Increasing integration of applicant countries into international financial markets: implications for monetary and financial stability

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1. Introduction

Growing integration of international financial markets entails an increase in financial flows between economies. Deeper integration into international financial markets can provide important benefits: access to foreign capital eases financing constraints for investment projects and thus increases economic growth. Besides the direct impact of additional resources, capital inflows often have positive externalities, such as spillovers of managerial and technical know-how, especially in the case of FDI. However, increasing capital flows also pose additional challenges for central banks. Capital inflows can have inflationary effects and can increase the vulnerability of an economy's financial system. Capital flow reversals may trigger financial crises. This paper analyses these aspects for four advanced transition economies (the Czech Republic, Hungary, Poland and Slovenia), widely expected to be among the first central and eastern European countries to join the European Union. The issue of financial integration is thus highly relevant for this group of countries.

In this paper we define monetary stability as price stability, and financial stability as an absence of financial crises. Our definition of financial crises is based on that of Kaminsky and Reinhart (1998), who distinguish between balance of payments crises[2] and banking crises. Balance of payments crises are characterised by "events" such as devaluations/flotations of the exchange rate and/or losses of official reserves in connection with large increases in interest rates. Banking crises include the closure, merger or takeover by the state of one or more financial institutions as a consequence of bank runs. If no bank run occurs, the closure, merger or takeover of or provision of large-scale government assistance to an important financial institution (or group of institutions) that marks the start of a string of similar outcomes for other financial institutions is also subsumed under the term "banking crisis". On many occasions, both types of crisis are strongly interlinked, a situation we will call a "twin crisis".

The paper is organised as follows. Section 2 deals with the impact of capital inflows on monetary developments. It starts with a brief overview of macroeconomic effects of capital inflows, with an emphasis on the impact of capital inflows on the current account in the Czech Republic, Hungary, Poland and Slovenia. Based on this brief theoretical introduction, we present stylised facts on the influence of capital flows on exchange reserves and monetary aggregates in CEECs. Section 3 investigates the impact of various kinds of capital inflows and other variables on the development of inflation in Hungary. For reasons of data availability, this analysis could be undertaken only for Hungary. Next, we turn to issues of financial stability (Section 4). We briefly discuss how capital inflows can pose a threat to financial stability. Subsequently, we analyse the development of several financial indicators in the accession countries that Kaminsky and Reinhart (1999) as well as Kaminsky et al. (1998) identified as the most reliable early warning signals of financial crisis. Finally, Section 5 contains conclusions about monetary and financial stability.

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[2] The term "currency crisis" is also often used for this kind of crisis in the literature.

2. Impact of capital flows on monetary development

2.1 Macroeconomic effects of capital flows

Whereas inflows of foreign direct investment had been small at the beginning of transition, an increase has been recorded recently. According to the World Investment Report 1999 (UNCTAD (1999)), the CEECs have been catching up with the rest of the world since 1993. Moreover, other forms of capital flows (portfolio investment) have started to develop dynamically in recent years. However, the capital inflows are heavily concentrated on only a few countries in the region. It is no coincidence that the Czech Republic, Hungary, Poland and Slovenia are generally seen as the best-performing countries in the region and the countries which are most likely to join the European Union in the near future.

From a balance of payments point of view, a surplus in the financial account (which is equivalent to a capital inflow) will automatically be accompanied by a deficit in the current account and/or an increase in official reserves. A current account deficit can result from imports of investment goods, including modern equipment. In such a case, capital inflows finance an enlargement or upgrade of production capacities, which has positive effects on the trade balance and the current account due to increased export opportunities and/or import substitution after completion of the investment. Furthermore, imports of investment goods are expected to adjust relatively quickly to the changed economic situation in the event of a reversal of capital flows, without causing significant welfare effects. Conversely, imports financed by capital inflows may be used for increased private consumption. Calvo et al. (1995) note that capital inflows to the CEECs were largely used to finance consumption growth between 1990 and 1993. This is also documented in Table 1. The current account deficit is more frequently associated with real growth of private consumption than with an increase in capital formation. This can be seen in a relatively high and negative correlation between the current account (as a share of GDP) and private consumption.

The development of the current account, consumption and investment exhibits different patterns in the CEECs covered by this study. In the Czech Republic, the real decline of both private consumption and investment led to surpluses of the current account at the beginning of economic transition. However, high private consumption growth fuelled a rapid rise in imports of consumption goods and resulted in burgeoning current account deficits (up to 7.6% of GDP in 1996) in the later phase of economic reforms. Simultaneously, capital formation slowed sharply and even declined in real terms from 1997. The current account deficits in Hungary can be traced to both imported investment and consumption goods, as reflected by a relatively high negative correlation between these variables between 1991 and 1994. This indicates that increases in imports have been related to the growth of consumption and investment to about the same extent in Hungary. However, the recent period (1995 to 1998) is characterised by an improvement of growth driven by both private consumption and investment and a simultaneous reduction of the current account deficit. This positive development may have several internal and external reasons. Among them, Inotai (1999) argues that the early FDI has already created new export capacities, contributing both to GDP growth and a recent improvement of external balances in Hungary.

In Poland, there is a highly negative correlation of private consumption with the current account, indicating an important share of consumption products in Polish imports. As investment is negatively correlated with the current account too, investment and private consumption seem to have caused increasing current account deficits in Poland recently. Contrary to other CEECs, Slovenia has been characterised by a balanced current account during the entire observation period.

As Calvo et al. (1995) note, the correlation of capital inflows with consumption rather than investment means that CEECs have a greater similarity to Latin American than to Southeast Asian countries. However, this does not necessarily need to cause concern in the CEECs. As Calvo et al. (1995) conclude, private consumption is still relatively low given the level of resources in these countries. Therefore, the recent increase in consumption could reflect a shift towards the equilibrium level of consumption which would be consistent with efficient use of all available resources. However, there is a risk that capital inflows may not be available throughout the whole period of convergence to safeguard the effective allocation of resources and an equilibrium level of consumption in line with

countries' resources. Wages and consumption could overshoot the equilibrium level. In both cases, private consumption and real wages may eventually fall, creating social tensions.

Table 1
The current account and selected GDP components in CEECs

	Current account[1]	Real capital formation[2]	Real private consumption[2]	Current account[1]	Real capital formation[2]	Real private consumption[2]
	Czech Republic			Hungary		
1991	1.2	–17.5	–28.5	0.8	–10.4	–5.6
1992	–1.0	8.8	15.5	0.9	–2.6	0.0
1993	0.3	–8.1	2.9	–9.0	2.0	1.9
1994	–0.1	17.3	5.3	–9.4	12.5	0.2
1995	–2.7	21.0	7.0	–5.6	–4.3	–7.1
1996	–7.6	8.7	7.1	–3.8	6.7	–3.2
1997	–6.1	–4.9	1.7	–2.2	9.2	2.6
1998	–1.9	–3.7	–2.3	–4.8	11.4	3.8
Correlation[3]						
1991/1998		–0.245	–0.382		–0.534	–0.240
1991/1994		–0.786	–0.939		–0.840	–0.670
1995/1998		0.107	–0.461		0.586	0.534
	Poland			Slovenia		
1991	–2.6	–4.4	6.3	1.0	–11.5	–11.0
1992	1.1	2.3	2.3	7.4	–12.9	–3.6
1993	–0.7	2.9	5.2	1.5	10.7	13.9
1994	2.5	9.2	4.4	4.2	12.5	3.8
1995	4.6	16.9	3.6	–0.1	17.1	9.2
1996	–2.4	20.6	8.6	0.2	4.2	2.4
1997	–4.2	21.9	7.0	0.2	10.1	3.3
1998	–5.3	14.8	4.5	0.0	13.7	2.4
Correlation[3]						
1991/1998		–0.147	–0.568		–0.541	–0.266
1991/1994		0.927	–0.700		–0.281	–0.125
1995/1998		–0.153	–0.461		–0.900	–0.731

[1] As a share of GDP. [2] Real growth. [3] Correlation of current account (as a share of GDP) and real growth of selected GDP components in indicated periods.

Sources: EBRD; OECD; IMAD Slovenia.

To avoid an increase of the current account deficit, a central bank may choose to intervene against the country's own currency in response to capital inflows, thus increasing its exchange reserves. Under a fixed exchange rate regime, capital inflows, which are converted at a fixed exchange rate to domestic currency, inevitably increase monetary aggregates unless the central bank pursues a sterilisation policy (for example through the sale of government paper).[3] However, sterilisation comes at a cost: when a central bank's domestic liabilities carry a higher interest rate than official exchange reserves do, it

[3] See Oblath (1998) and Durjasz and Kokoszczynski (1998) for a discussion of central bank interventions in Hungary and Poland, respectively.

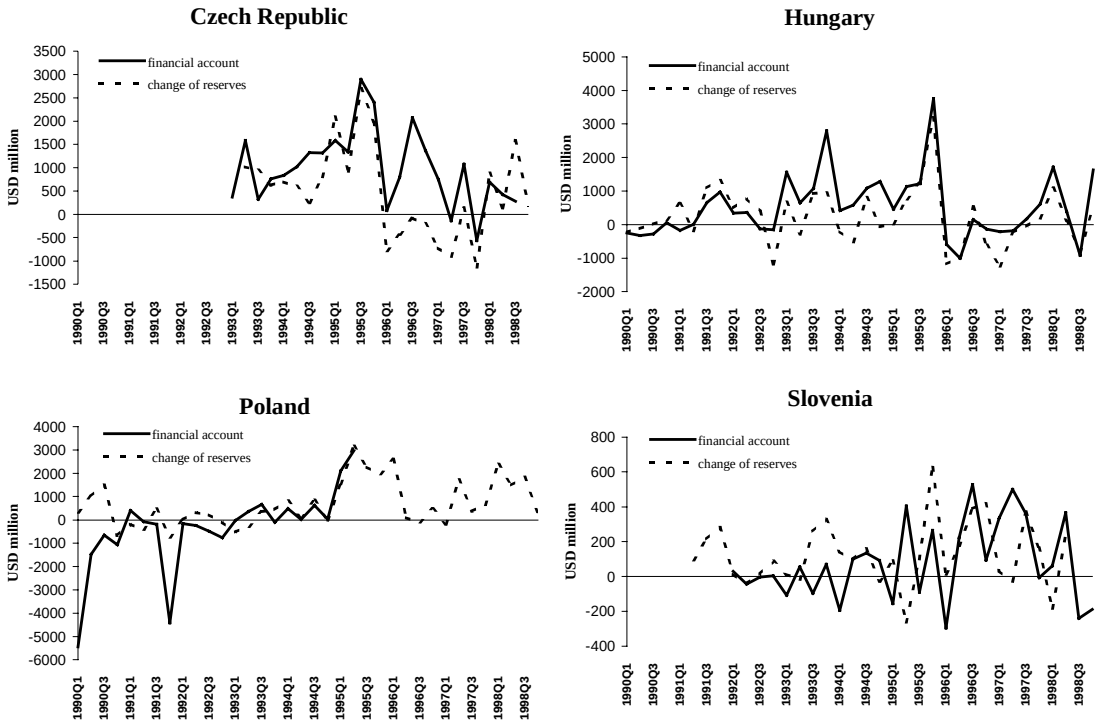
operates at a loss and thus increases the quasi-fiscal deficit. Under conditions of full capital mobility, sterilisation becomes ineffective, as any funds which are withdrawn from the money market by central bank sterilisation operations will quickly be replaced by new capital inflows. The cost of sterilisation will grow. As a consequence, in highly integrated financial markets, central banks have to accept some effect of capital inflows on monetary aggregates, which may cause inflationary pressures.[4]

2.2 Capital flows and exchange reserves in CEECs

Figure 1 shows that, as far as data are available, the growth of official reserves (excluding gold) in the CEECs was largely determined by the surplus on the financial account, whereas the development of the current account did not play an important role (with the possible exception of Slovenia). The Czech Republic, Hungary and Poland posted increasing exchange reserves financed by capital inflows. Declines in exchange reserves, for example in Hungary in 1996 and in the Czech Republic in 1996 and 1997, were likewise largely caused by a decline (Czech Republic) or even a dramatic reversal (Hungary) of capital inflows. The capital flows to Hungary switched from a maximum surplus on the financial account of US$ 3.8 billion in the fourth quarter of 1995 to a deficit of US$ 0.6 billion in the first quarter of 1997, which subsequently increased to US$ 1.0 billion (minimum of the available period). Contrary to the developments in the Czech Republic and Hungary, Poland largely succeeded in avoiding outflows of capital and a resulting decline of exchange reserves. In Slovenia, both capital flows and changes of reserves fluctuated strongly, with the average value relatively close to zero.

Figure 1

Financial account and the development of reserves in CEECs



Source: IMF, *International Financial Statistics (IFS)*.

[4] This effect on monetary aggregates can be avoided if capital inflows are utilised to repay foreign debt.

The relatively close relation between capital flows and exchange reserves is confirmed by the high correlation of these two variables (see Table 2). In Hungary, this correlation was 0.66 between 1990 and 1998. We found the highest correlation ($\rho = 0.80$) for the Czech Republic (1993 to 1998). By contrast, the development of exchange reserves in Slovenia, where capital inflows were relatively smaller, was influenced by other factors (e.g. the current account).

Table 2
Interdependence (correlation matrix) of capital flows in CEECs

		Balance of financial account				Change of exchange reserves			
		CZ	HU	PL	SI	CZ	HU	PL	SI
Czech Republic	ρ	1.000				1.000			
	N	23				23			
Hungary	ρ	0.371	1.000			0.532	1.000		
	N	23	36			23	36		
Poland	ρ	0.433	0.270	1.000		0.322	0.157	1.000	
	N	10	22	22		23	36	36	
Slovenia	ρ	0.167	0.020	0.362	1.000	0.048	0.316	–0.218	1.000
	N	23	28	14	28	21	29	29	29

Note: ρ = Pearson correlation, N = number of observations.
Source: *IFS*.

We also note a common trend in the development of capital flows in central and eastern Europe, which has been described by other authors.[5] This common trend could indicate the relevance of international factors in the explanation of capital flows to central and eastern Europe. The highest inflow of foreign capital to Hungary and the Czech Republic was observed between 1993 and 1995, while both countries experienced a slowdown of capital inflows or even capital outflows between 1996 and 1997. Hungary in particular experienced a high volatility of capital flows in 1998, but for the year as a whole foreign capital inflows were recorded in both countries. Correspondingly, the correlation of capital flows in the Czech Republic and Hungary is relatively high and positive ($\rho = 0.37$); the correlation of the development of foreign reserves is even higher ($\rho = 0.53$).

Table 3
Capital flows and exchange reserves in CEECs
Correlation of financial account and development of exchange reserves in CEECs

	Czech Republic	Hungary	Poland	Slovenia
Observation period	1993Q2–1998Q3	1990Q1–1998Q4	1990Q1–1995Q2	1992Q1–1998Q2
Correlation	0.797	0.663	0.483	0.190

Although Poland experienced episodes of capital outflows at the beginning of the 1990s, on the whole capital flows to Poland are correlated with flows to Hungary to a relatively high degree ($\rho = 0.27$) in the period 1990 to 1995.[6] The development of exchange reserves, which we found to be closely correlated with capital flows,[7] indicates that capital flows to Poland also continued in the more recent

5 Calvo et al. (1995); UNCTAD, *World Investment Report 1999*.

6 In the IMF's *International Financial Statistics*, quarterly balance of payments data are available only up to 1995.

7 A close relation between capital flows and the development of exchange reserves is assumed in some other studies, too: Calvo et al. (1993) use changes in exchange reserves as an approximation of capital flows to selected Latin American countries.

Table 4
Development of components of monetary aggregates in CEECs

	Monetary base (MB)		Monetary authorities			M2		Banking system		Nom. GDP	GDP def.
			NFA		NDA			NFA*	NDA		
	local curr. (mln)	% change	local curr. (mln)	As a % of MB	Local curr. (mln)	local curr. (mln)	% change	local curr. (mln)	local curr. (mln)	% change	
Czech Republic											
1991	–	–	–	–	–	–	–	–	–	29.4	46.2
1992	–	–	–	–	–	–	–	–	–	13.0	16.8
1993	166	–	148	89.0	–57	697	–	194	503	18.6	17.9
1994	223	34.4	204	91.6	17	840	20.4	233	607	14.4	10.9
1995	343	53.6	400	116.7	–59	1086	29.3	344	741	20.2	9.8
1996	344	0.5	367	106.7	–34	1156	6.4	310	845	13.8	9.6
1997	345	0.1	367	106.4	–25	1175	1.7	429	746	6.9	6.5
1998	422	22.5	403	95.4	19	1214	3.4	510	704	8.4	11.0
Hungary											
1991	799	52.3	237	29.7	311	1183	29.4	279	904	19.6	25.4
1992	888	11.1	274	30.8	391	1506	27.3	317	1189	17.8	21.6
1993	1019	14.8	549	53.9	189	1759	16.8	593	1166	20.6	21.3
1994	1169	14.7	636	54.4	237	1988	13.0	615	1373	23.0	19.5
1995	1516	29.7	1576	103.9	–270	2355	18.4	1508	846	28.6	25.5
1996	–	–	–	–	–	2854	21.2	–	–	22.8	21.2
1997	–	–	–	–	–	3507	22.9	–	–	23.9	18.5
1998	–	–	–	–	–	–	–	–	–	19.2	13.4
Poland											
1991	10943	28.2	3709	33.9	4492	26102	37.0	7791	18311	44.4	55.3
1992	14860	35.8	5951	40.0	4987	41108	57.5	13405	27703	42.1	38.5
1993	15993	7.6	7702	48.2	3468	55924	36.0	17212	38712	35.5	30.5
1994	19615	22.6	11340	57.8	6	77302	38.2	26448	50854	35.1	28.4
1995	28441	45.0	36636	128.8	–9989	104352	35.0	49184	55169	45.6	27.9
1996	34262	20.5	51789	151.2	–18944	136517	30.8	61524	74993	25.8	18.7
1997	45919	34.0	72284	157.4	–32798	176391	29.2	82808	93583	21.8	14.0
1998	53656	16.9	95610	178.2	–49159	220765	25.2	96300	124465	17.4	12.0
Slovenia											
1991	16	–	7	40.8	9	120	–	47	73	77.6	94.9
1992	37	133.1	71	190.7	–34	267	123.0	158	109	191.3	208.2
1993	51	38.2	103	199.8	–54	432	62.2	152	281	41.0	37.1
1994	81	56.9	189	235.0	–111	626	44.7	321	305	29.1	22.6
1995	101	25.2	250	248.4	–151	812	29.8	365	447	19.9	15.2
1996	117	15.6	330	282.8	–214	1001	23.3	488	513	15.0	11.1
1997	143	23.0	559	390.1	–416	1235	23.3	669	566	13.8	8.8
1998	172	19.7	594	346.1	–423	1476	19.5	702	774	11.6	7.3

Note: Monetary based reserve money. NFA = net foreign assets = foreign assets – foreign liabilities; NDA = net domestic assets = monetary base – net foreign assets; M2 = money + quasi money; GDP def. = GDP deflator.

* Excluding long-term foreign liabilities.

Sources: *IFS*; National Bank of Hungary.

period. Capital flows to Slovenia developed relatively independently of those in other CEECs, as both indicators show (Table 3).

2.3 Capital flows and monetary aggregates

In the previous section, we saw that capital flows fuelled sizeable increases in exchange reserves in most CEECs. The aim of this section is to investigate to what degree this capital inflow-driven build-up of exchange reserves had an impact on the development of monetary aggregates, in order to assess the inflationary potential arising from capital inflows.

Calvo et al. (1995) argue against sterilisation activities by CEE central banks in the early phase of transition (until 1993), because they ascribe increasing capital flows in this phase to rising money demand. Therefore, capital flows would not pose a danger for price stability. The development of inflation rates until 1995 lends support to this view. Although M2 was often growing more quickly than nominal GDP in the CEECs during this period, inflation rates were declining (inflationary shocks such as the devaluation in Hungary in 1995 are of course exceptions).

In about 1993, CEE central banks started to sterilise inflows, as documented by a sharp increase in the share of net foreign assets in the monetary base, as central banks were trying to reduce net domestic assets in response to quickly growing net foreign assets. Table 4 provides an overview of the extent of sterilisation operations in the CEECs: according to this table, the increase in net foreign assets was matched most closely by a decrease in net domestic assets in Slovenia. In Hungary and Poland, increases in net foreign assets were largely offset by declining net domestic assets while in the Czech Republic the degree of sterilisation appears to be the lowest. However, one should be aware of the problems involved in this simple comparison: As Oblath (1998, p. 197) points out, we are dealing with ex post information. Thus, we cannot tell to what extent the sterilised funds would have contributed to an increase in the current account deficit and/or the monetary base. In addition, the reaction of capital inflows in response to sterilisation measures is not captured.

The extent of sterilisation is also an indicator for the degree of integration into international financial markets. As stated above, under conditions of full capital mobility, sterilisation is ineffective. Thus, sterilisation operations would make little sense. One way to assess the effectiveness of sterilisation is to estimate offset coefficients. The change in the central bank's net foreign assets is explained by a change in net domestic assets and other variables. A coefficient of –1 for net domestic assets would imply the total ineffectiveness of sterilisation (or full integration into financial markets), as any decrease in net domestic assets would be met by an increase of equal size in net foreign assets. Buch et al. (1999) present a good overview of attempts to estimate offset coefficients in CEECs. They find that, with the possible exception of Slovenia, which was not covered in their study, CEECs exhibit a rather high degree of financial integration. Thus, the possibility of finding evidence of a relationship between capital inflows and inflation in CEECs should not be ruled out ex ante, as sterilisation policies seem not to have succeeded in fully insulating monetary aggregates from capital inflows.

3. Capital flows and inflation: a case study of Hungary

Because of a lack of data on the other countries covered by this study, we are able to explore these relationships in greater detail only for Hungary. This section discusses bivariate and multivariate relations between various types of capital flows and selected monetary variables in Hungary between 1992 (FDI) or 1994 (portfolio investment) and 1999.

Table 5 shows the result of Granger causality tests applied to capital flows (foreign direct investment and portfolio investment in Hungary) and selected monetary variables, including various price indices, real and nominal effective exchange rate indices, and various interest rates. We can see that the motives of direct investors are substantially different to those of portfolio investors. Direct investors are motivated mainly by real wages and exchange rates, while portfolio investors are attracted by the interest rate level. Various price indices are the only variables which exhibit a statistically significant

relationship with both types of investment. Simultaneously, prices also seem to be influenced by both types of capital flows. Thus, the relation between prices and capital flows could be mutual. Capital flows do not seem to have any other significant effects on the Hungarian economy. These results are largely similar to those presented by Halpern (1996).

Table 5
Granger causality test between capital flows and selected variables

	H0: Selected variables do not Granger cause capital flows				H0: Capital flows do not Granger cause selected variables			
	FDI	FDI	PI	PI	FDI	FDI	PI	PI
Number of lags	2	4	2	4	2	4	2	4
Number of observations	28	28	24	24	28	28	24	24
Real wages	*0.79*	**5.66**	*0.07*	*0.25*	*0.18*	*0.38*	*0.10*	*1.16*
CPI, beverages	*0.08*	*0.48*	**5.46**	2.69	**8.84**	**5.99**	*1.21*	*0.98*
CPI, services	*0.49*	2.80	**3.59**	*2.30*	**4.88**	*1.85*	*1.06*	*0.78*
CPI, energy	**6.28**	**3.23**	*1.78*	*1.10*	*0.51*	*0.69*	3.14	*1.24*
CPI, foodstuffs	*2.13*	**3.74**	*0.41*	*0.17*	*0.02*	*0.55*	*1.19*	*1.09*
CPI, total	*1.80*	2.36	2.81	*1.40*	*1.85*	*0.37*	**3.55**	*2.12*
Real effective exch. rate	**6.60**	**3.12**	*0.05*	*0.28*	*0.33*	*0.57*	*0.87*	*0.30*
Nom. effective exch. rate	**8.00**	**4.63**	*0.34*	*0.36*	*0.46*	*1.79*	*1.26*	*0.44*
Lending rate	*0.95*	*0.63*	**9.19**	3.38	*1.47*	*0.60*	*0.53*	2.91
Deposit rate	*0.13*	*0.16*	**5.76**	3.10	*0.41*	*0.20*	*0.88*	*0.73*
Treasury bills	*0.04*	*0.18*	**4.50**	2.72	*0.87*	*0.37*	*0.41*	*1.24*
Discount rate	*0.34*	*1.42*	**7.05**	2.85	*0.66*	*0.47*	*1.92*	*0.12*

Note: FDI = foreign direct investment; PI = portfolio investment; italics = not significant; bold print = significant at 5% level; normal print = significant at 10% level.

However, Granger causality tests do not provide information on the character of the relationship between selected variables. Furthermore, omitted variables may bias the test results. Therefore, we specified a vector autoregression (VAR) model of inflation in Hungary. The endogenous variables include the consumer price index (CPI), interest rates on treasury bills (TBR), and the nominal effective exchange rate (NEER). Treasury bill rates are highly correlated with lending rates and other interest rates, and can be taken as a proxy for the general level of interest rates in Hungary.

Furthermore, we included two exogenous variables, direct and portfolio investment (FDI and PI, respectively) converted to Hungarian forints. All variables are first differences, as indicated by D(.) in Table 6.

This model explains about 60% of the variance of the quarterly changes in consumer prices and about one third of the changes in interest rates and the exchange rate. As estimated impulse-response functions reveal, interest rate growth and exchange rate depreciation (displayed as a downward movement of the exchange rate index) increase inflation for one to two years. Depreciation and inflation cause the interest level to rise with a lag of about two quarters, which falls to zero after one year. The nominal effective exchange rate reacts most rapidly to a change in the other endogenous variables. An inflation shock causes a depreciation with a lag of two or three quarters, while higher interest rates already cause appreciation after one quarter. These effects diminish within one year.

Table 6
VAR model of inflation in Hungary, 1992Q1 – 1999Q1

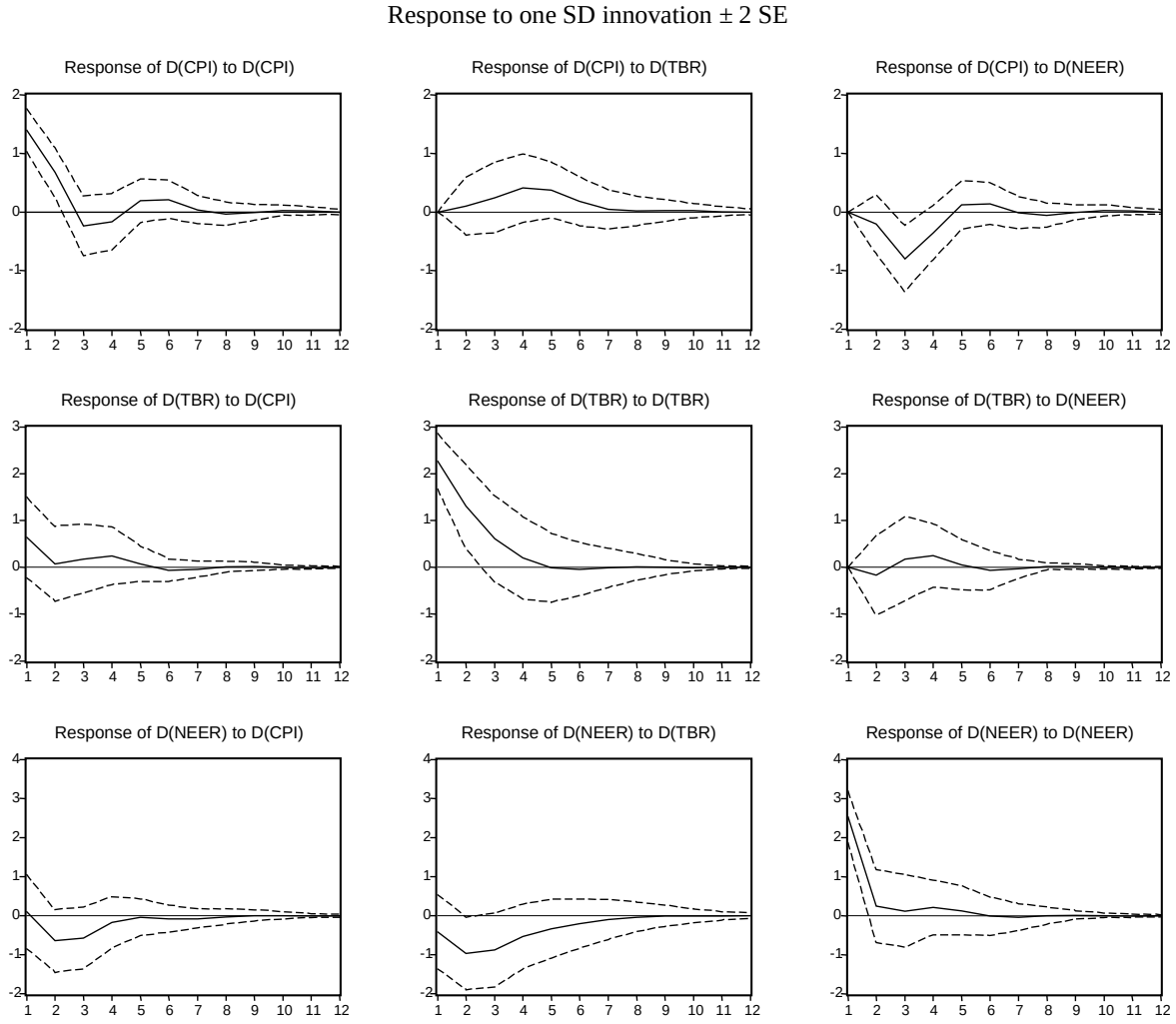
Endogenous variables	D(CPI)	D(TBR)	D(NEER)
D(CPI(–1))	0.476582	–0.200883	–0.285508
	(0.15251)	(0.25815)	(0.28163)
	(3.12482)	(–0.77818)	(–1.01376)
D(CPI(–2))	–0.416958	0.187135	–0.162131
	(0.15264)	(0.25835)	(0.28185)
	(–2.73172)	(0.72435)	(–0.57523)
D(TBR(–1))	0.026429	0.560851	–0.411247
	(0.12961)	(0.21937)	(0.23933)
	(0.20392)	(2.55665)	(–1.71834)
D(TBR(–2))	–0.014794	–0.055568	–0.102888
	(0.13908)	(0.23541)	(0.25682)
	(–0.10637)	(–0.23605)	(–0.40062)
D(NEER(–1))	–0.083702	–0.068417	0.096950
	(0.11932)	(0.20195)	(0.22033)
	(–0.70152)	(–0.33878)	(0.44003)
D(NEER(–2))	–0.265803	0.101204	–0.014731
	(0.10562)	(0.17877)	(0.19504)
	(–2.51661)	(0.56611)	(–0.07553)
Exogenous variables			
US$(–1)*FDI(–1)	9.87E–06	–6.08E–06	6.69E–06
	(3.6E–06)	(6.0E–06)	(6.6E–06)
	(2.77474)	(–1.00968)	(1.01891)
US$(–1)*PI (–1)	–1.02E–05	–1.08E–06	3.90E–06
	(4.3E–06)	(7.3E–06)	(7.9E–06)
	(–2.37475)	(–0.14826)	(0.49141)
Constant	2.706011	0.339926	–1.750549
	(0.95027)	(1.60843)	(1.75476)
	(2.84761)	(0.21134)	(–0.99760)
R-squared	0.621711	0.349859	0.309447
Adj. R-squared	0.470395	0.089802	0.033225
F-statistic	4.108703	1.345319	1.120285
Log likelihood	–50.74219	–66.00380	–68.52901
Akaike AIC	4.120151	5.172676	5.346828
Schwarz SC	4.544484	5.597009	5.771161

Note: Standard errors and t-statistics in parentheses.
Source: *IFS*.

In this system, the coefficient of foreign direct investment is statistically significant and positive in the first equation while portfolio investment exhibits a statistically significant negative relation with the inflation rate.

However, the relationship between portfolio investment and the inflation rate is not robust: when the interest rate variable is changed, the t-value of the coefficient of portfolio investment is no longer significant. Both types of investment seem to reduce the interest level and support an appreciation of the nominal effective exchange rate in Hungary. Other model specifications, which included the aggregated financial account, performed substantially worse. There is no significant relationship between the financial account and the inflation rate.

Figure 2
VAR impulses to indicators' shocks in Hungary



These effects are, incidentally, in accordance with the experiences of other countries (see Christoffersen and Wescott (1999) and Calvo et al. (1993)).

4. Impact of capital inflows on financial stability

4.1 Theoretical considerations

Capital flows can pose a threat to financial stability via two main channels: first, capital flows may cause an excessive real appreciation of the exchange rate and, second, they may produce a currency and maturity mismatch of assets and liabilities in the financial sector. While the first channel is relevant for both flexible and fixed exchange rate systems the second is decidedly more relevant for fixed exchange rate systems. Such a system encourages borrowing at lower interest rates in foreign currency as long as the exchange rate target of the central bank remains credible, and this may result in high open foreign exchange positions of banks (i.e. a currency mismatch of assets and liabilities) and firms. Even when capital inflows take the form of purchases of domestic currency-denominated assets by foreigners rather than borrowing in foreign currency capital, inflows pose additional risks for financial stability. As explained above, under conditions of full capital mobility, the central bank has no control over the monetary base under fixed exchange rates. If the monetary base increases because

of capital inflows, broader monetary aggregates will expand more than the amount of initial inflows because of the money multiplier. Thus, there will be a rise in the ratio of M2/ official reserves, which implies that the gap between liquid domestic assets (which could be converted into foreign currency-denominated assets) and the stock of foreign exchange available for meeting this demand grows. Although this problem can be mitigated through the use of higher minimum reserves, it cannot be avoided altogether.

Under conditions of less than full capital mobility, when sterilisation is partly effective, there are still some unwanted side effects. Beside the fiscal costs of sterilisation, the structure of capital inflows is likely to change in response to sterilisation operations. Montiel and Reinhart (1999) find evidence for a change in the composition of capital inflows in favour of short-term and portfolio flows as a result of sterilisation operations. At fixed exchange rates, capital inflows also tend to increase maturity mismatches in the banking sector, as foreigners' deposits with domestic banks will often have shorter maturities than the credits which are funded by the deposits.

In the light of the preceding discussion, a floating exchange rate system seams a preferable solution. It certainly has the big advantage that it does not encourage quasi-arbitrage between domestic and foreign interest rates, which would increase the fragility of the financial system. However, a floating regime is not entirely free from complications either. White (1999) gives a good overview of challenges for central banks which arise from the adoption of a floating exchange rate/direct inflation targeting framework. For transition economies, the issue of exchange rate overshooting seems to be of particular relevance. The expectation of large FDI inflows as a result of privatisation projects might also attract short-term inflows, which could lead to an overvaluation of the exchange rate. Beside the negative impact of an exchange rate misalignment on the real sector, strong expectations of exchange rate appreciation could induce banks and businesses to borrow excessively in foreign currency.

4.2 Development of economic and financial indicators

Given that we defined financial stability as the absence of financial crises, we analyse variables which are associated in the literature with financial crises. Kaminsky et al. (1998), who conducted extensive studies of a large number of balance of payments crises, identify the real exchange rate, banking crises, exports, stock prices, M2/reserves and output as the most reliable leading indicators of balance of payments crises. The real exchange rate, stock prices, the M2 multiplier, output and exports are mentioned by Reinhart (1999) as the most successful "predictors" of banking crises. As there are neither adequate time series of these indicators nor enough observations of crises available in CEECs, the empirical testing of the relevance of these indicators for transition countries is impossible at present. Thus, we have to stick to the presentation of "stylised facts" of the development of a set of indicators of financial vulnerability which is based on the findings of Kaminsky et al. (1998) and Reinhart (1999). We divided our set of financial indicators into two groups, monetary and real variables. The first group of variables should be expected to reflect credit booms and asset bubbles fuelled by the strong money supply growth resulting from capital inflows. The second group tends to mirror symptoms of the excessive real appreciation of the exchange rate.

4.2.1 Monetary variables: M2/reserves, short-term debt/reserves, stock prices

When the reforms began, the Czech Republic and Poland had to cope with very low levels of international reserves, resulting in high M2/reserves ratios. In about 1993, CEE central banks started to sterilise capital inflows, resulting in a sharp fall in this ratio until 1995. By then, international reserves had accumulated to a level deemed sufficient and – as stated before – the management of continuing capital inflows from the viewpoint of monetary and financial stability became an important issue in the accession countries. Apart from Slovenia,[8] all countries had started to follow a strategy of exchange rate targeting by that time, and steps to liberalise the capital account had been taken, with the

[8] Slovenia pursues a policy of monetary targeting but pays strong attention to exchange rate developments. Thus, in practice this policy comes close to a strategy of exchange rate targeting.

Czech Republic leading in this respect. In the next two years, this ratio again worsened markedly in Hungary and the Czech Republic, albeit starting from a low level. Although this indicator did not seem to have reached an alarming level by 1997,[9] the Czech Republic experienced a currency crisis. Thus, a capital inflow-driven credit boom does not seem to be the main cause of the crisis in the Czech Republic. Comparing a measure of liquid domestic assets such as M2 with the amount of foreign assets available in the economy to satisfy the demand for domestic assets if there is a run on the currency may yield insights into the severity of an exchange rate correction in the event of a loss of credibility. This could explain why the fall of the Czech koruna was fairly limited and why the currency crisis did not develop into a twin crisis.[10]

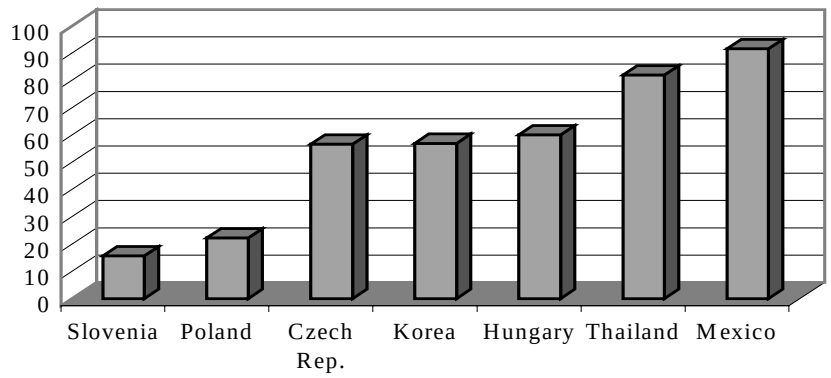
Table 7
M2/reserves

	Czech Republic	Hungary	Poland	Slovenia
1993	6.20	2.59	6.12	4.16
1994	4.98	2.65	5.26	3.30
1995	2.79	1.40	2.82	3.54
1996	3.30	1.78	2.64	3.08
1997	3.60	2.05	2.43	2.20
1998	3.38	1.97	2.30	2.51

Note: Since 1998, Hungary has not published figures for M2; the 1998 figure is based on the ratio of M2/M3 in 1997.

Sources: WIIW monthly reports; National Bank of Hungary.

Figure 3
Ratio of outstanding short-term debt to international reserves
In per cent, at end-1998



Sources: BIS; IMF *International Financial Statistics*.

While Reinhart's (1999) set of financial indicators includes the M2 multiplier, we include the ratio of short-term debt/reserves instead. Except for Poland, which experienced a noticeable growth trend of the M2 multiplier in the 1990s, in our view the development of this indicator does not yield many

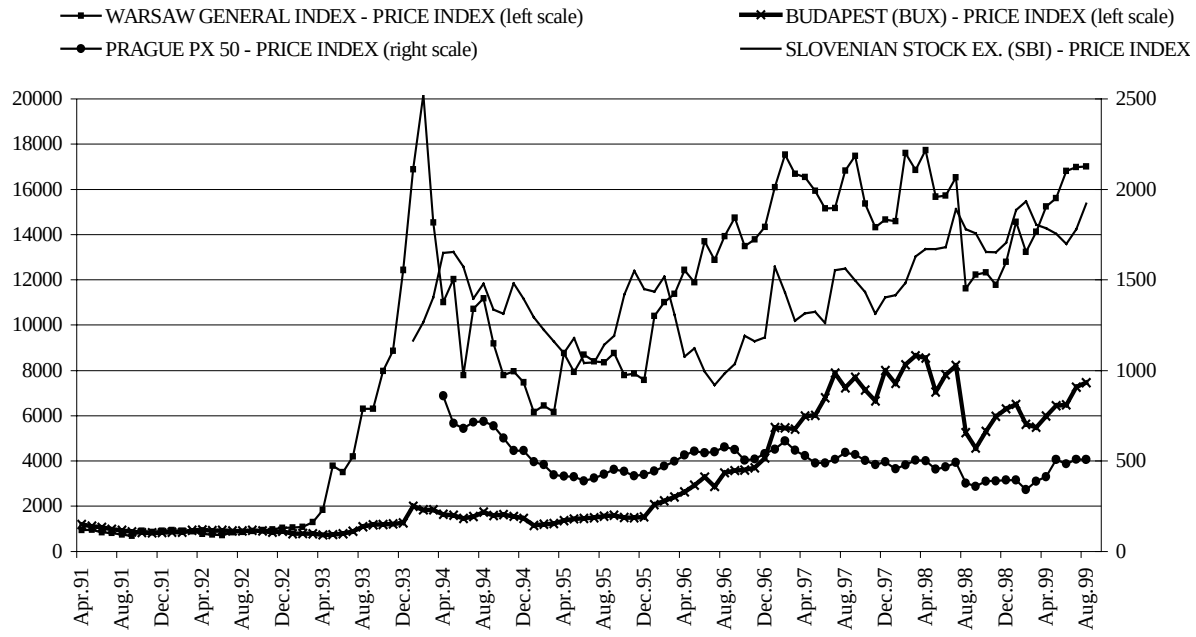
[9] Before the onset of the crisis, Korea's and Mexico's M2/reserves ratios reached levels of 6 to 7.

[10] Obviously, the Czech banking system has problems but they are a consequence of poor lending practices rather than exchange rate losses.

insights for our purposes. As Reinhart's (1999) investigations focus on the *evolution* of selected variables, the ratio of short term debt/reserves might not fit the author's concept. However high *levels* of short term debt/reserves are associated with several recent crisis experiences (Thailand, Korea, Mexico, Russia). Thus, the level of this ratio might be relevant for the analysis of the vulnerability of the financial system. Generally, low levels of this ratio seem to reflect the limited vulnerability of accession countries to sudden outflows of short-term funds. It also confirms the view that CEE banks have not borrowed aggressively abroad to fund domestic credits.

Source: Datastream.

Figure 4
Regional stock indices



Stock prices fell significantly before the Czech currency crisis, but even sharper falls had occurred in 1994 and after the crises in Asia and Russia. The bubble observed in Poland and the Czech Republic in 1994 was a result of the underdeveloped state of the stock market and had little effect on the banking sector and the economy as a whole. Although the market capitalisation and the liquidity of accession countries' equity markets have improved markedly, their role for the economy as a whole is probably still fairly unimportant. However, falls in CEE stock indices as a result of poor profitability of banks (which are heavily weighted in the indices) and large corporations might signal problems for the banking sector.

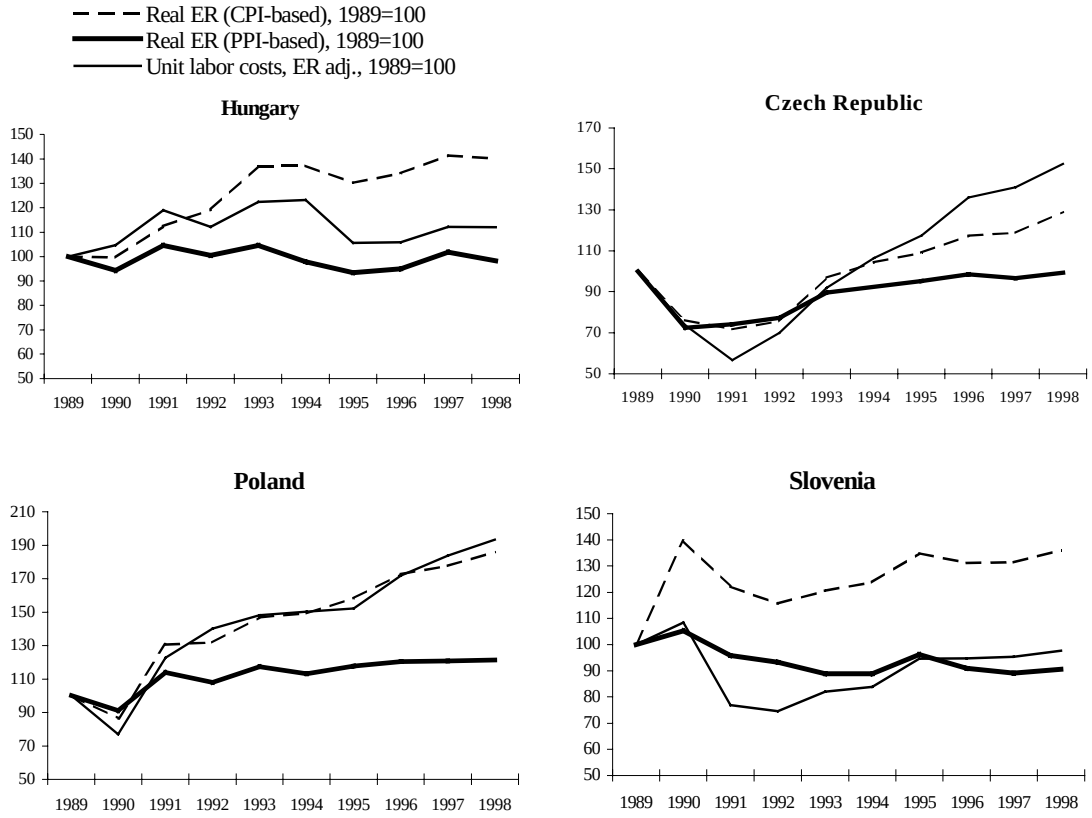
4.2.2 Real variables: real exchange rate, export volumes, output

Empirical studies by Halpern and Wyplosz (1997) and Krajnyak and Zettelmeyer (1997) that attempt to estimate equilibrium dollar wages for transition countries point to significant undervaluations of exchange rates[11] at the beginning of transformation. In the meantime, all regional currencies have appreciated significantly in real terms (on the basis of consumer prices), which raises the question of whether real appreciation might have gone too far. Things are complicated by the fact that equilibrium exchange rates are likely to appreciate during the transformation process. We would like to repeat some of the arguments put forward by Halpern and Wyplosz (1997) stating why this should be the

[11] Slovenia is an exception in this respect. However, Halpern and Wyplosz (1997) calculate equilibrium wages for Slovenia on the basis of data for former Yugoslavia, which is clearly problematic.

case: first, when formerly highly inefficient economies begin to respond to market forces, large gains in productivity can be expected. In parallel, a reduction of the sizeable industrial and agricultural sectors will take place, while the service sector (banking and finance, marketing, etc.) should grow strongly. When incomes begin to grow, demand for non-tradables rises, resulting in real appreciation. Second, if productivity gains in the tradables sector outperform productivity gains in the non-tradables sector, a real appreciation takes place according to the Balassa-Samuelson effect. Although this might appear contradictory to the previous argument, these effects are not mutually exclusive and may occur together or sequentially. Third, in planned economies natural resource prices and prices for public utilities were commonly set below market prices, leading to low non-tradables prices. These prices were raised gradually, resulting in real appreciation. Finally, improvements in product quality and better marketing should contribute to an improvement in the terms of trade.

Figure 5
Real exchange rates and unit labour costs

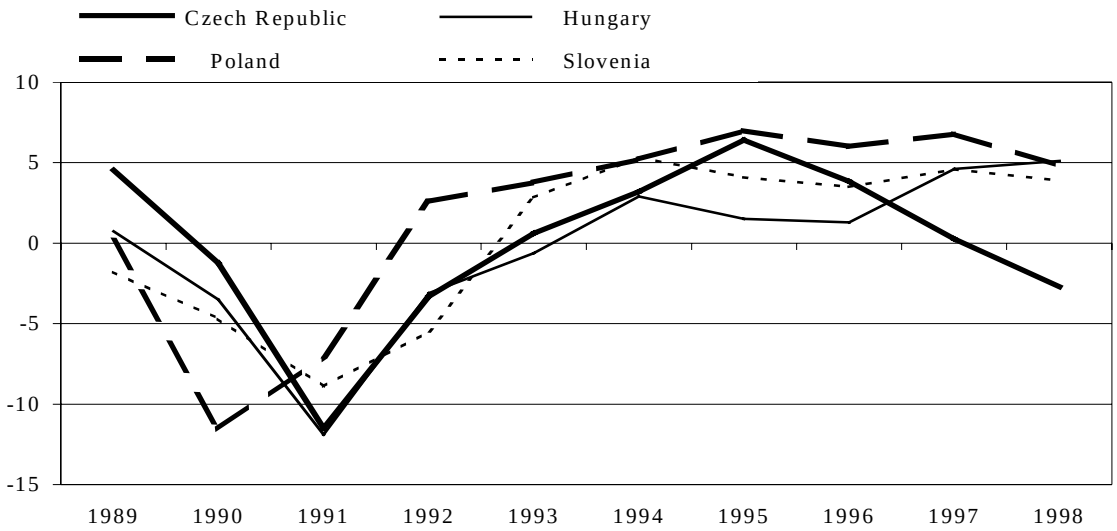


Source: Havlik (1999).

All countries in our sample except for Poland show a fairly uniform appreciation of the real exchange rate on a CPI basis of about 30% to 40% between 1989 and 1998. In the case of Poland, the appreciation amounted to 85%. Consistent with the arguments presented above, the real appreciation on the basis of the CPI (which has a much higher content of non-tradables) is significantly more pronounced than the appreciation on a PPI basis. In 1998, the Czech Republic and Hungary approached the PPI-based real exchange rate levels of 1989, while Slovenia continued to remain below the 1989 level. Poland proved to be an exception once more, with a real appreciation of more than 20%. As real exchange rates on a PPI basis (which represent the tradables sector better than the exchange rates on a CPI basis do) did not appreciate much against the currency of the most important trading partner, the European Union, there seems to be little danger of an exchange rate misalignment.

The analysis of unit labour costs yields a more mixed picture, however. Slovenia and Hungary experienced only small rises in exchange rate adjusted (ECU-based) unit labour costs of 6.8% and 12.2% respectively, whereas unit labour costs in Poland and the Czech Republic shot up by 108% and 56% respectively. Several observations seem to confirm the high relevance of unit labour costs for explaining trade and current account deficits: first, Slovenia, which experienced the smallest rise in exchange rate adjusted unit labour costs, has traditionally had a balanced current account or even surpluses. Second, episodes of very large current account deficits (Hungary 1994, Czech Republic in 1996) occurred after sharp rises in exchange rate adjusted unit labour costs. At first glance, the massive rise in Polish exchange rate adjusted unit labour costs, which did not cause severe macroeconomic imbalances up to 1998, may appear difficult to explain. However, by far the largest rise in unit labour costs occurred in 1991, which caused a marked erosion of the previous trade balance surplus. Nevertheless, the current account remained in check as a result of the debt relief granted to Poland. This debt relief caused a rise in the equilibrium exchange rate, as it reduced the need to achieve surpluses in the trade balance in order to service its foreign debt. Second, trade in US dollars, and in particular trade with CIS states, is more relevant for Poland than for the other countries covered in this paper. Approximately 16% of (classified) Polish exports went to CIS countries before the Russian crisis.[12] As the Russian rouble's real appreciation before the crisis was in excess of the real appreciation of the Polish zloty, Poland's trade-weighted (effective) exchange rate appreciated less than the ECU-based rate before the Russian crisis. As a result, until the outbreak of the Russian crisis there were no visible symptoms of an overvalued exchange rate in Poland. However, if one perceives the loss of the CIS export markets for Poland as permanent (at least for the medium term), the possibility exists that the zloty became overvalued at the end of 1998.

Figure 6
Real GDP growth
Annual percentage changes

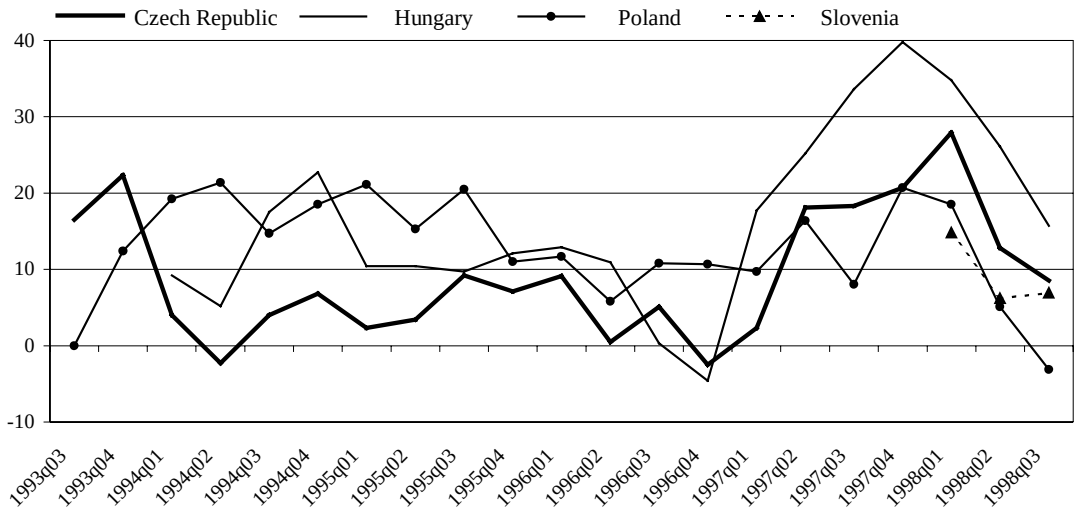


Source: WIIW monthly reports.

Output and export dynamics also support the view that no exchange rate misalignment occurred in Poland until 1998, while in the Czech case symptoms appeared which might point to a misalignment of the Czech koruna under short-run considerations. Before the Czech koruna's devaluation in 1997, Czech exports markedly lagged Polish exports, whereas the situation reversed after the devaluation of the Czech currency. GDP growth rates paint the same picture: continued high GDP growth rates in Poland contrasted with slowing growth rates and rising current account deficits in the Czech Republic before the Czech currency crisis.

[12] Poland's surplus in unclassified trade was also reduced significantly by the Russian crisis.

Figure 7
Export volume growth
Annual percentage changes



Source: Eurostat.

5. Implications for monetary and financial stability

When drawing conclusions for the conduct of monetary policy from our results, one must take into account the limits of the study, in particular the shortness of the time series and possible effects of structural changes in the transition economies covered. Bearing these caveats in mind, we consider the results of our VAR model for Hungary to be fairly encouraging. As mentioned before, the variance of the first differences of the CPI can be attributed to a large degree by the explanatory variables. There seems to be a fairly robust relationship between the development of the nominal exchange rate and the inflation rate, whereas the statistical link between nominal interest rates and inflation seems to be much weaker. Thus, this result provides support for the strategy of exchange rate targeting Hungary pursued throughout the sample period.[13] As interest rates are set in accordance with the exchange rate target and thus play a rather passive role, one would expect the exchange rate development to have a stronger impact on inflation than interest rates would. However, throughout the sample period Hungary had restrictions on capital movements in place which provided the National Bank of Hungary with some leeway in its interest rate policy notwithstanding the exchange rate target. As a result, ex ante, the possibility of a relationship between interest rates and the inflation rate might be considered. However, it is not certain that a statistically significant relationship between exchange rate variables and inflation can be found, as the exchange rate's role as a nominal anchor might be disturbed, for example by the process of price liberalisation. Our findings of a poor (statistical) link between interest rates and inflation on the one hand, and a fairly good linkage between the exchange rate and inflation on the other hand are in accordance with Christofferson and Wescott's (1999) results for Poland.

Our results suggest that, while Hungary sterilised capital inflows to a relatively high degree, it did not manage to prevent capital flows from having a certain effect on the inflation rate. The VAR model as well as the Granger causality test provide evidence for an impact of FDI on the inflation rate. Although the negative relation between portfolio inflows and the change in consumer prices would indicate a dampening effect of portfolio inflows on the inflation rate, this result should be treated with

[13] Since 1995, Hungary has pursued a "crawling peg regime". Before the introduction of this system, Hungary had applied a policy of devaluations on an irregular basis.

some scepticism. First, it is contrary to theoretical expectations and, second, the relation is statistically not robust. As FDI inflows appear to be related to the inflation rate although this is not the case for the financial account as a whole, one may conclude that FDI causes some demand-driven inflation, whereas the danger of a credit boom as a result of a large total inflow amount channelled through the banking system seems to be rather limited. This would suggest that growth in monetary aggregates is a weak link between capital inflows and inflation.

The levels and dynamics of financial indicators presented in this paper point to a relatively moderate vulnerability of the CEECs to financial crises at present. Few signs of a worsening of the indicators which seem to be caused by increasing financial integration could be detected. This overall positive assessment is supported by the relatively limited impact of the Russian crisis on the more advanced CEECs. On the contrary, there is no definitive answer as to how far the indicators applied in this study were able to "predict" the balance of payments crises in Hungary in 1994/95 and in the Czech Republic in 1997. However, it seems fair to conclude that the development of exchange rate adjusted unit labour costs was a relevant indicator in both cases. While the Hungarian crisis occurred under conditions of limited integration into international financial markets, the question of to what degree the advanced state of integration of the Czech Republic contributed to the Czech crisis cannot be fully answered. Among the indicators which we presented in this paper, the "real variables" reflect the problems in the Czech economy better than the "monetary variables". If improper intermediation of capital inflows were the main factor behind the crisis, the "monetary indicators" should look worse. Thus, we would draw the conclusion that excessive real appreciation (measured by exchange rate adjusted unit labour costs) in the run-up to the crisis is more relevant for explaining the Czech currency crisis. However, the question of whether capital inflows contributed to the worsening of exchange rate adjusted unit labour costs in the run-up to the crisis remains open.

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