Ability of the New EU Member States to Fulfill the Exchange Rate Stability Convergence Criterion

Daniel Stavarek

Silesian University - School of Business Administration

May 2006

Ability of the New EU Member States to Fulfill the Exchange Rate Stability Convergence Criterion[1]

Daniel STAVÁREK
Silesian University
School of Business Administration
Department of Finance
Univerzitní nám. 1934/3
733 40 Karviná
Czech Republic
e-mail: stavarek@opf.slu.cz
tel.: +420 596 398 316
fax: +420 596 312 069

Abstract

This paper assesses exchange rate development and volatility in six new EU member states (Cyprus, Czech Republic, Hungary, Poland, Slovakia, and Slovenia) during the period November 1996 - April 2006. The study is motivated by the unavoidable participation of the new member states' currencies in the Exchange Rate Mechanism II and fulfillment of the exchange rate stability convergence criterion. The development of exchange rates is examined by the calculation of various rates of return and the exchange rate volatility is analyzed using moving average standard deviations of the annualized daily returns of the nominal bilateral exchange rates. The results suggest that the dilemma of "participation or non-participation in ERM II" have been solved properly so far by all countries analyzed. The three ERM II participating currencies (SIT, CYP, SKK) entered into the mechanism at the optimal time of stable exchange rate development and low volatility. On the other hand, the admissible fluctuation band ± 2.25 % seems to be still too narrow for the remaining three currencies (CZK, HUF, PLN), thus the currencies should remain out of ERM II for some time.

J.E.L. classification: F31

key words: exchange rates, rate of return, volatility, ERM II, exchange rate stability criterion, new EU members states

This paper was presented at the Pennsylvania Economic Association 2006 Conference in Indiana, PA on June 1 – 3, 2006.

[1] Elaboration of the paper and its presentation at the PEA 2006 Conference in Indiana, PA, USA were supported by the Czech Science Foundation within the project GAČR 402/05/2758 "Integration of the financial sector of the new EU member countries into the EMU".

Introduction

The enlargement of the European Union (EU) in May 2004 established a gradual further spreading of the euro to all new member states (NMS). However, according to the Maastricht Treaty, the euro implementation is conditioned on the fulfillment of several convergent criteria. One of them is focused on exchange rate stability (ERSC) and goes hand in hand with compulsory participation in the European Exchange Rate Mechanism II (ERM II) for at least two years prior to the assessment of the ERSC fulfillment. Moreover, no downward realignment of central parity of the national currency vis-à-vis euro (devaluation) is possible within the two-year evaluation period. Additionally, fulfillment of the ERSC requires the exchange rate to have been maintained within a fluctuation margin around the central parity "without severe tensions". Although the standard fluctuation band of ERM II is ± 15 %, according to the European Central Bank (ECB) and other European authorities, maintaining the exchange rate within the narrow margin of ± 2.25 % (ERSC band) will be demanded for successful fulfillment of the ERSC (CNB, 2003, p. 3). If the exchange rate breaks through the fluctuation limit, a distinction is to be made between a breach of the upper margin and a breach of the lower margin. Therefore, even an excessive appreciation of national currency is implicitly more admissible than depreciation.

The aim of this paper is twofold. First, analyzing the exchange rate development in NMS and calculating various rates of return of the NMS currencies, the paper aims to reveal whether the currencies tend to appreciate or depreciate. Second, the exchange rate volatility is calculated to assess the ability of currencies to fluctuate within the ERSC band. Consequently, using the results obtained, we can determine whether the countries which currently participate in ERM II have chosen the optimal time of entry or not (from an exchange rate volatility and development point of view). The results for the ERM II-non-participating NMS can serve as one of the indicators used for the best timing of ERM II entry.

The paper is structured as follows: Section one provides an overview of the recent exchange rate developments and exchange rate regimes run in the countries analyzed. Section two describes analytical tools and data used and the third section presents empirical results. The paper ends with some conclusions.

1. Exchange Rate Regimes and Development of Exchange Rates

Although all post-communist NMS had to deal with many common economic problems during the transition period and shared a common target of joining the EU and

subsequently the Economic and Monetary Union (EMU), one can recognize a remarkable diversity in their exchange rate arrangements (Table 1). Prior the entry of the first NMS to ERM II, the range of exchange rate arrangements in the NMS ran the full spectrum from currency boards to free float. Such a diversity reflected different approaches chosen by the NMS to manage their transformation and specific economic and social conditions prevailing in each of them.[2]

Table 1
Exchange rate regimes in new EU member states

Country	*Exchange Rate Regime prior ERM II Entry*	*ERM II entry*	*ERM II parity*
Cyprus	Peg to euro with band ± 15 % (± 2.25 % from June 1992 to December 2000).	02/05/2005	0.585274 CYP/EUR
Czech Republic	Managed float to euro	---	---
Estonia	Currency board since 1992 (Estonian kroon initially pegged to German mark, since January 1, 1999 to euro).	28/06/2004	15.6466 EEK/EUR
Hungary	Crawling peg to euro with band ± 15 %	---	---
Latvia	Peg to euro (peg to Special Drawing Rights from 1994 to 2004)	02/05/2005	0.702804 LVL/EUR
Lithuania	Currency board since April 1994 (Lithuanian litas initially pegged to US dollar, since February 2002 to euro)	28/06/2004	3.45280 LTL/EUR
Malta	Currency basket peg since 1971 (last weight of euro in the basket: 70 %)	02/05/2005	0.429300 MTL/EUR
Poland	Free float	---	---
Slovakia	Managed float to euro	28/11/2005	38.4550 SKK/EUR
Slovenia	de jure: managed float, de facto: exchange rates within crawling bands	28/06/2004	239.640 SIT/EUR

Source: Backé and Thimann (2004), European Central Bank, national central banks

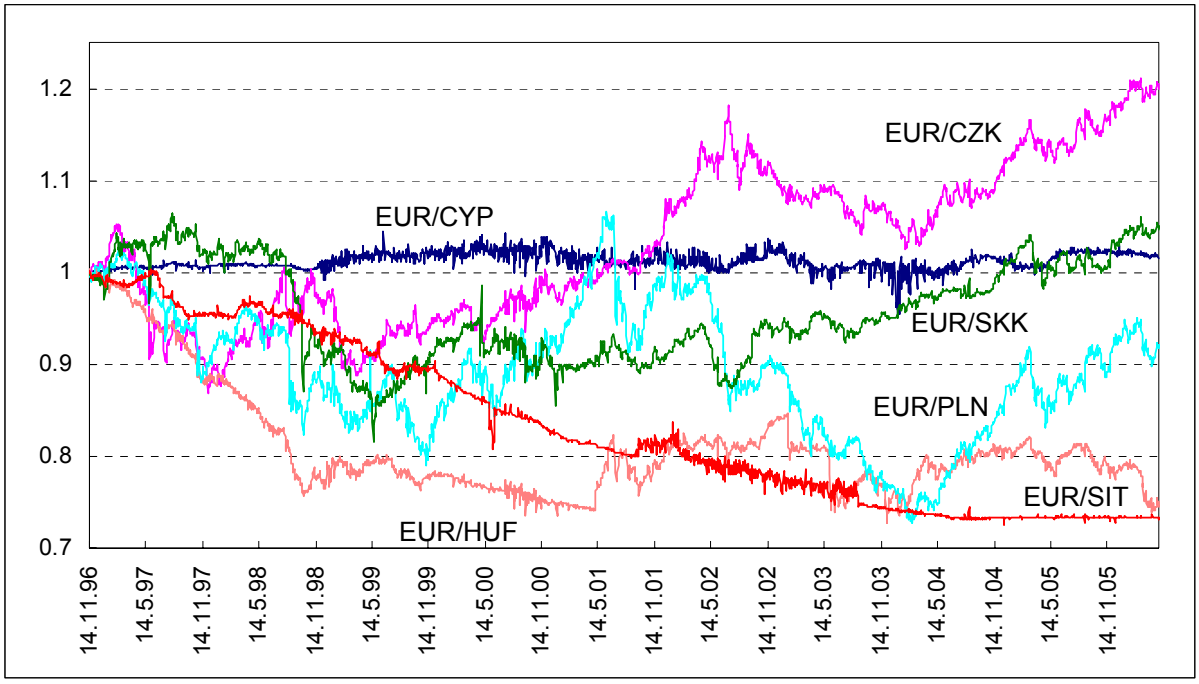
As Table 1 shows, seven of ten NMS had adopted ERM II by the end of 2005. Interestingly enough, all of them (except for Slovakia) are relatively small countries with a fixed exchange rate regime that predates their ERM II entry.[3] This fact confirms the doubts that quasi-fixed ERM II can be a source of instability in NMS which are applying flexible exchange rate arrangements and experiencing huge inflows of foreign investment resulting in appreciation pressures, suffering from unconsolidated public finance and enormous budget deficits, or standing ahead of indispensable reforms of pension, social-care and health-care systems.[4] Because of that, participation of the Slovak koruna in ERM II will serve as an

[2] See Backé and Thimann (2004) or Nerlich (2002) for more about exchange rate arrangements in NMC.
[3] The decision of the Slovak government and central bank to adopt ERM II in November 2005 was considered as surprising because the previous statements of national authorities indicated the entry to ERM II in the middle of 2006. It is hard to assess whether this decision was hasty or not but an upward realignment of the central parity is possible due to the general appreciation of the Slovak koruna in the last years.
[4] See Stavárek (2004) for more about effects of ERM II in NMS.

extremely useful source of information, experience and inspiration for the three remaining NMS (Czech Republic, Hungary, and Poland).

Different attitudes toward exchange rate policy can also be seen in the development of exchange rates. Figure 1 shows the percentage changes of six NMS national currencies vis-à-vis the euro from November 14, 1996 to the April 30, 2006. Development of the remaining four NMS currencies (EEK, LVL, LTL, and MTL) is not shown in the figure since these currencies were linked with very fixed exchange rate arrangements and experienced an extraordinary stable development. Two countries (Cyprus and Slovenia) were carrying out a consistent exchange rate policy during the entire period analyzed (before entry to ERM II). Thus, development of their currencies was very smooth and free of any serious shocks. All Visegrad countries (Czech Republic, Hungary, Poland, and Slovakia) witnessed shifts in the exchange rate policy from more fixed to more flexible regimes. All adjustments became evident in the exchange rate development and particularly in their trend and volatility.[5]

Figure 1
Exchange rates development in new EU member states (14/11/1996–30/04/2006, 14/11/1996 as a base)



Source: author's calculation based on data from Pacific Exchange Rate Service

Considering the percentage change of exchange rates, the Czech koruna was the currency with the highest rate of appreciation (19.97 %); on the other hand, the most

[5] Hungary and Poland were the countries with the most frequent regime adjustments over time. Hungary entered the transition process with a fixed peg and Poland with a crawling peg. In 1995, they moved towards narrow crawling bands and, finally, Poland adopted a free float in April 2000 and Hungary widened the band to ± 15 % in May 2001. Czech Republic and Slovakia abandoned a peg to currency basket (DEM, USD) in favor of managed float in May 1997 and October 1998, respectively.

depreciated currency was the Slovenian tolar (26.69 %). One can find a uniform development trend of CZK and PLN over most of the time period (except of 2002).[6] Moreover, the common appreciation trend of these two currencies which started at the beginning of 2004 was also true of the Slovak koruna.

2. Data and Analytical Tools

The dataset used in the analysis consists of daily nominal bilateral exchange rates of six NMS national currencies (Cypriot pound, Czech koruna, Hungarian forint, Polish zloty, Slovak koruna, and Slovenian tolar) against the euro. The exchange rate series covers the period from November 14, 1996 to April 30, 2006. All data were retrieved from the Pacific Exchange Rate Service.[7] Only data from business days are included in the dataset, and it should be noted that the Canadian civic holiday schedule applies. Exchange rates prior 1999 were calculated using exchange rates of NMS currencies against the German mark and the irrevocable conversion rate of the German mark to the euro.

The first part of the empirical estimation is focused on returns of NMS national currencies. To calculate the rate of return of any currency, the following formula was applied:

$$r_{tj} = \frac{ER_t - ER_{t-j}}{ER_{t-j}} \quad (1),$$

where r is the rate of return, ER is the spot exchange rate and j represents the period of time for which the rate of return is calculated. We selected three time horizons t, namely 30 days, 360 days and 720 days. We consider these time spans as the most representative and informative in the context of participation in ERM II. We used exchange rates in the indirect quotation (number of euro units for one unit of NMS national currency). Thus, the positive rate of return denotes appreciation of the NMS national currency.

The second section of empirical analysis deals with exchange rate volatility. In the literature, different approaches for measuring exchange rate volatility have been applied but there is not consensus on which measure is the most appropriate. Some papers use the standard deviation of the percentage change of the exchange rate or the standard deviation of the first differences of the logarithmic exchange rate. Others consider the average absolute difference between the previous period forward rate and the current spot rate to be the best indicator of the exchange rate volatility. Another possibility is to use the high-low variation

[6] However, the intensity of exchange rate changes was considerably higher in the case of PLN (mainly depreciation in the second half of 2002 and 2003).
[7] This service is provided free of charge for academic purposes by Werner Antweiler (University of British Columbia, Sauder School of Business, Vancouver, Canada) and available online at: http://fx.sauder.ubc.ca/.

defined as the percentage difference between the maximum and minimum spot rate over some certain period preceding the observation or as the difference between the highest and lowest daily return during the period observed. Recently, estimation of the exchange rate volatility seems to be increasingly adopting the use of generalized autoregressive conditional heteroscedasticity (GARCH) models. For more about the methods mentioned**,** including some critical assessment, see Dell Ariccia (1998).

In accordance with the previous discussion and due to lack of conformity on optimal measurement method, we experimented with several measures of exchange rate volatility. First, we applied a set of the moving sample standard deviations of the annualized daily returns of the nominal bilateral exchange rates. For all exchange rates, we estimated volatility calculating standard deviations of samples containing 30, 180, 360, and 720 daily annualized returns. In this case, the exchange rate volatility is defined as follows:

$$r_i = \frac{ER_i - ER_{i-1}}{ER_{i-1}} * 360 \tag{2}$$

$$V_t = \sqrt{\frac{\sum_{i=1}^{m} (r_i - \bar{r})^2}{m}} \tag{3},$$

where r_i is the annualized daily return, $\bar{r}$ represents the average of annualized daily returns, V_t is the standard deviation denoting exchange rate volatility and m is the order of the moving average (number of r_i included in the calculation).

Second, we also used another time-varying measure of volatility constructed by the moving average standard deviation of the changes in the logarithmic exchange rate:

$$V_t = \sqrt{\frac{\sum_{i=1}^{m} (er_{t-i-1} - er_{t-i-2})^2}{m}} \tag{4},$$

where *er* is the log of the exchange rate and other variables are defined as before. As with the previous case, we applied four orders of the moving average (30, 180, 360, and 720 days).

Finally, we applied as a measure of the exchange rate volatility the high-low variation (extreme-value variance) which is defined by the following formula:

$$\sigma_{hl} = max\ (r_i) - min\ (r_i) \tag{5},$$

where σ_{hl} is the high-low variation, $max\ (r_i)$ and $min\ (r_i)$ represent the maximum and minimum daily return in the respective period of time preceding the day of observation. The high-low variation is less sensitive to outliers than the standard variation.

3. Empirical Results

For the first step in the empirical analysis, we used the formula (1) to calculate the rate of return of all six NMS currencies. Three time horizons (1 month, 12 months, and 24 months) were applied. The one-month horizon was chosen to evaluate the short-term behavior of each currency. The two other periods were supposed to test the generally accepted hypothesis that appreciation of new NMS currencies is unavoidable due to inherent and automatic powers of nominal as well as real convergence. The returns calculated are not annualized but they show a percentage change during the particular period of time. All results are presented on the graphs in Figures 2 – 7.

We found the short-term development of currencies as relatively stable. The one-month returns showed much of stability especially during the last years. The proportion of positive and negative returns is quite balanced and the one-month rates of return were developing in regular and periodic cycles. Despite the stable development, in all countries we can discover some episodes of returns exceeding limits on the both sides of the ERSC fluctuation band ± 2.25 % for several days. Stressing the fact that the magnitude of one-month returns did not decrease during the last three years**,** one may see this band as unjustifiably tight for many NMS currencies.

The one-year and two-year rates of return indicate that the value of the majority of NMS currencies were continuously higher in the last one and half years than in the one or two years prior to the observation. On the other hand, from August 2005 to March 2006, the one-year returns decreased substantially in all NMS**,** even dropping to negative values in Hungary. As is evident in Figure 6, due to the specific exchange rate regime in Slovenia before entry to ERM II, the tolar's rate of depreciation was gradually slowing so its value at the end of April 2006 was slightly higher than one year ago (but still lower than two years ago). The second currency with exceptional development is the Slovak koruna. It is the currency with the longest period of appreciation. The rates of its annual and two-year appreciation fluctuated approximately 3-to-6 % and 5-to-9 % respectively in the last three years.

The two-year rate of return is interesting from the ERM II participants' point of view. The figures from the last months suggest that biennial return of many NMS currencies with a floating regime surpassed 4.5 %, which is the width of the ERSC fluctuation band. On the other hand, almost all currencies whose two-year change exceeded the band's width appreciated, which is more acceptable for evaluation of the ERSC fulfillment. The only one exception was Hungarian forint which experienced a dramatic slump in the last two months.

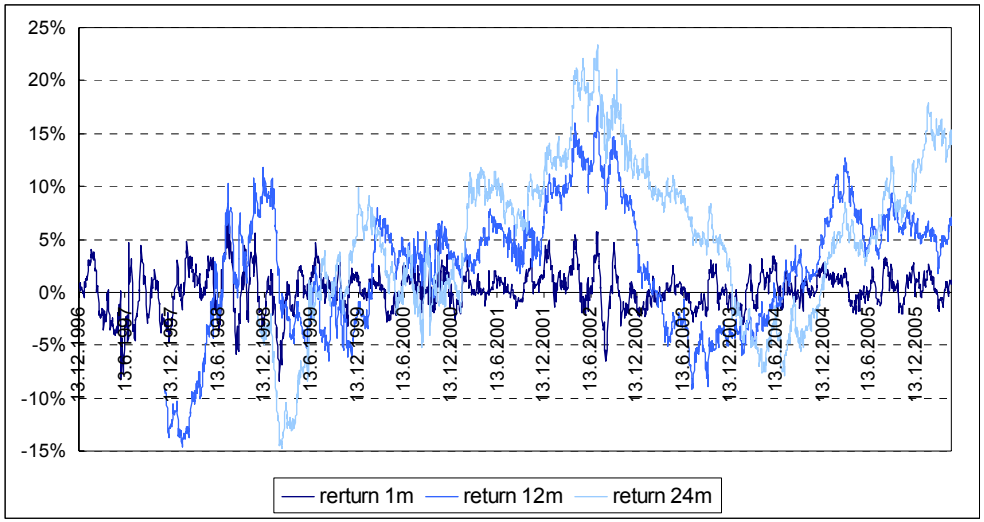
At the end of April 2006, the two-year rates of return of non-ERM II currencies ranged from -5.04 % in Hungary to 24.13 % in Poland. The interval for the EMR II currencies was from -0.60 % to 8.23 % with SIT on the lower margin and SKK on the upper margin. The entry to ERM II is denoted in the figures by the vertical line positioned at the appropriate date.

In the second step of the empirical analysis, we estimated volatility of exchange rates of NMS currencies against the euro. For this, we used exchange rates in direct quotation (number of NMS currency units for one unit of euro) and applied three alternative measures discussed above and defined by formulas (2) – (5). Even though the assumptions of the volatility measures are different from each other, the comparison of the three alternative methods reveals very strong correlations indicating that all versions adequately measure exchange rate volatility. The smallest correlation coefficient obtained (0.869) is between the moving average standard deviation of the changes in the logarithmic exchange rate and the high-low variation in Poland. The coefficients' values indicate almost perfect positive associations for all currencies and methods. Such results allow us to use only moving average standard deviations of the annualized daily returns of the nominal bilateral exchange rates for discussion on exchange rate volatility. See Figures 8 – 13 for graphs of the exchange rate volatility measures.

We calculated four moving average standard deviations covering different time intervals. We used one-month and six-month measures to estimate short-term and mid-term volatility and one-year and two-year indicators to analyze long-term volatility. One can point out that the exchange rate volatility development reflected the exchange rate regime applied in the particular country as well as shifts in the exchange rate policy. It is evident in the comparison of volatility development patterns of currencies with a more flexible regime (CZK, HUF, PLN, and SKK) and with a more fixed arrangement (SIT, CYP). The first group of currencies experienced a gradual decline of all four volatility measures and the differences among them almost disappear in the last three years. On the other hand, changes in exchange rate policy in Slovenia and to a lesser extend in Cyprus caused an explosive increase and subsequent rapid decline of the exchange rate volatility.

Figure 2

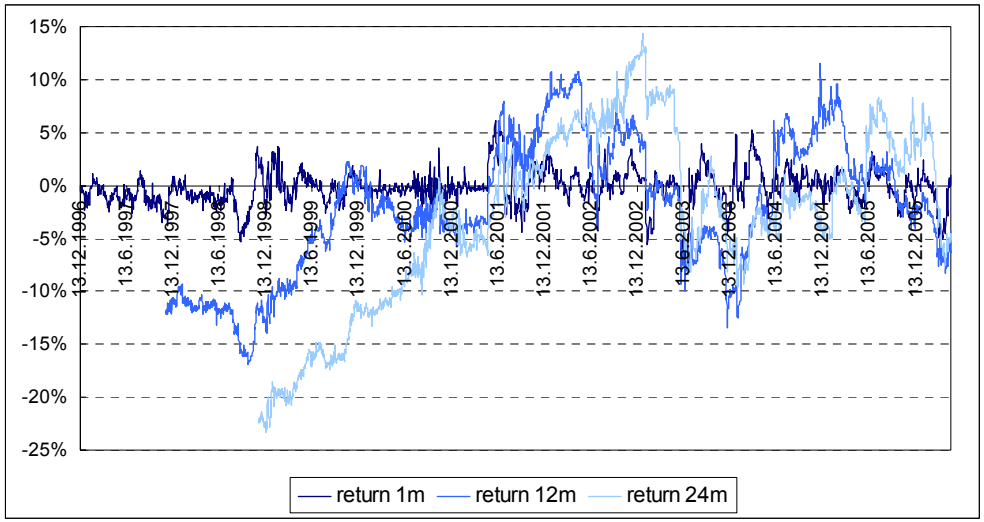
Rates of return of Czech koruna (13/12/1996–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 3

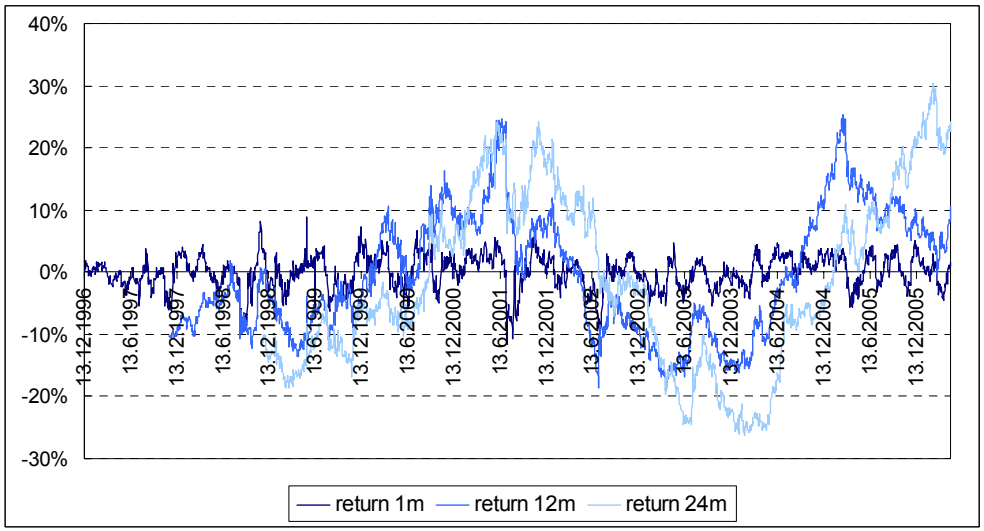
Rates of return of Hungarian forint (13/12/1996–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 4

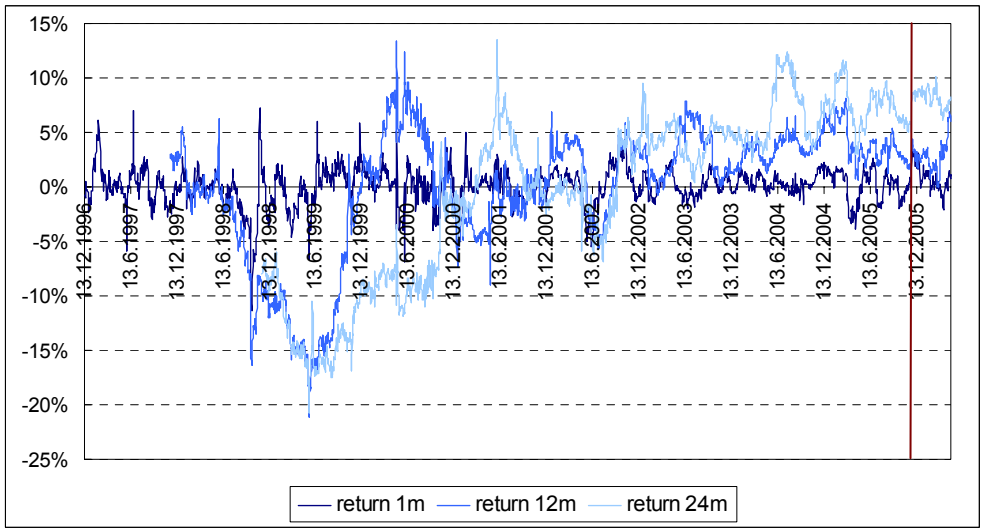
Rates of return of Polish zloty (13/12/1996–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

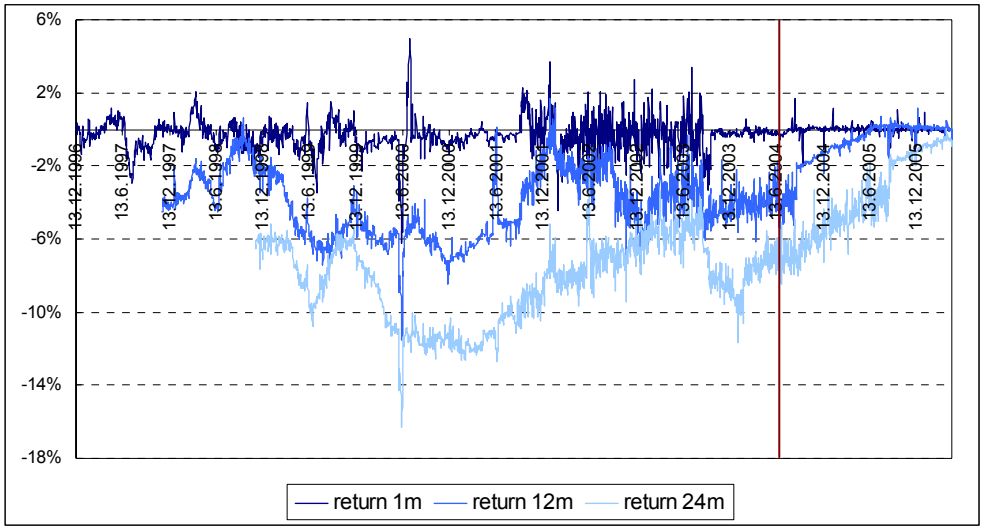
Figure 5

Rates of return of Slovak koruna (13/12/1996–30/04/2006)



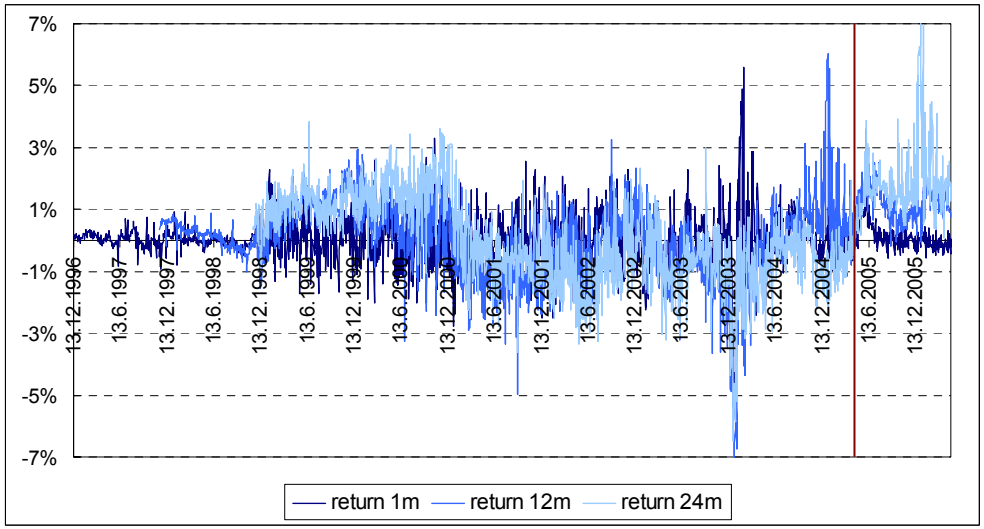
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 6
Rates of return of Slovenian tolar (13/12/1996–30/04/2006)



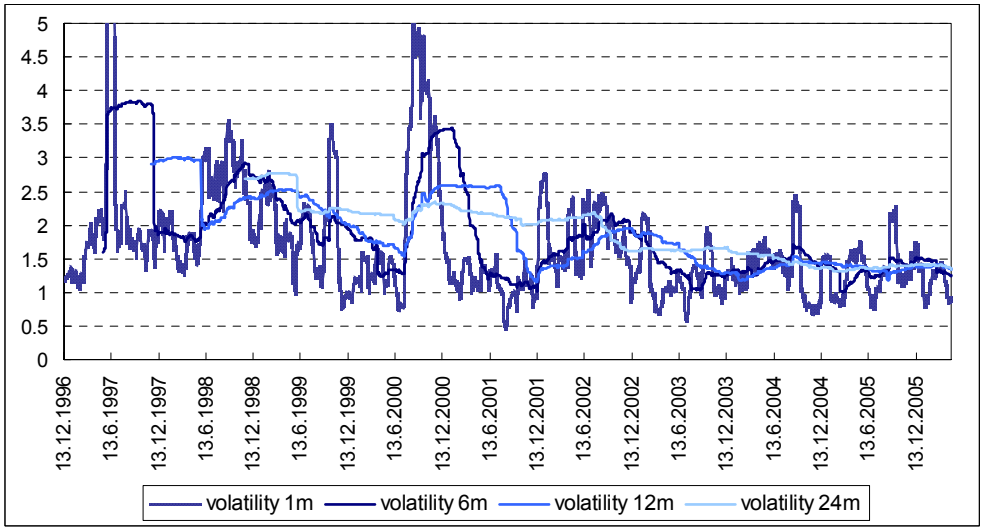
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 7
Rates of return of Cypriot pound (13/12/1996–30/04/2006)



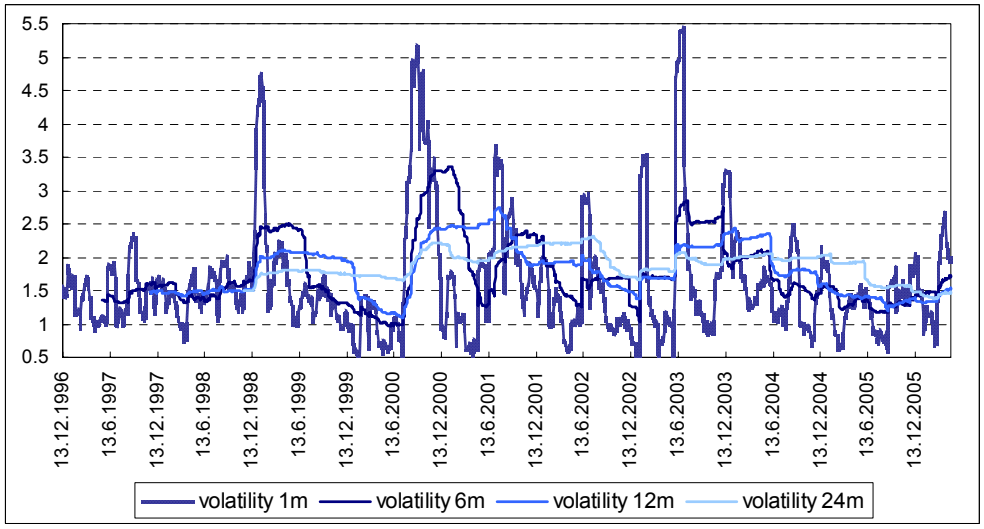
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 8
Volatility of the exchange rate CZK/EUR (13/12/1996–30/04/2006)



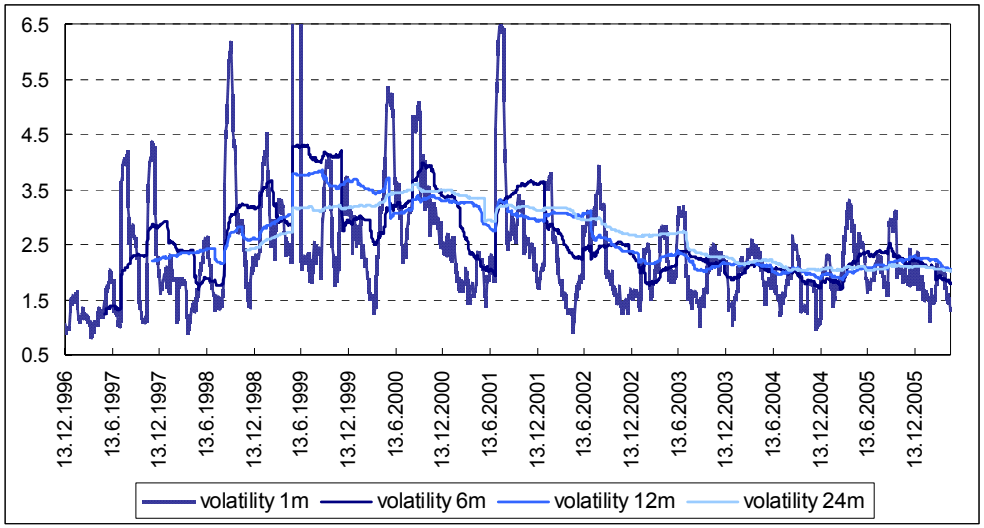
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 9
Volatility of the exchange rate HUF/EUR (13/12/1996–30/04/2006)



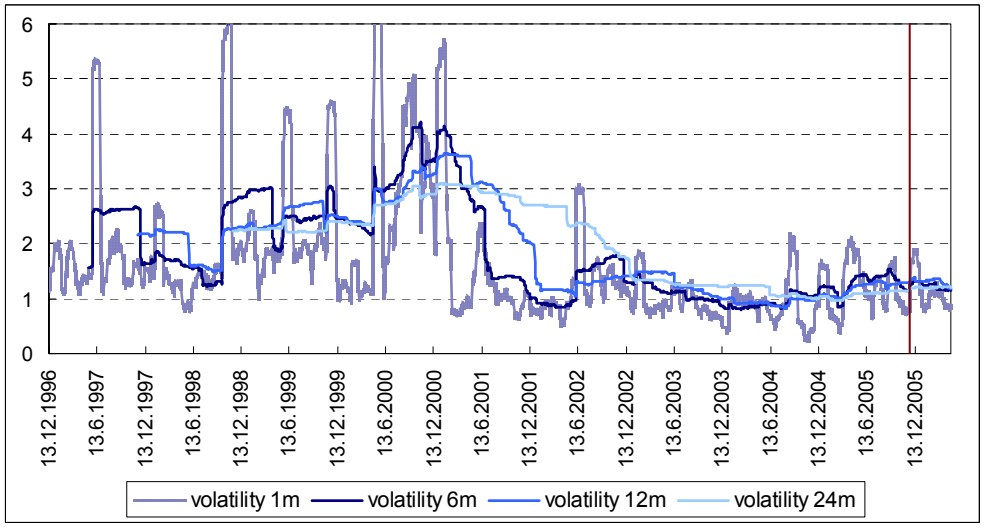
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 10
Volatility of the exchange rate PLN/EUR (13/12/1996–30/04/2006)



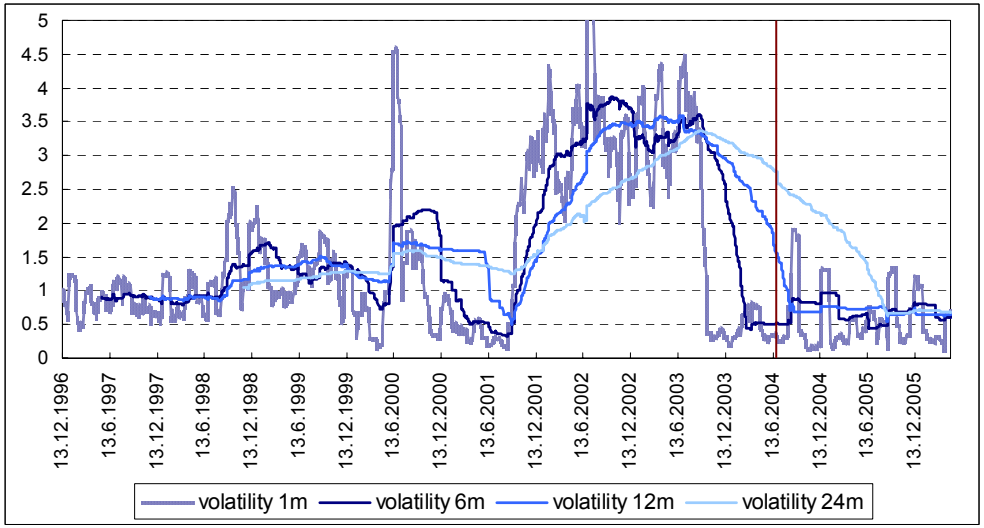
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 11
Volatility of the exchange rate SKK/EUR (13/12/1996–30/04/2006)



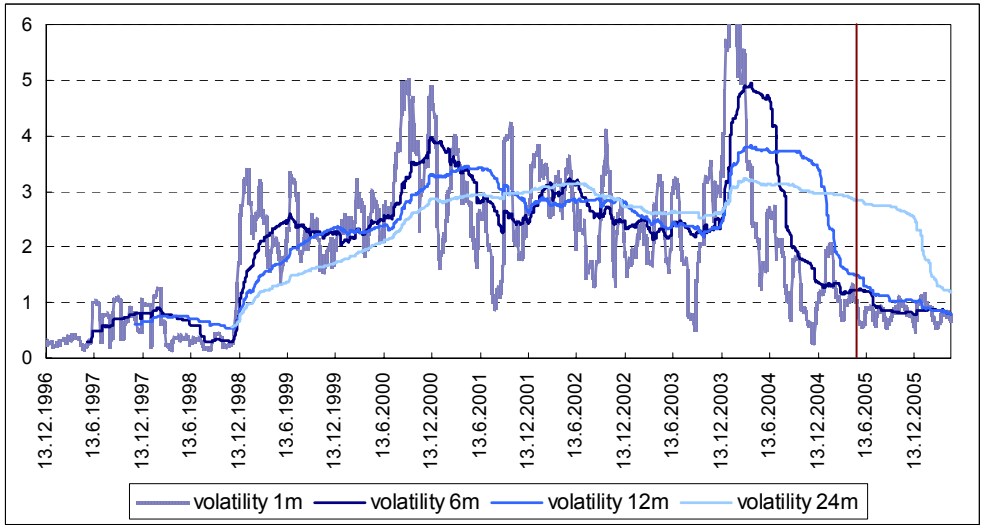
Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 12
Volatility of the exchange rate SIT/EUR (13/12/1996–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

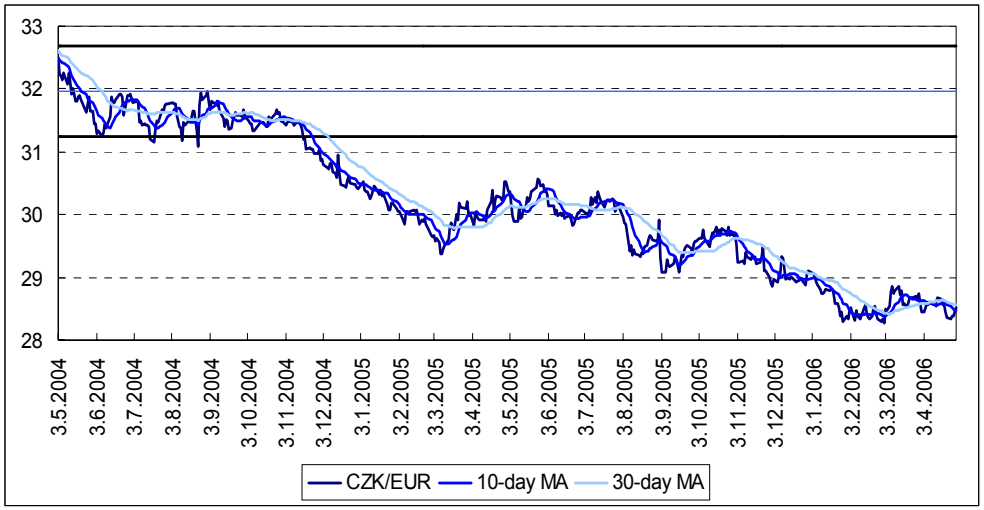
Figure 13
Volatility of the exchange rate CYP/EUR (13/12/1996–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 14

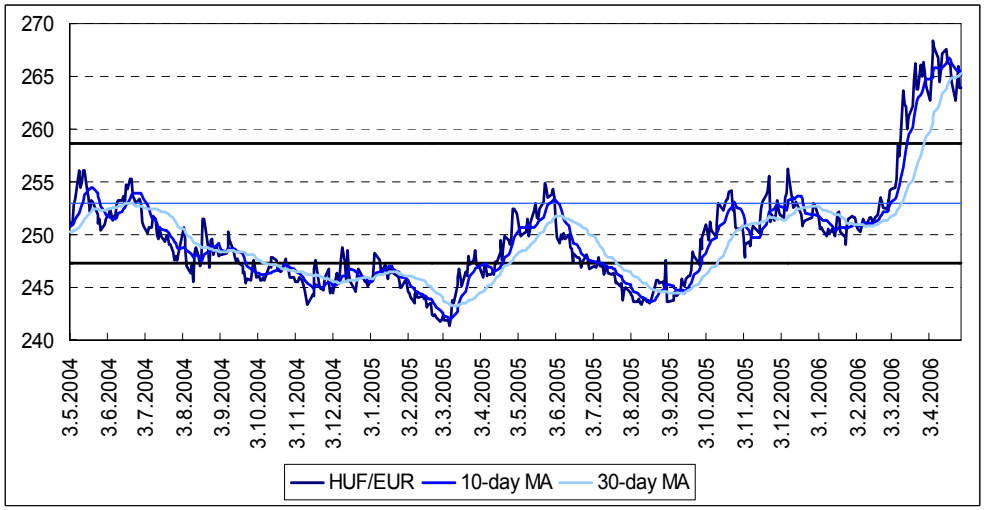
Simulation of ERM II participation – CZK/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 15

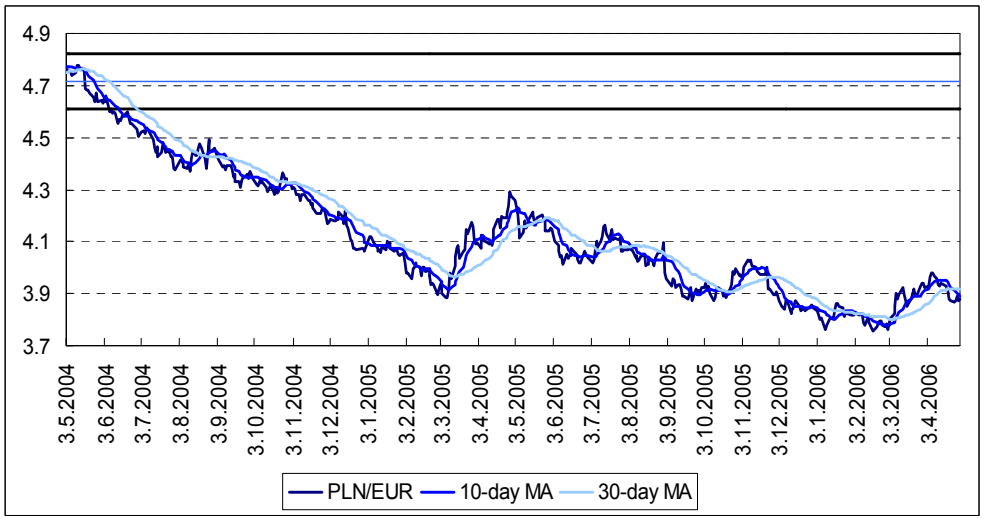
Simulation of ERM II participation – HUF/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 16

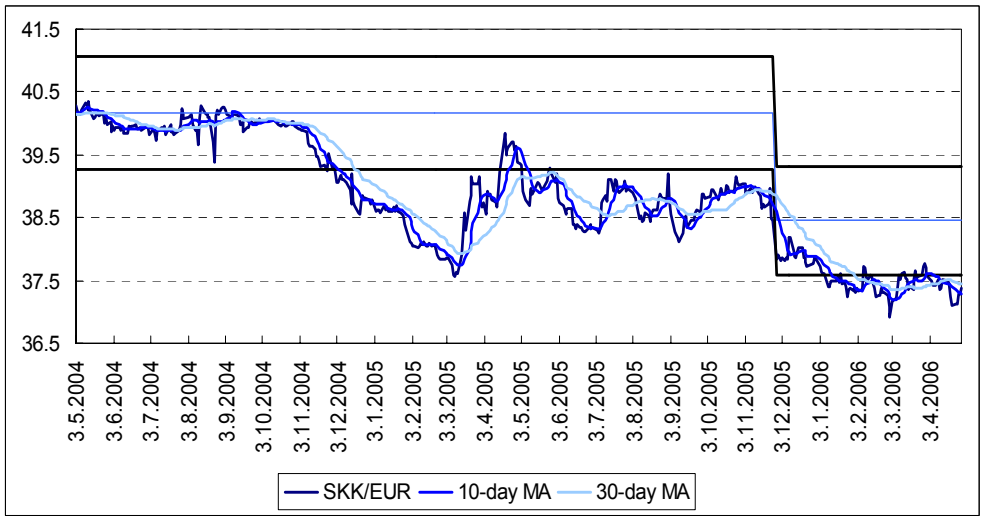
Simulation of ERM II participation – PLN/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 17

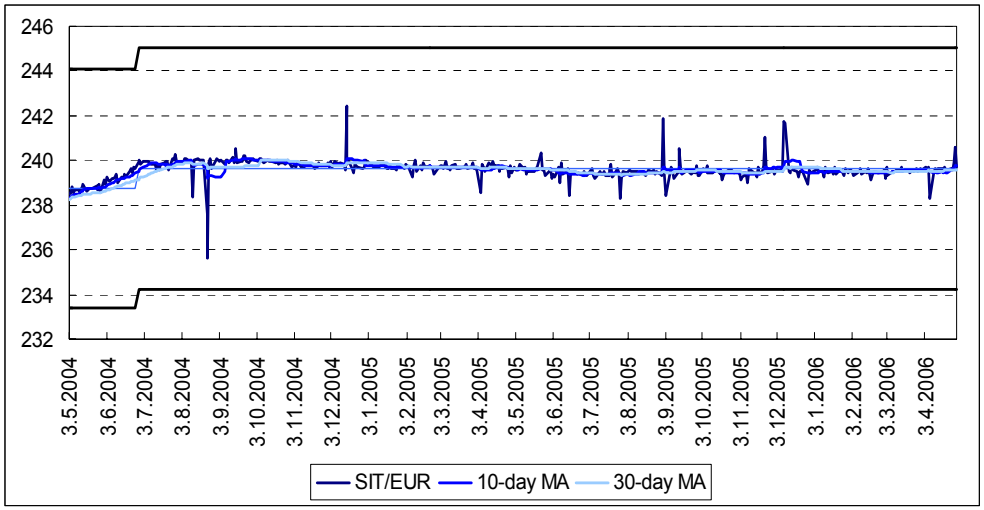
Simulation of ERM II participation – SKK/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 18

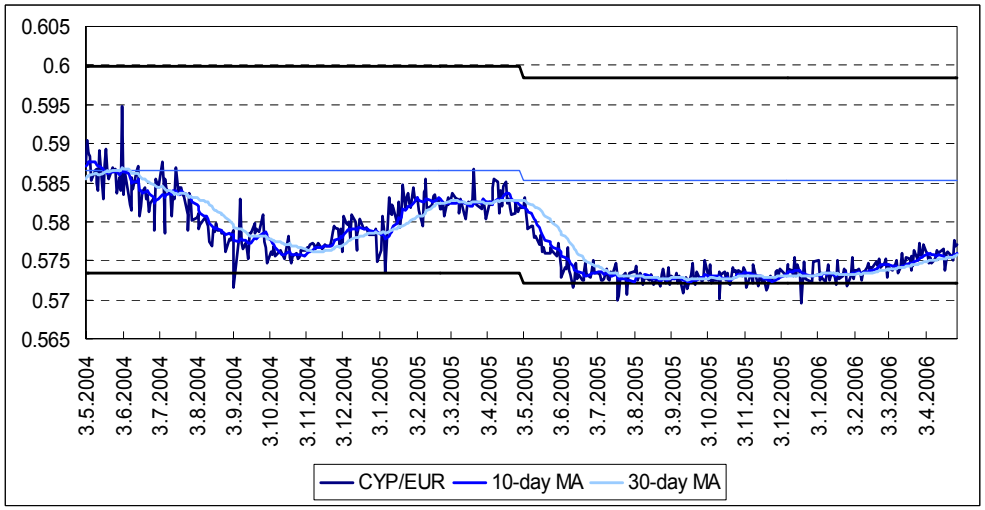
Simulation of ERM II participation – SIT/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

Figure 19

Simulation of ERM II participation – CYP/EUR (01/05/2004–30/04/2006)



Source: author's calculation based on data from Pacific Exchange Rate Service

However, there are some common features. The first one is shared by all currencies. At the end of April 2006, volatility of all exchange rates analyzed reached or was close to the minimum level on record. The second common feature is associated with the currencies already participating in ERM II. Using the volatility figures**,** we can conclude that all countries were successful in their timing of ERM II entry, because all three ERM II currencies entered into the mechanism in a period of very low and stable exchange rate volatility. Moreover, the volatility calculation also supports Slovakia whose decision to enter into ERM II was often referred to as very ambitious and maybe untimely. Slovakia made this monetary integration step in a time when its exchange rate volatility was the lowest among all Visegrad countries.

To put stress on the exchange rate volatility within the ERM II framework, an approach similar to the ECB methodology was applied.[8] This approach is based on the simulation of participation in ERM II with the average exchange rate from the first month observed as a substitute of the central parity. In this paper we used data from the last two years, which indicates that the May 2004 average exchange rate served as a benchmark.[9] Within this framework we identified the minimum and maximum exchange rates for each currency pair, derived upward and downward deviations respectively, and calculated the standard error. The same indicators were also estimated for the 10-day moving average. The 10-day moving average can enervate effects of any sporadic and short-lasting excessive deviation of the exchange rate. Thus, it provides a more polished picture about exchange rate volatility and more serious database for assessment of the ERSC fulfillment. The results are summarized in Table 2. Graphical illustrations of the ERM II participation are presented in Figures 14 – 19. The exchange rate, 10-day moving average, and 30-day moving average are depicted along with the central parity and ± 2.25 % margins.

[8] For practical application of the methodology mentioned see ECB (2004) as an example of a series of regular convergence reports published by ECB. The similar approach was also applied in Čech *et al.* (2005).
[9] This methodology is only illustrative and does not reflect any judgment as to the appropriate level of the central exchange rate.

Table 2
Volatility of exchange rates in new EU member states (01/05/2004–30/04/2006)

Exchange rate	Min	Max	Fluctuation band (%)	Standard error	Min 10-day mov. avrg.	Max 10-day mov. avrg.	Fluctuation band (%)
CZK/EUR	28.273	32.513	(11.57; -1.69)	1.1004	28.380	32.492	(11.23; -1.63)
HUF/EUR	241.41	268.34	(4.57; -6.08)	5.2394	242.02	266.75	(4.32; -5.45)
PLN/EUR	3.7567	4.7778	(20.36; -1.29)	0.2459	3.7778	4.7732	(19.91; -1.19)
SKK/EUR	36.907	40.342	(8.10; -0.46)	0.9212	37.192	40.260	(7.39; -0.25)
SKK/EUR (ERM II)	36.907	38.189	(4.03; 0.69)	0.2478	37.192	38.603	(3.28; 0.39)
SIT/EUR	235.65	242.45	(1.30; -1.55)	0.4386	238.33	240.11	(0.18; -0.57)
SIT/EUR (ERM II)	235.65	242.45	(1.67; -1.17)	0.3566	239.17	240.11	(0.20; -0.19)
CYP/EUR	0.56964	0.59474	(2.90; -1.38)	0.0045	0.57233	0.58769	(2.44; -0.18)
CYP/EUR (ERM II)	0.56964	0.58668	(2.67; 0.24)	0.0039	0.57233	0.58369	(2.21; 0.27)

Source: author's calculation based on data from Pacific Exchange Rate Service

Since three of the NMS currencies entered into ERM II during the period January 2004 – December 2005 we examined two scenarios for these currencies. Besides the two-year simulation with the May 2004 average exchange rate**,** we also calculated descriptive statistics of the authentic participation in ERM II. The results obtained are presented in Table 2. Logically, the time spans covered by the second scenario are shorter than two years (particularly 22 months for SIT, 12 months for CYP, and 5 months for SKK). Comparing the results of both scenarios, there is strong evidence of lower exchange rate volatility in ERM II characterized by a narrower fluctuation band. It must be noted that Slovenia and Cyprus were successful until the end of April 2006 in their effort to maintain an exchange rate of the national currency within the ERSC band ± 2.25 % around the central rate. After the entry into ERM II, the Slovak koruna accelerated its appreciation and reached the appreciation limit of the ERSC band in one month. Since that time, SKK/EUR exchange rate was fluctuating around the margin with a dominant tendency to go out of the band. Regarding SKK and CYP, no exchange rate movement to the depreciation zone occurred from the beginning of ERM II participation, and, thus, their maximum downward deviations from the central rate are positive.

Nevertheless, even the wider bands portraying the two-year simulation are not as wide as those of the three remaining currencies. During the simulation period, the appreciation margin of the ERSC band was exceeded in the case of exchange rates CZK/EUR, HUF/EUR, and PLN/EUR and the depreciation margin in the case of HUF/EUR. The extent of the margin breach were 9.32, 2.32, and 18.11 percentage points respectively above the allowed limit 2.25 % from the central rate and 3.83 percentage points below the allowed limit 2.25 % from the central rate. No matter which exchange rate or scenario considered one can

recognize effect of the 10-day moving average which smoothes fluctuations and contracts the fluctuation band. Despite this smoothing the width of the fluctuation bands remains excessive.

Conclusion

This paper assesses exchange rate development and volatility in six NMS. It applies a set of rates of return and moving average standard deviations of annualized daily returns on data of nominal bilateral exchange rates of national currencies vis-à-vis the euro. This kind of analysis gains importance when participation in ERM II and fulfillment of the ERSC are taken into account.

The currencies analyzed experienced a very different development from November 1996 April 2006**.** This was caused primarily by the exchange rate regime applied and specific economic and monetary conditions. The spread between changes of the most appreciated currency (CZK) and the most depreciated currency (SIT) was 46.66 percentage points at the end of April 2006. Nevertheless, since the beginning of 2004, there was a common appreciation trend of CZK, PLN, and SKK. Though, the intensity of further SKK appreciation should moderate as this currency entered into ERM II and started to fulfill ERSC in November 2005.

The results obtained suggest that the three currencies analyzed which have already started ERM II participation**,** entered the mechanism at the optimal time. It was characterized by stable exchange rate development and low exchange rate volatility. On the other hand, the exchange rate arrangements used in Cyprus and Slovenia prior to ERM II entry were in accordance with the spirit of ERM II and ERSC. Thus, the shift in exchange rate policy was not perceptible and the optimal timing of ERM II entry as well as maintaining the exchange rate fluctuation within a narrow band was not as difficult as it was in Slovakia. Slovakia was the first new EU member state with a floating exchange rate regime that entered into ERM II and started fulfillment of the ERSC. Although the experience with ERM II participation is very limited so far in Slovakia, one can also point out that Slovakia entered into ERM II at a favorable time. The exchange rate volatility of the SKK/EUR exchange rate was the smallest among Visegrad countries and there was no sign of intensive SKK depreciation in the future. Although the volatility measures of the three remaining exchange rates are not substantially higher than in Slovakia, in particular CZK and PLN still seem inclined to further appreciation which may be excessive in ERSC terms. As a consequence, Czech Republic, Poland, and Hungary should not follow Slovakia but stay out of ERM II for some time to come.

References

[1] BACKÉ, P. – THIMANN, C. (2004). *The acceding countries' strategies towards ERM II and the adoption of the euro: An analytical review.* [ECB Occasional paper series No. 10]. Frankfurt am Main: European Central Bank, 2004.

[2] BAUER, C., HERZ, B. (2005). How Credible Are the Exchange Rate Regimes of the New EU Countries? Market Evidence from Market Sentiment. *Eastern European Economics*. 43*,* 2005, no. 3, pp. 55–77.

[3] CNB (2003*). ERM II and the Exchange-rate Convergence Criterion. Information Material for the Czech Government.* Praha: Czech National Bank, 2003. < http://www.cnb.cz/en/monetary_policy/strategic_documents/download/erm_ii_vlada_15_07_03_en.pdf >

[4] ČECH, Z. – HORVÁTH, R. – KOMÁREK, L. (2005). Kurzová konvergence a vstup do eurozóny III: Vybrané problémy nových členských zemí EU. *Finance a úvěr – Czech Journal of Economics and Finance.* 55*,* 2005, no. 9–10, pp. 483–505.

[5] DE VITA, G. – ABBOTT, A. (2004). The impact of exchange rate volatility on UK exports to EU countries*. Scottish Journal of Political Economy*. 51*,* 2004, no. 1, pp. 62–81.

[6] DELL ARICCIA, G. (1998). *Exchange Rate Fluctuations and Trade Flows: Evidence from the European Union.* [IMF Working Paper WP/98/107]. Washington D.C.: International Monetary Fund, 1998. < http://www.imf.org/external/pubs/ft/wp/wp98107.pdf >

[7] ECB (2004). *Convergence report 2004*. Frankfurt am Main: European Central Bank, 2004.

[8] NERLICH, C. (2002). *Exchange rate strategies of EU accession countries: Does exchange rate policy matter?* [Paper presented at the KOBE Research Seminar on "Regional, economic, financial and monetary cooperation: the European and Asian experience", Frankfurt, 15–16 April 2002] Frankfurt am Main 2002. < www.mof.go.jp/jouhou/kokkin/tyousa/tyou046.pdf>

[9] STAVÁREK, D. (2004). *ERM II: Potential Source of Instability in the New EU-member Countries.* In Economic Policy Perspectives of Estonia in the European Union. Berlin: Berliner Wisseneschafts-Verlag, 2004, pp. 167–175.

[10] VERGIL, H. (2002). Exchange Rate Volatility in Turkey and Its Effects on Trade Flows. *Journal of Economic and Social Research*. 4*,* 2002, no. 1, pp. 83–99.