable intervention in the foreign exchange market.

[27] Concretely, Eichengreen (2004) proposes that the Bank of Korea attach more attention to the exchange rate when sending its Monetary Policy Report to the National Assembly or its monthly press releases following decisions of the Monetary Policy Committee.

Appendix: Model Estimates and the Empirical Policy Reaction Function

The Korean model used here has an IS equation, a Phillips curve, and an exchange rate equation, as given by expressions (2) through (4) in section 3. The equations are estimated over the period 1999:1-2006:12 using a SUR approach (see main text for data sources). The model estimates are as follows:

$$
\begin{aligned}
y_{t+1} &= \underset{(7.727)}{0.656}\, y_t - \underset{(-2.780)}{0.025}\, (i_t - \pi_t) + \underset{(2.519)}{0.543}\, y_t^{G7} && \text{(A.10)} \\
\pi_{t+1} &= \underset{(24.879)}{0.872}\, \pi_{t-3} + \underset{(2.428)}{0.046}\, y_{t-1} + \underset{(2.512)}{0.009}\, oil_t + \underset{(3.702)}{0.033}\, hwwa_{t-2} \\
&\quad - \underset{(-2.471)}{0.026}\, reer_{t-2} && \text{(A.11)} \\
e_{t+1} - e_t &= \underset{(3.069)}{0.295}\, (e_t - e_{t-1}) - \underset{(-2.472)}{0.042}\, \left(i_t^{G7} - i_{t-1}^{G7}\right) + \underset{(2.664)}{0.191}\, \left(y_{t-1} - y_{t-1}^{G7}\right) \\
&\quad + \underset{(2.506)}{0.125}\, tot_{t-1} && \text{(A.12)}
\end{aligned}
$$

where t-values are in parenthesis, and are robust to heteroskedasticity and serial correlation. The following external variables are used: y_t^{G7} denotes G7 real GDP; i_t^{G7}, G7 short-term interest rate; tot_t, Korea's terms of trade; oil_t, the oil price; $hwwa_t$, the HWWA non-oil commodity price index; and $reer_t$, the real effective exchange rate. All included explanatory variables are precisely estimated (at the 5% significance level) and have the conventional signs.[28]

Compared with the general model postulated in equations (2) through (4),

[28] Lag selection is made on the basis of the Akaike criterion, allowing for up to a maximum of 6 lags and choosing on the basis of relevant variables; variables may enter a given equation alternatively in levels or in first differences. Variables represent deviations from a Hodrick-Prescott trend. Interest rates and inflation rates are measured in per cent per annum terms, while the remaining variables are computed as percentage deviations from trend.

the most important differences are the lack of an exchange rate term in the IS curve (A.10) and the lack of a domestic interest rate term in the exchange rate equation (A.12). While the direct unresponsiveness of aggregate demand to a real exchange rate depreciation could in part be rationalised in terms of the latter's ambiguous effects,[29] it is worth noting that the exchange rate does exert an indirect influence on economic activity via real interest rate movements. With regard to the lack of a direct link between exchange rates and domestic interest rates, it does not prevent the latter from indirectly affecting the former via its influence on output. Our macro-model does not appear to be misspecified, judging from a comparison between the optimal interest rate path and the unconstrained policy rule (both being conditional on the same state variables of the model).[30] Among other features in (A.10)-(A.12), the moderate degree of Korean exchange rate pass-through implied by the Phillips curve is consistent with the findings reported in Ca' Zorzi, Hahn and Sánchez (2007).[31]

In order to close the model, we estimate autoregressive processes for external variables, which altogether appear to impact each of the expressions (A.10) through (A.12). We allow for up to 6 lags; however, at most two are found to be significantly different from zero. The values for the autoregressive coefficients are as follows. The first-order coefficients for y_t^{G7}, tot_t, $hwwa_t$ and oil_t are 0.931, 0.761, 0.898 and 0.759, respectively, while the first- and second-order coefficients for i_t^{G7} are 1.429 and -0.481, respectively. These estimates point to rather persistent external variables, with oil_t and tot_t being the least persistent and i_t^{G7} the most.

[29] In this regard, see the discussion in the Introduction about how an exchange rate depreciation may trigger pro-competitiveness and adverse balance sheet effects that point in different directions.

[30] Both the optimal interest rate path and that derived from the unconditional policy rule are found to be similar to observed call rates. These results are available from the author upon request.

[31] Sánchez (2007) finds that low pass-through in emerging East Asia can be rationalised as arising following a risk premium shock.

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Table 1. Summary statistics: 1991H1 - 2006H2

	1991H1 - 1997H1					2000H1 - 2006H2				
	Mean	**SD**	**Max**	**Min**	**AR**	**Mean**	**SD**	**Max**	**Min**	**AR**
A. Domestic variables										
Call interest rate	13.4	2.1	18.6	10.9	0.97	4.2	0.6	5.2	3.3	0.99
Real output										
Industrial production	3.9	2.0	7.6	-0.2	0.82	3.6	2.7	8.1	-2.6	0.57
GDP	7.6	2.4	11.8	2.4	0.86	5.2	2.7	11.0	0.1	0.57
Output gap										
Industrial production	0.1	1.6	2.3	-2.4	0.41	0.0	1.4	2.8	-2.4	-0.05
GDP	0.0	1.1	1.4	-1.4	0.59	0.0	0.7	1.5	-1.1	0.06
CPI inflation										
Headline	5.9	1.8	10.0	4.2	0.89	2.9	0.8	4.6	1.5	0.98
Core	5.9	1.6	9.1	3.5	0.91	2.6	0.7	3.6	1.2	0.99
Exchange rates										
REER	0.6	8.3	18.6	-12.0	-0.40	4.6	7.8	22.0	-11.2	0.21
NEER	-2.7	7.3	12.2	-14.6	-0.13	3.1	8.4	19.8	-14.5	0.15
Won/USD	3.6	6.1	15.0	-8.0	0.90	-2.8	9.6	25.2	-16.1	0.17
Won/Yen	6.1	15.7	29.6	-29.7	-0.01	-5.4	7.7	13.7	-17.6	0.06
B. External variables										
G7 real output	1.8	3.0	6.5	-1.9	0.76	1.4	3.3	5.4	-6.8	0.39
G7 short-term interest rate	4.9	1.1	7.5	3.9	0.93	2.7	1.0	4.3	1.3	0.99
Terms of trade	-2.1	11.4	21.0	-20.5	0.03	-4.3	9.3	9.9	-23.0	0.32
Oil price	-2.1	11.4	12.1	-28.9	0.14	1.8	10.1	18.3	-19.7	-0.42
Non-oil commodity prices	2.5	17.5	38.4	-17.1	0.48	11.8	16.4	53.3	-15.6	0.42

Note: Variables reported here are measured as annualised rates of growth between the last quarter of a given semester (H1 or H2) and the last quarter of the previous semester. The exceptions are: the call interest rates (in per cent per annum) and output gaps (in per cent), which are both averages for the semester in question. An increase in the nominal and real effective exchange rates (NEER and REER, respectively) denotes an appreciation; an increase in the bilateral exchange rates denotes a depreciation. The potential output measure used to compute the output gap consists of a Hodrick-Prescott trend, calculated separately for each period considered. SD is the standard deviation and AR the first-order serial correlation coefficient.

Sources: See the main text (section 3).

Table 2. Weights used in central bank loss function

Case	ω_π	ω_y	ω_{di}	ω_e	ω_{d^2i}
A. Standard benchmarks [a]					
1. Strict inflation targeting	1	0	0	0	0
2. "Flexible" inflation targeting (Rudebusch and Svensson, 1999)	1	1	0.5	0	0
3. Heavy (one-period) interest rate smoothing; concern for output	1	1	5	0	0
4. Heavy (one-period) interest rate smoothing; concern for exchange rate	1	0	5	1	0
5. Heavy one- and two-period interest rate smoothing	1	0	5	0	5
B. Optimisation-based measures [b]					
6. Optimal interest path	0.309	0	0.691	0	0
7. Optimal interest path constrained by setting w_{di}=0	0	0	0.691	0	0

a) For standard benchmarks, weights are normalised so that the inflation weight equals one.

b) For optimal interest rates (Case 6), weights are normalised to add up to one. Weights ω_y and ω_e are not found to be significantly different from zero, while two-period smoothing is not considered for optimisation purposes; thus, ω_y, ω_e and ω_{d^2i} are all set to zero. Measure 7 obtains by setting ω_π to zero.

Table 3. Correlation matrix for different call interest rate paths

	i_t	$\hat{i}_t$	i_t^1	i_t^2	i_t^3	i_t^4	i_t^5	i_t^6	i_t^7
i_t	1								
$\hat{i}_t$	0.974	1							
i_t^1	**0.380**	**0.471**	1						
i_t^2	0.925	0.971	**0.596**	1					
i_t^3	0.979	0.997	**0.464**	0.975	1				
i_t^4	**0.881**	0.944	**0.625**	0.963	0.937	1			
i_t^5	0.991	0.993	**0.422**	0.956	0.996	0.917	1		
i_t^6	0.984	0.996	**0.436**	0.963	0.999	0.927	0.998	1	
i_t^7	**0.697**	**0.601**	**-0.286**	**0.429**	**0.610**	**0.370**	**0.659**	**0.644**	1

The interest rate paths featuring in this Table are: i_t denotes actual interest rates; $\hat{i}_t$ are fitted values from the unrestricted policy rule; and i_t^κ correspond to cases κ=1,…,7 in Table 1 (with κ=1,…,5 being rule-of-thumb benchmarks, and κ=6,7 corresponding to optimisation-based interest rate paths). Bold figures indicate correlation coefficients below 0.9. Correlations are computed over the longest possible period, namely, 1999:6 - 2006:12.

Table 4. Estimates of central bank objective function parameters

	point estimate	t-statistic	p-value
ω_π	0.309	2.964	0.003
ω_y	0.020	1.274	0.203
ω_e	0.002	0.566	0.571

The reported weights, together with those put on one- and two-period interest rate smoothing, must add up to one. Two-period smoothing is not considered for optimisation purposes; thus $\omega_{d^2i} = 0$. Moreover, since ω_y and ω_e are both statistically insignificant, we set them to zero. The point estimate for ω_{di} thus equals 0.691.

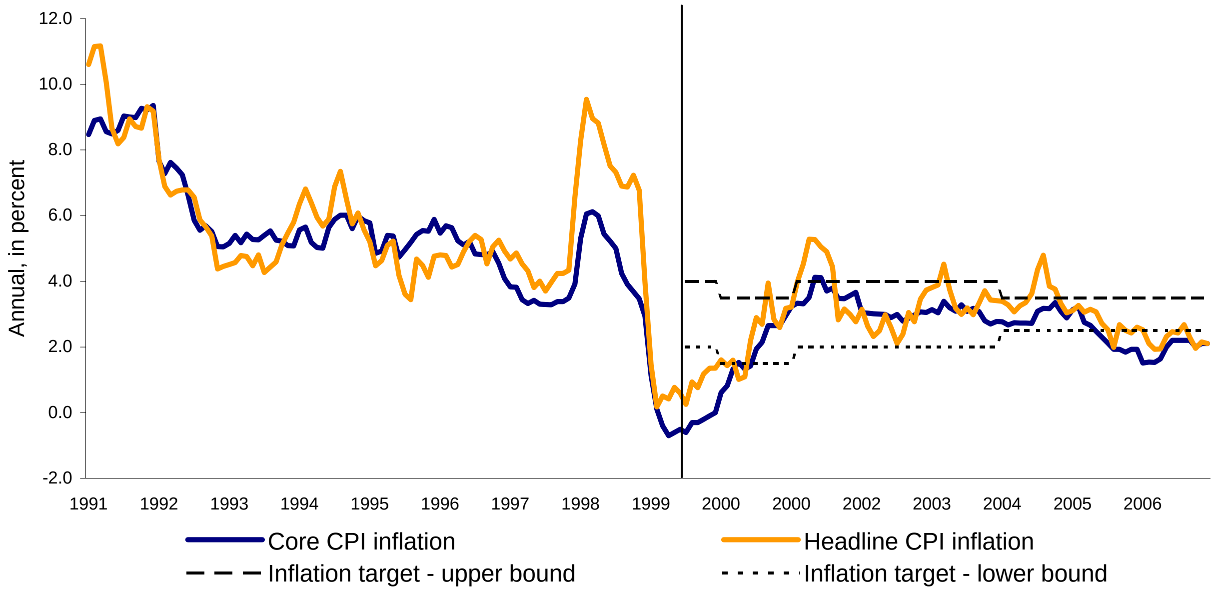

Figure 1. The inflation record, 1991-2005

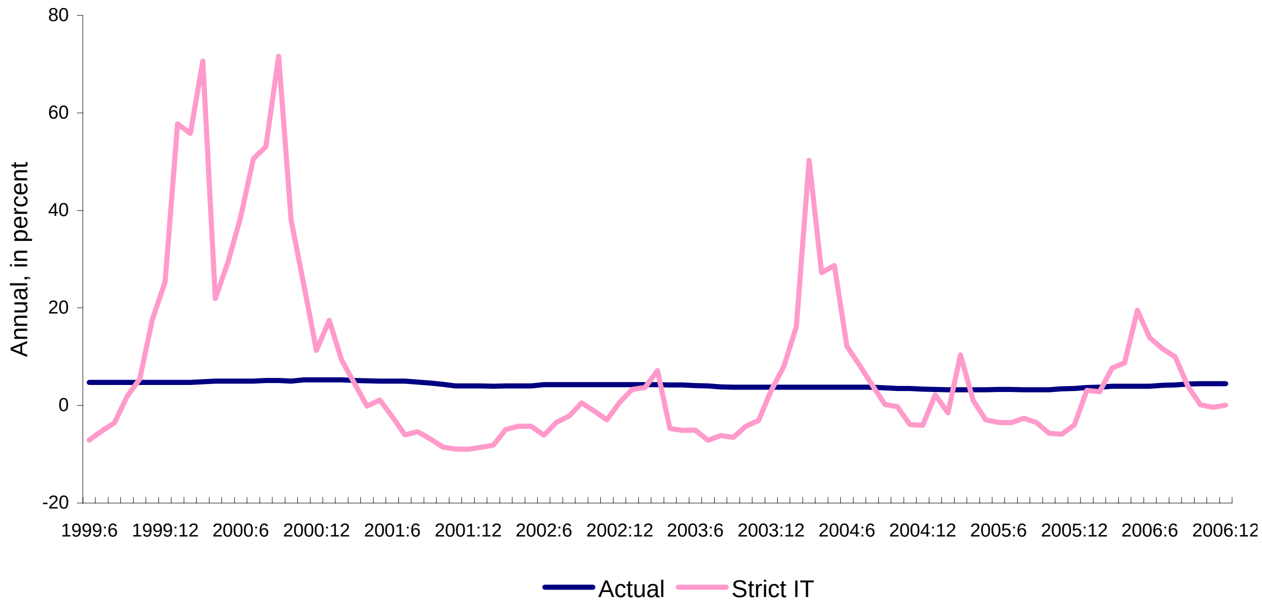

Figure 2. Actual and simulated call interest rates

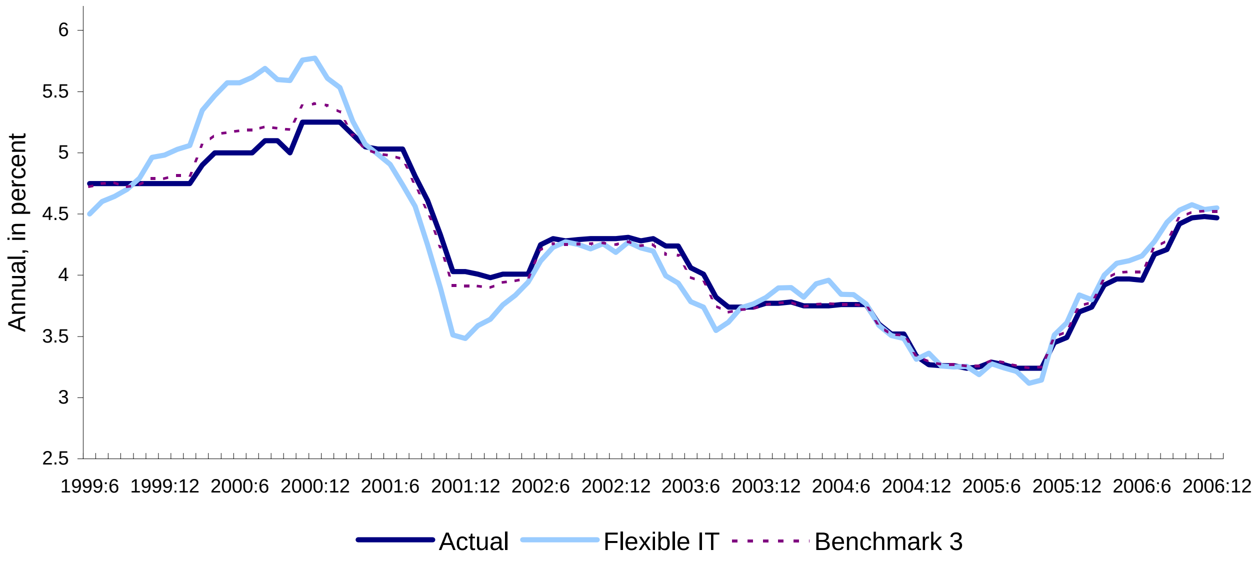

Figure 3. Actual and simulated call interest rates

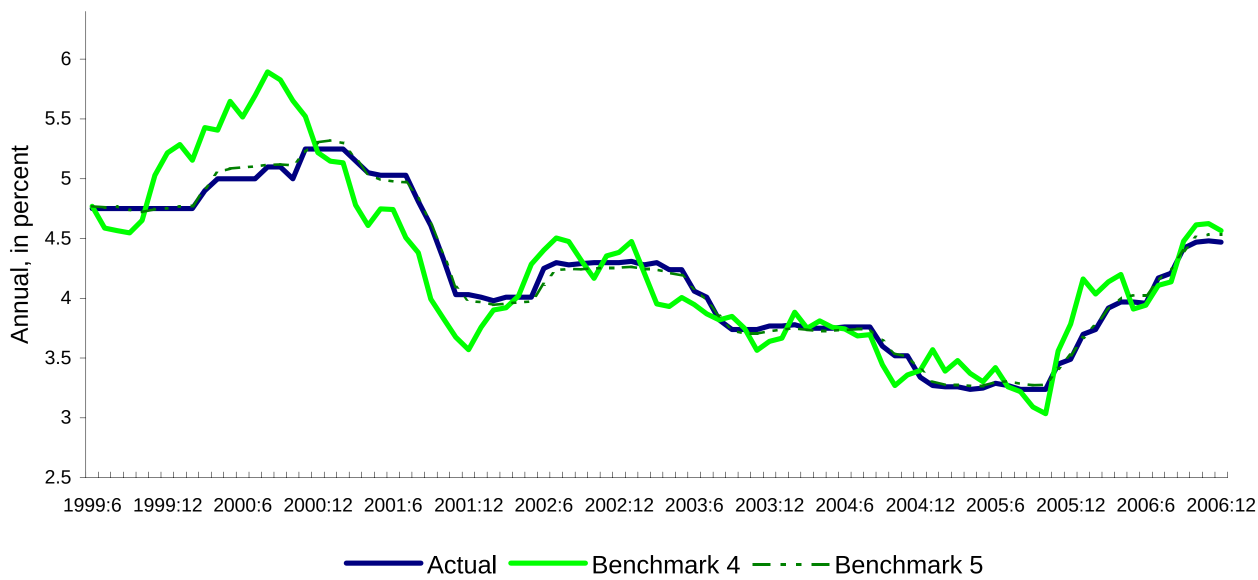

Figure 4. Actual and simulated call interest rates

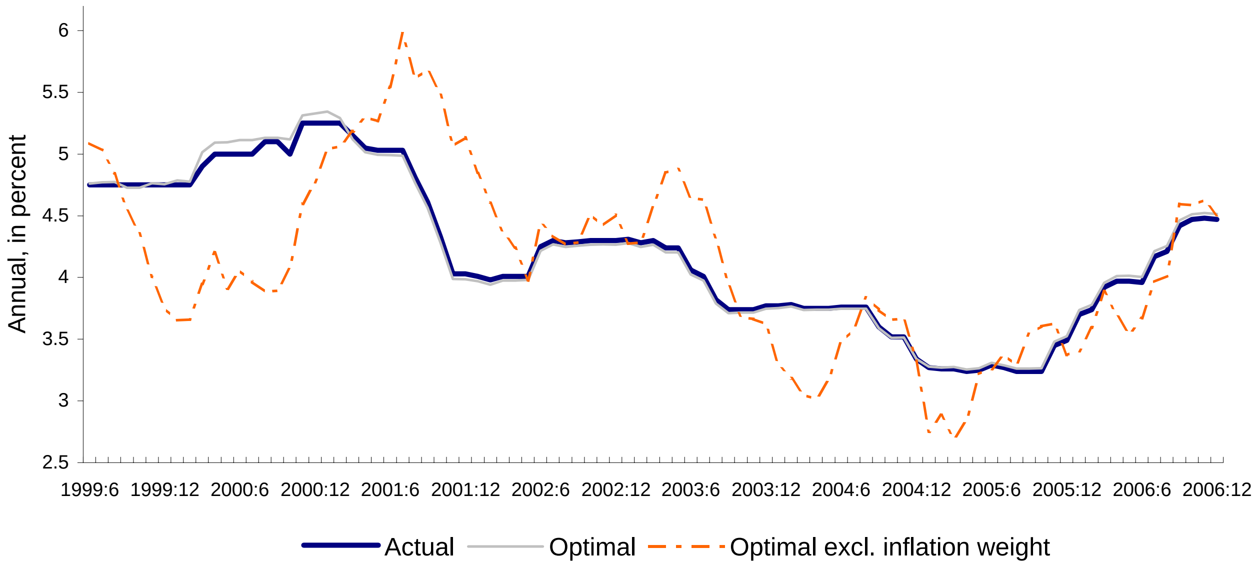

Figure 5. Actual and simulated call interest rates