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FIXED EXCHANGE RATE VERSUS INFLATION TARGETING: EVIDENCE FROM DSGE MODELLING

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CONTENTS

ABBREVIATIONS

AR – autoregressive
CES – constant elasticity of substitution
CPI – consumer price index
DSGE – dynamic stochastic general equilibrium
EMU – Economic and Monetary Union
ERM II – Exchange Rate Mechanism II
EU – European Union
GDP – gross domestic product
HICP – harmonised index of consumer prices
IS – investment and saving equilibrium
MCMC – Monte Carlo Markov Chain method
PPP – purchasing power parity
SDR – Special Drawing Rights

ABSTRACT

We evaluate implications of inflation targeting versus fixed exchange rate regime for the UK, Sweden, Poland, the Czech Republic, Estonia, Latvia and Lithuania, i.e. seven EU non-euro area countries. To this end, we estimate a small open economy DSGE model and simulate a model under estimated structural parameters and different sets of policy parameters. The results obtained are compared in terms of inflation, output gap and interest rate volatility. For inflation targeting countries, a policy switch to fixed exchange rate would entail 3–6 times higher inflation volatility. In the Baltic economies, a policy change to inflation targeting with fully flexible exchange rate would amplify inflation volatility 2–4 times, whereas the existing price stabilisation and exchange rate fluctuations within the ERM II bands would entail 3–6 times more volatile inflation. Policy simulations thus show evidence that in all the countries the existing monetary rule guarantees more stable inflation and output than under alternative regimes.

Key words: DSGE, small open economy, fixed exchange rate, inflation targeting, Bayesian estimation

JEL: C11, C3, C51, D58, E58, F41

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INTRODUCTION

The choice of an appropriate exchange rate regime has been in the focus of international debate for a long time. Essentially, what are the costs and benefits of various exchange rate regimes? What are the key decisive factors to opt for a certain exchange rate policy and how would structural features of economy affect the choice? Do alternative regimes entail different implications in terms of macroeconomic performance?

The numbers of models, theories, and suggestions aimed at addressing these issues proliferate in the economic literature. Yet little consensus has emerged about how the exchange rate regimes affect common macroeconomic targets, such as inflation and growth. To establish unambiguous relationships is a challenging task due to the many ways in which exchange rates and the broader economy mutually interact. While the debate continues, however, there are areas where some consensus is emerging, and there are valuable lessons from earlier experience for developing countries. In particular, there is empirical evidence suggesting that economies with elevated inflation and high openness may bring down inflation by fixing the domestic currency to the currency of their major low-inflation trading partners. Thus, a fixed exchange rate may serve as an instrument for price stabilisation.

At the same time, many central banks of industrial countries and developing economies have opted for pursuing inflation targeting as a monetary policy framework over recent years. As the experience of using inflation targeting for curbing inflation appeared to be quite successful in the countries which first applied this policy – New Zealand, Canada, the UK and Sweden, many other developed countries have adopted this experience despite the fact that inflation was relatively low in these countries.

Inflation-targeting central banks usually adhere to the policy of floating exchange rate. It is suggested that the floating exchange rate policy provides a degree of insulation against foreign monetary shocks and acts as a "shock absorber", which helps to stabilise the domestic economy in the face of foreign monetary shocks.

However, a number of empirical studies suggest that the use of inflation targeting as monetary policy in developing countries is associated with some difficulties. First, the neglecting of exchange rate target for small open economies may lead to high exchange rate volatility and a strong impact on firms' profitability. Higher pass-through also means that domestic prices react strongly to exchange rate fluctuations. Second, investments financed by external borrowing are very vulnerable to large negative changes in capital inflows (the so called "sudden stops"). Given the relative importance of foreign currency borrowing in the balance sheets of financial institutions, production firms and the government, the large depreciation following a sudden stop under a floating exchange rate regime can lead to widespread bankruptcies. Third, the main advantage of a floating exchange rate regime, i.e. the ability to tailor monetary policy to the domestic economy and domestic business cycle, is largely lost, if the respective monetary authority enjoys little credibility. Changes in the interest rate will not be effective in influencing firms' pricing decision to meet the inflation target, if firms do not believe that the central bank will stick to the announced policy, and will falter in the face of output fluctuations. Imperfect credibility may then require large swings in interest rates for the central bank to achieve the inflation target. It will also force the central bank to adhere strictly to the inflation target so as not to lose any credibility gained.

The Bank of England and *Sveriges Riksbank*, two central banks of the EMU opt-out countries, have been pursuing inflation targeting to achieve price stability as the key objective of monetary stance while allowing for flexible exchange rates of the national currencies. Meanwhile, exchange rate policy is an important issue for the new EU Member States since they all are required to join the EMU and adopt the euro as official currency.[1] A prerequisite for joining the common currency area is participation in the Exchange Rate Mechanism II (ERM II). While a standard ERM II requirement stipulates that a country should keep its exchange rate against the euro within a corridor of ±15%, EU Member States may keep their exchange rates within narrower corridors. The latter is the case of the three Baltic economies. Latvia has unilaterally committed to the limiting of nominal exchange rate movements against the euro within the band of ±1% around the central parity, while Lithuania and Estonia have opted for a currency board regime with litas and kroon respectively pegged to the euro at a fixed exchange rate.

Some proponents of adopting the ±15% fluctuation band argue that it offers an opportunity to conduct a relatively more independent monetary policy and direct inflation targeting could be a useful strategy. This naturally leads to the question of what the macroeconomic consequences of widening the band could be, if a country pursues a currency board regime or maintains a very narrow exchange rate band. At the same time, how would a policy change to exchange rate targeting affect the EMU candidate economies of Poland and the Czech Republic as well as the UK and Sweden, the two non-euro area countries, which have opted for inflation targeting policy?

To evaluate the implications of inflation targeting versus fixed exchange rate, we estimate, by using the Bayesian approach, a small open economy DSGE model proposed by Lubik and Schorfheide (2007) for four inflation targeting non-euro area countries the UK, Sweden, Poland and the Czech Republic, and three Baltic economies with fixed exchange rate regimes. We simulate the model under fixed estimated structural parameters and different sets of policy parameters and compare the results in terms of inflation, output gap and interest rate volatility.

The results suggest that monetary authorities of the UK, Sweden and Poland pursue stringent anti-inflationary policy, while that of the Czech Republic is moderate. All central banks demonstrate concern with the output gap and set rates in response to current rather than expected inflation. A policy switch from inflation targeting to exchange rate targeting would entail a substantial increase in inflation volatility. In the UK, inflation fluctuations would amplify 6.2 times, in Sweden and Poland fivefold, and in the Czech Republic 3.6 times. The exchange rate stabilisation would be achieved at the cost of considerably higher interest rate variability, particularly in the UK, with 7 times more volatile policy rate. Moreover, under fixed exchange rate, the output volatility in the four countries would amplify, though slightly, suggesting that the exchange rate insulates the domestic economies from external shocks. In Latvia, Estonia and Lithuania, the policy change to inflation targeting with fully

[1] Slovenia adopted the euro on 1 January 2007, Cyprus and Malta on 1 January 2008, Slovakia on 1 January 2009, Estonia on 1 January 2011.

flexible exchange rate would amplify inflation volatility 4.0, 2.7, and 1.9 times respectively, whereas the existing price stabilisation coupled with exchange rate fluctuations within ERM II bands entails 5.5, 3.7, and 3.0 times more volatile inflation. At the same time, under wider exchange rate bands, output fluctuations in the Baltic economies are slightly higher implying that the exchange rate does not serve as a shock absorber.

The empirical analysis conducted in this paper thus shows evidence that in all covered countries the existing monetary rule guarantees more stable inflation and output than under an alternative regime.

The paper is organised as follows. Section 1 presents a model framework which we proceed to estimate. Section 2 outlines the estimation strategy and the data. Section 3 contains the empirical results, robustness analysis and policy simulations. The final section concludes.

1. MODEL SETUP

The model setup follows a modified version of Gali and Monacelli (2005) small open economy framework proposed by Lubik and Schorfheide (2007). The world economy is modelled as a continuum of small open economies represented by the unit interval. The performance of each economy does not have any impact on the rest of the world. Economies face imperfectly correlated productivity shocks while sharing identical preferences, technology, and market structure.

Since the main focus in the model is put on the behaviour of the single economy and its interaction with the rest of the world, and for the sake of notational simplicity, superscript i is omitted when referring to the small open economy being modelled. Variables with an $i \in [0, 1]$ subscript refer to economy i as one among the continuum of economies constituting the world economy. Variables denoted by asterisk stand for the world economy as a whole.

1.1 Households

A representative household of a small open economy maximises its utility given by

$$E_0 \sum_{t=0}^{\infty} \beta^t U(C_t / A_t, N_t) \tag{1}$$

where N_t denotes hours worked, A_t is a world technology process, and C_t is a composite consumption index defined as

$$C_t \equiv \left[(1-\alpha)^{\frac{1}{\eta}} (C_{H,t})^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}} (C_{F,t})^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \tag{2}$$

$C_{H,t}$, in its turn, is an index of consumption of domestic goods represented by CES function

$$C_{H,t} \equiv \left(\int_0^1 C_{H,t}(j)^{\frac{\varepsilon-1}{\varepsilon}} dj \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

where $j \in [0, 1]$ denotes a differentiated good on the unit interval. $C_{F,t}$ is an index of imported goods defined by

$$C_{F,t} \equiv \left(\int_0^1 C_{i,t}^{\frac{\gamma-1}{\gamma}} di \right)^{\frac{\gamma}{\gamma-1}}$$

where $C_{i,t}$ stands for an index of goods imported from country i and consumed by domestic households. As in the case of consumption of domestic goods, the index of imports is given by the CES function

$$C_{i,t} \equiv \left(\int_0^1 C_{i,t}(j)^{\frac{\varepsilon-1}{\varepsilon}} dj \right)^{\frac{\varepsilon}{\varepsilon-1}}.$$

Parameter $\varepsilon > 1$ implies the elasticity of substitution between goods produced within a specific country. $\alpha \in [0,\ 1]$ measures a degree of openness which is commonly defined as the share of imports in GDP. Parameter $\eta > 0$ denotes the substitutability between domestic and foreign goods from the standpoint of the domestic consumer, while γ denotes the substitutability between goods imported from different markets.

The household maximises its utility defined in (1) subject to a budget constraint

$$\int_0^1 P_{H,t}(j)C_{H,t}(j)dj + \int_0^1\int_0^1 P_{i,t}(j)C_{i,t}(j)djdi + D_t \le D_{t-1}R_t + W_t N_t + T_t \tag{3}$$

for t = 0, 1, 2, … where $P_{H,t}(j)$ is the price of differentiated domestic good j and $P_{i,t}(j)$ is the price of differentiated good j imported from country i. R_t is return on financial investment D_{t-1} held at the end of period t – 1 (including shares in firms). Finally, W_t stands for the nominal wage, and T_t denotes lump-sum transfers (taxes).

1.2 Identities between Inflation, Exchange Rates and Terms of Trade

Next, several identities linking inflation, exchange rates and terms of trade are defined. Bilateral terms of trade between the domestic economy and country i are given by

$$S_{i,t} = \frac{P_{H,t}}{P_{i,t}},$$

which is nothing but the price of home goods in terms of country i's goods. Consequently, the effective terms of trade are defined as

$$S_t \equiv \frac{P_{H,t}}{P_{F,t}} = \left(\int_0^1 S_{i,t}^{1-\gamma}di\right)^{\frac{1}{1-\gamma}}.$$

Log-linearisation around the symmetric steady state gives

$$\pi_t = \pi_{H,t} - \alpha\Delta s_t, \tag{4}$$

where $\pi_t \equiv p_t - p_{t-1}$, $\pi_{H.t} \equiv p_{H,t} - p_{H,t-1}$ and lowercase letters stand for deviations from the steady state of the respective variables. Equation (4) implies that the inflation difference is proportional to the percentage change in the terms of trade where the coefficient of proportionality is captured by the degree of openness α.

Furthermore, it is assumed that the law of one price holds at a product level both for import and export prices, implying $P_{i,t}(j) = \varepsilon_{i,t}P_{i,t}^i(j)$ for all $i, j \in [0,\ 1]$. $\varepsilon_{i,t}$ is the bilateral nominal exchange rate, i.e. the price of country i's currency in terms of the domestic currency, whereas $P_{i,t}^i(j)$ is the price of country i's good j denominated in its own currency terms. Applying the law-of-one-price assumption to the definition of $P_{i,t}$ results in $P_{i,t} = \varepsilon_{i,t}P_{i,t}^i$ where $P_{i,t}^i \equiv \left(\int_0^1 P_{i,t}^i(j)^{1-\varepsilon}dj\right)^{\frac{1}{1-\varepsilon}}$ stands for country i's domestic price index.

Next, for the purpose of exchange rate policy analysis, the nominal exchange rate e_t is introduced in the consumer price index (CPI) inflation equation under the assumption that relative purchasing power parity (PPP) holds. To derive this relationship, we express $p_{F,t}$ from the terms of trade equation $s_t = p_{H,t} - p_{F,t}$ and plug into $p_{F,t} = e_t + p_t^*$ to obtain

$$p_{H,t} - s_t = e_t + p_t^* \quad (5).$$

Taking differences

$$\pi_{H,t} - \Delta s_t = \Delta e_t + \pi_t^*,$$

using equation (4) to substitute for domestic inflation and re-arranging, yields

$$\pi_t = \Delta e_t + (1-\alpha)\Delta s_t + \pi_t^* \quad (6).$$

1.3 Firms

The domestic economy is populated by a continuum of firms $j \in [0, 1]$ where each one produces a differentiated good using the same technology, represented by the production function

$$Y_t(j) = A_t N_t(j)$$

where A_t is the level of technology and $a_t \equiv \log A_t$ is described by the AR(1) process

$$a_t = \rho_a a_{t-1} + v_t.$$

All firms face identical demand curves and take the aggregate price level and aggregate consumption index exogenously. Following the price setting mechanism proposed by Calvo (1983), each firm may change its price with probability 1 – θ every period, irrespective of the last time of adjustment. Thus, each period a fraction 1 – θ of firms reset their prices, whereas the rest θ keep their prices unchanged. In this way, θ represents price stickiness.

Given that all firms resetting prices will choose the same price $\overline{P}_{H,t}$, the aggregate price level takes the form

$$P_{H,t} = \left[\theta(P_{H,t-1})^{1-\varepsilon} + (1-\theta)(\overline{P}_{H,t})^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}.$$

Assuming a steady state with zero inflation $\overline{P}_{H,t} = P_{H,t-1} = P_{H,t}$ for all t, log-linearisation of the last expression around the steady state results in

$$\pi_{H,t} = (1-\theta)(\overline{p}_{H,t} - p_{H,t-1}) \quad (7).$$

Equation (7) implies that inflation results from firms re-optimising their price each period so that it differs from the average t – 1 period price in the economy.

A firm re-optimising in period t will choose price $\overline{P}_{H,t}$ to maximise the present market value of its profits generated while the price remains effective

$$\max_{\overline{P}_{H,t}} \sum_{k=0}^{\infty} \theta^k E_t \left\{ Q_{t,t+k} \left(\overline{P}_{H,t} Y_{t+k|t} - \Psi_{t+k}(Y_{t+k|t}) \right) \right\} \tag{8}$$

subject to the set of demand constraints

$$Y_{t+k|t} = \left(\frac{\overline{P}_{H,t}}{P_{H,t+k}} \right)^{-\varepsilon} \left(C_{H,t+k} + \int_0^1 C^i_{H,t+k} di \right) = \left(\frac{\overline{P}_{H,t}}{P_{H,t+k}} \right)^{-\varepsilon} \hat{C}_{H,t+k} \equiv Y^d_{t+k} \left(\overline{P}_{H,t} \right) \tag{9}$$

for $k = 0, 1, 2, \ldots$ where $Q_{t,t+k} \equiv \beta^k (\tilde{C}_{t+k} / \tilde{C}_t)^{-\sigma} (A_t / A_{t+k})(P_t / P_{t+k})$ is the stochastic discount factor for nominal payoffs, $\Psi_t(\cdot)$ is the cost function, and $Y_{t+k|t}$ denotes the $t + k$ period output of a firm that last reset its price in period t.

Solving problems (8) and (9) and log-linearising result in

$$\overline{p}_{H,t} - p_{H,t-1} = (1 - \beta\theta) \sum_{k=0}^{\infty} (\beta\theta)^k E_t \{ \hat{mc}_{t+k|t} + (p_{H,t+k} - p_{H,t-1}) \} \tag{10}$$

where $\hat{mc}_{t+k|t} \equiv mc_{t+k|t} - mc$ stands for the log deviation of marginal cost from its steady state value mc.

1.4 Equilibrium

1.4.1 The demand side

Goods market clearing in the domestic economy requires

$$\frac{Y_t(j)}{A_t} = \frac{C_{H,t}(j)}{A_t} + \int_0^1 \frac{C^i_{H,t}(j)}{A_t} di$$

for all $j \in [0, 1]$ and all t, where $C^i_{H,t}(j)$ stands for country i's demand for domestically produced good j.

1.4.2 The supply side

Let $Y_t \equiv \left[\int_0^1 Y_t(j)^{1-\frac{1}{\varepsilon}} dj \right]^{\frac{\varepsilon}{\varepsilon-1}}$ represent an index for aggregate domestic output. One can derive a production function linking the aggregate domestic demand with aggregate employment. Market clearing in the labour market requires $N_t = \int_0^1 N_t(j) dj$.

Expressing labour demand from the firm's production function as $N_t(j) = Y_t(j)/A_t$ and plugging into the labour market clearing condition yields

$$N_t = \int_0^1 \frac{Y_t(j)}{A_t} dj .$$

Standard derivations yield domestic inflation as a function of deviations of marginal cost from its steady state value

$$\pi_{H,t} = \beta E_t\{\pi_{H,t+1}\} + \lambda \hat{mc}_t \tag{11}$$

where

$$\lambda \equiv \frac{(1-\theta)(1-\beta\theta)}{\theta} .$$

Equation (11) implies that inflation for domestically produced goods is not affected by parameters referring to the open economy. Conversely, real marginal cost as a function of domestic output in the open economy does differ from the closed economy case, which results from the wedge between output and consumption, and between domestic and consumer prices.

After some manipulations, we come up with the real marginal cost as function of domestic output $\tilde{y}_t$ and world output $\tilde{y}_t^*$

$$\hat{mc}_t = (\sigma_\alpha + \varphi)\tilde{y}_t + (\sigma - \sigma_\alpha)\tilde{y}_t^* \tag{12}$$

where σ and φ represent household risk aversion and labour supply aversion respectively, $\sigma_\alpha \equiv \dfrac{\sigma}{1+\alpha(\omega-1)} > 0$ and $\omega \equiv \sigma\gamma + (1-\alpha)(\sigma\eta - 1)$.

1.5 Monetary Policy

Monetary policy is defined by an interest rate rule in a way that the central bank sets its policy rate to adjust for deviations of CPI inflation, output, and exchange rate changes from the target levels

$$r_t = \rho_r r_{t-1} + (1-\rho_r)[\psi_1\pi_t + \psi_2\tilde{y}_t + \psi_3\Delta e_t] + \varepsilon_t^r$$

where the policy coefficients ψ_1, ψ_2, $\psi_3 \geq 0$, and ε_t^r stands for an exogenous policy shock. To describe the persistence in nominal interest rates, a smoothing term given by $0 < \rho_r < 1$ is incorporated in the policy rule.

1.6 A Simplified Version

We estimate a simplified version of Gali and Monacelli (2005) model proposed by Lubik and Schorfheide (2007) where $\varphi = 0$, $\eta = 1$ and $\gamma = 1$.

Below is a brief overview of the key final log-linearised equations of the model, which we will use for estimation:

$$\tilde{y}_t = E_t\{\tilde{y}_{t+1}\} - (\tau + \alpha(1-\tau)(2-\alpha))(r_t - E_t\{\pi_{t+1} + \alpha\Delta s_{t+1}\} - \rho_z z_t) + \alpha(2-\alpha)\left(\frac{1-\tau}{\tau}\right)E_t\{\Delta\tilde{y}^*_{t+1}\} \quad (13),$$

$$\pi_t = \beta E_t\{\pi_{t+1}\} + \alpha\beta E_t\{\Delta s_{t+1}\} - \alpha\Delta s_t + \frac{\lambda}{\tau + \alpha(2-\alpha)(1-\tau)}(\tilde{y}_t - \tilde{y}^n_t) \quad (14),$$

$$\pi_t = \Delta e_t + (1-\alpha)\Delta s_t + \pi^*_t \quad (15),$$

$$r_t = \rho_r r_{t-1} + (1-\rho_r)[\psi_1\pi_t + \psi_2\tilde{y}_t + \psi_3\Delta e_t] + \varepsilon^r_t \quad (16),$$

$$\Delta s_t = \rho_s \Delta s_{t-1} + \varepsilon^s_t \quad (17),$$

$$y^*_t = \rho_{y^*} y^*_{t-1} + \varepsilon^{y^*}_t \quad (18),$$

$$\pi^*_t = \rho_{\pi^*}\pi^*_{t-1} + \varepsilon^{\pi^*}_t \quad (19),$$

$$z_t = \rho_z z_{t-1} + \varepsilon^z_t \quad (20)$$

where

$\tilde{y}^n_t \equiv -\dfrac{\alpha(2-\alpha)(1-\tau)}{\tau}\tilde{y}^*_t$, $z_t \equiv \Delta a_t$, and $\tau \equiv \dfrac{1}{\sigma}$.

Equation (13) is the open economy IS curve implying that output depends on the expectations of future output both at home and abroad, the real interest rate, the expected changes in the terms of trade, and technology growth. Equation (14) represents the New Keynesian open economy Phillips curve. Movements in the output gap affect inflation, as they are associated with changes in real marginal costs, whereas the parameter λ affects the slope of the Phillips curve and is a function of other deeper parameters, but here it is considered to be structural. The changes in terms of trade enter the Phillips curve reflecting the fact that some consumer goods are imported. Equation (15) is a PPP version. Monetary policy in equation (16) is described by an interest rate rule where the central bank adjusts its instrument in response to deviations of CPI inflation, output, and exchange rate changes from the target levels. A smoothing coefficient that reflects the degree of persistence in the policy instrument is introduced. The rest of equations refer to exogenous terms of trade, foreign output, inflation and technology respectively. All follow a first-order autoregressive process.

2. MODEL ESTIMATION

2.1 Data Description

Two main methods for evaluating DSGE models have been proposed in the literature: calibration and econometric estimation. Calibration methods were very popular a few years ago, but their popularity has declined. This partly reflects the improvements in computational power and development of new econometric methods, such as the Bayesian approach. A now common approach is to augment log-likelihood with priors and perform Bayesian estimation (see, for example, Lubik and Schorfheide (2007), Smets and Wouters (2003)), which is also applied in our model.

For further analysis, we estimate the model for three economies with fixed exchange rate regime, i.e. Latvia, Lithuania and Estonia, and four inflation targeting EU non-euro area countries the UK, Sweden, Poland and the Czech Republic; policy simulations under various policy rules are likewise conducted.

We use observations on real output growth, inflation, nominal interest rates, exchange rate changes, and terms of trade changes in our empirical analysis. All data are at quarterly frequencies over the time span from the first quarter 1996 to the third quarter 2010, except for Latvia and Poland where the sample starts with the first quarter 1998, and Lithuania with data on interest rates available as of the fourth quarter 1999. Estimation covers the maximum period for all series obtained from the Eurostat database. The output growth rates are computed as log differences of GDP and scaled by 100 to convert them into quarter-on-quarter percentage changes. The inflation rates are defined as log differences of harmonised consumer price indices (HICP) and multiplied by 400 to obtain annualised percentage changes. The terms of trade, defined as the relative price of exports in terms of imports, are converted in log differences (scaled by 100) to obtain percentage changes. For Latvia, we use the overnight money market rate as a policy rate. For Lithuania, we apply interest rates set by the central bank on liquidity loans. As to Estonia, no data on central bank rates are available either from the Eurostat or the Bank of Estonia website; therefore, we apply 3-month money market rates.[2] The Bank of England targets the official bank rate paid on commercial bank reserves, which along with historical data on policy rates is available from the Bank of England's website.[3] For Sweden, Poland, and the Czech Republic, we use official refinancing operation rates obtained from the Eurostat's central bank interest rate series.

To obtain exchange rate series for Latvia, we take the average of commercial banks' bid and ask rates of the lats against the SDR until December 2004 and those against the euro afterwards.[4] We use log differences (scaled by 100) of exchange rates to obtain percentage deviation from the parity level to the SDR and euro in the respective periods. Due to the currency board regime, we do not apply exchange rate data for Estonia and Lithuania. For the four inflation targeting countries, we take log differences (scaled by 100) of trade weighted nominal exchange rate indices. Both policy rates and exchange rates are averaged over the respective quarter. GDP, HICP as well as export and import price indices are seasonally adjusted. All series are demeaned prior to estimation.

2.2 Choice of Priors

Tables 1 and 2 provide information about the priors for the three Baltic States and inflation targeting countries respectively. We choose priors for structural parameters

[2] A similar approach was used in Gelain and Kulikov (2009) DSGE model for Estonia.

[3] Up to 5 May 1997, the Bank of England targeted the minimum band 1 dealing rate, from 6 May 1997 to 2 August 2006 – the repo rate, and as of 3 August 2006 – the official bank rate.

[4] Until December 2004, the Latvian lats had been pegged to the SDR basket. In January 2005, the lats was repegged to the euro, and the Bank of Latvia has been unilaterally limiting the lats exchange rate against the euro to ±1% of the central rate.

to be estimated based on several considerations. Prior distributions are assumed to be independent. The priors for Latvia are set as in Ajevskis and Vītola (2009). For other countries, the priors for parameters of policy rule ψ_1, ψ_2, ψ_3, slope coefficient in the Phillips curve λ and intertemporal substitution elasticity τ are set as in Lubik and Schorfheide (2007). The exception is ψ_3 for the two currency board countries Estonia and Lithuania where we estimated two model specifications with calibrated and estimated ψ_3. The model with calibrated exchange rate coefficient yielded better results in terms of converging MCMC diagnostics and well-shaped posterior distributions; we, therefore, fixed ψ_3 for both economies at the sufficiently high value of 10 000.

Table 1

Prior distributions for Latvia, Lithuania and Estonia

Name	**Domain**	**Density**	**Latvia**		**Lithuania**		**Estonia**	
			Mean	**St. dev.**	**Mean**	**St. dev.**	**Mean**	**St. dev.**
1	2	3	4	5	6	7	8	9
ψ_1	R^+	Gamma	2.00	0.50	1.50	0.50	1.50	0.50
ψ_2	R^+	Gamma	0.05	0.13	0.25	0.13	0.25	0.13
ψ_3	R^+	Gamma	400	100	10 000	0	10 000	0
ρ_r	[0, 1)	Beta	0.20	0.10	0.89	0.05	0.88	0.05
α	[0, 1)	Beta	0.40	0.20	0.60	0.20	0.70	0.20
r	R^+	Gamma	2.50	0.50	2.50	1.00	2.50	1.00
λ	R^+	Gamma	0.50	0.25	0.50	0.25	0.50	0.25
τ	[0, 1)	Beta	0.20	0.10	0.50	0.20	0.50	0.20
ρ_s	[0, 1)	Beta	0.10	0.05	0.10	0.05	0.10	0.05
ρ_z	[0, 1)	Beta	0.10	0.05	0.20	0.10	0.40	0.20
ρ_{y*}	[0, 1)	Beta	0.99	0.05	0.95	0.05	0.95	0.05
$\rho_{\pi*}$	[0, 1)	Beta	0.50	0.20	0.26	0.13	0.26	0.13
σ_r	R^+	InvGamma	0.45	4.00	1.00	4.00	1.50	4.00
σ_s	R^+	InvGamma	2.00	4.00	2.00	4.00	2.00	4.00
σ_z	R^+	InvGamma	1.00	4.00	2.40	4.00	2.00	4.00
σ_{y*}	R^+	InvGamma	0.75	4.00	2.00	4.00	2.00	4.00
$\sigma_{\pi*}$	R^+	InvGamma	0.25	4.00	1.00	4.00	1.00	4.00

To capture potentially different macroeconomic histories, we allow for country specific variation in the import share, steady state interest rate, persistence coefficients and innovation standard deviations with an exception of the AR(1) coefficient of foreign inflation and its standard deviation identical for all economies.

The relatively short sample series limits us to conduct a pre-sample analysis for constructing priors; however, to get an idea about persistence in the data and magnitude of innovations, we use the same period as for estimation.

The prior means for interest rate smoothing match the AR(1) coefficient value of the observed series. The priors for preference parameter α are chosen to mimic the average import shares over the covered period. The model is parameterised in terms of the steady state real interest rate r rather than the discount factor β. r is annualised so that $\beta = \exp[-r/400]$. We use 2% as a steady state interest rate for countries with historically lower average policy rate and lower inflation target (the UK, Sweden, the Czech Republic), and set it at 2.5% for other economies.[5]

We fit an AR(1) process to the EU-25 HICP quarterly inflation in order to set the prior for π_t^*; the persistence coefficient is centred at 0.26, and standard deviation at 0.13 for all countries. The priors for foreign output shock are selected by estimating AR(1) for the ratio of EU-25 GDP to domestic GDP. The point estimates of the autoregressive coefficient range from 0.92 (UK) to 0.99 (Czech Republic). Thus, the prior for ρ_{y*} is centred at 0.9 for the UK and at 0.95 for other countries. We fit AR(1) to domestic output growth rates, which yields point estimates between 0.07 (Sweden) and 0.38 (Estonia), and slightly negative ones for Poland and the Czech Republic. We thus choose prior means for ρ_z of 0.4 for Estonia, 0.2 for the UK and Lithuania, and 0.1 for other countries. The terms of trade series yield 0.08 point estimate of AR(1) for Sweden and slightly negative ones for other countries; hence, we set a prior mean for ρ_s at 0.1 for all economies.

Table 2
Prior distributions for inflation targeting countries

Name	Domain	Density	UK		Sweden		Poland		Czech Republic	
			Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
1	2	3	4	5	6	7	8	9	10	11
ψ_1	R^+	Gamma	1.50	0.50	1.50	0.50	1.50	0.50	1.50	0.50
ψ_2	R^+	Gamma	0.25	0.13	0.25	0.13	0.25	0.13	0.25	0.13
ψ_3	R^+	Gamma	0.25	0.13	0.25	0.13	0.25	0.13	0.25	0.13
ρ_r	[0, 1)	Beta	0.95	0.05	0.95	0.05	0.90	0.05	0.95	0.05
α	[0, 1)	Beta	0.30	0.15	0.40	0.20	0.35	0.20	0.60	0.20
r	R^+	Gamma	2.00	1.00	2.00	1.00	2.50	1.00	2.00	1.00
λ	R^+	Gamma	0.50	0.25	0.50	0.25	0.50	0.25	0.50	0.25
τ	[0, 1)	Beta	0.50	0.20	0.50	0.20	0.50	0.20	0.50	0.20
ρ_s	[0, 1)	Beta	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05
ρ_z	[0, 1)	Beta	0.20	0.10	0.10	0.05	0.10	0.05	0.10	0.05
ρ_{y*}	[0, 1)	Beta	0.90	0.05	0.95	0.05	0.95	0.05	0.95	0.05
$\rho_{\pi*}$	[0, 1)	Beta	0.26	0.13	0.26	0.13	0.26	0.13	0.26	0.13
σ_r	R^+	InvGamma	0.50	4.00	0.50	4.00	1.00	4.00	1.00	4.00
σ_s	R^+	InvGamma	1.00	4.00	0.70	4.00	1.00	4.00	1.00	4.00
σ_z	R^+	InvGamma	1.00	4.00	1.20	4.00	1.00	4.00	1.00	4.00
σ_{y*}	R^+	InvGamma	0.10	4.00	0.50	4.00	1.00	4.00	1.50	4.00
$\sigma_{\pi*}$	R^+	InvGamma	1.00	4.00	1.00	4.00	1.00	4.00	1.00	4.00

3. RESULTS

3.1 Bayesian Estimates

The Bayesian estimates of structural parameters for the Baltic economies are listed in Table 3. In addition to 90% posterior probability intervals, we report posterior

[5] As of 2004, *Narodowy Bank Polski* has pursued inflation target at the level of 2.5% with a permissible fluctuation band of ± 1 percentage point. Since switching to inflation targeting in 1998, *Česká národní banka* has been consistently lowering its inflation target, and in March 2007, a new inflation target of 2% was announced with effect from January 2010. The inflation target of 2% has been introduced by *Sveriges Riksbank* since 1995 and as of December 2003 by the Bank of England.

means as point estimates. The low values of ψ_1 and ψ_2 compared to ψ_3 for Latvia imply no primary concern for inflation and output deviations in the monetary policy rule, whereas the high value of the exchange rate parameter ($\psi_3 = 44.9$) confirms the fixed exchange rate policy pursued by the Bank of Latvia. There is also a very high degree of interest-smoothing with an estimate of $\rho_r = 0.89$. For the two currency board economies, data appears rather uninformative in terms of Taylor rule parameter estimates, as posterior means are close to the prior values.

The estimates of structural parameters fall within plausible ranges. The openness parameter α is estimated to be higher than the observed Latvian import share, while the estimates are lower for Estonia and Lithuania. However, as outlined in several studies, this interpretation is improper somewhat. Rather, the estimation procedure attempts to opt for this value of α to reconcile the volatility of terms of trade and of CPI inflation in equation (15) and comply with the cross-coefficient restrictions incorporated in equations (13) and (14). The estimates of Phillips curve parameter λ for all Baltic economies are well above the prior means, reflecting the fact that domestic firms strongly react to output deviations in their optimal price setting behaviour. The intertemporal substitution elasticities τ appear below the prior values, with a surprisingly low posterior mean for Latvia, indicating that consumers are less willing than expected to change their consumption decisions in response to interest rate shocks. The estimates of stochastic processes reflect the substantial degree of persistence found in the data, most of which is captured by the high degree of autocorrelation in the foreign demand shock (0.96–0.98) and technology growth (0.53–0.83).

Table 3
Posterior estimation results for Latvia, Lithuania and Estonia

Name	**Latvia**			**Lithuania**			**Estonia**		
	Mean	**90% interval**		**Mean**	**90% interval**		**Mean**	**90% interval**	
1	2	3	4	5	6	7	8	9	10
ψ_1	1.62	0.92	2.22	1.52	0.71	2.32	1.47	0.68	2.21
ψ_2	0.08	0	0.21	0.25	0.05	0.43	0.25	0.05	0.44
ψ_3	44.95	44.78	45.14	–	–	–	–	–	–
ρ_r	0.89	0.89	0.90	0.89	0.81	0.97	0.88	0.80	0.96
α	0.85	0.79	0.91	0.39	0.29	0.50	0.48	0.39	0.58
r	2.43	1.47	3.19	2.49	0.89	4.02	2.45	0.93	3.96
λ	1.32	1.06	1.67	2.26	1.45	3.05	2.71	1.94	3.51
τ	0.11	0.05	0.17	0.35	0.15	0.54	0.37	0.16	0.58
ρ_s	0.27	0.22	0.32	0.35	0.24	0.47	0.25	0.14	0.36
ρ_z	0.61	0.61	0.61	0.53	0.42	0.65	0.83	0.75	0.92
ρ_{y*}	0.97	0.91	1.00	0.96	0.92	1.00	0.98	0.96	1.00
$\rho_{\pi*}$	0.40	0.38	0.42	0.21	0.12	0.30	0.11	0.04	0.17
σ_r	0.75	0.67	0.81	0.93	0.23	1.67	1.40	0.36	2.63
σ_s	2.33	2.02	2.74	1.92	1.59	2.25	1.79	1.50	2.05
σ_z	1.90	1.60	2.16	0.75	0.52	0.99	0.64	0.50	0.77
σ_{y*}	0.55	0.26	0.93	2.35	0.60	4.35	2.38	0.56	4.71
$\sigma_{\pi*}$	0.49	0.43	0.54	1.33	1.06	1.59	1.13	0.94	1.32

Note: Posterior estimates are based on 10 chains, each with 100 000 draws of Metropolis-Hastings algorithm.

The posterior estimates of structural parameters for inflation targeting countries are reported in Table 4. We find that the UK, Sweden and Poland pursue quite stringent anti-inflationary policy, while that of the Czech Republic is relatively moderate. Significant emphasis is put on output targeting as well, which is the most aggressive in the UK ($\psi_2 = 0.40$), while the exchange rate coefficient estimates are about a half the output gap magnitude, with the lowest in Poland (ψ_3 = 0.07). There is also a relatively high degree of interest rate smoothing in the UK, Sweden and Poland, while that in the Czech Republic is moderate. The structural parameter estimates suggest more closed economies than implied by the import shares, with the preference coefficients α ranging between 0.07 (in the UK) and 0.37 (in Sweden). However, as noted before, such interpretation is rather scarce, whereas the posterior estimate is a trade-off between volatility in the data and the model embedded cross-equation restrictions. Compared to the UK, other countries appear to have a notably lower degree of price stickiness, with the Czech Republic demonstrating the highest price flexibility (λ = 1.36). The intertemporal substitution elasticity τ appears surprisingly low for the UK and below the prior means for other economies. The estimates of autoregressive processes imply high persistence in technology growth and foreign demand shock data.

Table 4
Posterior estimation results for inflation targeting countries

Name	**UK**			**Sweden**			**Poland**			**Czech Republic**		
	Mean	**90% interval**		**Mean**	**90% interval**		**Mean**	**90% interval**		**Mean**	**90% interval**	
1	2	3	4	5	6	7	8	9	10	11	12	13
ψ_1	1.91	1.25	2.70	1.89	1.25	2.53	1.91	1.55	2.25	1.19	0.92	1.45
ψ_2	0.40	0.26	0.53	0.28	0.04	0.45	0.25	0.05	0.44	0.26	0.06	0.45
ψ_3	0.17	0.10	0.26	0.14	0.05	0.21	0.07	0.03	0.11	0.10	0.04	0.16
ρ_r	0.84	0.79	0.89	0.76	0.70	0.82	0.66	0.60	0.73	0.45	0.34	0.55
α	0.07	0.02	0.12	0.37	0.19	0.54	0.14	0.06	0.22	0.23	0.10	0.36
r	2.36	0.95	4.03	2.28	0.64	3.60	2.54	0.99	4.06	2.04	0.45	3.51
λ	0.38	0.18	0.61	0.95	0.55	1.37	0.98	0.49	1.42	1.36	1.00	1.77
τ	0.07	0.002	0.15	0.22	0.06	0.41	0.15	0.02	0.29	0.29	0.08	0.49
ρ_s	0.09	0.03	0.14	0.09	0.02	0.14	0.06	0.01	0.11	0.08	0.02	0.13
ρ_z	0.81	0.77	0.86	0.59	0.56	0.61	0.60	0.59	0.61	0.60	0.59	0.61
ρ_{y*}	0.93	0.89	0.96	0.97	0.94	1.00	0.99	0.98	1.00	0.99	0.98	1.00
$\rho_{\pi*}$	0.31	0.21	0.44	0.22	0.09	0.37	0.14	0.03	0.23	0.30	0.15	0.44
σ_r	0.17	0.13	0.20	0.21	0.16	0.26	0.34	0.26	0.42	0.60	0.47	0.72
σ_s	1.14	0.97	1.31	0.62	0.52	0.71	2.55	2.12	2.96	1.38	1.17	1.59
σ_z	0.32	0.24	0.40	0.60	0.45	0.74	1.63	1.27	2.00	0.83	0.62	1.03
σ_{y*}	0.62	0.03	1.40	0.89	0.14	1.85	2.72	0.31	6.00	2.76	0.41	5.62
$\sigma_{\pi*}$	2.73	2.33	3.12	2.31	1.95	2.63	4.62	3.87	5.37	2.88	2.44	3.31

Note: Posterior estimates are based on 10 chains, each with 50 000 draws of Metropolis-Hastings algorithm.

3.2 Robustness Analysis

By conducting the simulation analysis, the next task is to draw policy implications for volatility of inflation, output gap and interest rates conditional on whether the central banks pursued inflation targeting or fixed exchange rate regime. Admittedly, empirical results largely rely on the model framework. Hence, in this section we check robustness of our conclusions under alternative specification of the baseline structure. We do not modify the underlying structural equations, but consider alternative specification for the ad-hoc policy rule. In essence, we estimate the model for the four inflation targeting economies by defining the Taylor rule so that the monetary authority targets expected inflation instead of current inflation. The argument behind it is grounded in the forward-looking nature of the monetary policy process, which allows the central bank to take pre-emptive actions in response to future inflationary signals. To this end, we re-estimate our baseline model with the following Taylor rule structure:

$$r_t = \rho_r r_{t-1} + (1-\rho_r)[\psi_1 E_t \pi_{t+1} + \psi_2 \tilde{y}_t + \psi_3 \Delta e_t] + \varepsilon_t^r .$$

The posterior results are reported in Table 5. Regarding the estimates of policy parameters, we find that the inflation coefficients are considerably larger than under the current inflation rule, ranging from 1.72 (in the Czech Republic) to 3.76 (in Poland). This implies a much more aggressive policy stance, in particular for *Narodowy Bank Polski* and the Bank of England whose inflation coefficients increased twice and 1.6 times respectively. At the same time, interest rate persistence has declined with the lowest coefficient (0.36) for the Czech Republic. The slope coefficient in the Phillips curve has also decreased in all countries with average λ = 0.51 versus 0.92 under the current inflation targeting rule. Since central banks can achieve a higher degree of inflation smoothing by responding to its expected level and thus inducing more output volatility, the model fits the data by producing a lower value of the Phillips curve coefficient.

Table 5

Posterior estimation results under expected inflation targeting

Name	UK			Sweden			Poland			Czech Republic		
	Mean	90% interval		Mean	90% interval		Mean	90% interval		Mean	90% interval	
1	2	3	4	5	6	7	8	9	10	11	12	13
ψ_1	3.10	2.23	3.77	2.46	1.44	3.45	3.76	2.61	4.93	1.72	0.94	2.44
ψ_2	0.15	0.04	0.27	0.31	0.06	0.53	0.32	0.08	0.56	0.35	0.10	0.60
ψ_3	0.18	0.11	0.25	0.11	0.05	0.17	0.07	0.03	0.12	0.08	0.03	0.13
ρ_r	0.82	0.78	0.86	0.68	0.59	0.76	0.59	0.51	0.68	0.36	0.27	0.44
α	0.05	0.02	0.08	0.23	0.13	0.33	0.07	0.03	0.10	0.16	0.07	0.25
r	1.61	0.50	2.70	2.07	0.36	3.69	2.34	0.91	3.79	1.88	0.46	3.22
λ	0.26	0.16	0.36	0.52	0.32	0.71	0.44	0.25	0.61	0.83	0.53	1.11
τ	0.05	0.002	0.10	0.20	0.04	0.37	0.18	0.01	0.38	0.22	0.07	0.40
ρ_s	0.06	0.01	0.11	0.10	0.03	0.17	0.07	0.02	0.13	0.07	0.02	0.12
ρ_z	0.83	0.78	0.87	0.59	0.57	0.61	0.60	0.60	0.61	0.60	0.60	0.61
ρ_{y*}	0.94	0.90	0.97	0.96	0.92	1.00	0.99	0.98	1.00	0.99	0.98	1.00
$\rho_{\pi*}$	0.28	0.17	0.38	0.26	0.12	0.41	0.15	0.04	0.26	0.33	0.17	0.48
σ_r	0.16	0.13	0.18	0.20	0.16	0.23	0.37	0.30	0.44	0.48	0.39	0.57
σ_s	1.15	0.96	1.32	0.62	0.52	0.71	2.58	2.14	2.98	1.37	1.15	1.58
σ_z	0.31	0.22	0.38	0.57	0.41	0.72	1.71	1.30	2.13	0.76	0.51	0.99
σ_{y*}	0.55	0.03	1.18	1.13	0.16	2.28	7.99	0.34	20.77	2.37	0.42	4.75
$\sigma_{\pi*}$	2.81	2.38	3.23	2.33	1.99	2.68	4.73	3.97	5.51	2.89	2.45	3.33

Note: Posterior estimates are based on 10 chains, each with 50 000 draws of Metropolis-Hastings algorithm.

Finally, we perform posterior odds test for the hypothesis of current inflation targeting versus expected inflation targeting. The results (listed in Table 6) suggest that for all four countries the expected inflation targeting deteriorates the model fit measured by marginal data densities compared with the baseline specification. In essence, monetary authorities of the UK, Sweden, Poland, and the Czech Republic are more likely to respond to current inflation.

While it is possible that our conclusions can be altered in more elaborate models, we regard the estimated baseline framework as sufficient for the issues we are addressing in this paper.

Table 6
Posterior odds test

	Marginal data densities		**Posterior odds**
	Baseline	**Expected infl.**	
1	2	3	4
UK	–498.18	–504.33	470.39
Sweden	–487.32	–492.95	279.37
Poland	–669.27	–682.40	501 114.55
Czech Republic	–683.62	–688.00	80.13

Notes: The table reports posterior odds test of the baseline model against the model with expected inflation in the Taylor rule. The posterior probabilities are based on the output of Metropolis-Hastings algorithm. The marginal data densities are approximated by Geweke's (1999) harmonic mean estimator.

3.3 Policy Simulations

To evaluate implications of different monetary policy regimes, we choose the framework with current inflation in the Taylor rule as the most relevant in terms of model fit. We fix the estimated posterior means of the "deep" parameters and change policy parameters in the Taylor rule. The results obtained from various policy parameter sets are compared in terms of volatilities of the key model variables. This approach allows us to avoid the Lucas critique in performing counterfactual policy experiments.

We proceed with starting our policy simulations for the fixed exchange rate regime countries. First, the results are derived by applying coefficients estimated from the data, e.g. using $\psi_1 = 1.62$, $\psi_2 = 0.08$, $\psi_3 = 44.95$ for Latvia and referring to this case as a benchmark model. Table 7 provides the results. Under these parameter values, the exchange rate in Latvia appears to fit into the existing regime of ±1% band with 99% probability. Next, we fix the output gap coefficient at the estimated value (0.08 for Latvia, and 0.25 for Lithuania and Estonia) and simulate scenarios under stricter inflation targeting while allowing for wider exchange rate bands. At $\psi_1 = 2.5$ and fully flexible exchange rate ($\psi_3 = 0$), inflation volatility increases fourfold in Latvia, almost threefold in Estonia and twofold in Lithuania *vis-á-vis* its benchmark level, while interest rate fluctuations become less pronounced, which is consistent with the diminishing role of the interest rate in exchange rate stabilisation (see Columns 3, 8, and 13 of Table 7). Under even tighter inflation targeting ($\psi_1 = 4$), inflation fluctuations decrease with respect to the previous case (Columns 4, 9, and 14). What is surprising though is that under stringent inflation targeting inflation turns out to be almost thrice more volatile than under the peg in Latvia, while being 1.8 and 1.2 times higher under the currency board regime in Estonia and Lithuania respectively. Further, we simulate a scenario where the central bank pursues inflation targeting ($\psi_1 = 2.5$) and sets its policy to stabilise the output gap (ψ_2 set above the posterior mean, i.e. 0.5 for Latvia, and 1.5 for Estonia and Lithuania). Additional concern for the output gap accounts for a small decrease in inflation volatility and just a marginal decline in output gap variability. Finally, fixing ψ_1 and ψ_2 at the benchmark values while reducing ψ_3 to minimum (close or equal to 0), we come up with exchange rate fluctuations[6], which fit into ±15% band stipulated by the ERM II for the EMU candidates. In this scenario (Columns 6, 11, and 16), inflation volatility is 5.5, 3.7 and 3.0 times higher for Latvia, Estonia and Lithuania respectively than in the benchmark model with fixed exchange rate policy. Surprisingly in all scenarios with wider exchange rate bands, the output fluctuations amplify, though slightly, suggesting that the exchange rate does not serve as a shock absorber.

Table 7
Standard deviations under various policy regimes, countries with fixed exchange rate

Name	**Latvia**					**Lithuania**					**Estonia**				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ψ_1	**1.62**	**2.5**	**4**	**2.5**	**1.62**	**1.52**	**2.5**	**4**	**2.5**	**1.52**	**1.47**	**2.5**	**4**	**2.5**	**1.47**
ψ_2	**0.08**	**0.08**	**0.08**	**0.5**	**0.08**	**0.25**	**0.25**	**0.25**	**1.5**	**0.25**	**0.25**	**0.25**	**0.25**	**1.5**	**0.25**
ψ_3	**44.95**	**0**	**0**	**0**	**0**	**10 000**	**0**	**0**	**0**	**0**	**10 000**	**0**	**0**	**0**	**0.3**
Δe	0.35	2.73	2.06	2.59	3.64	0.001	3.22	2.41	2.97	4.67	0.001	3.78	2.65	3.45	4.96
π	2.55	10.19	7.33	9.57	14.00	5.92	11.17	7.31	9.99	17.52	5.13	14.10	9.10	12.61	19.22
r	6.55	2.48	3.08	2.53	2.03	2.30	1.21	1.32	1.23	1.13	5.08	4.08	4.26	4.09	3.83
y	5.28	5.59	5.46	5.57	5.81	2.18	2.35	2.25	2.33	2.61	2.53	2.73	2.60	2.72	2.95

Further on, we proceed with policy simulations for the inflation targeting countries. As before, we fix the estimated posterior means of the "deep" parameters and change inflation and exchange rate parameters in the Taylor rule. For the sake of comparability, in the fixed exchange rate regime scenario, we choose the value for ψ_3 so that the exchange rate fluctuations are limited to ±1% corridor. The simulation results obtained under different parameter sets are reported in Table 8.

First, we apply the coefficients estimated from the data. Under the existing inflation targeting in the UK, inflation volatility is 1.82, while exchange rate fluctuations are limited to ±8.9% band. Setting ψ_1 and ψ_2 at the estimated level while fixing ψ_3 to 0, i.e. assuming no concern for exchange rate stabilisation implies only a marginal increase in exchange rate volatility (to ±9.3%) and virtually no effect on inflation, interest rate and output gap volatility (Column 3). Finally, a shift in the policy from inflation targeting to exchange rate targeting (ψ_1 = 0 and ψ_3 = 45 where the latter ensures exchange rate fluctuations within ±1% band) raises inflation volatility 6.2 times and entails 7 times higher interest rate variability (Column 4). Moreover, the output gap fluctuations amplify, though slightly, under the fixed exchange rate, implying that the exchange rate serves as a shock absorber.

Table 8
Standard deviations under various policy regimes, inflation targeting countries

Name	**UK**			**Sweden**			**Czech Republic**			**Poland**		
1	2	3	4	5	6	7	8	9	10	11	12	13
ψ_1	**1.91**	**1.91**	**0**	**1.89**	**1.89**	**0**	**1.91**	**1.91**	**0**	**1.19**	**1.19**	**0**
ψ_2	**0.40**	**0.40**	**0.40**	**0.28**	**0.28**	**0.28**	**0.25**	**0.25**	**0.25**	**0.26**	**0.26**	**0.26**
ψ_3	**0.17**	**0**	**45**	**0.14**	**0**	**9**	**0.07**	**0**	**30**	**0.10**	**0**	**5**
Δe	2.95	3.10	0.33	2.31	2.47	0.33	5.12	5.31	0.34	3.16	3.36	0.34
π	1.82	1.81	11.29	1.70	1.70	8.70	3.60	3.70	19.58	3.41	3.56	12.24
r	1.31	1.32	9.30	1.00	0.96	2.71	3.44	3.39	12.64	2.68	2.64	3.27
y	1.38	1.37	1.74	2.10	2.10	2.48	4.65	4.65	5.10	3.05	3.03	3.23

[6] Within 99% confidence interval.

In the case of Sweden, inflation volatility is 1.70 under the current inflation targeting regime, while the exchange rate fluctuations fit into ±7% band. Similar to the UK, relaxing ψ_3 to zero entails no particular changes for the economy, whereas a shift from inflation targeting to exchange rate targeting results in five times more volatile inflation and a loss of instrument to stabilise output after the economy is hit by an external shock.

Inflation targeting for Poland implies 3.60 inflation volatility and exchange rate fluctuations within ±15% band. Such a high exchange rate variability is, to some extent, on account of the sharp depreciation of zloty's NEER in the last quarter of 2008 (12%) and a further drop in the first quarter of 2009 (14%). A change of the monetary policy to exchange rate targeting would result in a marginal increase of output gap variability, while inflation fluctuations would amplify more than five times.

The regime shift implications for the Czech Republic are quite similar. A policy switch to exchange rate targeting allowing for ±1% fluctuations of the koruna would entail inflation volatility 3.6 times above its level under the existing monetary regime. In contrast to other countries, though, where exchange rate stabilisation would be achieved at the cost of considerably higher interest rate variability (in the UK and Poland in particular), for the Czech economy it would be associated with just a marginal increase in interest rate inconstancy.

CONCLUSIONS

In this paper we estimate a small open economy DSGE model for the UK, Sweden, Poland and the Czech Republic, four inflation targeting non-euro area countries, and three Baltic States with fixed exchange rate regime. To draw implications of inflation targeting versus fixed exchange rate, we simulate a model under estimated structural parameters and different sets of policy parameters and compare the results in terms of inflation, output gap and interest rate volatility.

The results suggest that monetary authorities of the UK, Sweden and Poland pursue stringent anti-inflationary policy, while that of the Czech Republic is moderate. All central banks demonstrate concern with the output gap and set rates in response to current rather than expected inflation. A policy switch from inflation targeting to exchange rate targeting would entail a substantial increase in inflation volatility. In the UK, inflation fluctuations would amplify 6.2 times, in Sweden and Poland fivefold, and in the Czech Republic 3.6 times. The exchange rate stabilisation would be achieved at the cost of considerably higher interest rate variability, most pronounced in the UK, with seven times more volatile policy rate. Moreover, under the fixed exchange rate, output volatility in the four countries would amplify, though slightly, suggesting that the exchange rate insulates domestic economies from external shocks. In Latvia, Estonia and Lithuania, a policy change to inflation targeting with fully flexible exchange rate would amplify inflation volatility 4.0, 2.7, and 1.9 times respectively, whereas the existing price stabilisation coupled with exchange rate fluctuations within the ERM II bands entails 5.5, 3.7, and 3.0 times more volatile inflation. At the same time, under wider exchange rate bands, the output fluctuations are slightly higher, implying that the exchange rate in the Baltic economies does not serve as a shock absorber.

The simulation results for the four inflation targeting countries, thus, show evidence that the existing monetary regime guarantees considerably more stable inflation and output gap than would result under the fixed exchange rate policy. As implied by empirical estimates, the economies of the UK, Sweden, Poland, and the Czech Republic are relatively more closed than those of the Baltic States, while a flexible exchange rate serves as absorber in the face of external shocks. On the contrary, in monetary transmission of the Baltic countries, the exchange rate channel considerably affects the consumer price dynamics. That can be largely attributed to quite a high import component both in domestic consumption and manufacturing. The policy simulations conducted in this paper thus provide evidence of lower inflation fluctuations under the existing fixed exchange rate policy in the Baltic States. This result supports the view that a country with elevated inflation and high openness may bring down inflation by fixing the domestic currency to the currency of its major low inflation trading partners.

The empirical analysis conducted in this paper shows evidence that in all the covered countries the existing monetary rule guarantees more stable inflation and output than under alternative regimes. Thus, there is no unambiguous recipe to opt for fixed exchange rate to meet the inflation stabilisation objective. The choice of monetary regime crucially depends on structural features of the economy.

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