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Exchange rate regimes and exchange market pressure in the new EU member countries*

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1. Introduction

Starting from central planning eight CEECs – the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia – changed to a market economy and joined the European Union in the spring of 2004. It is to be expected that they will also join the Economic and Monetary Union (EMU) in the near future.

One of the selection criteria to judge whether a country is allowed to join EMU is related to the stability of its exchange rate in the preceding period. According to the Maastricht criteria in order to be eligible the currency of the candidate country has to participate fully in the EMS. In the present context this means that the country has to join ERM II. Moreover the currency should not be subject to serious pressures within that system in the two years that precede entry into EMU.

In this respect the European Commission has already made it clear that some of the current exchange rate regimes in the CEECs are not acceptable (see European Commission, 2001). As a matter of fact the following regimes are not compatible with ERM II: crawling pegs, independent floats or managed floats without a mutually agreed central rate and pegs to anchors other than the euro. This means that all CEECs except Estonia and Lithuania (who have currency boards) will have to modify their exchange rate arrangements when joining ERM II. Slovenia has already abandoned its managed float.

The Czech Republic, Hungary, Poland and the Slovak Republic currently use exchange rate regimes that can be classified as floating. In our opinion, the change towards ERM II constitutes a potential danger for these countries of increased

susceptibility to currency crises. In the terminology of this paper they have to change their exchange rate regime from one classified as "extreme" (floating exchange rate) to one classified as "intermediate" (fixed but adjustable exchange rate).

Economic theory has recently stressed the vulnerability to currency crises of intermediate exchange rate arrangements (see Fischer (2001)). Intermediate exchange rate arrangements, such as conventional fixed pegs, fall between the two extreme exchange rate systems, viz. monetary union or currency board which can be classified as credible hard pegs (irrevocably fixed exchange rate systems) on the one hand and floating exchange rates on the other. The reason for the high vulnerability of intermediate exchange rate systems is that they can never be made fully credible (as long as the central bank cares about domestic objectives) and that the central bank has an incentive to devalue once economic agents expect it to happen (see De Grauwe & Grimaldi, (2002)).

Increased capital mobility and capital import dependency further increase this vulnerability. In a world of high capital mobility the required increase in the domestic interest rate to counter a currency crisis becomes prohibitively high. In this respect it should be noted the CEECs have removed all impediments to capital mobility and have increasingly benefited from capital inflows. Following the transition to a free market, capital inflows increased from $3.2 billion to $22.3 billion in 1990-1995. During the second half of the 1990s they averaged $23.2 billion per year, equivalent to 6.3 % of the CEECs' gross domestic product. These capital inflows make the candidate countries more vulnerable to sudden capital withdrawals. This concern has been voiced by a number of economists (see e.g. Buiter and Grafe, (2002)). Several countries, such the Czech Republic in 1997, have already experienced rapid capital

outflows on a smaller or bigger scale in the past (see Vanneste, Van Poeck & Veiner, (2003)).

An important research question therefore is to what extent does ERM II membership for the CEECs, which constitutes a compulsory transition to an intermediate exchange rate regime for a number of them, increase their vulnerability to currency crises and reduce their chances to fulfil the Maastricht exchange rate criterion? If ERM II does increase their vulnerability to currency crises then ERM II membership could be counterproductive.

In this paper we test the bipolar view of currency crises with data for the CEECs and investigate whether in the past currency crises have been more frequent in CEECs with intermediate systems, as compared to those with credible fixed and flexible systems. Although there already exists an extensive empirical literature on explaining or predicting the occurrence of foreign exchange crises (see e.g. Flood and Marion (1998)) few studies have tested the bipolar view. Notable exceptions are Bubula and Otker-Robe (2003), using data for developed and emerging market countries, and Effenberger (2004) based on data for the CEECs. These studies provide some support for the proponents of the bipolar hypothesis. Darvas and Szapary (2000), however, found no empirical evidence that the spillover effects of the global financial crises of 1997-99 on five small open economies (including three CEECs) was primarily influenced by the exchange rate regime in place.

To answer the research question we focus on exchange market pressure (emp) as a general measure of tensions on the foreign exchange market and countries susceptibility to crisis. We compute a quarterly measure of emp for the various CEECs over the period 1990-2002 and relate it to the exchange rate system under

which they operated. The advantage of this measure is that it enables a comparison of exchange market pressure in the different exchange rate regimes applied by these countries or over time within the same country. We also compute the proportion of currency crises to which the CEECs have been subjected. In a subsequent regression analysis exchange market pressure is explained by a number of fundamental economic variables and the exchange rate regime.

The rest of the paper is organised as follows. In section 1 we give an overview of the current exchange rate regimes in the CEECs and consider the compatibility of the current choice with ERM II. We also stress the difference between being member of ERM II and compliance with the Maastricht exchange rate criterion. In section 2 we present a brief overview of currency crises models and explain the bipolar view. Next (section 3) we compute a measure of exchange market pressure (emp) for the countries under investigation on the basis of which crises quarters are subsequently defined. We compare the average value of emp and the occurrence of crises quarters for different exchange rate regimes. In section 5 we show the results of a regression analysis explaining exchange market pressure by a set of fundamental economic variable. We test whether the exchange rate regime offers an additional explanation. In section 6 we make some concluding remarks giving more perspective to our findings.

2. ERM II membership and the Maastricht exchange rate criterion

The current exchange rate regimes of the eight new EU-members are shown in table 1, together with their ERM II-status. On 27th June 2004 the currencies of Estonia and Lithuania, who keep their currency boards, joined ERM II. This transition is not biting since the characteristics of a currency board are more stringent than ERM II. Slovenia on the other hand had to abandon its managed floating regime and shift towards a less flexible regime, viz. a horizontal band.

Of the five remaining countries four currently operate under an exchange rate arrangement that is not compatible with ERM II and therefore has to be adjusted in the future.

Table 1. Exchange rate regimes in the new EU members and ERM II-status

Country	Exchange rate regime	ERM II-status
Czech Republic	° managed float ° inflation target	° not compatible
Estonia	° pegged to euro ° currency board	° member since June 2004 with 15% fluctuation band
Hungary	° crawling peg	° not compatible
Latvia	° fixed exchange rate	° compatible ° no member
Lithuania	° pegged to euro ° currency board	° member since June 2004 with 15% fluctuation band
Poland	° managed float	° not compatible
Slovak Republic	° managed float	° not compatible
Slovenia	° horizontal band	° member since June 2004 with 15% fluctuation band

It should be clarified that ERM II membership and the fulfilment of the Maastricht exchange rate stability criterion are not the same.[*] In ERM II the central rates and fluctuation bands of participating countries' currencies against the euro are set by common procedure. The standard fluctuation band is ± 15%, while not excluding the possibility of setting a narrower band (Estonia, Lithuania and Slovenia have a 15% fluctuation band, while Denmark – the only other member – has 2.25% fluctuation margin). Intervention support of the ECB to the national central banks (NCB) is automatic at the margins of the band (marginal interventions); any intervention within the band (intra-marginal interventions) need not to be – but may be – supported by the ECB. Further, the ECB and the NCBs have a formal right to suspend intervention should the price stability objective be jeopardized. In ERM II realignments of central parity are made by common procedure, which both the ECB and the member states have the right to initiate.

The Maastricht exchange rate criterion states that a member state has to respect the normal fluctuation margins provided for the exchange rate mechanism of the European Monetary System without severe tensions for at least the last two years before the examination. In particular, the member state shall not have devalued its currency on its own initiative in the same period. Participation in ERM II for at least two years at the time of the assessment is therefore compulsory. But more is required: there should be no downward realignment of the central parity within the two-year examination period (upward realignment of the central parity is implicitly possible). Moreover, the exchange rate has to been maintained within a fluctuation margin of 2.25% (i. e. narrower than the standard band of 15%) around the central parity in

[*] See Czech National Bank (2003). The other Maastricht convergence criteria with respect to the inflation rate, the interest rate and the government deficit and debt position are not considered in this paper.

ERM II "without severe tensions". In other words, maintaining the exchange rate within the narrow margin of 2.25% "at any cost" by means of excessive interventions or non-market measures will not necessarily be assessed as successful fulfilment of the exchange-rate stability criterion. If the exchange rate moves outside this band, a distinction is to be made between a breach of the upper margin and breach of the lower margin (a breach of the upper margin being implicitly more admissible). In such a case it is necessary to examine the duration of the deviation, the reasons for it, and interest rates and intervention policy at the time of the deviation.

3. Currency crises and the bipolar view

Since the collapse of the Bretton Woods system in the 1970s and especially since the major currency crises of the last decade, currency crises have been a widely studied subject. The theories of currency crises can be broadly divided into three generations of models.

Weak macroeconomic fundamentals are the main cause of currency crises according to the first generation models pioneered by Krugman (1979). Krugman's model considers the situation where the government pursues an overly expansionary monetary policy in a fixed exchange rate system. The excessive expansion of domestic credit results from monetization of fiscal deficits or from supporting a weak banking system. It leads to a fall in the domestic interest rate, capital outflow and a loss of international reserves. Rational speculators regard this situation as unsustainable and find the maintenance of a fixed peg impossible in the long run. They anticipate the devaluation and launch an attack long before the international

reserves are completely exhausted. In conclusion the crisis stems from monetary or fiscal policies that are inconsistent with the fixed exchange rate regime. Since such crises result from macroeconomic imbalances they are in principle predictable.

However, the crisis of the EMS at the beginning of the 1990s has demonstrated that countries with relatively sound macroeconomic fundamentals can be victim of speculative attacks too. According to Eichengreen, Rose and Wyplosz (1994) there was no considerable difference between the behaviour of macroeconomic variables during the EMS pre-crisis and the crisis periods and the crisis could not be explained by overly expansionary monetary policies in the countries concerned. So the EMS crisis gave support to the second generation models which incorporate the phenomenon of self-fulfilling expectations and multiple equilibria. In this model the central bank has an incentive to devalue when speculators expect devaluation. For example, in Obstfeld (1994) a loss in confidence sharply increases the interest rate and raises government's cost of debt servicing. Finally the central bank abandons the peg as the cost of maintaining it exceeds the cost of abandoning it.

The core of the previous models is combined in the so-called third generation models. Third generation models were developed after the outburst of the South-East Asian crisis of 1997. Besides macroeconomic fundamentals (the inconsistency of economic policy with the fixed exchange rate regime) and the role of expectations, these models stress problems in the banking sector and weak institutions in general as the main driving forces behind banking crisis which spill over into currency crisis. Weak supervision of the banking sector and implicit government guarantees, leading to moral hazard problems and over-indebtedness abroad are crucial elements in these models.

Although different in structure the three generation of models suggest that pegged exchange rate systems are intrinsically vulnerable to currency crisis. In an adjustable pegged exchange rate regime, a central bank always has a temptation to renege on its promise not to devalue and hence to abandon the peg. This temptation increases with the importance that the central bank attaches to other objectives than defending the peg. This can be any economic objective that is conceivably part of the central bank's (or the government's) social welfare function and whose attainment involves a trade-off with the fixed peg (e.g. output stabilisation or employment growth). The temptation to renege further increases with the size of the shock to the economy (e.g. the deepness of the recession) and the cost of defending the peg (e.g. output loss as a result of the interest rate increase to defend the peg). The temptation to abandon the peg decreases with the cost of the devaluation. An important cost of the devaluation is the loss of credibility of the monetary authorities after the devaluation.

Hence countries should prefer extreme exchange rate arrangements (such as a currency board or a freely floating exchange rate) to intermediate exchange rate arrangements (such as an adjustable fixed peg system). This is the bipolar view on exchange rate arrangements and currency crises. According to this view countries should opt for corner solutions to avoid currency crises. Flexible exchange rate regime advocates moreover stress that this system offers greater financial stability and allows transition countries to reform their economies more smoothly. Masson (1999) adds that structural differences between the CEECs and the EU-countries make adjustable pegs in the CEECs especially vulnerable to speculative attacks.

4. Exchange market pressure and currency crises in the CEECs

In this section we investigate in a more formal way to what extent exchange markets in the CEECs have been subject to tensions between 1990 and 2003 and whether the choice of the exchange rate regime has mattered in explaining different experiences. More specifically, we test the relevance of the bipolar view for these countries. To this purpose we compute a quarterly measure of exchange market pressure (emp) for each of the CEECs[†]. We also compute the proportion of currency crises quarters to which the CEECs have been subject. A crisis quarter is defined as one in which the value of emp takes an exceptionally high value.

The notion of exchange market pressure was introduced by Girton and Roper (1977). They started from the insight that excess demand or supply on the foreign exchange market can result in a change in the price of foreign exchange as well as in a change in the level of foreign reserves. The interesting feature of the concept is that is applicable to all exchange rate systems and to different degrees of exchange rate management. We use the extended version which includes the change in the interest rate differential, in addition to reserve and nominal exchange rate changes (see Eichengreen et al. (1995)). As a matter of fact, interest rates have been frequently used in CEECs to alleviate exchange market pressure[‡]. Exchange market pressure

[†] For an measurement and explanation of exchange market pressure in the original EU-countries see Pentecost, Van Hooydonk and Van Poeck (2001).

[‡] In the spirit of the emp-measure one might also include (changes in) capital controls, since capital controls have also been used to alleviate exchange market pressure. The empirical research testing the effectiveness of capital controls often relies on data from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. However, this source does not measure the intensity of controls and only reports on capital outflows. In the case of CEECs it is especially hard to connect

therefore also captures those attacks that have been successfully resisted by the monetary authorities (since it includes reserve and interest changes). It is therefore a good measure of crisis proneness. We also take into account the different volatility of the components by using variance smoothing weights. The weights on the intervention and interest rate terms are the ratio of the standard error of the percentage change of the exchange rate over the standard error of the percentage change of reserves and the interest rate differential respectively. Exchange market pressure is thus defined as:

$$(1)\quad emp_{ERW} = \dot{e} - \frac{\sigma_{\dot{e}}}{\sigma_{\dot{r}}} \cdot \dot{r} + \frac{\sigma_{\dot{e}}}{\sigma_{(i_s - i_s^*)}} \cdot (i_s - i_s^*)$$

where:

$\dot{e}$ rate of depreciation of domestic currency;

$\dot{r}$ increase in domestic international reserves;

$i_s - i_s^*$ interest rate differential;

$\sigma_{\dot{e}}, \sigma_{\dot{r}}, \sigma_{(i_s - i_s^*)}$ standard error of the variables respectively.

The data used to compute emp is derived from IMF International Financial Statistics (see Appendix I). Changes in the exchange rate are computed relative to the German mark using the fixed Euro conversion rate after 1999. We also use Germany as anchor

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increased capital controls with increased speculative pressure on their currencies. The eight EU joiners have achieved almost full alignment with the aquis' requirements on free capital movement. Hence during the last decade there has been almost a constant trend of liberalisation of capital flows. For these reasons we do not include capital controls in our emp-measure calculations.

to compute the changes in the short term interest rate differential. We drop the possibility of intervention by foreign authorities, which is quite realistic for the CEECs. So only the unilateral intervention measure is used.

Appendix II shows the evolution of the different components used to compute the emp-measures and appendix III shows the resulting emp-measure[§] for each CEEC.

Table 2. Exchange rate regimes in the new EU members 1990-2002.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Czech Republic	3	3	3	3	3	3	4	7	7	7	7	7	7
Estonia	na	na	2	2	2	2	2	2	2	2	2	2	2
Hungary	3	3	3	3	3	6	6	6	6	6	6	6	6
Latvia	na	na	(8)	(8)	3	3	3	3	3	3	3	3	3
Lithuania	na	na	(8)	(8)	2	2	2	2	2	2	2	2	2
Poland	3	5	5	5	5	6	6	6	6	6	7	7	7
Slovak Republic	3	3	3	3	3	3	4	4	7	7	7	7	7
Slovenia	na	(7)	7	7	7	7	7	7	7	7	7	7	7

Note: End-year observations. Codes in parentheses refer to the periods when the newly-introduced national currencies have not yet assumed the status as the sole legal tender. The meanings of the codes are: na=not available, 1=currency union (no separate legal tender), 2=currency board arrangements, 3=conventionally fixed pegs (adjustable pegs, de facto pegs), 4=horizontal bands, 5=crawling pegs, 6=crawling bands, 7=managed floating without preannounced path for the exchange rate, 8=independent floating.

Source: von Hagen and Zhou (2002), IMF Annual Report on Exchange Rate Arrangements and Exchange Restrictions and authors observations for 2000 onwards. For a description of the major characteristics of the different exchange rate regimes, see Ghosh, Gulde & Wolf (2003, table 1.1).

[§] We tried several emp-measures starting with the classical simple Girton-Roper and ending with the more sophisticated Eichengreen et. al. (1995) measure. All measures proved to be highly correlated.

Table 3. Exchange rate regime and emp-measure in new EU members 1990-2002.

Exchange rate regime[2]	Observations	Average emp-measure	Standard deviation	Number of "crisis" quaters[1]	Proportion of "crisis" quaters[1] (%)
Currency unions (1)	-	-	-	-	-
Currency board arrangements (2)	79	-2.12	5.04	1	1.3%
Total fixed regimes	79	-2.12	5.04	1	1.3%
Conventionally fixed pegs (3)	73	-0.60	7.80	8	11.0%
Horizontal bands (4)	14	1.26	7.94	2	14.3%
Crawling pegs (5)	17	0.22	11.74	4	23.5%
Total intermediate regimes	*104*	*-0.22*	*8.50*	*14*	*13.5%*
Crawling bands (6)	51	-3.22	6.44	1	2.0%
Managed floating (7)	94	-1.37	5.14	3	3.2%
Independent floating (8)	-	-	-	-	-
Total flexible regimes	*145*	*-1.86*	*5.99*	*4*	*2.8%*
Results of one-way ANOVA to test the means between fixed, intermediate and flexible systems					
F-statistic		*2.781*			
Significance of the F		*0.063*			

[1] *The "crisis" periods occur when the time series exceeds the sample mean by 1.5 standard deviation.*

[2] *The figures between brackets refer to the IMF classification in table 2.*

The choice of the exchange rate regimes by the CEECs over the period 1990-2002 is reflected in Table 2 by an indicator ranging from 1 (currency board) to 8 (independent floating). These are end of year observations according to the official IMF classification (for the computations and the regression analysis we use end of quarter observations[**]). For our purpose, we prefer the IMF classification over other classifications. The IMF classification is a *de jure* classification based on the stated policy intentions of the monetary authorities (with some corrections for overly clear

deviations between stated intentions and practice). The drawback of this approach is that policy practices may indeed diverge from promises. As an alternative, in appendix IV a *de facto* classification by Reinhart and Rogoff (2004) is used. De facto classifications are based on actual movements of the exchange rate. They are essentially backward-looking and may reflect exchange rate policy intentions very poorly. For a comparison of both types of classification and a defence of the de jure approach, both because of the central role of policy intentions for expectations formation and significant conceptual and practical problems associated with de facto classifications, see Gosh, Gulde & Wolf (2003).

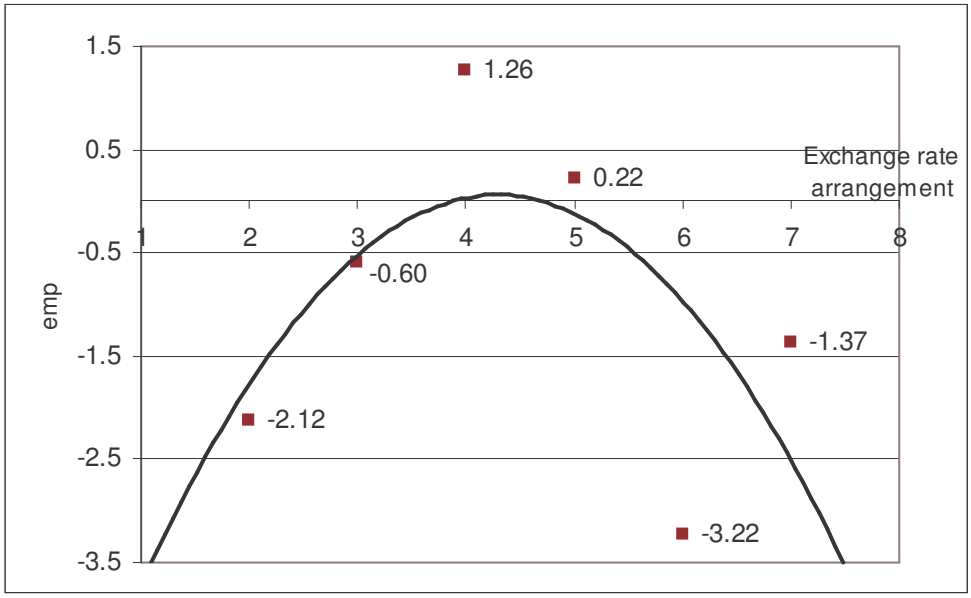
Table 3 reports the average emp-measure computed for each of the exchange rate regimes that occurred in the CEECs. We also compute the number of crisis quarters. A crisis quarter is defined as one in which the emp-measure exceeds the mean value by 1.5 standard deviation. However, the general picture and conclusions are not significantly altered by using weaker (1 standard deviation) or stronger (2 standard deviations) definitions of a crisis. We also show the averages over all countries and quarters for the total fixed regimes, total intermediate exchange rate regimes and total floating regimes. Currency unions and currency board arrangements are thereby classified as credible fixed exchange rate regimes; conventional fixed pegs, horizontal bands and crawling pegs as intermediate regimes; and crawling bands, managed floating and independent floating as flexible regimes.

A rough indication in favour of the bipolar view that exchange market pressure is higher in intermediate regimes than in the extreme cases, is given by the observation

[**] When a currency crisis occurs and the authorities opt for another exchange rate regime after the crisis but within the same quarter, we characterize that quarter with the regime that existed at the outbreak of the quarter.

that on average exchange market pressure was higher for CEECs operating under intermediate regimes as compared to credible fixed or flexible regimes (viz. -0.22, -2.12 and -1.86 respectively). This is also illustrated in figure 1, which is suggestive for a hump-shaped relationship between emp and the exchange rate system. The analysis of variance confirms that the exchange rate regime does influence the average emp-measure as the F-statistic is high and significant. [††]

Figure 1. Exchange rate arrangement (IMF classification) and average emp



The last column of table 3 shows that the CEECs with intermediate regimes experienced also more currency crises than those that operated under a credible fixed or a flexible regime, when judged by the proportion of crisis quarters. The incidence of crisis quarters is much higher in intermediate regimes as compared to the corner regimes.

[††] This conclusion also holds for the Reinhart-Rogoff classification but the results are statistically much weaker (see appendix IV).

5. Regression analysis

In order to test for the validity of the bipolar view applied to the CEECs' crises experience we additionally ran a number of regression equations explaining exchange market pressure by a set of fundamental variables and adding an exchange rate regime dummy. This exchange rate regime dummy takes the value of 1 for the extreme exchange rate regimes and 0 for the intermediate regime. Hence the expected coefficient of this dummy is negative. As for the choice of the fundamentals we based ourselves on the findings of the theoretical and empirical literature (see Flood and Marion, 1998 for an overview). The following explanatory variables were used in a regression based on panel data for the 8 CEECs over the period 1990 (Q1) – 2003(Q1): current account balance (as % of GDP), domestic credit growth rate, real depreciation rate, inflation differential (with Germany), growth rate of government borrowing.

We did not include international reserves or the money supply-reserves ratio since reserves also enter in the computation of the emp-measure. We also did not include structural variables (although the use of country dummies could potentially improve the regression results).

Our regression results are presented in table 4. They confirm to a large extent the existing empirical literature on the determinants of currency crises: the current account and domestic credit growth significantly contribute in explaining exchange market pressure. The results can be marginally improved by adding the real depreciation rate, the inflation differential or the growth rate of government borrowing. This being said, we should keep in mind Flood and Marion's (1998)

remark, that it is hard to generalise such results, since the empirical literature has shown that the relative importance of various fundamentals can vary over time for a single country and across countries during a single period.

In table 4, the exchange rate regime dummy is entered in an additive way. It is readily seen that the regime dummy significantly contributes and with the expected sign to explaining exchange market pressure: countries with intermediate regimes, ceteris paribus, experience higher exchange market pressure than countries with extreme exchange rate regimes, either credibly fixed or flexible rates.

Alternatively, we have made use of interaction variables, testing the hypothesis that the effect of the economic fundamentals on exchange market pressure differs according to the exchange rate regime in operation. Therefore, we re-estimated the regression equations which revealed the two most important economic fundamentals for exchange market pressure in our data set, viz. current account balance and domestic credit growth where the dummy was entered in a multiplicative way. The hypothesis of a different effect depending on the exchange rate regime is not contradicted by the estimation results, as shown by the regression below:

$$emp = \underset{(6.91)}{-3.62} - \underset{(3.87)\ (2.06)}{(0.39 - 0.24D)CA} + \underset{(3.81)\ (1.17)}{(0.083 - 0.028D)DC}$$

R2=0.128; R2 adjusted=0.118; F=11.893, t-values between brackets

According to the above regression equations, a 1%-point increase in the current account deficit (as % of GDP increases exchange rate pressure by 0.15 in credibly fixed and floating regimes and by 0.39 in intermediate ones. An increase in the domestic credit growth rate of 1% leads to an increase of exchange rate pressure of 0.08 when the economy operates under an intermediate regime and only 0.05 in the extreme regime cases. All this confirms the bipolar view on exchange rate arrangements applied to the CEECs experience.

Table 4. Regression results: dependent variable – exchange market pressure

	Explanatory variables							Statistics		
Regre s-sion No.	Constant	Current account	Domestic credit growth	Real depreciation	Inflation differential	Government borrowing	Exchange rate arrangement dummy	R^2	R^2_{ad}	F
1	-1.126 (-1.576)	-0.201* (-2.820)					-1.841* (-2.387)	0.040	0.034	6.820
2	-2.581* (-3.501)	-0.246* (-3.569)	0.0637* (5.374)				-1.606* (-2.166)	0.119	0.111	14.562
3	-3.009* (-3.681)	-0.267* (-3.760)	0.0636* (5.363)		0.0996 (1.209)		-1.523* (-2.047)	0.123	0.112	11.303
4	-2.592* (-3.412)	-0.243* (-3.489)	0.0652* (5.442)	-0.0498 (-0.779)			-1.704* (-2.288)	0.120	0.109	10.996
5	-1.580* (-1.963)	-0.223* (-3.039)			0.105 (1.221)		-1.753* (-2.265)	0.045	0.036	5.050
6	-1.150 (-1.605)	-0.206* (-2.867)				0.0002 (0.602)	-1.859* (-2.405)	0.041	0.032	4.658
7	-2.622* (-3.547)	-0.252* (-3.642)	0.0641* (5.401)			0.0003 (0.845)	-1.628* (-2.193)	0.121	0.110	11.091
8	-3.029* (-3.701)	-0.272* (-3.815)	0.0639* (5.387)		0.0955 (1.156)	0.0002 (0.769)	-1.547* (-2.076)	0.124	0.111	9.149
9	-2.599* (-3.418)	-0.247* (-3.532)	0.0652* (5.415)	-0.0388 (-0.587)		0.0002 (0.655)	-1.715* (-2.300)	0.121	0.108	8.867

Notes:

1. Dataset consists of 328 quarterly observations for 8 countries over the 1st quarter of 1990 to 1st quarter of 2003. For the sources and description of data see appendix I.

2. *t*-statistics are given in parentheses.

* Statistically significant at 5% level.

6. Concluding remarks

In this paper, we argued that the transition to EMU of the Central and Eastern European countries that became member of the EU in 2004 could be turbulent because they are required to enter ERM II and to fulfil the Maastricht convergence criterion, more specifically the exchange rate stability criterion, at the same time. The membership of ERM II constitutes for some of them a shift from a flexible to an adjustable peg system. Several economists have argued that adjustable peg systems are more vulnerable to currency crises than credible fixed pegs or freely floating regimes. This is the so-called bipolar view of exchange rate arrangements and currency crises. The empirical part of the paper confirmed this view for the CEECs in the period 1990-2003.

The results of the regression estimations can be interpreted in two ways. One is that the entry of the CEECs in ERM II increases their vulnerability to speculative attacks and therefore should be avoided. Buiter and Grafe (2002) e.g. believe that there is a good economic case for the leading CEECs to become members of EMU without having to go through a two-year period of formal ERM membership. But this is not a real option anymore since ERM II membership has been made compulsory for those CEECs that want to become a member of the EMU. We therefore prefer another interpretation, viz. that the CEECs should not enter ERM II before their fundamentals are in the "safe" region so that they are less candidate for speculation. It is therefore of utmost importance that their public finances are under control, inflation is subdued and that the CEECs enter ERM II with sustainable central parities. The real exchange rates of CEECs, especially those with pegged currencies have been appreciating during the last decade. This might

eventually require a correction for some of them (Czech Republic, Hungary, Slovakia) at the moment entering into ERM II (see Pictet (2004) and Coudert and Couharde (2002) for a different view).

After entry into ERM II with a credible central parity, participation in the system may yield additional credibility and hence stability. As De Grauwe & Grimaldi (2002) have argued the probability of a currency crisis in a fixed exchange rate regime such as ERM II may be lower when participation in that regime without devaluation is a condition for entry into the EMU. This is because in that case the cost of devaluation for the government sharply increases. Since this is known to the market it is likely to affect the expectations of speculators in a positive way. In this respect the experience of the former South-European EMS-members can be illustrative. As it is well known, these countries went through a smooth transition course into the EMU, once an entry date and a credible conversion rate for their currencies was established.[*]

[*] In the case of Greece, however, entry into ERM II (March 1998) was accompanied by a devaluation of its currency by 13,5%. Subsequently, the drachma never came under pressure in the two years of participation in ERM II.

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Appendix I – Data sources

$\dot{e}$ – Rate of depreciation of domestic currency. Defined as the percentage change of exchange rate vis-à-vis Deutsche mark. Calculated on the basis of IMF International Financial Statistics line ae.

$\dot{r}$ – Proportional change in domestic international reserves. Defined as the change in the level of reserves divided by money base of previous period – IMF International Statistics financing of the balance of payments (line 79dad), for Poland the change in net foreign assets (line 11-line16c) was used; the whole was deflated by inherited money base (IFS line 14).

$i_s - i_s^*$ – Change in the short term interest rate differential with Germany – IMF International Statistics money market rate (line 60b) for Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovak Republic and Slovenia. Treasury bill rate (line 60c) for Hungary.

CA – Current account (as % of GDP) – IMF *International Financial statistics line 78ALD and line 99b.*

DC – Domestic credit growth rate – percentage change compared to previous period. Calculations based IMF International Financial statistics line 32 (domestic credit).

Real depreciation rate – defined as $\dot{q} = \dot{e} - \dot{p} + \dot{p}^*$, where $\dot{p}$ and $\dot{p}^*$ are domestic and German inflation rates respectively. The time series are lagged for 1 period. IMF International Financial statistics line 64 consumer price index and line ae bilateral dollar rate

Inflation differential (with Germany) – IMF International Financial statistics line 64 consumer price index.

Growth rate of government borrowing – percentage change compared to previous period. IMF International Financial statistics lines 12a and 22a (claims on central government).

D – Exchange rate dummy – dummy variable takes the value of 1 for the exchange rate arrangements 1, 2, 6, 7 and 8 (see table 1) and the value of 0 for the exchange rate arrangement 3, 4, and 5.

Appendix II - Components of exchange market pressure

Figure 2. Index of nominal exchange rate (national currency per euro (before 1999 ECU)) 1993, Q1=100.

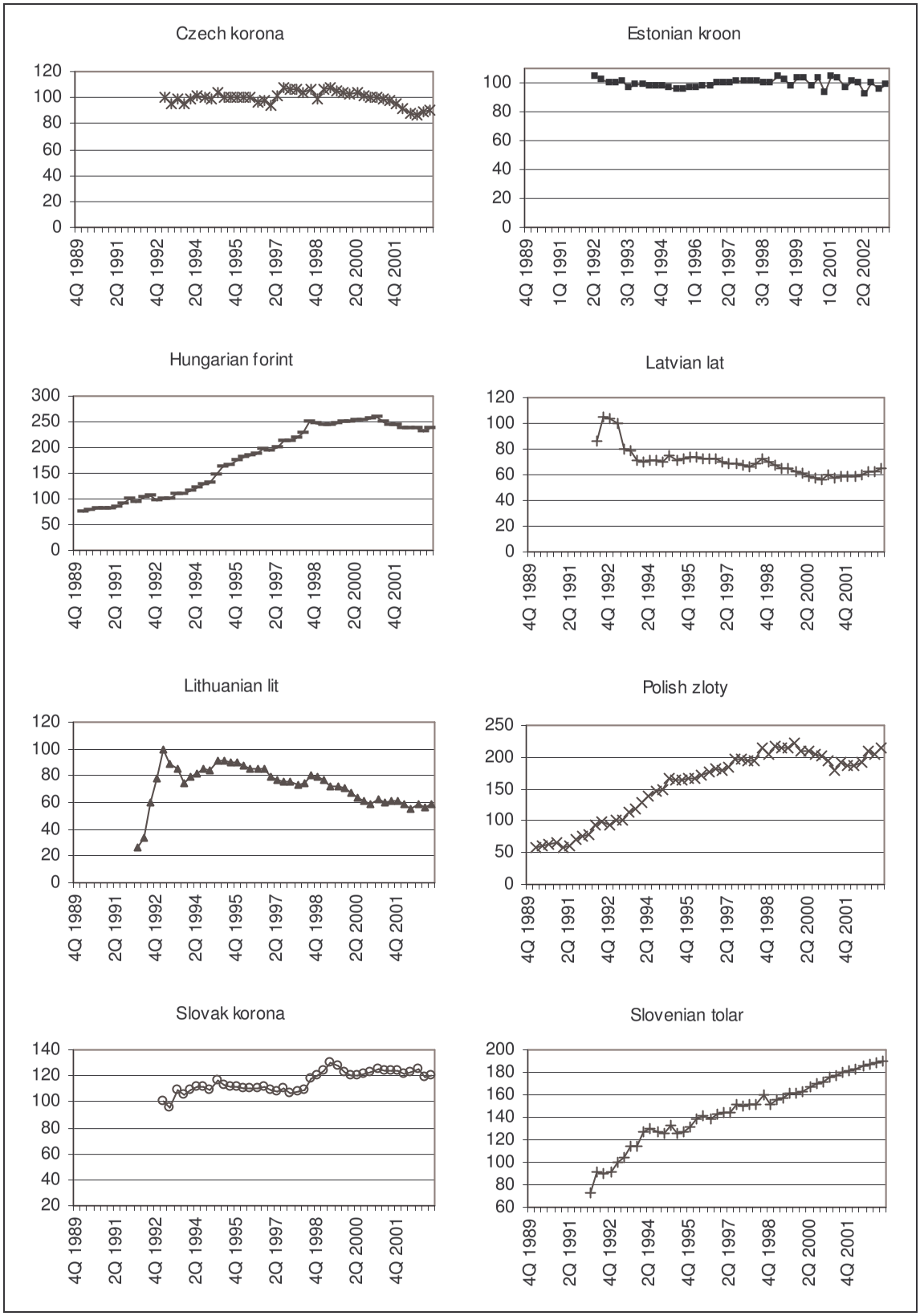


Figure 3. Short term interest rate.

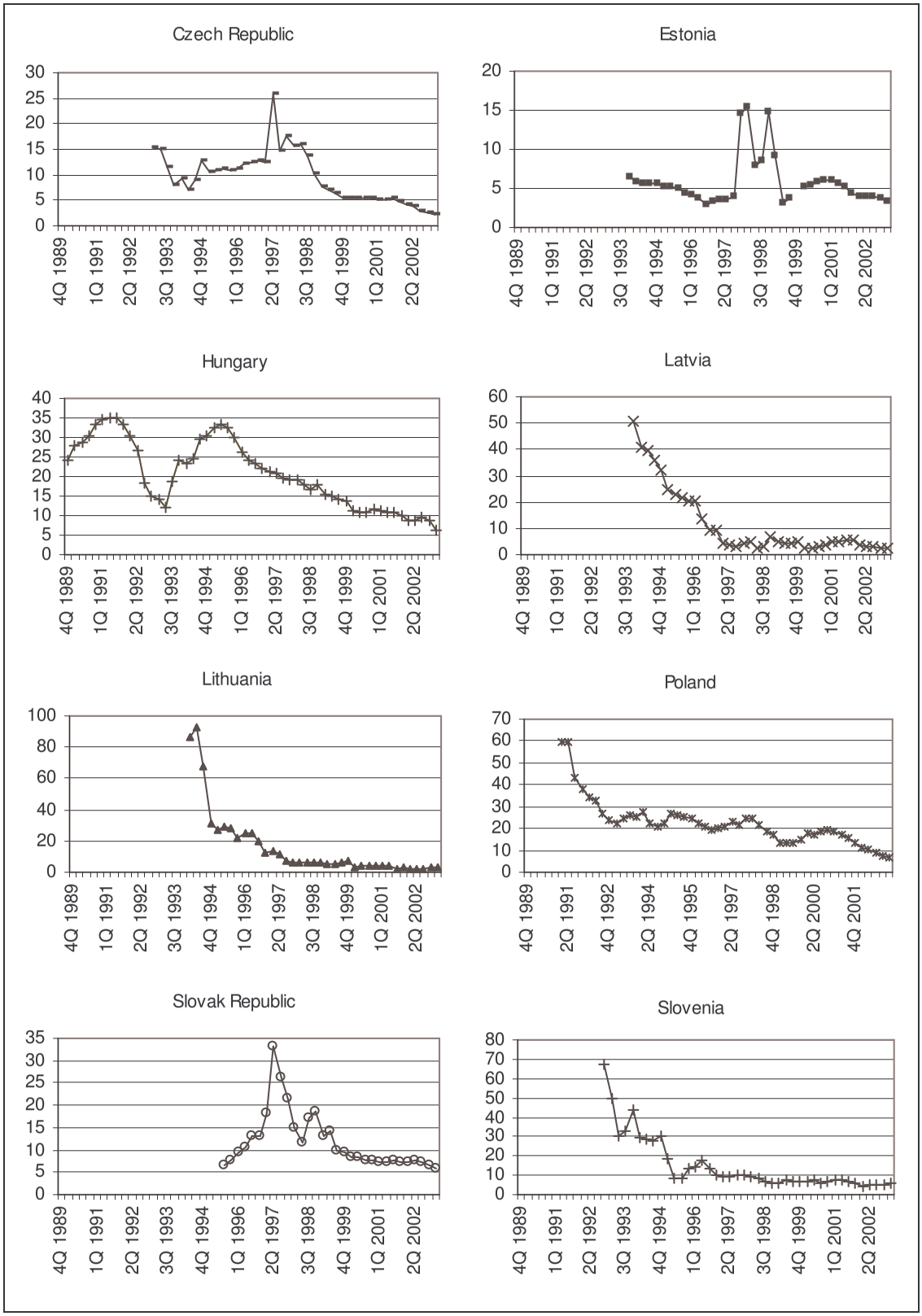
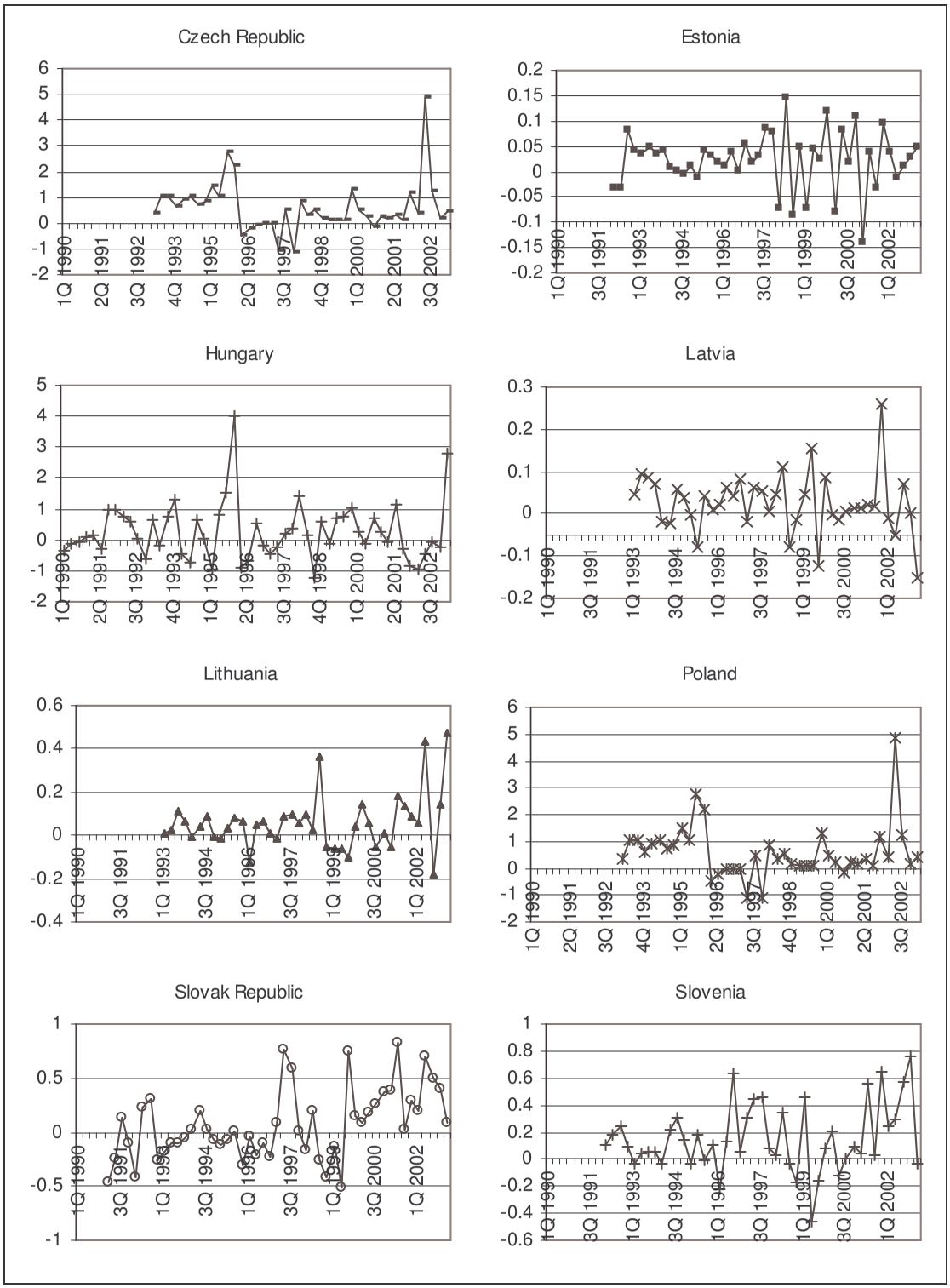


Figure 4. Change in the international reserves, in milliards of the US dollars.



Appendix III

Figure 5. Exchange market pressure in the Czech Republic.

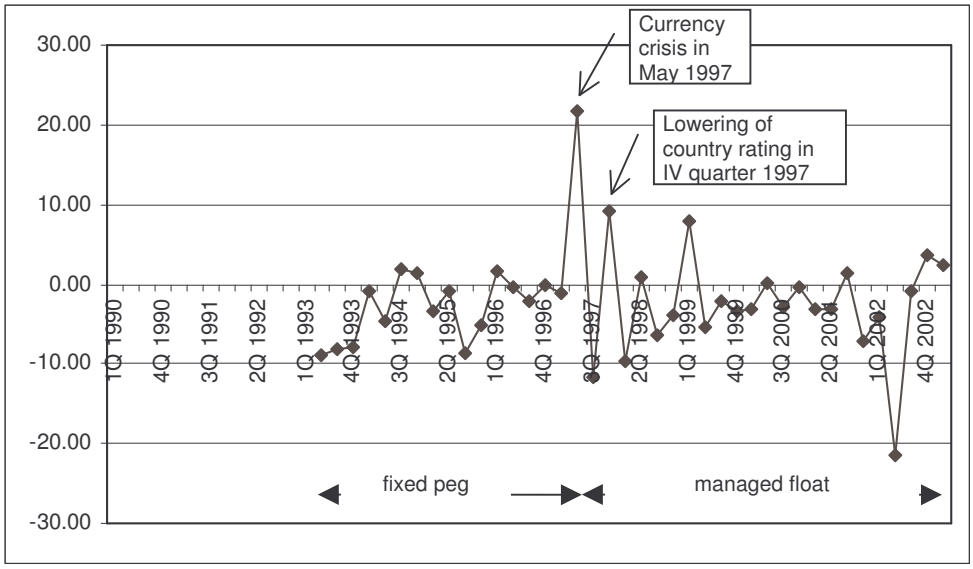


Figure 6. Exchange market pressure in Hungary.

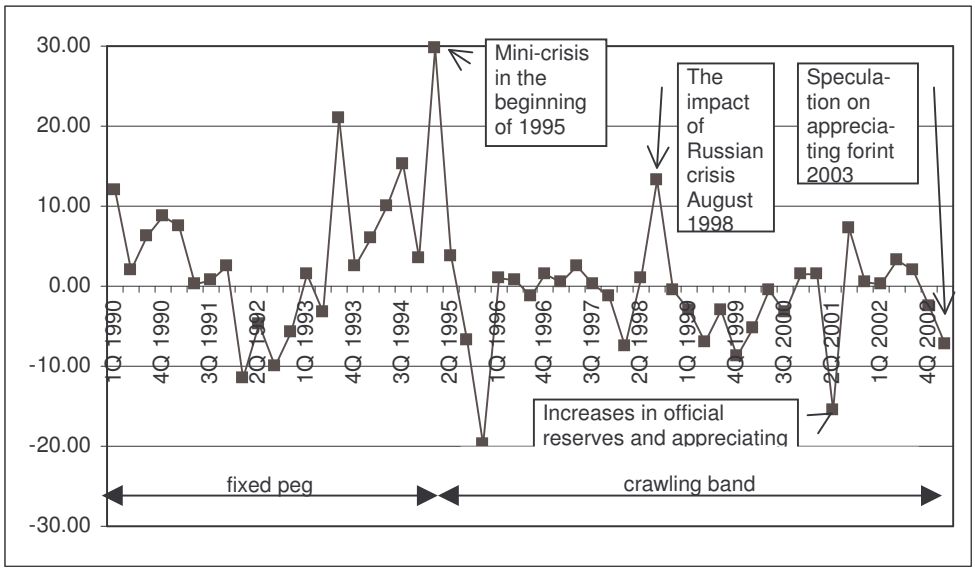


Figure 7. Exchange market pressure in Poland.

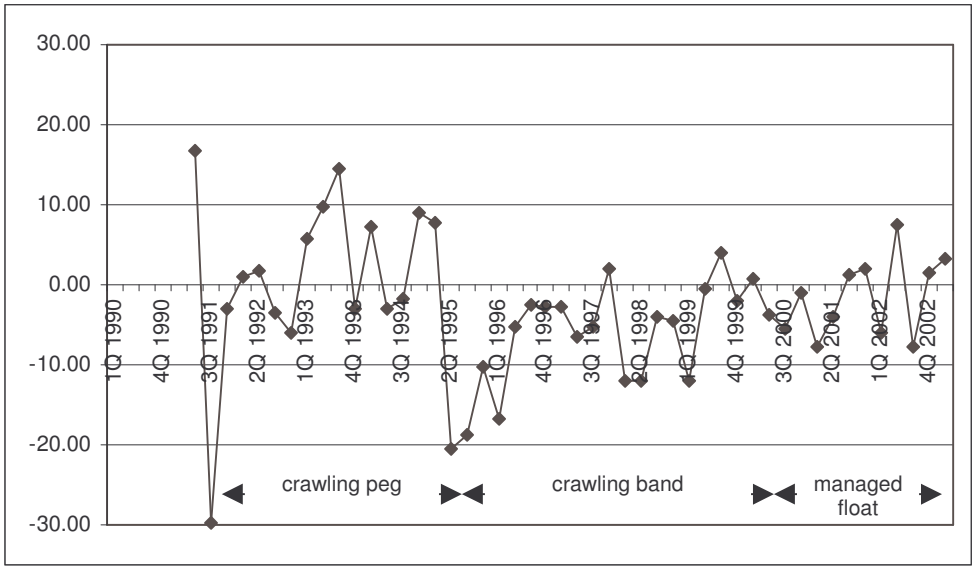


Figure 8. Exchange market pressure in Slovak Republic.

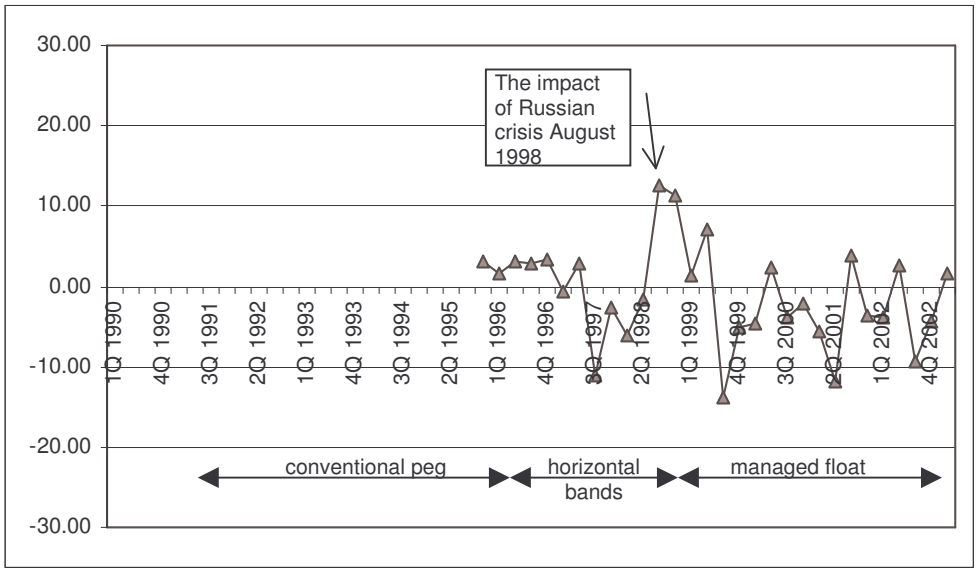


Figure 9. Exchange market pressure in Slovenia.

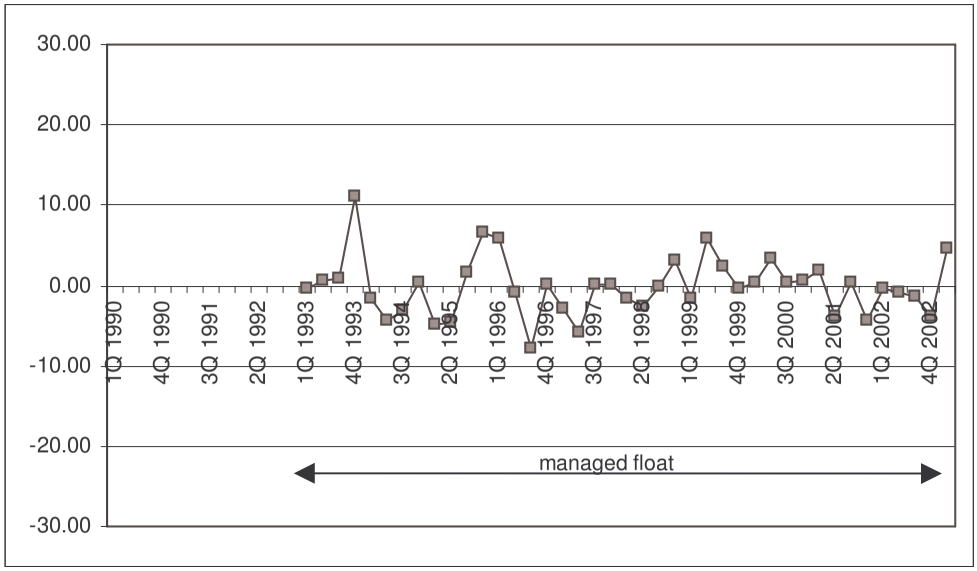


Figure 10. Exchange market pressure in Estonia.

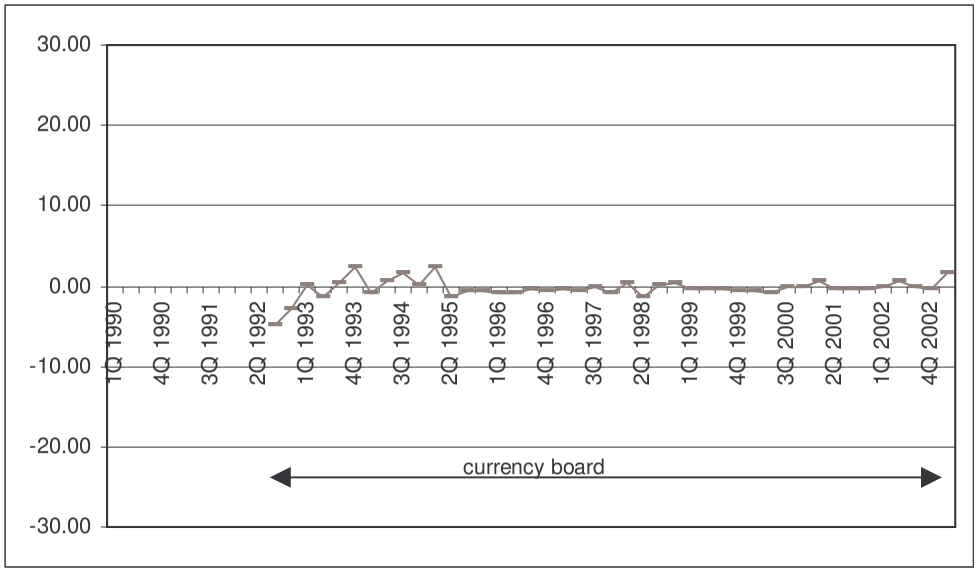


Figure 11. Exchange market pressure in Latvia.

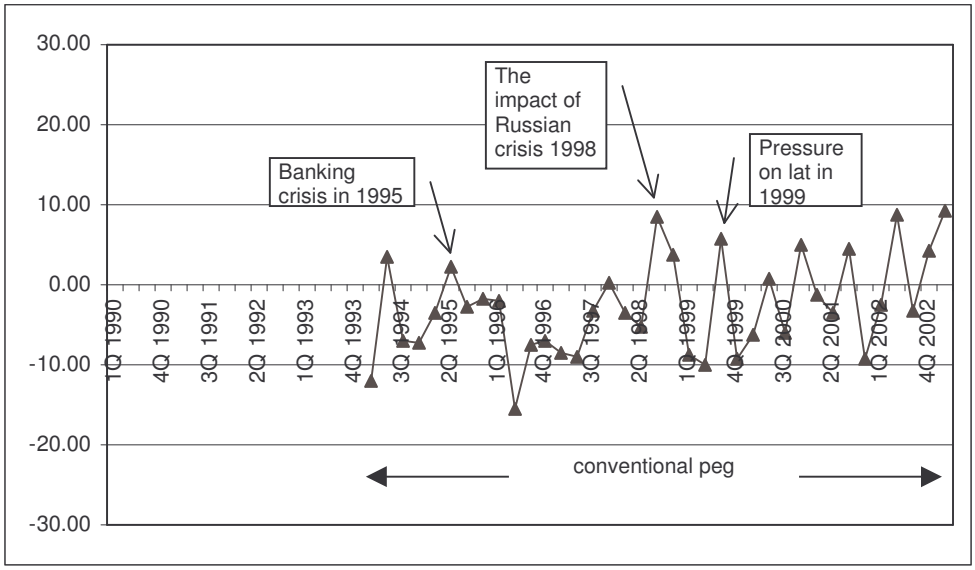
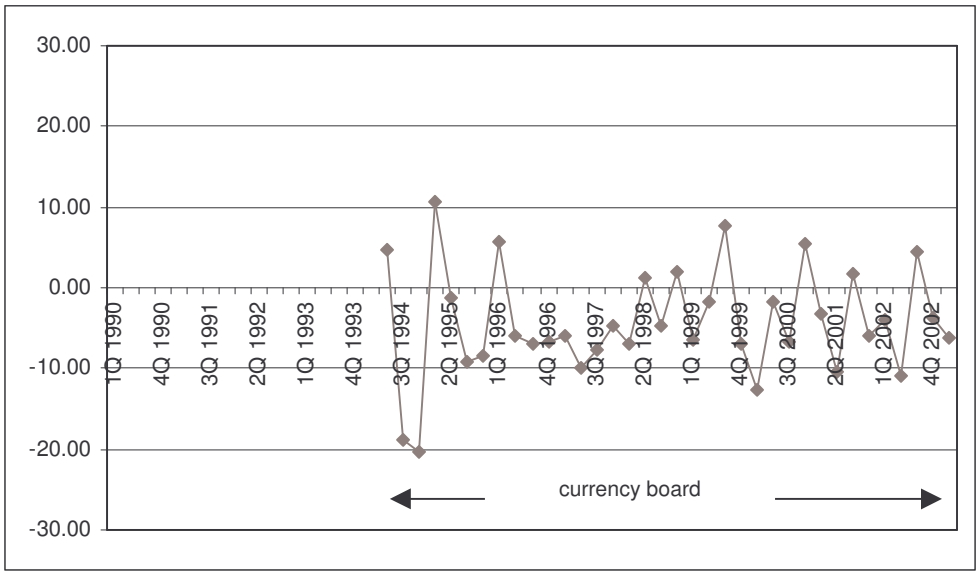


Figure 12. Exchange market pressure in Lithuania.



Appendix IV – Emp-measure and the Reinhart-Rogoff classification of exchange rate regimes

Table 3b. Exchange rate regime (Reinhart-Rogoff classification) and emp-measure in new EU members.

	Observa-tions	Average emp-mea-sure	Standard deviation	Number of "crisis" qua-ters[1]	Proportion of "crisis" quaters[1] (%)
No separate legal tender (1)	-	-	-	-	-
Pre announced peg or currency board arrangement (2)	75	-1.92	3.95	0	0%
Total fixed regimes	*75*	*-1.92*	*3.95*	*0*	*0%*
Pre announced horizontal band that is narrower than or equal to +/- 2% (3)	36	-2.44	6.06	2	5.6%
De facto peg (4)	-	-	-	-	-
Pre announced crawling peg (5)	-	-	-	-	-
Pre announced crawling band that is narrower than or equal to +/- 2% (6)	-	-	-	-	-
De facto crawling peg (7)	-	-	-	-	-
De facto crawling band that is narrower than or equalto +/- 2% (8)	78	-0.15	6.18	4	5.1%
Pre announced crawling band that is wide than or equal to +/- 2% (9)	17	-2.36	5.30	0	0%
De facto crawling band that is narrower than or equal to +/- 5% (10)	48	-1.13	8.91	7	14.6%
Total intermediate regimes	*179*	*-1.08*	*6.94*	*13*	*7.3%*
Moving band that is narrower than or equal to +/- 2% (i.e., allows for both appreciation and depreciation over time) (11)	-	-	-	-	-
Managed floating (12)	52	-2.56	5.66	1	1.9%
Freely floating (13)	-	-	-	-	-
Freely falling (14)	15	-2.90	12.78	3	20.0%
Total floating regimes	*67*	*-2.64*	*6.66*	*4*	*6.0%*
Results of one-way ANOVA to test the means between fixed, intermediate and flexible systems					
F-statistic		*1.488*			
Significance of the F		*0.227*			

[1] *The "crisis" periods occur when the time series exceeds the sample mean by 1.5 standard deviation.*

Figure 1b. Exchange rate arrangement (Reinhart-Rogoff classification) and average emp