How credible are the exchange rate regimes of the EU accession 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 to categorize the de facto the exchange rate regimes and derive a market based measure of the credibility of these exchange rate regimes. We empirically determine the de facto exchange rate regimes of EU accession countries and test their credibility as assessed by the market participants. In the run-up to EU accession most CEEC have reached high credibility in their exchange rate management. However, some of the future EU and 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 shaped by the prospect of membership in the European Union (EU) and 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 are going to join the European Union. Bulgaria and Romania are expected to follow by 2007. In this process the choice of the exchange rate regime has been a crucial economic issue as these countries have become more integrated into world markets and have aimed at stability orientated monetary policies.

When deciding on the exchange rate regime governments face Mundell's well-known impossible trinity. They can only realize only two of the following three objectives, namely capital mobility, exchange rate stability, and monetary independence. So if they opt for capital mobility they have to choose 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. Obviously, exchange rate stability comes at a price. 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 the process of radical economic changes 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 considerable gaps between officially proclaimed exchange rate regime and the de facto behavior of the exchange rate (e.g. Levy-Yeyati and Sturzenegger (2004, forthcoming), 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. The credibility of the exchange rate policy 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. Also, only a credible peg can reduce the likelihood of currency crises and the costs of disinflation.

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

- 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. First, we classify the exchange rate systems of the CEEC. Second, we develop a measure for the market's assessment of an exchange rate regime (section 3). 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 4). Section 5 concludes.

2 Exchange rate volatility and nominal anchor

When deciding on its exchange rate policy a government has to determine two key features:

- the degree of exchange rate stabilization,

- the nominal anchor, i.e. the exchange rate which is to be stabilized.

In the case of the CEEC there have been strong incentives for exchange rate stabilization as these countries have developed into open economies which do not have a long history of macroeconomic stability. Concerning the nominal anchor the Deutschmark/Euro has been a natural choice for many countries. The CEEC have developed close trade relations with the EU and the EU accession implies membership in the Euro exchange rate mechanism (ERM2) and subsequently the

EMU. Another possible anchor is the US Dollar because of its central role as an international currency.

Formally, the exchange rate policy implies choosing the feedback parameters α and λ from $(0,1)$

$$m = \frac{1-\lambda}{\lambda}\left[(1-\alpha)\left(e_{\text{euro}} - \overline{e}_{\text{euro}}\right) + \alpha\left(e_{\text{dollar}} - \overline{e}_{\text{dollar}}\right)\right]$$

Figure 1 about here

e denotes the exchange rate, and m is a policy instrument, e.g. money supply or an interest rate. The feedback parameter λ describes to what degree a central bank stabilizes its exchange rate, while parameter α determines the relative weight of the Deutschmark/Euro and the US Dollar as nominal anchors. $\overline{e}$ denotes the respective exchange rate target. Low values of λ imply a strong reaction of the central bank to exchange rate movements, i.e. a fixed exchange rate regime. $\alpha = 0$ indicates a Euro peg and $\alpha = 1$ a Dollar peg. (see figure 1).

Table 1 about here

During the transformation and accession process there have been marked changes in the official exchange rate policies of the CEEC (see table 1). Concerning exchange rate volatility, i.e. the choice of λ, there has been tendency towards polarization. Several countries stabilize their exchange rate today to a larger degree than at the beginning of the transition and accession process. Others have moved into the opposite direction. Concerning the nominal anchor, i.e. the choice of α, there is a clear tendency towards the Euro (see figure 1).

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 Deutschmark/Euro, i.e. $\lambda \to 0$ and $\alpha = 0$. Estonia maintained the Deutschmark/Euro peg right from the introduction of the Estonian Kroon, while Bulgaria switched from flexible exchange rates to the peg in 1997. Lithuania and Latvia also strictly pegged their currencies since 1994, i.e. $\lambda \to 0$. Lithuania first chose a currency board with the US Dollar

($\alpha = 1$) and then switched to the Euro in February 2002 ($\alpha = 0$). Latvia pegs its lat to the Special Drawing Rights (SDR) ($0 < \alpha < 1$). Malta also switched to peg a currency basket which includes the Euro (70%), the US Dollar (10%), and the British Pound (20%).

Slovenia and Romania 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.

The remaining countries have increased the flexibility of their exchange rate regime or have maintained their original floating exchange rate system. Cyprus reduced the degree of official exchange rate stabilization vis-à-vis the Euro by widening the band to ±15% in 2001. The Czech and Slovak Koruna 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 changed from a symmetric US Dollar-Deutschmark basket, i.e. $\alpha = \frac{1}{2}$, in 1991 to the Euro, i.e. $\alpha = 1$, in 2001. The official rate of devaluation declined and became more steady until 2001 indicating rising λ. However, in May 2001 the band was widened to ±15%, i.e. an increase in λ. Hungary moved from a crawling peg to a pegged exchange rate in a broad horizontal band. Poland switched officially from a crawling peg at the beginning of the 1990s to a free float in 2000.

3 Market assessments of the exchange rate regime

3.1 The basic model

The market's assessments of the underlying exchange rate and monetary policy crucially affects the viability and the economic consequences of an exchange rate regime. For example the second generation currency crises models show how self-fulfilling expectations of market participants can trigger currency crises, while the Barro-Gordon model analyzes the role of credibility for the effects of monetary policy (see e.g. Obstfeld (1994), Jeanne (2000) and Barro and Gordon (1983)).

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 further develops the approach of Jeanne and Rose (2002) by introducing technical trading and non i.i.d. macroeconomic variables.

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.

Implied volatility smiles are well known from empirical analyzes 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 reported 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. The measured volatility in our model is the empirical volatility of the asset itself.

3.2 Technical trading: trends and volatility

A central feature of our model is the technical traders' assessment of the excess return ρ_{t+1} of a foreign investment.[1] In contrast to the fundamentalists, technical traders extract information f_t from observed exchange rate trends. The instantaneous update of a fundamental evaluation is rather costly compared to updating

[1] For a detailed analysis see Bauer and Herz (2003b).

a technical analysis. Thus, chartists use the technical analysis to process the new information at time t.[2]

$$\mathbb{E}_t^{\text{chartist}}(\rho_{t+1}) = \mathbb{E}_{t-1}(i_t - i_t^*) + (1-\mu)\, f_t + \nu_t. \tag{1}$$

The technical traders' expectation of the excess return consists of the lagged expectation of the interest differential between foreign and home $i_t - i_t^*$, the trend expectation $(1-\mu)\, f_t$, and noise ν_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

$$2ag - \ln(1+c) = \frac{\left(\frac{a\bar{B}}{N_i} v_e + (1-\mu) f\right)^2}{(1+c) v_e \left(1 + \frac{1+\beta}{\beta\sqrt{c}} \sqrt{1 - \frac{v_{fund}}{v_e}}\right)^2} \tag{2}$$

for $v_e \in (\, v_{e,\min},\, v_{e,\max}\,)$.[3] The equilibrium curve is also influenced by the fundamental variance v_{fund}, the fraction of fundamentalists N_i, the size of the noise c, the interest semi-elasticity of money demand β, the market size $\bar{B}$, the market entry costs g, and the risk aversion of the traders a. Figure 2 displays plots of the equilibrium volatility: the volatility smiles. Size and location of the smile vary when alternative market structures and exchange rate regimes are modelled. The model can be solved for the conditional volatility of the exchange rate without specifying the type of trend used by the chartists.

Models of technical traders often use weighted averages of past exchange rate changes (e.g. De Grauwe and Grimaldi (2002))

$$f_t = \sum_{i=1}^{n} w_i r_{t-i}. \tag{3}$$

[2]see De Grauwe and Grimaldi (2002)

[3]A full derivation of the equilibrium equation is left to the appendix available from the authors.

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.

3.3 Monetary policy: fundamental and excess volatility

Monetary policy influences the volatility of the exchange rate via two channels, fundamental exchange rate volatility and credibility. In case of an managed exchange rate the conditional volatility of the exchange rate is low, while the volatility is high in case of floating exchange. If the 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 $\overline{e}$[4]

$$m_t = -\mu_{NB}\mathbb{E}_{t-1}\left(e_t - m_t - \overline{e}\right) + \varepsilon_t. \tag{4}$$

Such an exchange rate management implies that the central bank reduces the fundamental or base volatility of the exchange rate. This fundamental volatility is the volatility created by various macroeconomic variables. Monetary policy may also reduce the potential of 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 not managed ($\mu_{NB} = 0$), the assumption of a trend breaking exchange rate policy would be irrational. Thus free floating exchange rates have ceteris paribus not only higher fundamental volatility, but also higher excess volatility, too.

The excess volatility depends on the activity of the technical traders and thus on the relative weight of fundamentalists and chartists in the market. 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 e.g. the Euro - Polish Zloty market are more likely to be

[4]The target value $\overline{e}$ may be varying over time to account for various exchange rate regimes like crawling bands.

influenced by trading strategies like technical trading.[5] In contrast foreign exchange markets for the three large currencies US Dollar, Euro and Japanese Yen should have relatively fewer technical traders. Transactions between the large currencies are to a higher degree portfolio based or pure transmitting transactions for the exchange of less liquid currencies.

Figure 2 displays the impact of different monetary regimes, credibility, and fraction of chartists on the volatility smile derived in the theoretical model 2.

Figure 2 about here

Figure 3 shows a stylized volatility smile represented by an even 4^{th} order polynomial. The fundamental or base volatility is the minimum volatility. This level of volatility is only caused by macroeconomic variables. In contrast, the excess volatility is the increase of 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.

Figure 3 about here

Each of the smiles in figure 2 displays two extreme levels of volatility. The low volatility equilibrium resembles the 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. The high volatility equilibrium occurs at large trends when all technical traders are active. The increase in volatility between these two levels is the maximum excess volatility. While monetary policy can influence both base and excess volatility, its influence on the excess volatility depends on its credibility.

Combining our results we identify four sectors in the base volatility - excess volatility plane:

1. credible managements with low base and low excess volatility,

2. non-credible managements with low base and high excess volatility,

[5] De Grauwe and Decupere (1992) find only very weak evidence for psychological barriers in Dollar/Yen and Dollar/Deutschmark exchange rates.

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

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

with border cases:

1. tight pegs or fixes with virtually no volatility and

2. crises with extremely high volatility.

Figure 4 about here

4 Empirical characteristics of the exchange rates

The theoretical model yields two main implications: (1) 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. Both hypotheses are tested and analyzed in this empirical section. In the first part we analyze the smile of the measured volatility over the entire sample period. In the second part we discuss the development of the exchange rate regimes and their credibility over time.

Our data covers Euro exchange rates of 12 EU accession countries (2004: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Cyprus, and Malta; 2007: Bulgaria and Romania) as well as the rates of Turkey and the US for a comparison. The data[6] 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.

Taking a look at the Euro exchange rates of the accession countries

Figure 5 about here

[6] The Bulgarian Leu series starts at 19/07/2000.

and their logarithmic returns

Figure 6 about here

several characteristics are obvious. Estonia has maintained a strict peg to the Euro for the entire sample period.[7] Latvia switched to a strict Euro peg in 2002 which it has maintained since. 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. Romania has established a crawling peg vis-à-vis the Euro with a constant rate of devaluation. Its volatility is, except for the disturbance in March 1999, quite moderate and declining. Finally the Turkish Lira has obviously undergone a regime shift after the 2001 crises from low to high volatility or from a managed to a floating regime. The other exchange rates have – at first glance – medium or small variances with no significant breaks.

4.1 Volatility smiles

Figure 7 shows kernel regressions of the volatility smile for the exchange rates over the entire sample period.[8] Figure 8 enlarges the plot of the non floaters, which are hardly distinguishable in the larger plot. Both figures distinctly reveal the volatility smile of 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.

Figure 7 about here

[7] Therefore the Estonian Kroon will not be included into the empirical analysis.

[8] 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 (2003a) for details.

Figure 8 about here

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, i.e. it is far less than in the case of floating regime like the Poland of Turkey.

Bauer and Herz (2003a) show that the U-shape of the conditional volatility is evident in OECD exchange rates and is not replicated by simple benchmarks 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 a U-shaped dependency between trend and volatility as is characteristic for the data. Bauer and Herz (2003b) 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 they classify the exchange rate which is available on a daily and even intraday base solely on its behavior that reflects the market's assessment of underlying exchange rate regime.

The model predicts and the empirical estimates from figures 7 and 8 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. Table 2 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

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

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

$$\sigma_t = \omega \left[1-\beta(1)\right]^{-1} + \left\{1 - \left[1-\beta(L)\right]^{-1} (1-L)^d \phi(L)\right\} \varepsilon_t^2 + \xi f_t^2. \tag{5}$$

The coefficient for the squared trend is highly significant for each exchange rate. The FIGARCH coefficients in the enriched model remain significant[9], i.e. we cannot propose technical trading as the only source 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.

Table 2 about here

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

$$(1-\beta(L))\,\sigma_t = \omega + \phi(L)\,\varepsilon_t^2 + (\gamma(L)\,\varepsilon_t)^2, \tag{6}$$

where $\gamma(L)$ is a suitable polynomial of the lag operator L.[10] 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.

4.2 Monetary regimes and credibility

In a next step we estimate the fundamental and the excess volatility of each currency. To analyze the development of the regimes we carry out these estimations for each year separately. As shown above fundamental and excess volatility can be interpreted

[9] 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.

[10] Of course one could find various other formulations of this definition, e.g. combine ϕ and γ to one single polynomial.

as measures for the type and the credibility of an exchange rate regime. Figure 9 summarizes the results.[11]

We can differentiate several groups of exchange rates, which we examined in more detail below.

Figure 9 about here

The first group comprises countries with managed and fixed Euro exchange rates. The Bulgarian Leu and 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 in the tiny black cloud around the origin in figure 10.The Czech Republic, the Slovak Republic, Slovenia, and Malta all exhibit a decline of the excess volatility after 1999 which indicates a rise in the credibility of their exchange rate regimes. The Slovenian Tolar and the Slovakian Koruna keep their 2000 volatility within the estimation errors, while the fundamental volatility further decreases in the case of Malta. 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 exhibits medium base volatility and low excess volatility, i.e.a relatively high credibility of the exchange rate regime regime. Note that all currencies remain in the sectors ”tight pegs” and ”credible bands” for the entire sample period. Figure 10 is enlarged from figure 9, representing the rectangle between the axis and the first tickmarks on the axes.

Figure 10 about here

The second group of the exchange rate is the group of Dollar oriented exchange rate regimes. These are the Latvian Lats until 25/01/2002 and the Lithuanian Litas. The US Dollar is displayed as a benchmark. The peg of the Lithuanian Litas to the Dollar was credible, as can be seen from the comovement of the two curves. In the

[11] To keep the graphic as clearly arranged as possible, we restrict the displayed area. The data of the Turkish Lira is split up at the 2001 crises.

year 2002 Lithuania switch to a Euro peg which implies zero volatility. The Latvian Lats is pegged to the SDR and mimics the US Dollar curve to a lesser degree. This peg can also be considered as very credible due to the very low excess volatility. Figure 11 is enlarged from figure 9.[12]

Figure 11 about here

The last group consists of the remaining countries Hungary, Poland, Romania, and Turkey after the 2001 crisis. Poland has exhibited a significant increase in excess volatility during 2001 signaling low credibility during that time. The Hungarian Forint increased fundamental volatility while loosing credibility at the same time. The reductions of base volatility in 2000 and 2002 were only temporary. Especially the widening of the band to $\pm 15\%$ 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 continuing decrease of base volatility indicates that the continuous devaluation has become more steady. In the year 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.[13]

Figure 12 about here

[12] The fundamental volatility axis has been upscaled by factor 2, the excess volatility by factor 6.

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

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

After joining the European Union in May 2004 the new member states are going to enter the EMU consultation process. To become EMU members the countries have to secure central bank independence and have to comply with the so-called convergence criteria on 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 EU accession countries 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.

A next group of countries has also established a remarkable degree of 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 any 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 by the market participants to be credible.

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 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 gained back much of its credibility during the following two years. Thus a further tightening of the exchange rate management seems to be in accordance with the 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 $\pm 1.5\%$ 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 crises the Polish Zloty experienced large excess volatility due to a lack of credibility. The Hungary Forint moved from a de jure and de facto 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 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 and the EU accession countries.

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6 Figures and tables

6.1 Figures

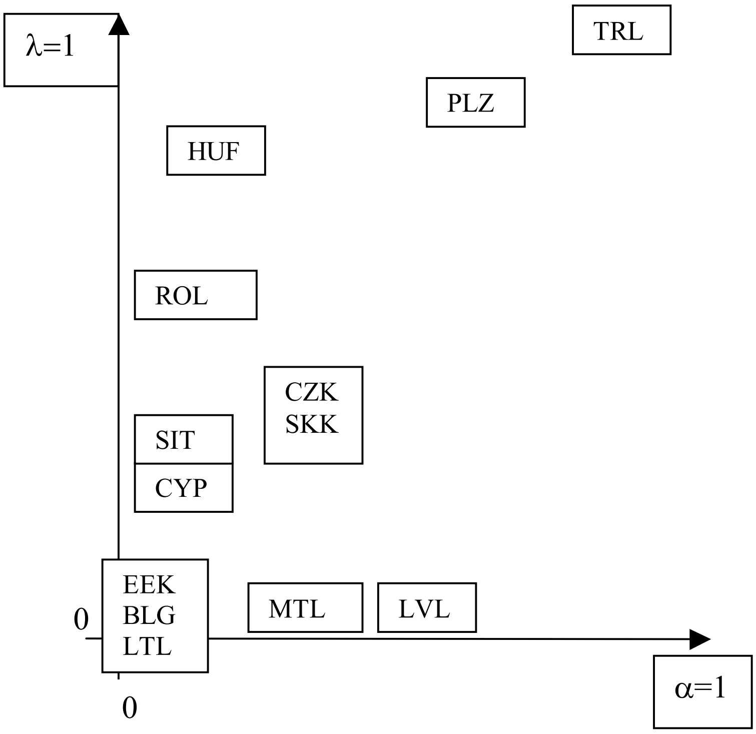

Figure 1: Current exchange rate regimes of CEEC

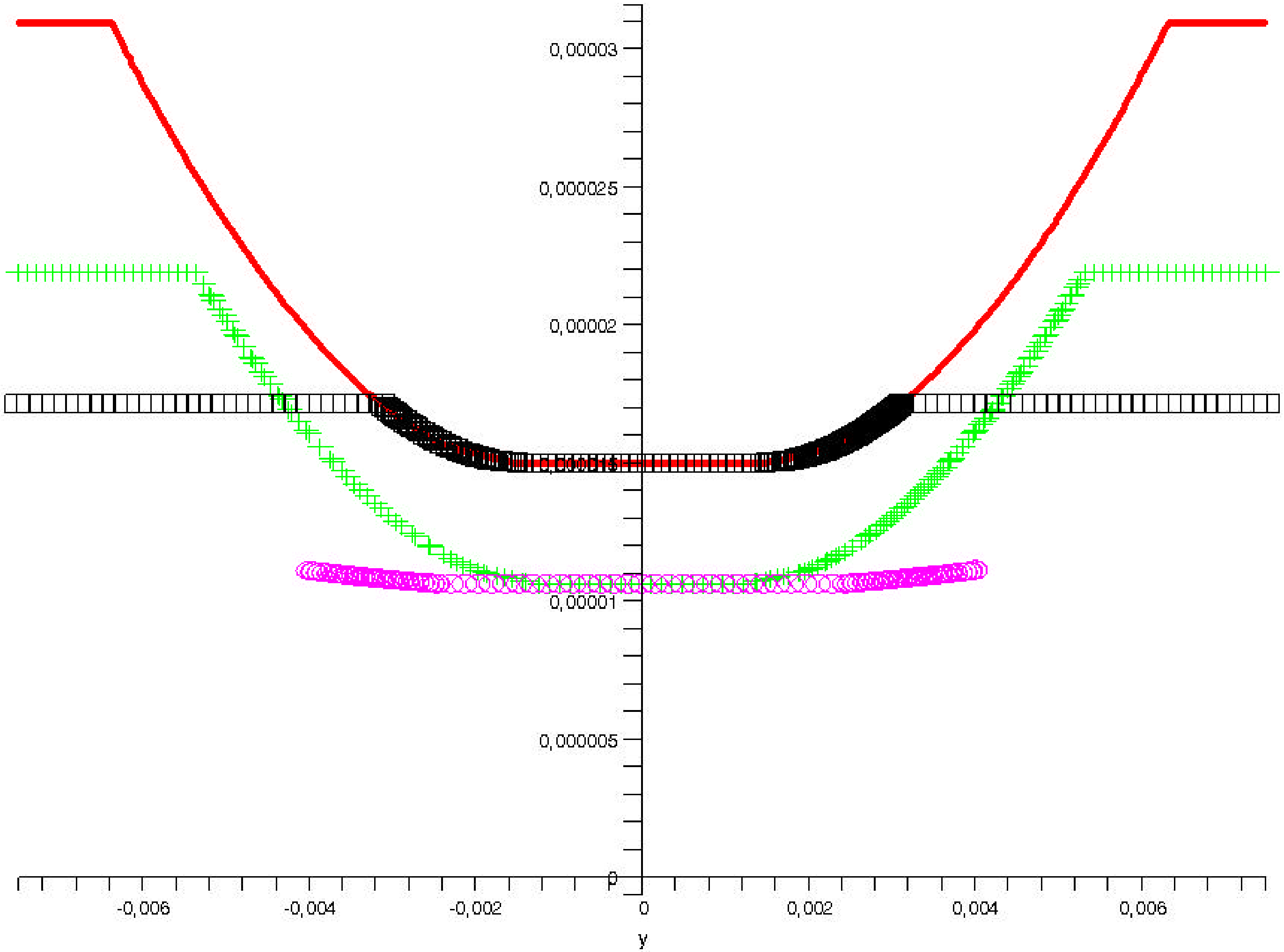

Figure 2: Volatility smile for di¤erent markets and exchange rate regimes: (line) ‡oat of small currency, (boxes) ‡oat of large currency, (crosses) non-credible management, (circles) credible management

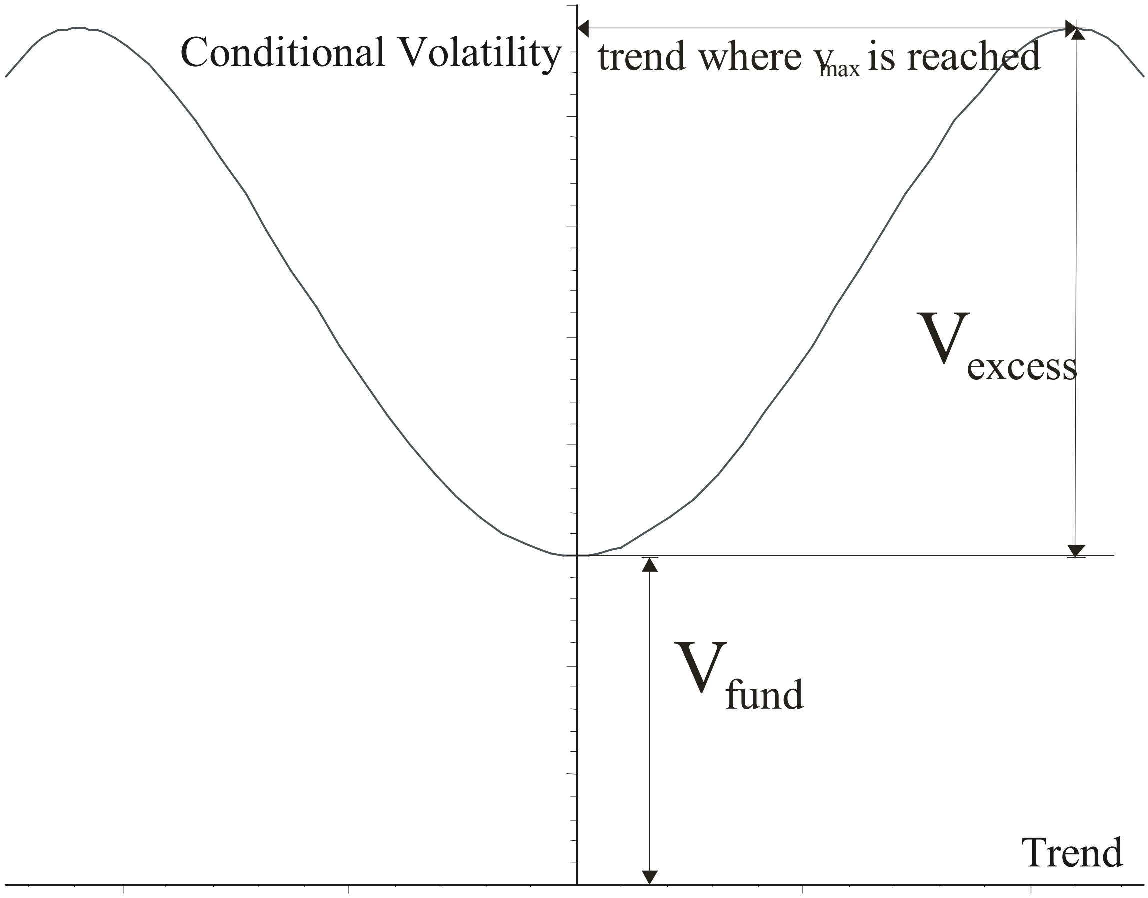

Figure 3: Stylized volatility smile with measure of fundamental and excess volatility

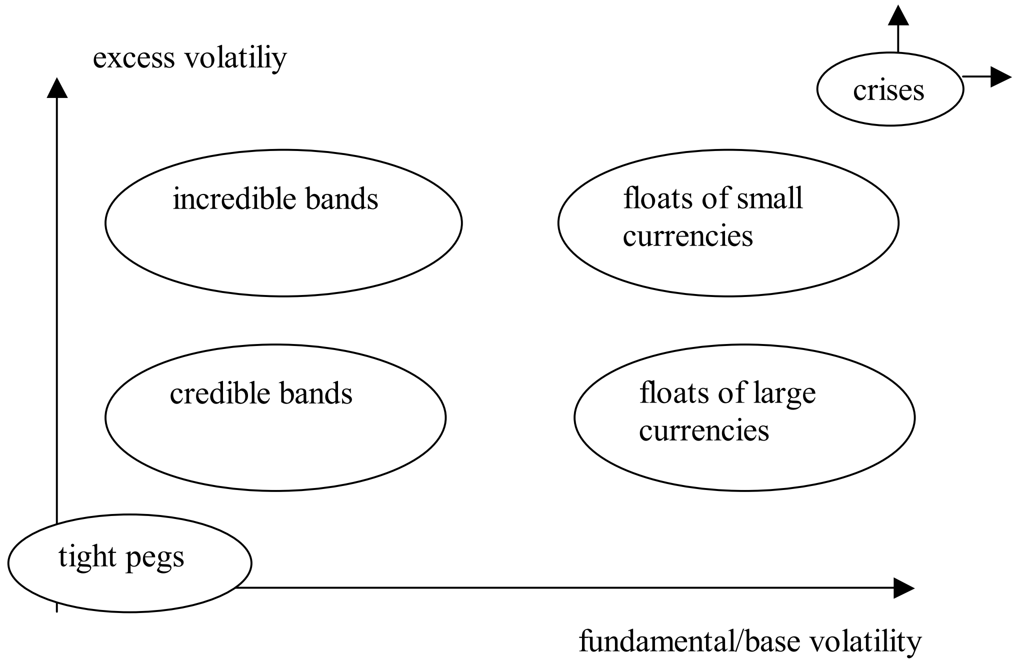

Figure 4: Classification scheme of exchange rate regimes based on market assessment

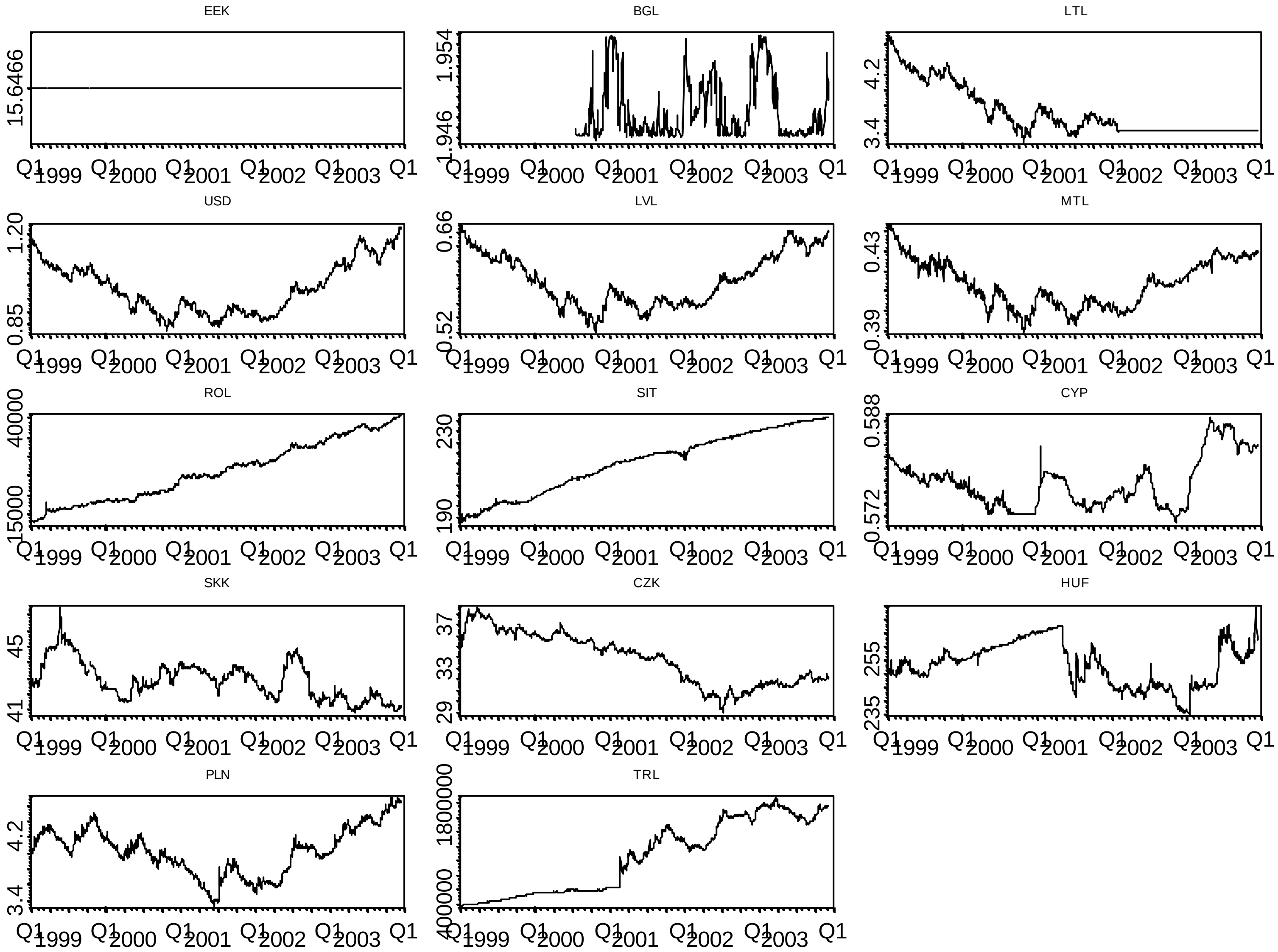

Figure 5: Exchange rates of CEEC 1999-2003: source ECB statistical release

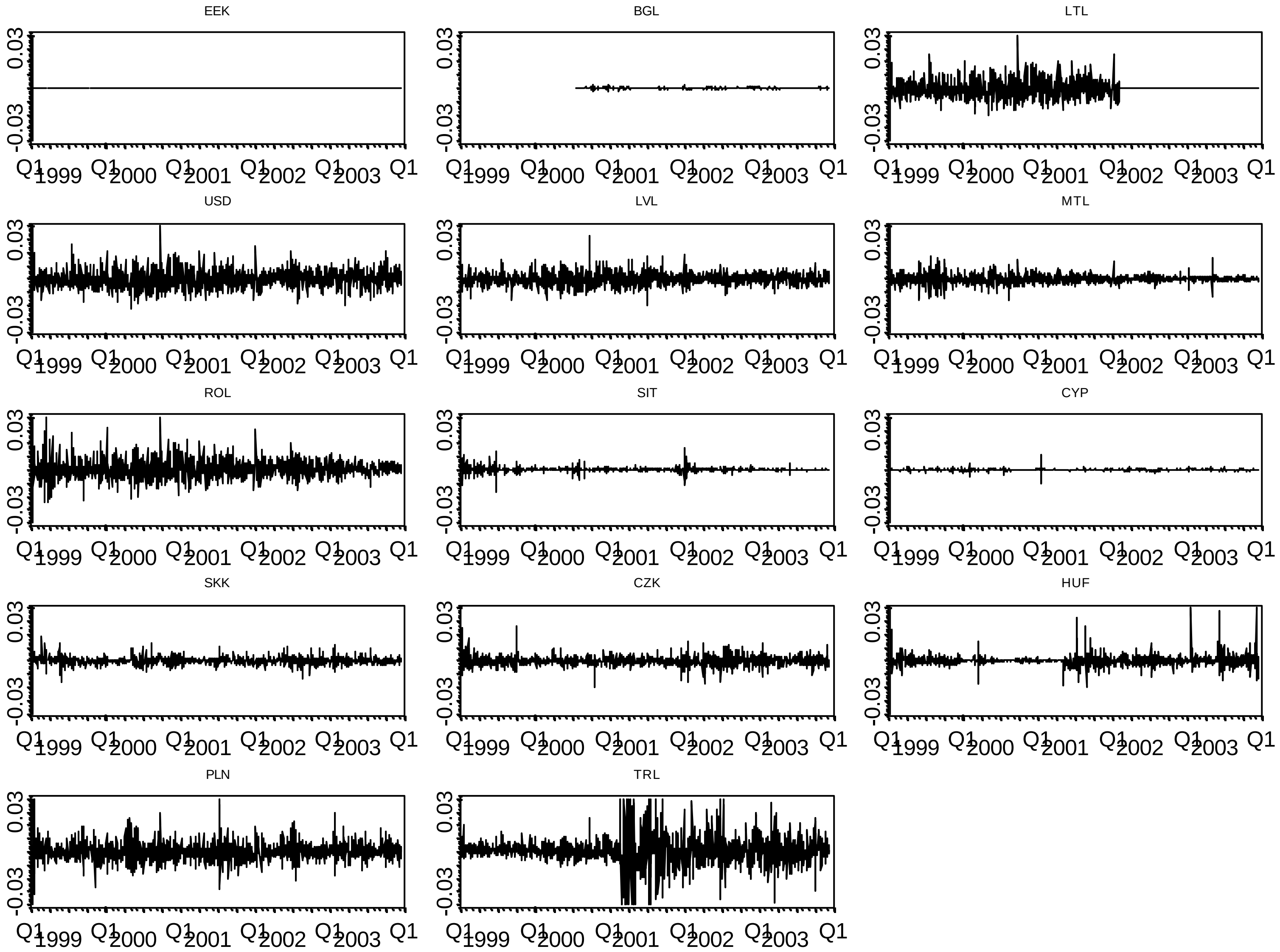

Figure 6: Exchange rate returns of CEEC 1999-2003: source ECB statistical release

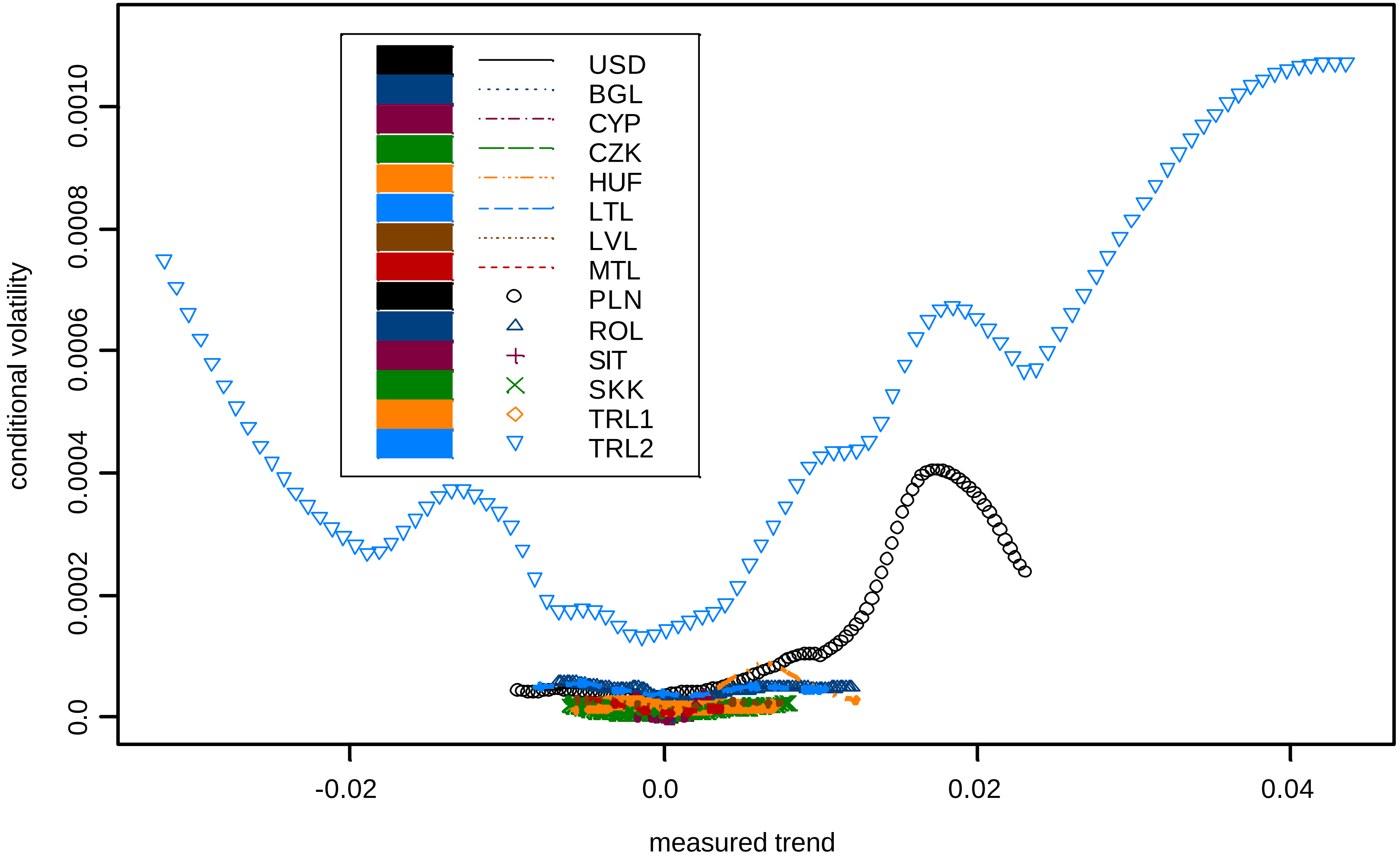

Figure 7: Kernel regression of trend and conditional volatility of EU (potential) accession countries: 1999-2003

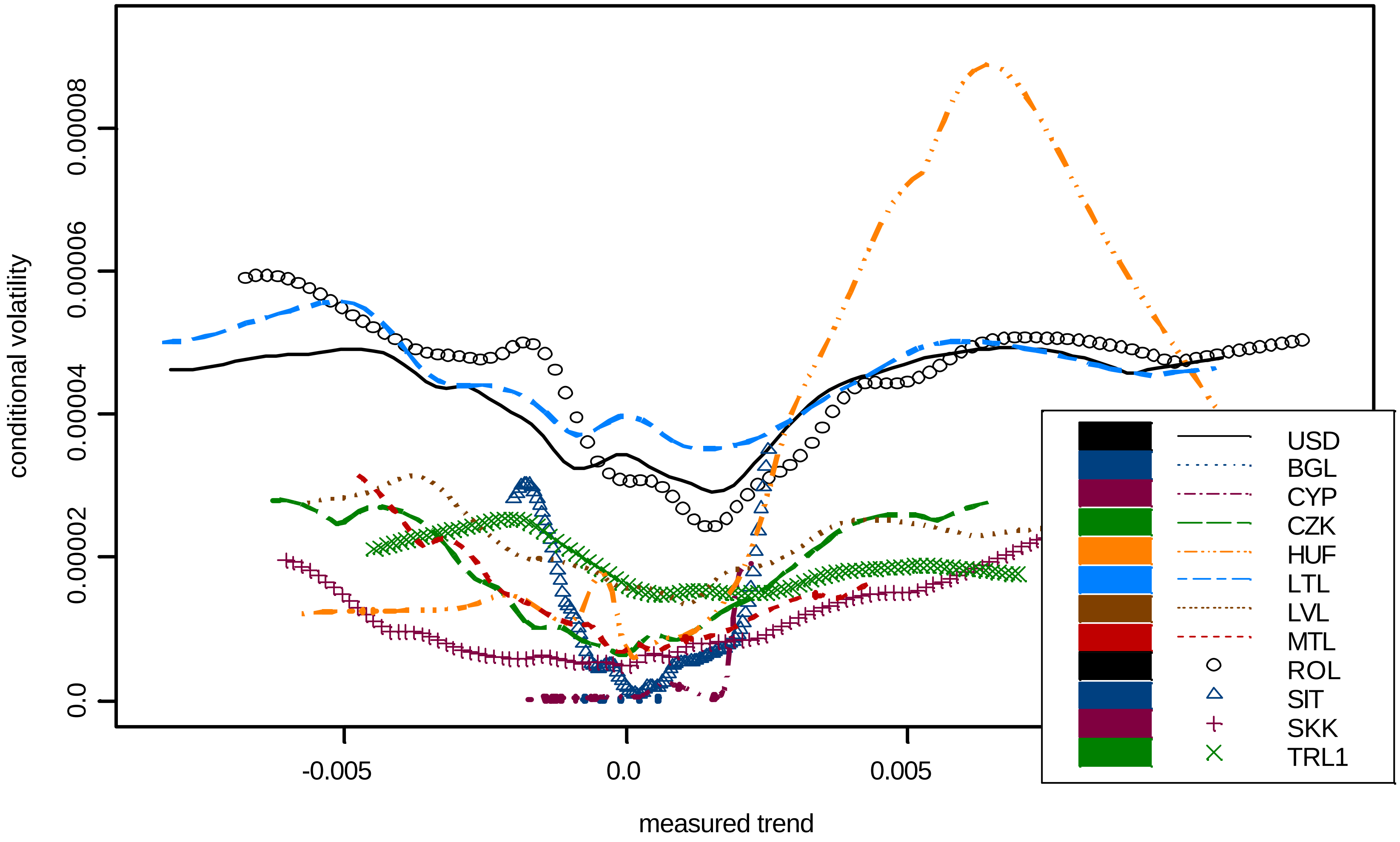

Figure 8: Kernel regression of trend and conditional volatility of EU (potential) accession countries with stable exchange rate regimes: 1999-2003

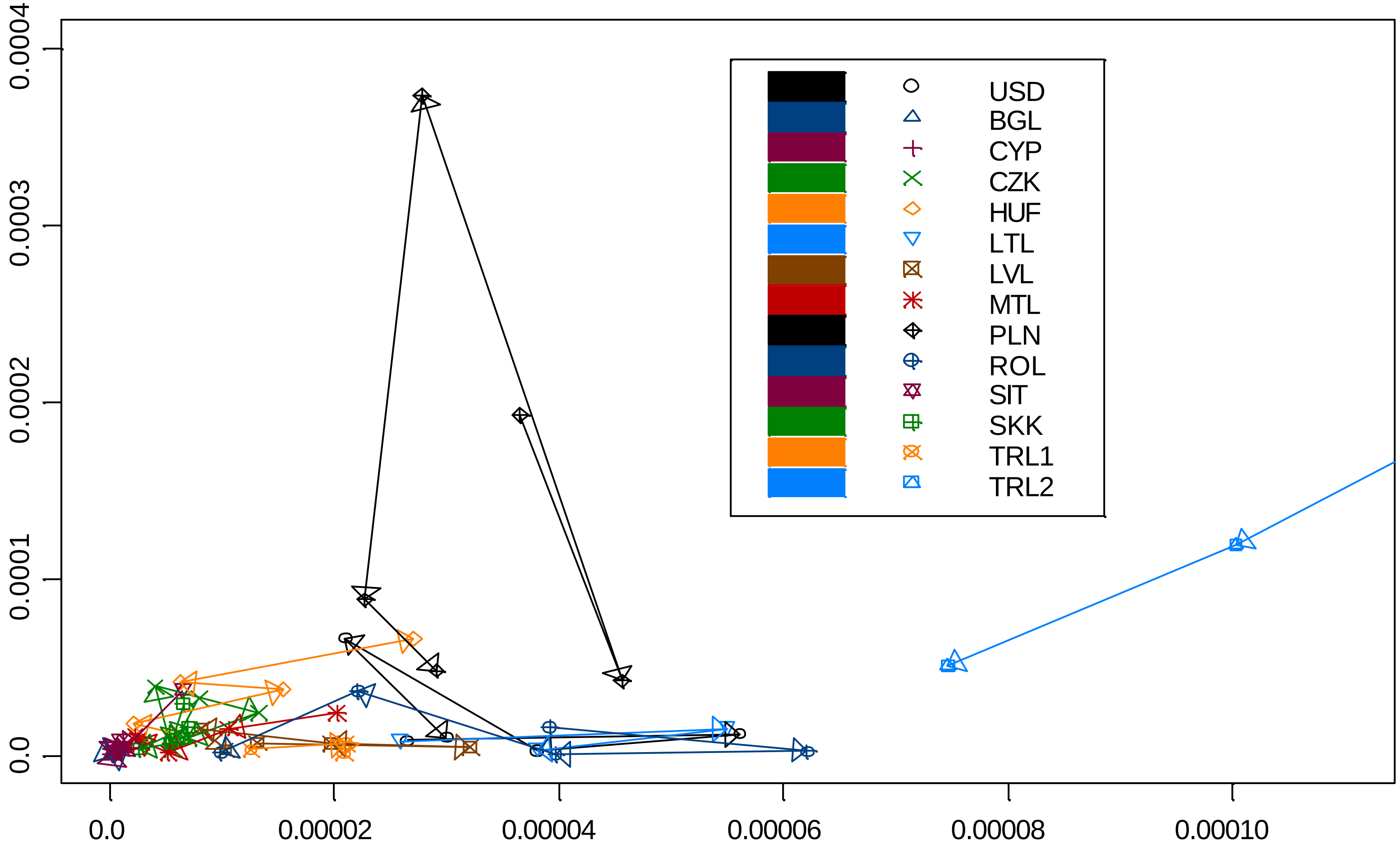

Figure 9: Development of market's assessment of the EU accession countries exchange rate regimes

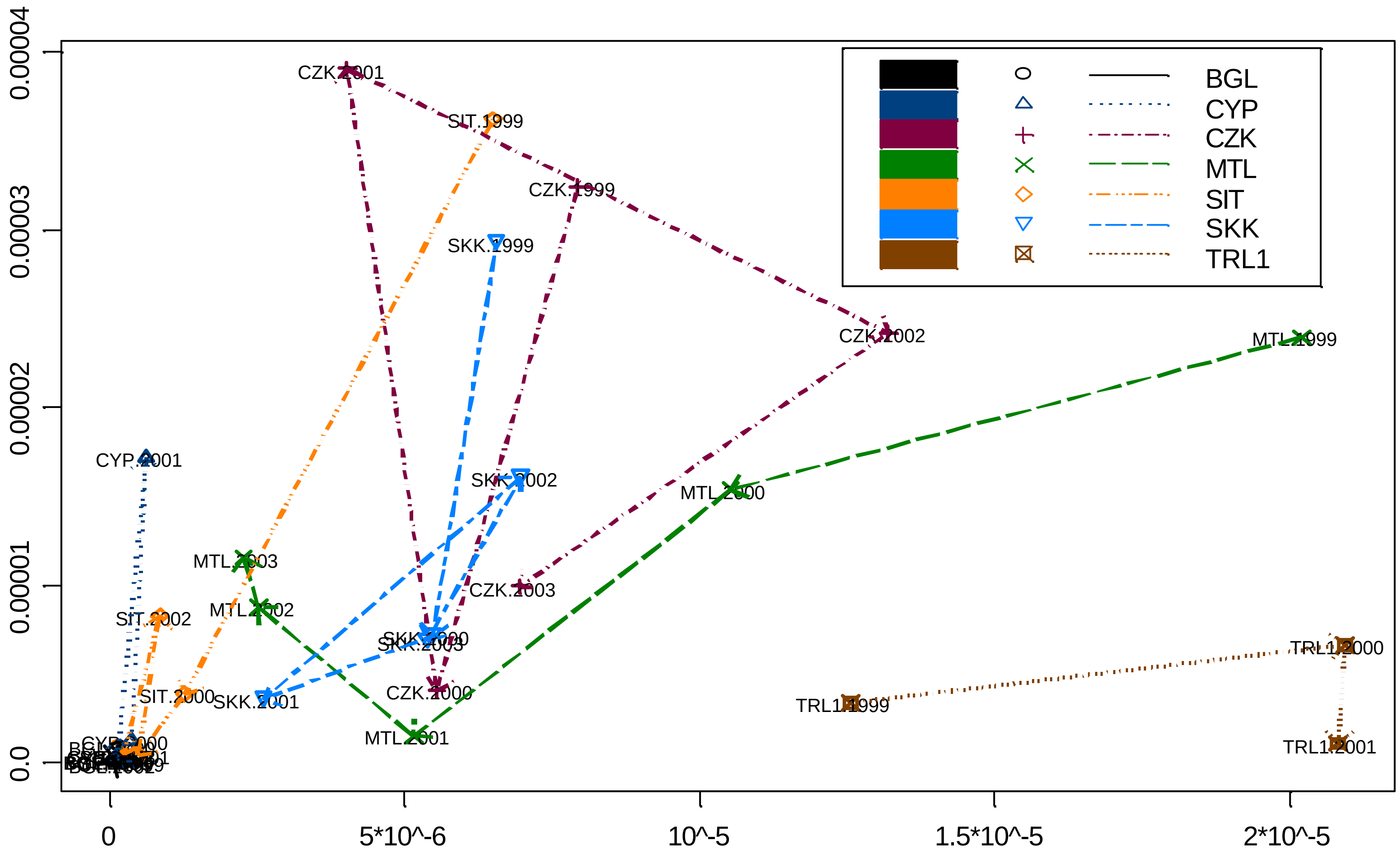

Figure 10: Development of market's assessment of the EU accession countries exchange rate regimes: Euro oriented regimes

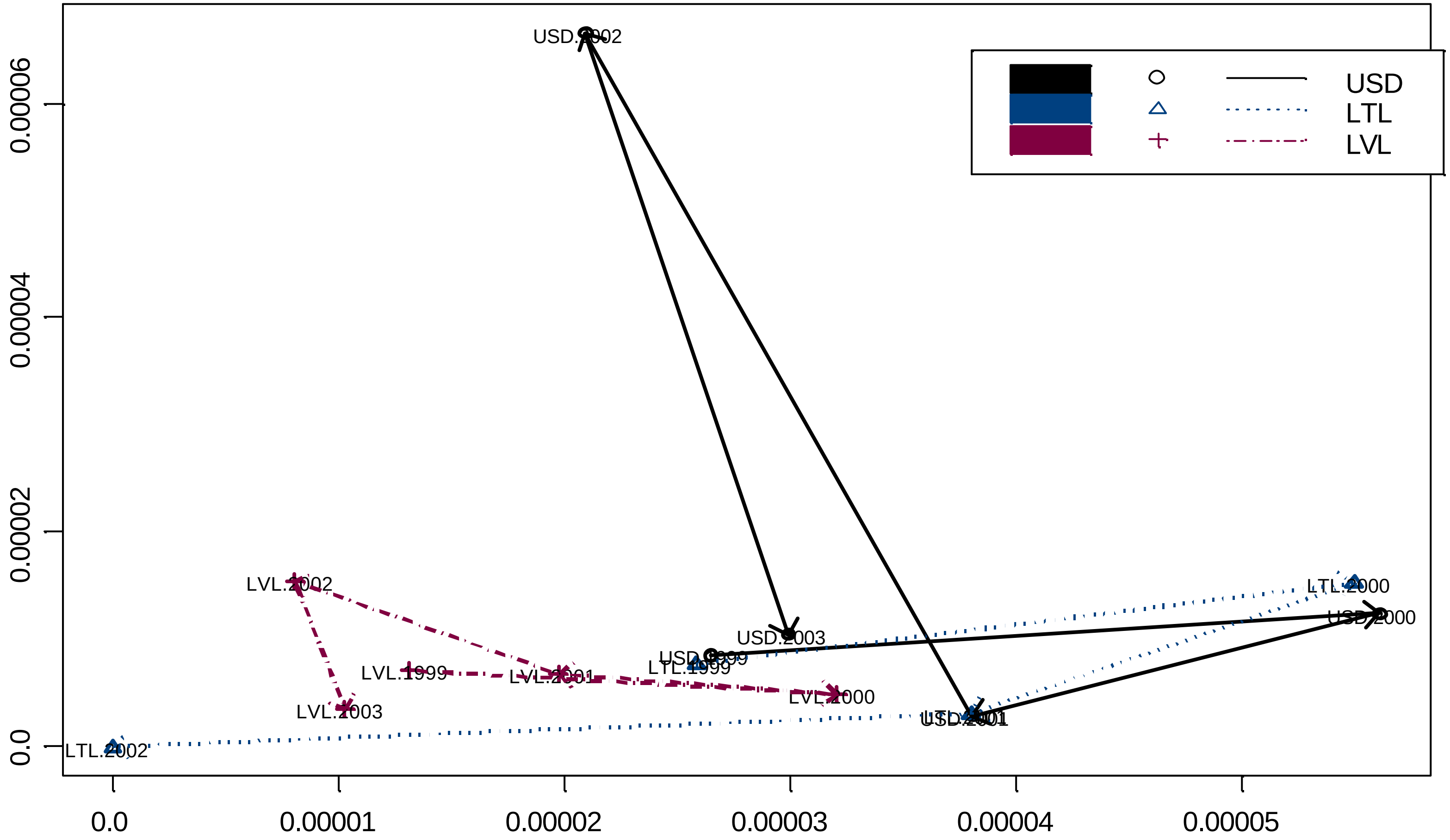

Figure 11: Development of market's assessment of the EU accession countries exchange rate regimes: Dollar oriented regimes

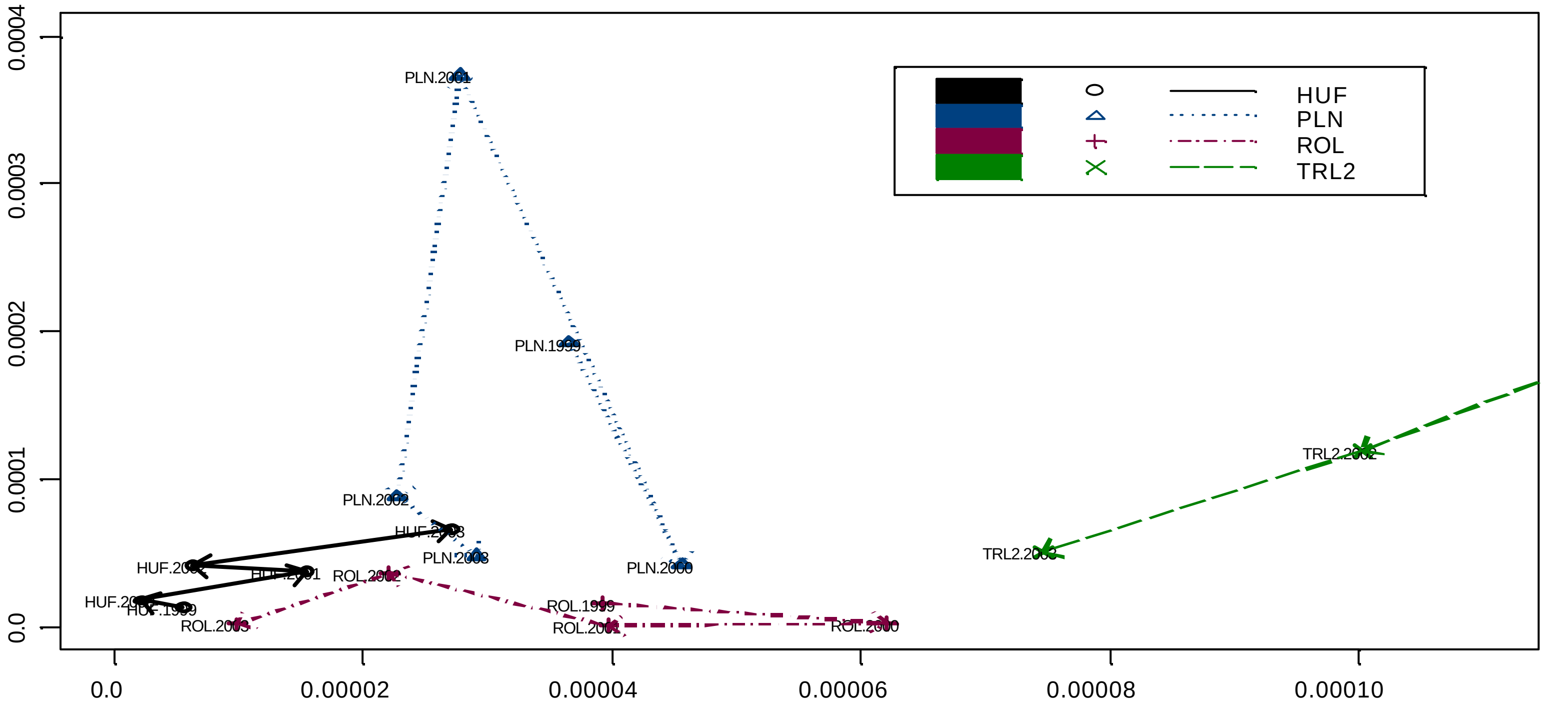

Figure 12: Development of market's assessment of the EU accession countries exchange rate regimes: Remaining group

6.2 Tables

Table 1: Exchange Rate Arrangements in Central and Eastern Europe

	90	91	92	93	94	95	96	97	98	99	00	01	02
Bulgaria	3	8	8	8	8	8	8	2	2	2	2	2	2
Czech Rep	3	3	3	3	3	3	6	7	7	7	7	8	8
Estonia	n.a.	n.a.	2	2	2	2	2	2	2	2	2	2	2
Hungary	3	3	3	3	3	6	6	6	6	6	6	4	4
Latvia	n.a.	n.a.	8	8	3	3	3	3	3	3	3	3	3
Lithuania	n.a.	n.a.	8	8	2	2	2	2	2	2	2	2	2
Poland	3	5	5	5	5	6	6	6	6	6	8	8	8
Romania	3	7	7	7	7	7	7	7	7	7	7	6	6
Slovak Rep.	3	3	3	3	3	3	6	6	7	7	7	7	7
Slovenia	n.a.	n.a.	7	7	7	7	7	7	7	7	7	7	7

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)

Table 2: Estimates of FIGARCH(1,d,1) fraction coe¢cient in model 1 and model 2 and squared trend coe¢cient in model 2 (sd in brackets)

Country	d model 1	sd of d1	d model 2	sd of d2	ξ model 2	sd of ξ	d1-d2	sd of d1-d2
USD	0.27¤¤¤	0.054	0.21¤¤¤	0.051	1.3¤¤¤	0.43	0.059¤¤¤	0.074
BGL	0.57¤¤¤	0.052	0.40¤¤¤	0.067	1.2¤¤¤	0.26	0.17¤¤¤	0.085
CYP	1.00¤¤¤	0.050	0.10¤¤¤	0.038	1.8¤¤¤	0.10	0.90¤¤¤	0.063
CZK	0.03	0.044	0.11¤¤¤	0.024	6.4¤¤¤	0.62	-0.076¤	0.050
HUF	0.25¤¤¤	0.027	0.76¤¤¤	0.030	14¤¤¤	0.48	-0.51¤¤¤	0.040
LTL	0.23¤¤¤	0.052	0.18¤¤¤	0.058	1.1¤¤	0.67	0.048	0.078
LVL	0.36¤¤¤	0.066	0.27¤¤¤	0.047	1.7¤¤¤	0.57	0.10	0.081
MTL	0.31¤¤¤	0.043	0.19¤¤¤	0.024	7.6¤¤¤	0.89	0.11¤¤	0.050
PLN	0.30¤¤¤	0.050	0.15¤¤¤	0.026	5.6¤¤¤	1.0	0.15¤¤¤	0.056
ROL	0.50¤¤¤	0.082	0.45¤¤¤	0.066	0.70¤¤	0.33	0.049	0.106
SIT	0.68¤¤¤	0.022	0.08¤¤¤	0.011	15¤¤¤	1.1	0.60¤¤¤	0.025
SKK	0.33¤¤¤	0.048	0.14¤¤¤	0.020	6.1¤¤¤	0.63	0.19¤¤¤	0.052
TRL	0.86¤¤¤	0.052	0.65¤¤¤	0.026	7.3¤¤¤	0.27	0.21¤¤¤	0.058
TRL1	0.16¤¤¤	0.040	0.01	0.056	0.41¤¤¤	0.10	0.15¤¤	0.069
TRL2	0.45¤¤¤	0.089	0.05¤	0.032	2.3¤¤¤	0.74	0.40¤¤¤	0.094

signi…cance levels: ¤ 10%, ¤¤ 5%, ¤¤¤ 1n%,

Table 3: Market assessment of CEEC exchange rates

Country	1999	2000	2001	2002	2003
USD	3	3	3	3	3
BGL	1	1	1	1	1
CYP	1	1	1	1	1
CZK	2	1	2	1	1
EEK	peg	peg	peg	peg	peg
HUF	1	1	2	4	4
LTL	3	3	3	peg	peg
LVL	3	3	3	1-3	1-3
MTL	1	1	1	1	1
PLN	4	4	crises	4	4
ROL	3	3	3	1	1
SIT	1	1	1	1	1
SKK	1	1	1	1	1
TRL	1	1	1/crises	4	4

1: credible managements with low base and low excess volatility,

2: non-credible managements 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