How credible are the exchange rate regimes of the new EU countries? Empirical evidence from market sentiments

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Abstract

EU accession countries have strong incentives to stabilize the exchange rate with respect to the Euro as the nominal anchor. We present a microstructure model of the foreign exchange market based on technical trading that allows us to categorize the de facto exchange rate regimes and derive a market based measure of the credibility of

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these exchange rate regimes. Our empirical results indicate that in the run-up to EU accession most CEEC have reached high credibility in their exchange rate management. However, some of the future EMU participants will have to strengthen their efforts and further focus their exchange rate policy on stabilizing the Euro exchange rate.

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1 Motivation

At the beginning of the 1990s the Central and Eastern European countries (CEEC) embarked on a transformation process to develop into market economies. Since the middle of the 1990s this process has been dominated by the prospect of membership in the European Union (EU) and subsequently the European Monetary Union (EMU). In May 2004 eight CEEC (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, and Slovenia) together with Cyprus and Malta joined the European Union. Bulgaria and Romania are expected to follow by 2007. Three countries, Slovenia, Estonia and Lithuania made the next step towards the Euro and joined the ERM II exchange rate mechanism on the end of June 2004. In this process
the choice of the exchange rate regime has been an important economic issue as these countries have become more integrated into world markets and as monetary stability gained greater importance as a policy objective.

When deciding on the exchange rate regime governments face Mundell’s well-known impossible trinity. They can realize two of the following three objectives, namely capital mobility, exchange rate stability, and monetary independence. So as the new EU members (have to) opt for capital mobility the remaining choice is between exchange rate stability and monetary independence. Stabilizing the exchange rate can have the advantage of facilitating trade and foreign direct investment and it can help to increase monetary credibility. However, exchange rate stability comes at a price.\footnote{By pegging a currency the central bank gives up its monetary independence and cannot counteract negative shocks to the economy. This trade-off between exchange rate stability and monetary independence is particularly critical for countries that are in a process of radical economic change such as the CEEC.} When evaluating an exchange rate regime and its economic consequences it is crucial to take into consideration the de facto (as opposed to the de jure) exchange rate policy and the market’s expectations of this exchange rate policy. It is well-known that there might exist a considerable discrepancy between the officially proclaimed exchange rate regime and the de facto behavior of the exchange rate (e.g. Levy-Yeyati and Sturzenegger (2004),
Reinhard and Calvo (2002), von Hagen and Zhou (2002), and Reinhard and Rogoff (2004)). Also the credibility of an exchange rate regime might change considerably over time, which obviously affects the trade-off between exchange rate stability and monetary independence. An exchange rate peg facilitates trade only if it is credible. As long as exporters and importers expect the exchange rate to deviate from the announced path they still have to bear the costs of exchange rate volatility. As pointed out by Andersen (1994) only a credible peg can reduce the likelihood of currency crises and the costs of disinflation. Any exit option for the central bank together with imperfect information creates uncertainty about the future monetary policy which in turn leads to misallocation of resources and suboptimal output.

In the following we want to analyze these three dimensions of the exchange rate policies of the ten new EU members:

- the official exchange rate regimes,
- the de facto exchange rate behavior, and
- the market’s assessment of the exchange rate policies, i.e. the credibility of the central banks’ announcements and actions.

The paper is organized as follows. We develop a measure for the market’s assessment of an exchange rate regime in section 2. We then apply it to the CEEC data in the period since 1999, i.e. after the introduction of the Euro and provide an analysis of the development of the exchange rate regimes over
the sample period (section 3). Section 4 concludes.

2 Market assessments of the exchange rate regime

2.1 The basic model

Market’s assessments of the underlying exchange rate and monetary policy crucially affect the viability and the economic consequences of an exchange rate regime. The second generation currency crises models for example show how self-fulfilling expectations of market participants can trigger currency crises (see e.g. Obstfeld (1994) and Jeanne (2000)). Adoptions of the Barro-Gordon model to exchange rate regimes analyze the role of credibility for the effects of monetary policy. E.g., Andersen (1994) points out that a loss of credibility leads to misallocation of resources and suboptimal output. Bensaid and Jeanne (2000) show that the independence of the central bank under an exchange rate objective cannot prevent self-fulfilling currency crises. Earlier works on Barro-Gordon models for exchange rates like Melitz (1988) finds rules of thumb for the participation of high and low inflation countries in the EMS to categorize the situations under which one of the possible regimes float, peg with possible realignments, and monetary union is optimal.
In the following we analyze the exchange rate behavior and the role of market sentiments in a micro-structure model of the foreign exchange market which also takes into account the macroeconomic environment. In particular we are interested in the role of technical trading in currency markets. The impact of technical trading on asset volatility has been analyzed by Bertola and Caballero (1992) for exchange rates and has been generalized for other assets by Balduzzi, Foresi and Hait (1997). Our model generalizes the approach of Jeanne and Rose (2002) by introducing technical trading and non i.i.d. macroeconomic variables.

The macroeconomic aspects of the model are captured by a conventional two country monetary model of the exchange rate. In money market equilibrium, money supply \( m_t \) equals the interest elastic money demand in both countries. The exchange rate is given by

\[
e_t = m_t - m_t^* + \alpha (i_t - i_t^*) + q_t,
\]

where \( p \) denotes the price level, \( i \) the interest rate, and \( q \) the real exchange rate. Foreign is a large country that remains in the long run equilibrium, i.e. foreign macroeconomic variables are normalized to

\[
m_t^* = p_t^* = i_t^* = 0,
\]

so that the exchange rate equation (1) simplifies to

\[
e_t = m_t + \alpha i_t + q_t.
\]
The microeconomic aspects of the model build on an overlapping generations model with risk averse heterogeneous traders. The foreign country is large relative to the home country so that the market processes are driven by the foreign traders’ investment decisions. The foreign traders face a portfolio optimization problem between a safe asset in their domestic country and an asset in the small home country which has a risky return due to the unknown exchange rate change. Adjustments of the interest rate clear the market.

The optimal wealth allocation depends on the expected excess return of domestic bonds relative to foreign bonds, so that the investments depend on the expected exchange rate, the interest differential, and the risk of such investments. We extend the theoretical approach of Jeanne and Rose (2002) along two lines. First, we introduce an explicit monetary and exchange rate policy by the central bank. Secondly, we specify technical trading as a source of noise in exchange markets.

Technical traders react to trend signals and create excess volatility through their actions. Strong signals, e.g. steep or rampant trends, induce technical traders to enter the market thereby increasing the exchange rate volatility. This yields a smile of the observed exchange rate volatility. Volatility increases if trends are strong and declines if trends fade, i.e. volatility smiles if plotted against the trend.
2.2 Technical trading: trends and volatility

A central feature of our model is the technical traders’ assessment of the excess return

$$\rho_{t+1} = i_t - i_t^* + e_t - e_{t+1}$$

(4)

of a foreign investment. Traders in the foreign exchange market face a portfolio allocation problem. They have to optimize the portfolio weights of the foreign asset position under uncertainty about the excess return of that asset. Based on public and individual information each trader chooses his optimal action, i.e. whether to enter the foreign exchange market at some cost and to determine the optimal size of the foreign position. The interest rates adjust to ensure money market equilibrium.\(^3\)

Heterogeneity in the foreign exchange market is represented by two types of traders: fundamentalists and technical traders. In contrast to the fundamentalists, technical traders extract information \(f_t\) about the excess return from observed exchange rate trends. The instantaneous update of a fundamental evaluation is rather costly compared to updating a technical analysis. Thus, chartists use technical analysis to process the new information at time \(t\).\(^4\)

$$E_t^{\text{fund}}(\rho_{t+1}) = E_t(\rho_{t+1})$$

and

$$E_t^{\text{chartist}}(\rho_{t+1}) = E_{t-1}(\rho_{t+1}) + (1 - \mu) f_t + \nu_t.$$  

(5)  

(6)
The technical traders’ expectation of the excess return consists of the lagged expectation of the excess return $\rho_{t+1}$ which includes the interest differential between foreign and home $i_t - i_t^*$, the trend expectation $(1 - \mu) f_t$, and noise $\nu_t$. The term $(1 - \mu)$ depicts the credibility of monetary policy as seen by the technical traders. If the monetary policy is credible, i.e. $\mu \approx 1$, the impact of trends on technical traders is negligible. The central bank is expected to break exchange rate trends. Only very large trends, $|(1 - \mu) f_t| \gg 0$, can significantly influence the traders’ decisions. If credibility is low, i.e. $\mu \approx 0$, even relatively small trends are expected to continue and to yield excess returns.

The model solution for the conditional volatility $v_e$ of the exchange rate is characterized by

$$2ag - \ln(1 + c) = \frac{\left(\frac{BV}{Ni}v_e + (1 - \mu) f\right)^2}{(1 + c)v_e \left(1 + \frac{1+\beta}{\beta \delta \gamma} \sqrt{1 - \frac{v_{\text{fund}}}{v_e}}\right)^2}$$

for $v_e \in (v_{e,\text{min}}, v_{e,\text{max}})$. The equilibrium curve is also influenced by the fundamental variance $v_{\text{fund}}$, the number of fundamentalists $N_i$, the size of the noise $c$, the interest semi-elasticity of money demand $\beta$, the market size $\bar{B}$, the market entry costs $g$, and the risk aversion of the traders $a$.

The stylized volatility smile in figure 1 shows the equilibrium solution. The smile is characterized by two levels of volatility. The low volatility equilibrium represents the fundamental or base volatility of the exchange rate. It
is located around the center where trends are small. No chartists are in the market and excess volatility is zero. This volatility is caused by macroeconomic variables. In contrast, the high volatility equilibrium occurs at large trends when all technical traders are active. The difference in volatility between these two levels is the maximum excess volatility induced by technical trading. Since technical traders are most active when large trends occur the maximum level of volatility is reached at large trends.

This brings us to the question, in which way technical traders extract trend information from the data. Models of technical traders often use weighted averages of past returns $r_t$ (e.g. De Grauwe and Grimaldi (2002))

$$f_t = \sum_{i=1}^{n} w_i r_{t-i}. \tag{8}$$

Positive weights $w$ correspond to trend followers, negative weights to adverse trading strategies. Exponential trends are given by $w_i = w^i$, $0 < w < 1$. We use a simple moving average trend rule with $w_i = \frac{1}{n}$ and a window size of $n = 5$ trading days.

Implied volatility smiles are well known from empirical analysis of derivatives using various versions of the Black-Scholes pricing formula. Some explanations link these volatility smiles to technical trading due to portfolio
insurance and hedging (e.g. Frey and Stremme (1997) and Sircar and Papanicolaou (1998)). Note that the smile of the implied volatility in this literature differs from the smile of the measured volatility discussed in this paper. The implied volatility is the solution of the pricing formula of a derivative, where the derivation depends on certain assumptions on the underlying process of asset returns and market structure. In contrast, the measured volatility in our model is the empirical volatility of the asset itself.

2.3 Monetary policy: fundamental and excess volatility

In our context, monetary policy influences the volatility of the exchange rate via two channels, fundamental exchange rate volatility and credibility. In the case of a managed exchange rate the conditional volatility of the exchange rate is low, while it is high in the case of a floating exchange rate. If monetary policy is focused on stabilizing the exchange rate, its goal is to reduce the expected difference between the exchange rate and the target rate $\bar{e}^{6.7}$

$$m_t = -\mu_{NB}\mathbb{E}_{t-1}(e_t - \bar{e} - m_t) + \varepsilon_t.$$  \hfill (9)

Within this exchange rate policy the central bank reduces the fundamental or base volatility of the exchange rate, which is created by various macroeconomic variables. Monetary policy can also reduce the excess volatility. If the
exchange rate management is credible ($\mu \approx 1$), excess volatility is reduced to a large degree, since technical traders have no incentive to enter the market. If the exchange rate is floating ($\mu_{NB} = 0$), the assumption of a trend breaking exchange rate policy would be unreasonable. Thus free floating exchange rates have ceteris paribus not only higher fundamental volatility, but also higher excess volatility.

The amount of excess volatility depends on the activity of the technical traders and thus on the relative weight of fundamentalists and chartists in the market as well as the size of the noise. If there are only few technical traders, the maximum excess volatility created by their activity is lower than in a market with a high share of technical traders. We assume that small currency markets like the Euro - Polish Zloty market are more likely to be influenced by technical trading than foreign exchange markets for the three major currencies US Dollar, Euro and Japanese Yen.\textsuperscript{8} Transactions between the large currencies are to a higher degree portfolio based or pure vehicle transactions for the exchange of less liquid currencies. Furthermore, the number of traders and trades in large market is much higher than in small markets. Thus the individual weight of each trader is higher in small markets and information is more clumpy. The structure of private information in large foreign exchange markets should be closer to white noise than in small currencies markets.
Figure 2 plots the equilibrium volatility for various exchange rate regimes: the volatility smiles. Size and location of the smiles vary with the market structure and the exchange rate regime. The model can be solved for the conditional volatility of the exchange rate without specifying the type of trend used by the chartists. Figure 2 displays the impact of the type of the monetary regime and the credibility on the volatility smile derived in the theoretical model in equation (7).

Each of the smiles in figure 2 can be characterized by its fundamental and excess volatility. Monetary policy can influence both base and excess volatility. The base volatility depends directly on the behavior of macroeconomic variables like money. By managing the exchange rate the central bank (partially) offsets the fluctuations of fundamental variables and thus lowers the base volatility. The influence of the monetary policy on the excess volatility depends on its credibility. The chartists’ activity and in turn the level of excess volatility is reduced only if the policy is credible, i.e. if the chartists believe in trend breaking interventions by the central bank.

Summarizing, we can combine our results to identify four sectors in the fundamental volatility - excess volatility plane:
1. credibly managed exchange rate regimes with low base and low excess volatility,

2. non-credibly managed exchange rate regimes with low base and high excess volatility,

3. floats of large currencies with high base and low excess volatility,

4. floats of small currencies with high base and high excess volatility.

Tight pegs with virtually no exchange rate volatility and currency crises with extremely high volatility are the border cases.

3 Empirical characteristics of the exchange rates

The theoretical model yields two main implications: (1) observed volatility smiles and (2) the size as well as the location of the smile, i.e. the base and the excess volatility, characterize the type of exchange rate policy and its credibility. In this empirical section we analyze the behavior of exchange rates and test these hypotheses. After discussing descriptive statistics of the
rates we analyze the smile of the measured volatility over the entire sample period. Afterwards we discuss the development of the exchange rate regimes and their credibility over time.

Our data covers Euro exchange rates of the ten new EU members (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Cyprus, and Malta), two accession countries (2007: Bulgaria and Romania) as well as the rates of Turkey and the US for a comparison. The data are available from 01/01/1999 to 12/12/2003. Each series consists of 1266 data points and is drawn from the ECB internet data base.

From interpreting the Euro exchange rates

\textbf{Figure 4 about here}

and their logarithmic returns

\textbf{Figure 5 about here}

several characteristics can be noted.

A first group of countries has emphasized exchange rate stability for a relatively long time. Due to the perspective of EU membership it comes as no surprise that some countries have chosen to peg their currencies to the Euro. Estonia (EEK) has maintained a very strict Deutschmark/Euro peg right from the introduction of the Estonian Kroon,\textsuperscript{10} while Bulgaria (BGL)
switched from flexible exchange rates to the peg in 1997. Lithuania (LTL) and Latvia (LVL) also tightly pegged their currencies since 1994. Lithuania first chose a currency board solution with the US Dollar as the nominal anchor and then switched to a Euro peg in February 2002 which it has maintained since. Latvia pegs its Lat to the Special Drawing Rights (SDR). Malta (MTL) also switched to peg a currency basket which includes the Euro (70%), the US Dollar (10%), and the British Pound (20%).

Slovenia (SIT) and Romania (ROL) are interim cases. Slovenia has maintained the same official managed float classification over the whole period while Romania has slightly tightened its official managed float to a crawling peg in 2001. Romania has established a crawling peg vis-à-vis the Euro with a constant rate of devaluation. The exchange rate volatility is, except for the disturbance in March 1999, quite moderate and declining.

The remaining countries have increased the flexibility of their exchange rate regime or have maintained their original floating exchange rate system. Cyprus (CYP) reduced the degree of official exchange rate stabilization vis-à-vis the Euro by widening the band to ±15% in 2001. The Czech (CZK) and Slovak Koruna (SKK) started (as a common currency) in an officially fixed exchange regime and are classified since 1997 and 1998 respectively as a more flexible managed float arrangement. The nominal anchor for the Hungarian Forint (HUF) changed from a symmetric US Dollar-Deutschmark basket in
1991 to the Euro in 2001. The official rate of devaluation declined and became more steady until 2001. However, in May 2001 the band was widened to ±15%. Hungary moved from a crawling peg to a pegged exchange rate in a broad horizontal band. Poland (PLN) switched officially from a crawling peg at the beginning of the 1990s to a free float in 2000. The volatility of the Hungarian Forint evidently increased during the 2001 crisis and has stayed on this higher level, while the Polish Zloty behaves quite volatile throughout the sample period. Finally the Turkish Lira (TRL) has obviously undergone a regime shift after the 2001 crisis from low to high volatility, i.e. from a managed to a floating regime.\textsuperscript{11}

\subsection{Volatility smiles}

Figure 7 shows kernel regressions of the volatility smile for the exchange rates over the entire sample period.\textsuperscript{12} The lower part of figure 7 enlarges the plot of the non-floaters, which are hardly distinguishable in the larger plot. Both figures reveal the volatility smile for all non-strictly pegged currencies. Each of the exchange rates can be classified according to the equilibrium patterns shown in figure 2. Evidently the exchange rates of the small floating countries, Poland and Turkey, are characterized by a more pronounced U-shape.
One remarkable result of this first analysis is the conditional volatility of the Romanian Leu. Its excess volatility is remarkably low implying that the pre-announced crawling peg is credible. The minimum of the volatility is at an average logarithmic trend of 0.0014% per working day or 35% per year, i.e. the smile is shifted to the right. The Romanian Leu has an excess volatility comparable to that of Lithuanian Litas, i.e. far less than in the case of floating regimes like the Polish Zloty or the Turkish Lira.

Bauer and Herz (2004a) show that the U-shape of the conditional volatility is also evident in OECD exchange rates and is not replicated by simple benchmark models like a random walk. They further show that even sophisticated heteroskedastic time series models, namely GARCH\((p,q)\) or FIGARCH\((1,d,1)\), do not show an U-shaped dependency between trend and volatility as is characteristic for the data.\(^{13}\)

The model predicts and the empirical estimates from figure 7 suggest that the volatility of an exchange rate is related to its trend. The actual trend is indeed a very important predictor for the conditional volatility of the exchange rate and influences the volatility process significantly. The next test confirms the trend’s influence on volatility even under consideration of
other effects that might affect the volatility. FIGARCH-models are typically used to explain complex patterns like volatility clusters and the long memory property in the volatility structure of empirical time series, that cannot be reproduced by simpler models. Table 1 compares the results of two FIGARCH models, one with the trend and the other without the trend as an additional explanatory variable for the volatility process. Model 1 corresponds to a FIGARCH$(1, d, 1)$ model – using common notation from e.g. Bollerslev, Baillie and Mikkelsen (1996), who give a theoretical foundation for this class of models – with variance equation

$$
\sigma_t = \omega [1 - \beta (1)]^{-1} + \left\{ 1 - [1 - \beta (L)]^{-1} (1 - L)^d \phi (L) \right\} \varepsilon_t^2.
$$

In an analogous way model 2 corresponds to the estimation with the squared trend component as an exogenous variable in the variance equation

$$
\sigma_t = \omega [1 - \beta (1)]^{-1} + \left\{ 1 - [1 - \beta (L)]^{-1} (1 - L)^d \phi (L) \right\} \varepsilon_t^2 + \xi t^2. \quad (10)
$$

The coefficient for the squared trend is highly significant for each exchange rate. The FIGARCH coefficients in the enriched model remain significant, i.e. there are also causes other than technical trading for the long memory property of exchange rates. Yet, the fraction parameter declines significantly for 10 of the 15 estimations, indicating the effect of technical trading on the long memory characteristic.
Building on our findings it would be interesting to develop a class of GARCH-in-quadratic-Mean processes. The variance equation of such model is

\[(1 - \beta (L)) \sigma_t = \omega + \phi (L) \varepsilon_t^2 + (\gamma (L) \varepsilon_t)^2, \quad (11)\]

where \( \gamma (L) \) is a suitable polynomial of the lag operator \( L \).\(^{15}\) The quadratic mean term might be able to replicate the U-shaped structure by implying a high volatility after a trend, i.e. if the mean of the innovations of the last periods is highly positive or negative.

### 3.2 Exchange rate regimes and credibility

In the next step we want to gain further insight in the structure of the exchange rate regimes and their credibility. Using an OLS-regression we fit the even fourth order polynomial

\[v_{t+1} = \gamma_0 + \gamma_2 f_{t}^2 + \gamma_4 f_{t}^4 \quad (12)\]

to the trend-volatility estimates and extract the estimates of fundamental and excess volatility as proposed in figure 1. Figure 8 shows the estimates of fundamental and excess volatility over the entire sample period.\(^{16}\)

The visualization of the regression results in figure 8 allows a more direct
interpretation than the kernel regressions illustrated in figure 7. The fundamental and the excess volatility are estimated from each volatility smile and each country estimate is displayed in the fundamental/excess volatility plane.

The excess volatility is a measure of the credibility of the monetary policy. We again find that over the entire sample period the Turkish Lira and the Polish Zloty show the highest excess and fundamental volatility. The excess volatility of the Romanian Leu is remarkably low implying that the pre-announced crawling peg is credible. The intermediate positions of Latvia is the result of their peg to the SDR, which is mainly an weighted average of US Dollar and Euro. The intermediate positions of Lithuania stems from averaging over the regime shift from a Dollar to a Euro peg.

To analyze the development of the regimes and their credibility we carry out these estimations for each year separately. As shown above fundamental and excess volatility can be interpreted as measures for the type and the credibility of an exchange rate regime.

We can differentiate three groups of exchange rates, which we examine in more detail below. The first group comprises countries with managed and fixed Euro exchange rates. The Bulgarian Lev and the Cyprus Pound reveal nearly no excess nor base volatility for the sample period, indicating a credible tight peg. All estimates for these two countries over the entire sample
period are crammed around the origin in figure 9. The Czech Koruna, the Slovak Koruna, the Slovenian Tolar, and the Maltese Pound all exhibit a declining excess volatility after 1999 which indicates a rise in the credibility of their exchange rate regimes. The Slovenian Tolar and the Slovakian Koruna behave relatively stable, while the fundamental volatility further decreases in the case of the Maltese Pound. The Czech Koruna, however, is less stable during the 2001 crisis and shows a significant decline of credibility. After a rise of the fundamental volatility in 2002 it regains stability and credibility and returns to its 2000 level in 2003. The Turkish Lira before the crises in 2001 shows a relatively low excess volatility. Note that all currencies of the first group remain in the sectors "tight pegs" and "credible bands" for the entire sample period.

The second group of exchange rates can be characterized as Dollar oriented exchange rate regimes. These are the Latvian Lats until 25/01/2002 and the Lithuanian Litas. The US Dollar is also displayed as a benchmark in figure 10. The peg of the Lithuanian Litas to the Dollar was tight and credible, as can be seen from the comovement of the two curves. In 2002 Lithuania switch to a Euro peg which implies a zero volatility of the euro
exchange rate. The Latvian Lats is pegged to the SDR and mimics the US Dollar to a lesser degree. This peg can also be considered as very credible due to the very low excess volatility.

The last group consists of the remaining countries Hungary, Poland, Romania, and Turkey after the 2001 crisis (see figure 11). Poland has exhibited a significant increase in excess volatility during 2001 signaling low credibility during that time. In the case of the Hungarian Forint fundamental volatility increased while credibility dropped at the same time. The reductions of base volatility in 2000 and 2002 were only temporary. Especially the widening of the band to ±15% in May 2001 and a devaluation of the central parity of the Forint by 2.26% in June 2003 led to a loss of credibility. An interesting exchange rate in this group is the Romanian Leu. The very low excess volatility indicates a strong credibility of the crawling peg and the ongoing reduction of base volatility indicates a transition to a smooth continuous devaluation. In 2003 the base and excess volatility are comparable to exchange rates regime with narrow and highly credible exchange rate bands. The pre-announced crawling peg appears to have only nominal effects. Finally, the Turkish Lira has obviously switched to a floating regime after the crisis in 2001.\textsuperscript{18} In 2004
Turkey seems to begin to manage its exchange rate again.

As a by-product of our analysis we derive a classification of the de facto exchange rate regimes (table 2), which differ distinctly from the official regimes according to the IMF classification in table 3.\textsuperscript{19}

4 The exchange rate and monetary policies of the new EU member states: where do we stand?

After having joined the European Union in 2004 the new member states are going to enter the EMU consultation process. Slovenia, Estonia and Lithuania made the next step towards the Euro and joined the ERM II exchange rate mechanism on in June 2004. To become EMU members these countries have to secure central bank independence and have to comply with the so-called convergence criteria of fiscal, monetary, and exchange rate policy. Given the monetary and exchange rate policy so far what kind of central bank policies can be expected in this transition period?

First, several of the new EU members already pursue a relatively tight
exchange rate management and should therefore have little problems to stabilize their Euro exchange rate according to the exchange rate criterion. This is particularly obvious for Estonia, Lithuania and the prospective EU member Bulgaria which have officially announced Euro pegs, that are highly credible. Having entered the ERM II in June 2004 Estonia and Lithuania can meet the exchange rate criteria of observing the normal fluctuation margins of the exchange rate mechanism for at least two years in July 2006, so that EMU membership would be within reach by the beginning of 2007.

A next group of countries has also established a remarkable credibility of their exchange rate policies. However, these policies are not yet in accordance with a stable Euro exchange rate. Latvia has to switch from the SDR peg to an Euro peg. Given the high credibility of the SDR peg the central bank should have little problems changing the nominal anchor. Malta is in a similar situation. It maintains a very credible peg to a currency basket with a large Euro share and should therefore be able to switch to a pure Euro peg without major problems. Slovenia has gradually reduced the volatility of its Deutschmark/Euro exchange rate in recent years. Since 2000 the market assigns a very high credibility to the steady process of small devaluations. The prospective EU member state Romania is in a similar situation. It has announced a crawling peg vis-à-vis the Euro which is considered to be credible by the market participants. Slovenia, which together with Estonia and
Lithuania has entered the ERM II exchange rate mechanism in June 2004, is in a different position than its two Baltic comrades. With an average rate of devaluation of 5% the Slovenian Tolar may remain within the bandwidth of ±15% for over two years without the need of adjustment. However, the steady devaluation comes along with a comparably high inflation. Although inflation declined form 8.9% in 2000 to 5.6% in 2003, further efforts are necessary to meet the monetary convergence criteria.

The remaining countries have experienced a de jure increase in the flexibility of their exchange rate regime or have maintained their original floating exchange rate system. However, these countries can be split into two groups on the basis of the de facto exchange rate behavior. Cyprus, the Czech Republic and the Slovak Republic maintained credible narrow bands with regard to the Euro, while Hungary and Poland (as well as Turkey) currently show no signs of a credible exchange rate management.

While the Czech Republic officially switched to a managed float in 1997, the de facto exchange rate volatility with respect to the Deutschmark/Euro has not changed dramatically in this period. The Czech regime lost credibility during the 2001 crisis. However, the exchange rate regime does not seem to have been considered as unstable, and it regained much of its credibility during the following two years. Thus a further tightening of the exchange rate management seems to be in accordance with market sentiments. The
Slovak Koruna – having switched to a managed float in 1998 – did not experience a comparable loss of credibility during 2001. The central bank even increased its stabilization efforts and gained further credibility. This relatively high credibility of the exchange rate regime and the stability during the 2001 crisis suggest that the market sentiments are in accordance with a further stabilization of the Euro exchange rate. While Cyprus officially lowered the degree of exchange rate stabilization vis-à-vis the Euro in 2001, the volatility of the Cyprus Pound as well as the market’s assessment make this regime a credible de facto peg with the exchange rate fluctuating in a band of only ±1.5% during the last five years. Therefore market sentiments do not seem to contradict the transition to an official Euro peg.

Poland switched from a crawling peg to a free float in 2000. During the 2001 crisis the Polish Zloty experienced large excess volatility due to a lack of credibility. The Hungary Forint moved from a crawling peg to a pegged exchange rate in a broad horizontal band. However, this movement was much slower than in the case of other countries and also left a considerable degree of exchange rate volatility, which even seemed to have increased in 2003. It is interesting to note, that the exchange rate regime of the Hungarian Forint is assessed with the same (low) credibility as the officially freely floating Polish Zloty. Both currencies therefore lack an important pre-requisite for a smooth transition to EMU membership. Both countries should concentrate
on (re)gaining the credibility of their monetary policy.

We have also included Turkey which is under consideration as a future EU member. Turkey switched from a credibly managed exchange rate regime to a free float with the highest volatility of all currencies in the sample. The exchange rate behavior gives a first indication on the still vast differences in the field of exchange rate and monetary policy between Turkey, the EU accession countries and the new EU members.

Notes

1 See e.g. Frenkel and Menkhoff (2000, chapter 2).

2 Brada and Kutan (2002) use a cointegration approach to analyze the monetary policy of a panel of (potential) Balkan and Mediterranean Candidates for European Union during the late 90s. They find that the market oriented economies Cyprus, Malta, Slovenia and Croatia significantly orient their monetary policy to the German policy, while other countries fail to do so.

3 For a detailed analysis see Bauer and Herz (2004b).

4 See De Grauwe and Grimaldi (2002).

5 A full derivation of the equilibrium equation is left to the appendix available from the authors.

6 The target value $\varepsilon$ may be varying over time e.g. in the case of a crawling peg.

7 The macroeconomic framework with interest parity and money demand equation yields
a simple equation for the equilibrium exchange rate

\[ e_t = m_t + \alpha (i_t - i_t^*) + q_t. \]

To stabilize the expected deviation of the exchange rate from a target the money supply is adjusted according to (9). In order to prevent circular calculation the expected deviation is calculated without the money supply itself.

\(^8\)De Grauwe and Decupere (1992) find only very weak evidence for psychological barriers in Dollar/Yen and Dollar/Deutschmark exchange rates.

\(^9\)The Bulgarian Leu series starts at 19/07/2000.

\(^10\)Therefore the Estonian Kroon will not be included into the empirical analysis.

\(^11\)For the empirical analysis of the exchange rate behavior we split the Turkish Lira time series into two parts, one before the 2001 crisis (TRL1) and one afterwards (TRL2).

\(^12\)The model implies that technical traders react to the occurrence and strength of trends. Thus volatility increases after the appearance of trends. Plots therefore show the measured trend of period \( t \) and conditional volatility of period \( t + 1 \). This separation of the windows from which trend and volatility are estimated also ensures that typical time series processes like random walk, GARCH or FIGARCH processes do not show the smile. See Bauer and Herz (2004a) for details.

\(^13\)Bauer and Herz (2004b) investigate the impact of a credible explicit monetary policy within the microstructure exchange rate model and generate a classification for exchange rates due to their de facto behavior. In contrast to other popular de facto classification schemes like Levy-Yeyati and Sturzenegger (2003), Reinhard and Rogoff (2004) or Reinhard and Calvo (2002) this algorithm does not rely on additional macroeconomic data like reserves, which are typically available only on a monthly base. Instead the classification is based only on the exchange rate itself which is available on a daily and even intraday base.
i.e. the exchange rate’s behavior that reflects the market’s assessment of the underlying exchange rate regime.

14 The fraction parameter estimates of the two Turkish subsamples are not significant on the 5% level. However, the sample size might be too small for reliable estimation in these cases.

15 Of course one could find various other formulations of this definition, e.g. combine $\phi$ and $\gamma$ to one single polynomial.

16 The estimates of fundamental and excess volatility of the Turkish Lira go far beyond the scope of the other exchange rates and are thus excluded from this figure.

17 The figures 9, 10, and 11 have different scales. The limits for fundamental and excess volatility are $(2 \cdot 10^{-5}, 4 \cdot 10^{-5})$, $(6 \cdot 10^{-5}, 7 \cdot 10^{-5})$, and $(11 \cdot 10^{-5}, 40 \cdot 10^{-5})$.

18 The value for 2001 is not displayed due to scaling reasons: $v_{base} = 0.00042$, $v_{excess} = 0.0012$.

19 For other classifications of the de facto exchange rate regimes see e.g. Levy-Yeyati and Sturzenegger (2004), Reinhard and Calvo (2002), von Hagen and Zhou (2002), and Reinhard and Rogoff (2004).


<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004 (forecast)</th>
<th>2005 (forecast)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.9%</td>
<td>8.4%</td>
<td>7.5%</td>
<td>5.6%</td>
<td>3.5%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

21 This change in the official policy caused the only (minor) disturbance during the sample period.
References


5 Figures and tables

5.1 Figures

Figure 1. Stylized volatility smile with measure of fundamental and excess volatility
Figure 2. Volatility smile for different markets and exchange rate regimes: (line) float of small currency, (boxes) float of large currency, (crosses) non-credible management, (circles) credible management.
Figure 3. Classification scheme of exchange rate regimes based on market assessment.

- incredible bands
- credible bands
- floats of small currencies
- floats of large currencies
- tight pegs
- crises
- excess volatility
- fundamental/base volatility
Figure 4. Euro exchange rates 1999-2003
Figure 5. Euro exchange rate returns 1999-2003
Figure 6. Kernel regression of trend and conditional volatility of the Euro exchange rates (new EU members, (potential) accession countries, and the US: 1999-2003)
Figure 8. Market assessment of the exchange rate regimes: entire sample period

The Turkish Lira represents an outlier at (0.000076, 0.00270) due to the 2001 crisis and is omitted from the plot.
Figure 9. Development of market’s assessment of exchange rate regimes: Euro oriented regimes
Figure 10. Development of market’s assessment of exchange rate regimes: Dollar oriented regimes
Figure 11. Development of market’s assessment of exchange rate regimes: Remaining group
5.2 Tables
Table 1

Estimates of FIGARCH(1,d,1) fraction coefficient in model 1 and model 2 and squared trend coefficient in model 2

<table>
<thead>
<tr>
<th>Country</th>
<th>d model 1</th>
<th>sd of d1</th>
<th>d model 2</th>
<th>sd of d2</th>
<th>d1−d2</th>
<th>sd of d1−d2</th>
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<td>0.055</td>
<td>0.056</td>
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significance levels: * 10%, ** 5%, *** 1%,
# Table 2

## Market assessment of CEEC exchange rates

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<th>Country</th>
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</table>

1: credibly managed exchange rate regimes with low base and low excess volatility,

2: non-credibly managed exchange rate regimes with low base and high excess volatility,

3: floats of large currencies with high base and low excess volatility,

4: floats of small currencies with high base and high excess volatility.
### Table 3

**Exchange Rate Arrangements in Central and Eastern Europe**

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</tr>
</tbody>
</table>

Source: IMF (various issues).

1: exchange rate arrangements with no separate legal tender

2: currency board arrangements

3: other conventional fixed peg arrangements (within a band of most ± 1%)

4: pegged exchange rate arrangements within horizontal bands (at least ± 1%)

5: crawling pegs (with small, pre-announced adjustment)

6: exchange rates with crawling bands

7: managed floating with no pre-announced path for the exchange rate

8: independent floating (market-determined exchange rate and independent monetary policy)