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*The paper shows that seigniorage income in relation to GDP is usually higher in the acceding countries than in the euro area. This difference results from the acceding countries' higher monetary base in relation to GDP and the fact that required reserves are remunerated below market rates.*

*Appreciations and depreciations of the domestic currencies have a significant impact on seigniorage. Seigniorage is expected to decrease somewhat in the coming years. Even though an expansive monetary policy could increase nominal seigniorage revenue, more than the gain on seigniorage would, in that case, be spent on higher debt servicing costs. Euro area membership would probably increase the acceding countries' seigniorage revenues and would be disadvantageous for incumbent members.*

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The views expressed are those of the authors and need not necessarily coincide with the views of the Oesterreichische Nationalbank.



The EU enlargement process has entered its final stages. The outcome of the EU accession referendums was positive in all acceding countries, and now the national parliaments of the incumbent EU Member States are called on to complete the process of ratifying the accession treaties. On May 1, 2004, the ten acceding countries will become new Member States of the European Union.

This enlargement process was the core topic of the Oesterreichische Nationalbank's East-West Conference in early November 2003. The major economic factors and economic policy measures enhancing transition, catching-up and a range of integration processes were reviewed under the title "The Economic Potential of a Larger Europe – Keys to Success." Two of the best-known academics in this field, Barry Eichengreen and Charles Wyplosz, presented their views on the appropriate path of monetary integration and the political future of the EU.

At the eve of the opening of the East-West Conference, the new premises of the Joint Vienna Institute (JVI), which are jointly provided by the Austrian Ministry of Finance and the Oesterreichische Nationalbank, were inaugurated. On this occasion, Pamela Bradley, Director of the JVI, and the representatives of the cosponsoring Austrian authorities – Karl-Heinz Grasser, Minister of Finance, and I – had the pleasure to welcome, among others, Horst Köhler, Managing Director of the IMF, and Gertrude Tumpel-Gugerell, member of the Executive Board of the European Central Bank. The new premises are part of the agreement with the International Monetary Fund (IMF) to prolong the activities of the JVI in Austria in recognition of the ongoing great need for education and training especially in those Eastern and Southeastern European countries that will not become part of the enlarged European Union in 2004. The new premises will underpin the JVI's efforts to support the transformation process by building up human capital.

Many high-ranking representatives of international institutions that support the JVI joined this opening event. As capacity building and human resources are definitely crucial to the success of catching-up and EU enlargement, these representatives' comments were also highly appreciated at the East-West Conference. Among others, IMF Managing Director Köhler and EBRD President Lemierre enriched the debate.

At the East-West Conference 2003, representatives of the central banks of the acceding countries were invited to present their countries and their banks; to this end, they brought with them large amounts of impressive audiovisual material from all corners of Europe. The traditional gala dinner was truly a feast for the eyes and ears, with both excellent music performances and tasty specialities typical of the new member countries. Befitting the occasion, Gertrude Tumpel-Gugerell held the dinner speech. In her former position as Vice Governor of the Oesterreichische Nationalbank, Gertrude Tumpel-Gugerell supported the EU enlargement process by giving top priority to analyses and research in this field. For more detailed information on the conference, please check the summary of the East-West Conference in this volume of Focus on Transition.

Most studies in this volume have as their theme one of the most important topics for the future of the acceding countries, namely monetary integration. After having become EU members, the acceding countries will in the long

run have to adopt the euro – the key questions are when and how this should happen. Without any doubt, the countries will have to meet the Maastricht convergence criteria, in particular the exchange rate criterion, which makes issues related to ERM II (exchange rate mechanism II) the focus of the current debate. Recently, the European institutions most deeply involved in the issues of monetary integration, i.e. the European System of Central Banks (ESCB), the European Commission and the Ecofin Council have started to publicly communicate their positions on ERM II participation as well as on the interpretation and application of the exchange rate criterion. The key word is “equal treatment,” which means that newcomers will have to fulfill the same conditions as countries which have already adopted the euro.

From an economist’s point of view, the answers to the key questions are not so clear-cut. It is not an easy task to determine the optimal entry date for ERM II participation and the optimal central rate to the euro at that date, or to design and implement the appropriate monetary and exchange rate policy before and during ERM II participation. This volume of Focus on Transition provides a first general review of the status quo of the relevant economic theory and empirical research and lists the pros and cons closely related to the questions raised above. Most of the studies were written by economists of the Foreign Research Division, some of them in coauthorship.

The broad range of contributions starts with a literature survey by Balázs Égert that provides a comprehensive overview of different theoretical and empirical approaches to the assessment of equilibrium exchange rates. This careful evaluation of the existing literature concludes by identifying the areas that require further research. The second study, by Balázs Égert and Kirsten Lommatzsch, contributes to filling part of this research gap. The focus of this study is on the sustained appreciation of the tradable price-based real exchange rate in the acceding countries. The authors develop and empirically test a theoretical model that aims to explain at least part of this appreciation as an equilibrium phenomenon driven by productivity and quality advances. The third study, authored by Jesús Crespo-Cuaresma, Jarko Fidrmuc and Ronald MacDonald, highlights the monetary approach to the exchange rate. Various panel cointegration estimators are used to estimate a variant of the monetary model of the exchange rate using data from six acceding countries. The fourth contribution is more policy-oriented: Balázs Égert, Thomas Gruber and Thomas Reininger analyze the challenges for EU acceding countries’ exchange rate strategies after EU accession and the implications of ERM II participation. The authors devote special attention to the asymmetric application of the exchange rate criterion. Finally, János Kun, who used to work in the Foreign Research Division, provided a study about seigniorage in the acceding countries. After assessing the current size of seigniorage revenues, the author discusses possible implications of the future monetary integration process for the volume of such revenues.

In addition to these economic studies, this issue of Focus on Transition contains a chapter on recent economic developments in selected Central and Eastern European countries, namely the Czech Republic, Hungary, Poland, the Slovak Republic, Slovenia and Russia, and reports on recent activities, with the 50<sup>th</sup> anniversary East Jour Fixe as a special highlight.

Finally, I am pleased to announce the launch of our newly established Internet platform at *ceec.oenb.at*, which provides the most recent data, analyses, publications, and – last but not least – a list of upcoming events related to the OeNB's research activities on Central and Eastern Europe.

If you have any comments or suggestions about this publication, please contact:

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Klaus Liebscher  
Governor

Silvia Kirova

## The Oesterreichische Nationalbank Has Launched a New Website

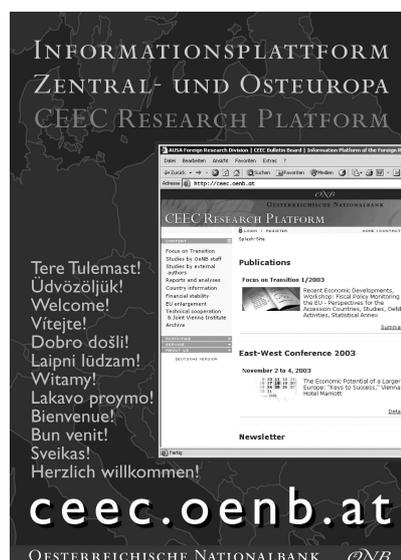
At the East-West Conference of the OeNB which took place from November 2 to 4, 2003, in Vienna, Josef Christl, member of the OeNB's Governing Board, announced the launch of the "Central and Eastern European Countries (CEEC) Research Platform."

The Oesterreichische Nationalbank sees giving the public access to topical information and high-quality research on Central and Eastern European countries and on the challenges related to transition and catching-up as one of its major tasks. The launch of this website reflects the Oesterreichische Nationalbank's commitment to further enhancing the public and academic understanding of the process of accession as well as of economic, monetary and financial integration. May 1, 2004, is not only the end of the accession process for ten new EU member countries, but also the start of a new era that we will observe closely with our research. Moreover, the research on the website extends to other countries in addition to the ten new Member States.

You can find the following material on our website:

- "Focus on Transition," the OeNB's publication on Central and Eastern Europe edited by the Foreign Research Division. The archives contain all electronically available back issues;
- Studies published by the OeNB's staff in OeNB publications and in external publications related to the process of economic transition, integration and catching-up in particular in the CEE countries;
- An in-depth analysis of the economic developments in the Czech Republic, Hungary, Poland, the Slovak Republic, Slovenia and Russia;
- Statistics providing an overview of countries and of economic indicators;
- Informative reports and studies on financial stability in various CEE countries and on the economic impact of the EU enlargement in the rubrics Financial Stability and EU Enlargement;
- Information about the technical cooperation activities with transition countries in Central and Eastern Europe, the western Balkans and the CIS republics;
- Schedule and reports on the OeNB's CEE-related activities, such as the East-West Conference, the East Jour Fixe, workshops, seminars, lectures;
- The service part of our website with valuable links, subscription to e-mail alerts and a dialogue forum where you can post your contributions. You can send your inquiries or proposals directly to the CEEC team at [ceec@oenb.at](mailto:ceec@oenb.at); and
- More information about the CEEC Analysis Unit of the OeNB's Foreign Research Division and the staff members.

The CEEC Research Platform is available in German and English. We hope that you will find this new website useful and that you will take advantage of the opportunity to stay in touch with us. Click on <http://ceec.oenb.at>.



# RECENT ECONOMIC DEVELOPMENTS

Compiled by  
Antje Hildebrandt<sup>1</sup>

## I Introduction

In the first half of 2003 real GDP growth rates in the Central European acceding countries ranged between 4.0% in the Slovak Republic and 2.2% in Slovenia. Economic growth thus continued to be robust and far higher than average growth in the European Union itself. With the exception of Poland and the Slovak Republic, private consumption was the mainstay of the economy. In Poland both private consumption and net exports made major contributions to growth. In Slovakia a strong improvement in net exports more than offset a steep decline in private consumption growth. The performance of gross fixed capital formation was largely sluggish. The first half of 2003 saw gross fixed capital formation contract in Poland, the Czech Republic and the Slovak Republic and stagnate in Hungary. Only Slovenia posted significantly stronger year-on-year growth in gross fixed capital formation.

Consumer price trends were very uneven in the five Central European countries. Owing to an increase in administered prices in early 2003, Slovakia led the pack with an inflation rate of 7.8% in the first half of 2003 (year on year). In the Czech Republic, by contrast, prices slipped by 0.2%. Except in Slovenia, inflation rates advanced once more by the end of the third quarter of 2003, and the deflationary trends in the Czech Republic also came to a halt. This was partly attributable to a rise in food and energy prices, but also to a further liberalization of administered prices and tax increases.

In 2003 (full year) all Central European acceding countries (except for Slovenia) will far exceed the budget deficit ceiling of 3%, standardized for the “excessive deficit procedure” in accordance with the Treaty establishing the European Community. To comply with this limit and to control the momentum of public debt, fiscal reforms, household consolidations, tax reforms and the restructuring of the social security systems are top priorities in these countries. For instance, Slovakia is planning to introduce a flat rate tax of 19% for households in early 2004 and at the same time to increase the tax allowance. Moreover, the reduction in corporate tax rates in several acceding countries is designed to revive investment and to further increase foreign direct investment (FDI) after accession to the EU.

In the first half of 2003 all Central European acceding countries reported a current account deficit. Only in the Czech Republic and Slovakia were net inflows and direct investment sufficient to offset fully the current account deficit. EU accession, as scheduled for May 2004, will be a key determinant for future trends in the balance of payments subaccounts of these countries.

In September 2003 final referendums on EU accession were carried out in the acceding countries, with the majority of the population in all countries clearly voting for accession. Now the acceding countries only need to ratify the Accession Treaty, with the following countries having already notified the EU Council of Ministers of the ratification: Malta (July 29), Poland (August 5), Cyprus (August 6), Slovakia (October 9) and Lithuania (October 10).

In early November 2003 the European Commission published its Monitoring Report on the implementation of the acceding countries’ commitments (made in the accession negotiations) regarding the *acquis communautaire*.

<sup>1</sup> Stephan Barisitz, Jarko Fidrmuc, Antje Hildebrandt, Thomas Reiningger, Tobias Schweitzer, Zoltan Walko.

Table 1

**Schedule of Referendums on EU Accession<sup>1)</sup>**

Date	Country	Approval %	Turnout
March 8	Malta	53.6	91.0
March 23	Slovenia	89.6	60.3
April 12	Hungary	83.8	45.6
May 10 to 11	Lithuania	91.0	63.3
May 16 to 17	Slovakia	92.5	52.2
June 7 to 8	Poland	77.5	58.8
June 13 to 14	Czech Republic	77.3	55.2
September 14	Estonia	64.0	66.8
September 20	Latvia	72.0	67.0

Source: European Commission.

<sup>1)</sup> The government of Cyprus does not plan to hold a referendum.

The report notes that the acceding countries have made considerable progress in adopting the EU's *acquis communautaire*. However, it also listed a series of deficits present in these future Member States.

The report pointed to shortcomings that could have detrimental effects on other Member States, e.g. in the area of food standards. It also emphasized, however, that failure on the part of an acceding country to implement EU provisions could have negative consequences for the country itself. For instance, all acceding countries need to step up their efforts to establish the necessary agencies which have enough muscle to transfer EU funds to farmers under the Common Agricultural Policy (CAP). In particular, acceding countries needing to catch up in this respect are Malta, Poland, the Slovak Republic and Hungary. Most acceding countries still need to take action on harmonizing legislation for the mutual recognition of proof of professional qualifications.

Progress reports for the acceding and candidate countries Bulgaria, Romania and Turkey were also published by the European Commission in early November 2003. So far only Bulgaria has been recognized as a functioning market economy. Romania, by contrast, needs to take more resolute action in expediting progress already achieved to date. According to the European Commission, Turkey still has a long way to go before it can attain the standards of a functioning market economy.

In Russia real GDP growth in the first half of 2003 accelerated to 7.0% year on year. Internal demand is the main driving force, with a sharp increase in gross capital formation standing out, in particular (+12.1% in the period from January to September). This surge is attributable to continued high levels of world market prices for energy and commodities as well as to the strong expansion of bank loans to enterprises. In addition, FDI grew thanks to the positive effects of past reform efforts and to greater overall political stability under President Putin (despite the latest events). Buoyed by both increases in public sector wages (from a modest base) and adjustments of pensions, consumer spending also expanded. There was only a slight fall in year-on-year CPI inflation, from 15.1% in December 2002 to 13.1% in October 2003. The federal budget in the first eight months of 2003 was marked by a surplus of 2.7% of GDP on a pro rata basis. The current account surplus in the first nine months of 2003 amounted to some 10% of pro rata GDP. In view of the forthcoming parliamentary and presidential elections, the pace of structural reform slowed down in the previous year. The arrest of Mikhail Khodorovsky, CEO of the Yukos Group, at

the end of October led to uncertainty in business circles and to a sharp tumble on the Moscow stock exchange. Investment could be jeopardized by this insecurity, and capital flight abroad threatens to assume greater proportions once again.

## 2 Czech Republic: An End to Falling Prices

Real GDP growth in the Czech Republic was 2.3% in the first half of 2003 (2002: +2.0%). As in 2002, final consumption was the main engine for growth, with private consumption and public consumption rising by 4.9% and 1.3%, respectively. The robust growth of private consumption is traceable to the sharp increase in real wages (+7.2% in the first half of 2003) and to historically low interest rates. By contrast, the change in gross fixed capital formation in the first six months had a slightly dampening effect on economic growth, as did the performance of net exports. It is noteworthy that 1.2 percentage points of economic growth resulted from the change in inventories.

Table 2

<b>Gross Domestic Product and Its Demand Components</b>						
	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
	<i>Real year-on-year change in %</i>					
Gross domestic product	0.5	3.3	3.1	2.0	1.6	2.3
Private consumption	1.7	2.5	3.6	4.0	3.8	4.9
Public consumption	2.4	- 0.9	5.4	5.6	6.5	1.3
Gross fixed capital formation	-1.1	5.3	5.5	0.7	0.1	-0.3
Exports of goods and services	6.1	17.1	12.2	2.8	1.7	4.6
Imports of goods and services	5.3	16.9	14.0	4.3	5.5	5.9

*Source: Eurostat, national statistical office, OeNB, WIW.*

GDP growth is currently too weak to provide perceptible positive stimuli to the labor market. The rate of registered unemployed was 9.5% in November 2003. Despite active labor market measures that have already been implemented and planned, the unemployment rate will remain around 10% in the medium term as well. This is because restructuring measures still to be implemented in many enterprises could lead to layoffs. High FDI flows have so far only had a minimal impact on employment, as investments were largely in high-tech industries with high levels of labor productivity and consisted partly of mere company acquisitions.

The first half of 2003 was marked by falling consumer prices: The year-on-year inflation rate was only positive in June (0.3%). After prices stagnated in August and September, the highest inflation rate since December 2002 was then posted in October (0.4%). Falling prices for foodstuffs and nonalcoholic beverages were primarily responsible for these price trends. Slightly positive inflation is expected in full-year 2003 on the back of alcohol and tobacco tax increases. Inflation is thus clearly below target, which was 3% to 5% in January 2002 and will fall steadily to 2% to 4% by December 2005.

For the third time in 2003, the Czech central bank cut its key interest rate – the two-week repo rate – by 25 basis points to 2.0% at the end of July. The main reason given for this trim in interest rates was the continued low risk of inflation.

Table 3

**Labor Productivity, Wages, Producer Prices and the Exchange Rate**

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Year-on-year change of period average levels in %</i>						
Gross production of industry (real)	-3.1	5.4	6.7	4.9	5.3	5.6
Labor productivity of industry (real)	3.6	9.1	6.1	6.8	7.8	7.8
Gross average wage of industry (nominal)	6.6	7.1	6.4	6.7	6.5	5.2
Unit labor cost of industry (nominal)	3.0	-1.8	0.3	-0.1	-1.2	-2.4
Producer price index (PPI) of industry	1.0	4.9	2.9	-0.5	-0.9	-0.7
Consumer price index (CPI)	2.1	3.9	4.7	1.8	0.6	-0.2
Exchange rate (nominal):						
CZK <sup>1)</sup> per 1 EUR, + = EUR appreciation	2.0	-3.4	-4.3	-9.5	-9.0	1.5
EUR per 1 CZK, + = CZK appreciation	-1.9	3.6	4.5	10.6	9.9	-1.5
<i>Period average levels</i>						
Key interest rate per annum (in %)	6.8	5.3	5.1	3.5	3.0	2.5
Exchange rate (nominal):						
CZK <sup>1)</sup> per 1 EUR	36.88	35.61	34.07	30.82	30.56	31.55
EUR per 1 CZK	0.0271	0.0281	0.0294	0.0324	0.0327	0.0317

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIW.

<sup>1)</sup> CZK: Czech koruna.

From mid-July to mid-September the Czech koruna hovered above CZK/EUR 32.0, having fluctuated around CZK/EUR 31.5 since the start of the year. This depreciation resulted primarily from uncertainty surrounding the outcome of the parliamentary decision on fiscal reform. Once the fiscal package was approved, the koruna bounced back again, and has seen a slight uptrend ever since.

Table 4

**Key Interest Rate, CPI Inflation and Nominal Exchange Rate****Changes against the Euro**

	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
<i>%</i>						
Key interest rate (per annum)	5.3	5.3	4.8	3.0	2.8	2.0
CPI inflation (year on year)	2.5	4.0	4.1	0.8	0.6	0.0
Nominal year-on-year change of the exchange rate:						
CZK <sup>1)</sup> per 1 EUR, + = EUR appreciation	2.0	-3.4	-6.4	-11.7	-4.3	7.2
EUR per 1 CZK, + = CZK appreciation	-2.0	3.6	6.8	13.2	4.5	-6.7

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIW.

<sup>1)</sup> CZK: Czech koruna.

The fiscal reform planned for 2004–06 aims to gradually reduce the budget deficit from a projected 7.6% in 2003 to 4.0% in 2006. The deficit is to be reduced largely by implementing measures designed to curb expenditure, e.g. cuts in subsidy payments, moderate increases in public sector wages and health-care and pension savings measures. On the revenues front, measures will focus on raising indirect tax rates (excise taxes, sales taxes). Corporate taxes, by contrast, are to be lowered.

Despite weakening export momentum, the trade balance improved marginally from -2.0% in the first half of 2002 to -1.5% in the first half of 2003. While the year-on-year growth rate of visible goods exports declined from the first half of 2002 to the first half of 2003, that of visible goods imports was relatively stable at a lower level. Similarly, the current account balance shows only minor

differences compared with the same period in the previous year, although the sharp decline in the services surplus is striking. The current account deficit was offset by the inflow of foreign direct investment.

Table 5

<b>Monetary Developments</b>					
	1999	2000	2001	2002	2003 1 <sup>st</sup> half
	<i>Nominal year-on-year change of the annual average stock in %</i>				
Broad money (incl. foreign currency deposits)	9.0	6.4	11.1	6.7	3.1
	<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>				
Net foreign assets of the banking system	13.2	7.8	8.1	7.8	5.6
Domestic credit (net) of the banking system	- 4.8	-1.0	0.0	- 9.8	0.1
<i>thereof: claims on households</i>	0.2	0.3	1.1	1.8	2.6
<i>claims on enterprises</i>	- 4.0	-5.3	-7.2	-13.6	-3.2
<i>claims (net) on general government</i>	0.7	3.9	6.0	2.0	0.7
Other domestic assets (net) of the banking system	0.6	-0.4	3.1	8.7	-2.6

Source: National central bank, OeNB.

Table 6

<b>Government Budget</b>						
	1999	2000	2001	2002	2003	2004
	<i>% of GDP</i>					
<b>General government</b>						
Revenues (ESA 95) <sup>1)</sup>	..	..	42.1	42.4	42.4	43.8
Expenditures (ESA 95) <sup>1)</sup>	..	..	47.1	49.1	50.0	49.7
<i>thereof: interest payments</i>	1.1	1.0	1.2	1.7	1.6	1.3
Balance (ESA) <sup>2)3)</sup>	- 3.7	- 4.0	- 5.5	- 6.7	- 7.6	- 5.9
Primary balance (ESA 95) <sup>2)</sup>	- 2.6	- 3.0	- 4.3	- 5.0	- 6.0	- 4.6
Balance (national methodology)						
Gross debt (ESA 95) <sup>2)</sup>	14.3	16.6	23.3	26.9	30.5	34.2

Source: European Commission, Eurostat, national ministry of finance, OeNB, WIW.

<sup>1)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 2001: PEP 08/2002.

<sup>2)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 1999-2001: Fiscal Notification of the Czech Republic of April 2003.

<sup>3)</sup> The balance given here for 2001 is derived from the Fiscal Notification of April 2003; it may differ from revenue and expenditure as given in the PEP 08/2002.

Table 7

<b>Balance of Payments</b>						
	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	<i>EUR million</i>					
Merchandise exports	24,651	31,509	37,271	40,713	20,285	21,358
<i>Merchandise exports: year-on-year change in %</i>	6.9	27.8	18.3	9.2	9.1	5.3
Merchandise imports	26,448	34,918	40,705	43,034	21,007	21,920
<i>Merchandise imports: year-on-year change in %</i>	4.1	32.0	16.6	5.7	4.7	4.3
<b>Trade balance</b>	- 1,797	- 3,409	- 3,434	- 2,322	- 722	- 563
<i>% of GDP</i>	- 3.5	- 6.1	- 5.4	- 3.1	- 2.0	- 1.5
Services balance	1,130	1,536	1,706	706	603	221
Income balance (factor services balance)	- 1,265	- 1,490	- 2,450	- 4,022	- 1,978	- 1,675
Current transfers	552	403	524	934	186	171
<b>Current account balance</b>	- 1,379	- 2,960	- 3,653	- 4,704	- 1,913	- 1,846
<i>% of GDP</i>	- 2.7	- 5.3	- 5.7	- 6.4	- 5.3	- 5.0
<b>Direct investment flows (net)</b>	5,879	5,356	6,121	9,670	6,766	2,105
<i>% of GDP</i>	11.4	9.6	9.6	13.1	18.8	5.7

Source: National central bank, OeNB.

Since November 2002 the Czech Republic has been rated A1 by Moody's and A- by Standard & Poor's and issued with a stable outlook by both rating agencies.

The privatization process (also of the banking sector) is reaching a conclusion. The government would now like to expedite the sale of government stakes in strategically important enterprises (both network and heavy industries). For instance, the government's 63% holding in Unipetrol was put out to tender again in November 2003. With privatization coming to an end, the dissolution of the National Privatization Fund is also scheduled for end-2005.

Table 8

### Gross Official Reserves and Gross External Debt

	end-1999	end-2000	end-2001	end-2002	2003 end-June <sup>1)</sup>
<i>EUR million</i>					
Gross official reserves (excluding gold)	12,745	13,937	16,261	22,597	22,131
Gross external debt	22,473	22,671	25,153	25,048	23,424
<i>% of GDP</i>					
Gross official reserves (excluding gold)	24.7	25.0	25.5	30.6	30.0
Gross external debt	43.6	40.7	39.4	33.9	31.7
<i>Import months of goods and services</i>					
Gross official reserves (excluding gold)	4.8	4.1	4.2	5.4	5.3

Source: Eurostat, national central bank, OeNB, WIIV.

<sup>1)</sup> % of GDP 2002.

### 3 Hungary: On the Road to Smaller Economic Imbalances

Following GDP growth of 3.3% in the previous year, Hungary posted a growth rate of 2.5% in the first half of 2003. Despite losing steam, private consumption remained the engine of growth – thanks to continued high levels of real wage growth, particularly in the public sector. The loose fiscal policy was reflected in a marked acceleration of public consumption growth. Investment growth, by contrast, was brought to a halt by clearly restricted public sector investment, which was not fully compensated by the pick-up in the private sector. Continued sluggish foreign demand, together with reduced competitiveness due to the appreciation of the real exchange rate during the last two years, was reflected in a dramatic deterioration in net exports.

Labor supply went down despite the slowdown in growth. In the period from July to September, the jobless rate (ILO methodology) fell to 5.7% – below

Table 9

### Gross Domestic Product and Its Demand Components

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Real year-on-year change in %</i>						
Gross domestic product	4.1	5.3	3.9	3.3	3.6	2.5
Private consumption	5.6	5.5	5.7	10.0	10.6	..
Public consumption	1.5	1.9	4.3	2.2	3.2	..
Gross fixed capital formation	5.9	7.5	3.6	6.1	5.4	0.3
Exports of goods and services	12.3	20.9	9.6	3.8	2.3	2.5
Imports of goods and services	13.3	19.1	7.0	6.1	7.6	7.5

Source: Eurostat, national statistical office, OeNB, WIIV.

the level of the comparable 2002 period. Nevertheless, in the private sector gross nominal wage growth was brought into line with lower inflation rates. In the public sector, by contrast, wage growth still remained high (approximately 25% year on year). Over the coming months, it will be a challenge for economic policy to limit nominal wage growth to 7% to 8% (agreed by both sides of the industry), despite strong inflationary pressures anticipated.

Table 10

<b>Labor Productivity, Wages, Producer Prices and the Exchange Rate</b>						
	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Year-on-year change of period average levels in %</i>						
Gross production of industry (real)	10.1	18.5	4.1	2.9	5.0	3.9
Labor productivity of industry (real)	5.1	17.0	5.6	4.7	6.8	6.5
Gross average wage of industry (nominal)	13.4	15.0	14.5	12.4	11.8	9.3
Unit labor cost of industry (nominal)	7.9	- 1.7	8.4	7.4	4.7	2.6
Producer price index (PPI) of industry	5.1	11.6	5.2	- 1.8	- 1.4	0.7
Consumer price index (CPI)	10.0	9.8	9.2	5.3	4.7	4.3
Exchange rate (nominal):						
HUF <sup>1)</sup> per 1 EUR, + = EUR appreciation	4.9	2.9	- 1.3	- 5.4	- 3.8	1.5
EUR per 1 HUF, + = HUF appreciation	- 4.7	- 2.8	1.3	5.7	3.9	-1.5
<i>Period average levels</i>						
Key interest rate per annum (in %)	15.2	11.5	11.1	9.0	9.2	6.9
Exchange rate (nominal):						
HUF <sup>1)</sup> per 1 EUR	252.78	260.06	256.65	242.88	242.25	247.25
EUR per 1 HUF	0.0040	0.0038	0.0039	0.0041	0.0041	0.0040

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIV.

<sup>1)</sup> HUF: Hungarian forint.

Following a slowdown to 3.6% year on year until May, inflation rose to 4.9% in October. Inflation rates are expected to be around 5% for the rest of the year. Administrative price hikes and changes to indirect taxes will give rise to an inflationary push in early 2004, with a peak of some 7% likely to be reached by the end of the first quarter. Given the reasons for the rise in inflation, Magyar Nemzeti Bank (MNB) revised upward its original inflation target for end-2004 from 3.5%  $\pm$  1% to "no higher than 5.5%." In addition, monetary policy focuses on the 2005 target of 4%  $\pm$  1%.

In addition to inflation trends, exchange rate developments are also a key factor for monetary policy. In early 2003, for instance, interest rates were cut by 300 basis points to defend the strong end of the currency band. At

Table 11

<b>Key Interest Rate, CPI Inflation and Nominal Exchange Rate</b>						
<b>Changes against the Euro</b>						
	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
%						
Key interest rate (per annum)	14.3	11.8	9.8	9.5	8.5	9.5
CPI inflation (year on year)	11.2	10.1	6.8	4.6	4.8	4.7
Nominal year-on-year change of the exchange rate:						
HUF <sup>1)</sup> per 1 EUR, + = EUR appreciation	- 0.5	4.2	-6.5	-4.7	-4.6	4.8
EUR per 1 HUF, + = HUF appreciation	0.5	- 4.0	7.0	4.9	4.9	-4.6

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIV.

<sup>1)</sup> HUF: Hungarian forint.

mid-year, the MNB responded to the currency's dramatic softening by hiking the key interest rate by 300 basis points to 9.5%. The resultant widening of the interest rate gap revived the inflow of foreign capital into the bond market, and the forint established itself in the official target corridor of HUF/EUR 250–260 until the end of September. The currency weakened further during October, which was attributable to negative Polish and Russian capital market effects and to the fear that the central bank might respond to the currency's weakness by hiking interest rates. The deepening budget deficit and current account deficit also provided a bleak backdrop.

Table 12

### Monetary Developments

	1999	2000	2001	2002	2003 January–May
<i>Nominal year-on-year change of the annual average stock in %</i>					
Broad money (incl. foreign currency deposits)	17.7	17.4	16.3	9.8	12.1
<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>					
Net foreign assets of the banking system	11.4	9.7	9.0	1.4	0.6
Domestic credit (net) of the banking system	4.8	15.6	9.5	14.9	22.6
<i>thereof: claims on households</i>	1.7	3.1	4.2	6.5	9.4
<i>claims on enterprises</i>	7.4	19.0	12.6	9.0	5.6
<i>claims (net) on general government</i>	– 4.3	– 6.6	– 7.3	– 0.5	7.7
Other domestic assets (net) of the banking system	1.5	– 3.7	– 1.3	– 5.7	– 6.4

Source: National central bank, OeNB.

Following a general government deficit of 9.2% of GDP in 2002, the government is predicting a deficit of 4.8% for 2003. In light of the budget's performance in the first ten months of this year (deficit almost 10% above the level of the comparable period in the previous year), a far higher deficit looks likely, however. The government plans to reduce the deficit to 3.8% of GDP in 2004 by increasing revenues, in particular.

The current account deficit in the first eight months of 2003 has already overshoot the level for the full-year 2002 (4% of GDP), which was primarily traceable to the performance of the goods and services balance. To make mat-

Table 13

### Government Budget

	1999	2000	2001	2002	2003	2004
<i>% of GDP</i>						
<b>General government</b>						
Revenues (ESA 95) <sup>1)</sup>	..	..	46.1	44.5	43.2	44.4
Expenditures (ESA 95) <sup>1)</sup>	..	..	50.2	53.7	48.0	48.2
<i>thereof: interest payments</i>	7.5	5.7	4.9	3.7	3.6	3.4
Balance (ESA) <sup>2)3)</sup>	– 5.6	– 3.0	– 4.7	– 9.2	– 4.8	– 3.8
Primary balance (ESA 95) <sup>2)</sup>	1.9	2.7	0.2	– 5.5	– 1.2	– 0.4
Balance (national methodology)						
Gross debt (ESA 95) <sup>2)</sup>	61.2	55.5	53.4	57.5	57.2	56.3

Source: European Commission, Eurostat, national ministry of finance, OeNB, WIW.

<sup>1)</sup> Data as far as possible according to ESA 95; 2002–04: PEP 08/2003; 2001: PEP 08/2002.

<sup>2)</sup> Data as far as possible according to ESA 95; 2002–04: PEP 08/2003; 1999–2001: Fiscal Notification of Slovenia of April 2003.

<sup>3)</sup> The balance given here for 2001 is derived from the Fiscal Notification of April 2003; it may differ from revenue and expenditure as given in the PEP 08/2002.

ters worse, inflows of net direct investment financed only 8.5% of the deficit. As a result, net foreign debt rose relative to December 2002 by EUR 1.3 billion (from 22.5% to 23.3% of GDP) in the first half of 2003 alone. Net private sector debt grew by almost EUR 2 billion. Unlike in the last few years, in 2004 the Hungarian government is planning to issue foreign currency bonds not only for redemption purposes but also comprising net issues to the tune of some EUR 1.5 billion.

Table 14

<b>Balance of Payments</b>						
	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	<i>EUR million</i>					
Merchandise exports	24,059	31,278	34,697	36,821	18,579	18,029
<i>Merchandise exports: year-on-year change in %</i>	14.3	30.0	10.9	6.1	8.1	- 3.0
Merchandise imports	26,102	34,457	37,193	39,024	19,283	19,676
<i>Merchandise imports: year-on-year change in %</i>	14.8	32.0	7.9	4.9	- 3.7	2.0
<b>Trade balance</b>	- 2,044	- 3,180	- 2,496	- 2,203	- 704	- 1,647
<i>% of GDP</i>	- 4.5	- 6.3	- 4.3	- 3.2	- 2.1	- 4.5
Services balance	834	1,230	1,643	636	240	- 79
Income balance (factor services balance)	- 1,464	- 1,545	- 1,513	- 1,679	- 988	- 947
Current transfers	372	343	399	475	246	295
<b>Current account balance</b>	- 2,301	- 3,152	- 1,967	- 2,771	- 1,205	- 2,378
<i>% of GDP</i>	- 5.1	- 6.2	- 3.4	- 4.0	- 3.6	- 6.5
<b>Direct investment flows (net)</b>	1,658	1,215	2,518	633	441	- 827
<i>% of GDP</i>	3.7	2.4	4.4	0.9	1.3	- 2.3

Source: National central bank, OeNB.

Hungary's rating for long-term foreign debt remained unchanged (Moody's A1, Standard & Poor's A-).

After coming to a standstill last year, privatization activity showed renewed signs of life in the reporting year. In addition to the disposal of holdings in smaller enterprises and the sale of property, the sale of Postabank and Konzumbank should be mentioned. The disposal of a 12% stake in the oil company MOL and the sale of the shipping company Mahart and the steel enterprise Dunafer are scheduled to take place by the end of the year. In addition, the government forecasts privatization revenues of 0.5% of GDP a year for the next two years.

Table 15

<b>Gross Official Reserves and Gross External Debt</b>					
	end-1999	end-2000	end-2001	end-2002	end-2003 end-June <sup>1)</sup>
	<i>EUR million</i>				
Gross official reserves (excluding gold)	10,757	11,883	12,072	9,873	10,745
Gross external debt	29,010	32,093	37,286	38,523	39,895
	<i>% of GDP</i>				
Gross official reserves (excluding gold)	23.9	23.5	20.9	14.1	15.4
Gross external debt	64.4	63.4	64.4	55.1	57.1
	<i>Import months of goods and services</i>				
Gross official reserves (excluding gold)	4.2	3.6	3.3	2.5	2.7

Source: Eurostat, national central bank, OeNB, WIIW.

<sup>1)</sup> % of GDP 2002.

#### 4 Poland: Fiscal Difficulties in an Export-Driven Recovery

In Poland economic growth in the second quarter of 2003 quickened to 3.8% year on year, after rising 2.2% in the first quarter. After 2001 and 2002, which were marked by near stagnation, the first half of 2003 saw a sharp upswing (+3.0%). Private consumption and improved net exports made major contributions to growth while gross fixed capital formation shrank further by 2.6%. However, the rate of contraction of gross fixed capital formation has been decreasing; after 7.5% in full-year 2002, it was 3.6% in the first quarter and 1.7% in the second quarter. Private consumption growth is based primarily on non-wage-related income trends, i.e. on the profits of both the self-employed and enterprises as well as on pensions. Despite the sluggish state of the euro area economy, further declining unit labor costs and continued currency depreciation markedly sped up export growth. Gross fixed capital formation began to expand again in sectors closely related to exports. The fact that the self-employed and enterprises increasingly tend to channel their growing profits into investments might, however, have a dampening effect on private consumption growth and thus exacerbate the impact of the high jobless rate on consumption. The government expects real GDP to grow by 3.5% in 2003 and by 5% in 2004.

Table 16

#### Gross Domestic Product and Its Demand Components

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
	Real year-on-year change in %					
Gross domestic product	3.9	4.1	1.0	1.3	2.0	3.0
Private consumption	5.3	2.8	2.1	3.3	3.3	2.6
Public consumption	1.0	1.1	0.6	1.3	1.8	0.0
Gross fixed capital formation	8.9	- 2.9	-6.8	-7.5	-5.0	- 2.6
Exports of goods and services	-2.5	37.8	1.2	4.3	5.8	12.8
Imports of goods and services	1.0	15.5	-0.1	2.5	2.9	8.7

Source: Eurostat, national statistical office, OeNB, WIIV.

At 20%, the jobless rate (ILO methodology) was, on average in the first half of 2003, as high as in 2002. While at 17.8% the rate of registered unemployed was still higher in the first half of 2003 than a year ago (17.4%), it reached 2002 levels in the third quarter, thus reflecting the first effects of the emerging upturn on the labor market. In the first half of 2003 a continued decline in employment contributed to a steep rise in industrial labor productivity.

Despite further decreasing unit labor costs, the growth rate of industrial producer prices rose to 2.6% year on year in the first half of 2003. This growth is, firstly, attributable to the depreciation of the zloty and to higher oil prices. Additionally, it explains the improved profit situation of enterprises. The rise in consumer prices, however, slowed down to 0.5% in the first half of the year since a year-on-year decline in particular in prices for agricultural products and foodstuffs for the time being more than offsets the effects of growth in both industrial producer prices and energy prices. Since April, however, there has been a slight rise in inflation, which reached 0.9% in September – a rate well below the Monetary Policy Council's target corridor of 1.5% to 3.5%. The

Table 17

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<b>Labor Productivity, Wages, Producer Prices and the Exchange Rate</b>						
<i>Year-on-year change of period average levels in %</i>						
Gross production of industry (real)	4.7	7.8	0.6	1.4	3.8	6.9
Labor productivity of industry (real)	9.6	17.9	6.0	7.4	9.0	10.0
Gross average wage of industry (nominal)	9.4	10.9	6.9	3.7	3.1	2.5
Unit labor cost of industry (nominal)	- 0.1	- 5.9	0.8	-3.4	-5.4	- 6.8
Producer price index (PPI) of industry	5.6	7.9	1.6	1.0	1.6	2.6
Consumer price index (CPI)	7.3	10.1	5.5	1.9	1.1	0.5
Exchange rate (nominal):						
PLN <sup>1)</sup> per 1 EUR, + = EUR appreciation	7.8	- 5.1	- 8.5	5.1	9.0	16.4
EUR per 1 PLN, + = PLN appreciation	- 7.2	5.4	9.3	-4.8	-8.3	-14.1
<i>Period average levels</i>						
Key interest rate per annum (in %)	13.7	17.9	15.9	8.8	7.7	6.1
Exchange rate (nominal):						
PLN <sup>1)</sup> per 1 EUR	4.23	4.01	3.67	3.85	4.04	4.27
EUR per 1 PLN	0.2365	0.2493	0.2726	0.2595	0.2475	0.2343

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIV.

<sup>1)</sup> PLN: Polish zloty.

two-week intervention rate was cut in several small steps from 6.75% at the end of December 2002 to 5.25% at the end of June 2003 and has since been left unchanged. However, with effect from October 31, the reserve ratio for all deposits (i.e. zloty and foreign currency deposits) was lowered from 4.5% to 3.5%. The level of real interest rates (based on past increases in producer prices) fell from about 7.7% in 2002 to 3.4% in the first half of 2003. Monetary conditions also eased owing to the effective weakening of the zloty, for which the narrowing of the nominal gap between Polish and international interest rates is the major factor. Bank lending to enterprises, adjusted for the rise in the PPI, is currently stagnating.

Table 18

	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
<b>Key Interest Rate, CPI Inflation and Nominal Exchange Rate</b>						
<b>Changes against the Euro</b>						
%						
Key interest rate (per annum)	16.5	19.0	11.5	7.5	6.8	5.3
CPI inflation (year on year)	9.8	8.5	3.6	1.3	0.8	0.9
Nominal year-on-year change of the exchange rate:						
PLN <sup>1)</sup> per 1 EUR, + = EUR appreciation	3.0	- 8.1	- 7.7	6.0	11.3	9.6
EUR per 1 PLN, + = PLN appreciation	-2.9	8.8	8.3	-5.6	-10.1	-8.8

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIV.

<sup>1)</sup> PLN: Polish zloty.

According to data compiled under ESA 95 for the general government budget, the widening of the deficit in 2001 was primarily caused by a rise in interest payments, whereas a corrective rise in noninterest expenditures, which had previously been forced down to match the growth-related decline in revenue levels, increased the deficit in 2002. For full-year 2003, it is anticipated that the further rise in noninterest payments can largely be offset by (growth-related) higher revenue. Despite the assumption of both a sharp acceleration in GDP growth to 5.0% and a relatively strong annual average exchange rate

Table 19

**Monetary Developments**

	1999	2000	2001	2002	2003 1 <sup>st</sup> half
	<i>Nominal year-on-year change of the annual average stock in %</i>				
Broad money (incl. foreign currency deposits)	24.5	15.1	12.0	1.6	0.0
	<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>				
Net foreign assets of the banking system	7.8	7.0	4.2	0.9	0.7
Domestic credit (net) of the banking system	23.2	10.9	6.8	6.7	3.5
<i>thereof: claims on households</i>	6.3	6.9	4.2	2.8	2.2
<i>claims on enterprises</i>	10.3	6.4	3.3	0.4	1.6
<i>claims (net) on general government</i>	6.6	- 2.4	-0.6	3.5	-0.3
Other domestic assets (net) of the banking system	-6.6	- 2.9	1.0	-6.0	-4.1

Source: National central bank, OeNB.

of PLN/EUR 4.25, the government's Pre-Accession Economic Program (PEP) envisaged a deficit of 5.0% in 2004. In the subsequent initial draft budget for 2004, the target deficit was estimated at 5.7%. Whereas the revenue ratio in 2004 will decrease slightly due to income tax cuts in 2003 and to corporate tax cuts (from 27% to 19%) in 2004, a further pronounced rise in noninterest expenditures is envisaged. In addition, there is uncertainty about Eurostat's ruling (pending) on the definition of the deficit according to ESA 95, which could increase deficit-to-GDP ratios by more than one percentage point. The medium-term plan for fiscal consolidation does not provide for substantial cuts in expenditure until 2005, with the draft budget in autumn 2004 likely to be overshadowed by parliamentary elections, which will take place in 2005. Despite relatively upbeat assumptions about future privatization revenues, this plan provides for a rise in the public debt ratio (under ESA 95) from 41.6% at end-2002 to 51.4% at end-2005, or a rise from 47.2% to 59.3% according to the national definition, which inter alia also includes government guarantees. This means the 50%, 55% and 60% ceilings stipulated in the Constitution will be almost attained or exceeded, in which case some drastic fiscal consolidation will have to be implemented in the years to come.

Table 20

**Government Budget**

	1999	2000	2001	2002	2003	2004
	<i>% of GDP</i>					
<b>General government</b>						
Revenues (ESA 95) <sup>1)</sup>	..	..	41.8	42.1	43.1	42.9
Expenditures (ESA 95) <sup>1)</sup>	..	..	45.3	45.9	47.2	47.9
<i>thereof: interest payments</i>	2.1	2.2	3.2	2.8	3.0	2.7
Balance (ESA) <sup>2)</sup> <sup>3)</sup>	- 1.5	- 1.8	- 3.0	- 3.8	- 4.1	- 5.0
Primary balance (ESA 95) <sup>2)</sup>	0.6	0.4	0.2	- 1.0	- 1.1	- 2.3
Balance (national methodology)	..	..	..	- 6.0	- 6.1	- 5.8
Gross debt (ESA 95) <sup>2)</sup>	42.7	37.2	37.3	41.8	44.3	46.9

Source: European Commission, Eurostat, national ministry of finance, OeNB, WIIW.

<sup>1)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 2001: PEP 08/2002.

<sup>2)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 1999-2001: Fiscal Notification of Poland of April 2003.

<sup>3)</sup> The balance given here for 2001 is derived from the Fiscal Notification of April 2003; it may differ from revenue and expenditure as given in the PEP 08/2002.

Owing to an improvement in the trade balance and due to the increase in net exports from small-scale cross-border trade that offsets the deterioration of the income balance, the current account deficit shrank to 2.7% of GDP in the first half of 2003. The performance of these subaccounts can be explained, inter alia, by the depreciation of the zloty. Other factors are further declining unit labor costs and possibly also a rush in small-scale cross-border trade in view of future changes to the border regimes with Russia, Belarus and Ukraine following EU accession. Net direct investment flows, which only offset just over 50% of the current account deficit, contracted at the same time.

Table 21

<b>Balance of Payments</b>						
	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	<i>EUR million</i>					
Merchandise exports	24,697	30,569	33,787	34,854	16,539	17,387
<i>Merchandise exports: year-on-year change in %</i>	- 8.1	23.8	10.5	3.2	- 0.6	5.1
Merchandise imports	38,175	44,815	46,816	45,779	21,940	21,618
<i>Merchandise imports: year-on-year change in %</i>	- 2.4	17.4	4.5	- 2.2	- 5.5	- 1.5
<b>Trade balance</b>	-13,478	-14,246	-13,029	-10,926	- 5,401	- 4,231
<i>% of GDP</i>	- 9.3	- 8.0	- 6.4	- 5.5	- 5.4	- 4.7
Services balance	- 1,529	- 1,824	- 1,089	- 1,059	- 574	- 703
Income balance (factor services balance)	- 745	- 821	- 1,000	- 1,731	- 905	- 1,140
Current transfers	1,513	1,819	2,216	2,304	986	1,041
Unclassified transactions (small cross-border trade)	3,410	4,306	4,905	4,298	1,481	2,630
<b>Current account balance</b>	-10,829	-10,767	- 7,997	- 7,114	- 4,413	- 2,403
<i>% of GDP</i>	- 7.4	- 6.1	- 3.9	- 3.6	- 4.4	- 2.7
<b>Direct investment flows (net)</b>	5,954	8,838	7,732	3,957	2,075	1,363
<i>% of GDP</i>	4.1	5.0	3.8	2.0	2.1	1.5

Source: National central bank, OeNB.

The reduction in currency reserves is likely to be primarily attributable to the firming of the euro against the U.S. dollar. The rating for long-term government foreign currency liabilities is BBB+ (Standard & Poor's) and A2 (Moody's).

Table 22

<b>Gross Official Reserves and Gross External Debt</b>					
	end-1999	end-2000	end-2001	end-2002	2003 end-June <sup>1)</sup>
	<i>EUR million</i>				
Gross official reserves (excluding gold)	26,192	28,179	28,835	27,316	26,878
Gross external debt	64,962	73,687	80,911	79,369	79,734
	<i>% of GDP</i>				
Gross official reserves (excluding gold)	18.0	15.8	14.1	13.6	13.4
Gross external debt	44.6	41.4	39.5	39.6	39.8
	<i>Import months of goods and services</i>				
Gross official reserves (excluding gold)	7.3	6.7	6.6	6.4	6.7

Source: Eurostat, national central bank, OeNB, WIIW.

<sup>1)</sup> % of GDP 2002.

## 5 Slovak Republic: Paving the Way for Tax Reform

At 4.0%, GDP growth in the first half of 2003 remained relatively high in the Slovak Republic. This was primarily traceable to a steep rise in real exports (22.7%), which far exceeded the robust growth of real imports (15.8%). By contrast, private consumption (1.3% in the first half of 2003) slumped, having been the mainstay of the Slovak economy the year before (2002 annual average growth: 5.3%). A similar trend was visible in public consumption, with growth rates declining from 4.3% in the election year 2002 to 0.2% in the first half of 2003. Gross fixed capital formation continued to trend downward, contracting by 1.2%. The unfavorable development in investment may thus be interpreted as a potential future curb to export-supported GDP growth.

Table 23

### Gross Domestic Product and Its Demand Components

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
	<i>Real year-on-year change in %</i>					
Gross domestic product	1.3	2.2	3.3	4.4	4.8	4.0
Private consumption	3.4	- 1.8	3.9	5.3	5.0	1.3
Public consumption	- 7.7	0.7	5.0	4.3	2.0	0.2
Gross fixed capital formation	-18.3	2.0	9.9	-0.9	- 1.4	- 1.2
Exports of goods and services	5.3	13.8	6.7	5.9	11.2	22.7
Imports of goods and services	- 6.3	10.2	12.1	5.1	10.9	15.8

Source: Eurostat, national statistical office, OeNB, WIIW.

The share of registered unemployed in the Slovak Republic fell from 17.5% in December 2002 to some 14% in summer 2003. However, this level was still relatively high, even when compared with other transition economies in the region. The reduction in the reported unemployment rate is partly attributable to tighter monitoring measures for those recipients of unemployment benefits who are informally employed at home or abroad. At the same time, according to preliminary evaluations, cuts in both unemployment and social benefits have boosted participation in the labor market.

Table 24

### Labor Productivity, Wages, Producer Prices and the Exchange Rate

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
	<i>Year-on-year change of period average levels in %</i>					
Gross production of industry (real)	- 2.0	8.3	7.6	6.7	9.7	7.7
Labor productivity of industry (real)	1.0	11.8	6.6	6.5	9.0	7.2
Gross average wage of industry (nominal)	7.9	9.1	10.2	7.3	6.7	7.0
Unit labor cost of industry (nominal)	6.8	- 2.4	3.4	0.7	-2.2	- 0.2
Producer price index (PPI) of industry	4.2	10.9	6.5	2.0	2.1	8.3
Consumer price index (CPI)	10.5	12.1	7.1	3.4	2.8	7.8
Exchange rate (nominal):						
SKK <sup>1)</sup> per 1 EUR, + = EUR appreciation	11.4	- 3.4	1.7	- 1.4	- 1.0	- 2.6
EUR per 1 SKK, + = SKK appreciation	-10.2	3.5	- 1.7	1.4	1.0	2.7
	<i>Period average levels</i>					
Key interest rate per annum (in %)	8.8	8.5	7.8	7.8	7.8	6.5
Exchange rate (nominal):						
SKK <sup>1)</sup> per 1 EUR	44.10	42.59	43.31	42.69	42.76	41.51
EUR per SKK	0.0227	0.0235	0.0231	0.0234	0.0234	0.0241

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIW.

<sup>1)</sup> SKK: Slovak koruna.

Following the rise in expenditure taxes on selected goods (primarily alcoholic beverages and fuel) and a further liberalization of administered prices, inflation has gathered considerable momentum. In October annual inflation reached 9.6%, its highest level since July 2000. Although core inflation also rose from a level of around 2% a year, prior to the announcement of the price increases, it dropped back slightly from 3.3% in July to 2.9% in October 2003.

The monetary policy strategy of Národná banka Slovenska (NBS) is based on inflation and monetary indicators, but also takes account of exchange rate developments (managed float). In September 2003 (i.e. almost one year after its previous interest rate move), the NBS cut all of its three key interest rates by 25 basis points. This means that the two-week repo tender limit rate is now 6.25%, the overnight sterilization rate is 4.75% and the refinancing rate is 7.75%. These rate cuts were mainly viewed as being connected to the appreciation in the Slovak koruna, which during the first half of the year had required repeated interventions by the NBS in the foreign exchange market.

Table 25

### Key Interest Rate, CPI Inflation and Nominal Exchange Rate

#### Changes against the Euro

	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
	%					
Key interest rate (per annum)	8.8	8.0	7.8	8.3	6.5	6.3
CPI inflation (year on year)	14.2	8.4	6.4	2.8	3.4	9.5
Nominal year-on-year change of the exchange rate:						
SKK <sup>1)</sup> per 1 EUR, + = EUR appreciation	0.0	2.2	-0.9	-1.2	-3.1	-3.5
EUR per 1 SKK, + = SKK appreciation	0.0	-2.2	0.9	1.2	3.2	3.6

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIV.

<sup>1)</sup> SKK: Slovak koruna.

Table 26

### Monetary Developments

	1999	2000	2001	2002	2003 1 <sup>st</sup> half
	<i>Nominal year-on-year change of the annual average stock in %</i>				
Broad money (incl. foreign currency deposits)	8.6	15.0	11.9	8.3	5.9
	<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>				
Net foreign assets of the banking system	- 4.7	6.6	2.3	14.1	17.5
Domestic credit (net) of the banking system	12.8	7.9	11.3	- 0.6	-11.3
thereof: claims on households	1.8	1.9	1.2	1.4	1.8
claims on enterprises	0.4	0.0	-15.9	- 2.3	2.2
claims (net) on general government	7.6	6.4	24.7	0.2	-13.3
Other domestic assets (net) of the banking system	0.4	0.5	- 1.7	- 5.3	- 0.3

Source: National central bank, OeNB.

According to final figures, the general government deficit came to 7.2% of GDP (on the basis of ESA 95) in the election year 2002. The government thus clearly failed to meet its original deficit target of around 4% of GDP. Slovakia aims to lower its deficit-to-GDP ratio to below 3% by 2006, with the budget deficit to be reduced to 5% of GDP as early as 2003 and to 3.9% of GDP by 2004 (under ESA 95). To this end, the Slovak Republic has approved compre-

hensive fiscal reform, which should further boost economic momentum via lower marginal tax rates and greater transparency. FDI, particularly so-called greenfield projects, should play a leading role in this respect.

Table 27

<b>Government Budget</b>						
	1999	2000	2001	2002	2003	2004
	% of GDP					
<b>General government</b>						
Revenues (ESA 95) <sup>1)</sup>	..	..	41.2	41.8	39.7	38.9
Expenditures (ESA 95) <sup>1)</sup>	..	..	46.6	49.0	44.7	42.8
thereof: interest payments	3.3	4.1	3.6	3.7	2.9	2.5
Balance (ESA) <sup>2)</sup> <sup>3)</sup>	- 6.4	-10.4	- 7.3	- 7.2	- 5.0	- 3.9
Primary balance (ESA 95) <sup>2)</sup>	- 3.1	- 6.3	- 3.7	- 3.5	- 2.1	- 1.4
Balance (national methodology)						
Gross debt (ESA 95) <sup>2)</sup>	43.8	46.9	48.1	44.3	45.0	45.7

Source: European Commission, Eurostat, national ministry of finance, OeNB, WIIW.

<sup>1)</sup> Data as far as possible according to ESA 95; 2002–04: PEP 08/2003; 2001: PEP 08/2002.

<sup>2)</sup> Data as far as possible according to ESA 95; 2002–04: PEP 08/2003; 1999–2001: Fiscal Notification of Slovak Republic of April 2003.

<sup>3)</sup> The balance given here for 2001 is derived from the Fiscal Notification of April 2003; it may differ from revenue and expenditure as given in the PEP 08/2002.

A key component of the reform package is the introduction of a flat income tax of 19% for both households and enterprises. Furthermore, all goods and services will also be taxed at a flat VAT rate of 19%. In the summer of 2003 consumer taxes on selected goods (primarily alcoholic beverages and fuel) were raised substantially to avoid emerging budget revenue shortfalls.

Buoyant exports in the first half of 2003 caused a marked improvement in the current account. Whereas the current account deficit in 2002 exceeded 8% of GDP on an annual average, in the first half of 2003 this indicator was only 1.3% of GDP. This improvement was largely backed up by the performance of the trade balance, with the deficit narrowing from 9.0% to 1.7%.

The performance of the capital account followed that of the current account. At a net EUR 490 million (3.6% of GDP), direct investment remained

Table 28

<b>Balance of Payments</b>						
	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	EUR million					
Merchandise exports	9,558	12,841	14,097	15,256	7,191	9,042
Merchandise exports: year-on-year change in %	0.4	34.4	9.8	8.2	1.7	25.7
Merchandise imports	10,592	13,833	16,479	17,519	8,175	9,276
Merchandise imports: year-on-year change in %	- 8.4	30.6	19.1	6.3	1.7	13.5
<b>Trade balance</b>	- 1,034	- 992	- 2,382	- 2,263	- 984	- 234
% of GDP	- 5.5	- 4.6	- 10.4	- 9.0	- 8.1	- 1.7
Services balance	140	475	535	484	198	56
Income balance (factor services balance)	- 282	- 382	- 349	- 485	- 261	- 127
Current transfers	162	127	236	205	80	126
<b>Current account balance</b>	- 1,015	- 771	- 1,960	- 2,059	- 967	- 179
% of GDP	- 5.4	- 3.6	- 8.6	- 8.2	- 8.0	- 1.3
<b>Direct investment flows (net)</b>	657	2,227	1,630	4,256	295	487
% of GDP	3.5	10.4	7.1	16.9	2.4	3.6

Source: National central bank, OeNB.

modest in the first half of the year (2002: almost 17% of GDP). Although the government was preparing further privatization projects for 2003 (e.g. in the energy sector), these have yet to be implemented and will probably be postponed for some years. If financial market trends are favorable, this will also result in higher sales proceeds.

In November 2002 the Slovak Republic was rated A3 by Moody's and in December 2002 BBB by Standard & Poor's.

The country is gearing to reform the healthcare and social services sectors, which will provide significant support to the fiscal reform package, particularly in terms of its impact on the budget as a whole. Key measures of the healthcare (e.g. joint financing of treatment costs) and pension (e.g. increase in retirement age) reforms should be approved by parliament in the second half of 2003. However, experts say that further reform measures will still be necessary, e.g. regarding the structure of the second pillar of pension insurance.

Table 29

<b>Gross Official Reserves and Gross External Debt</b>					
	end-1999	end-2000	end-2001	end-2002	2003 end-June <sup>1)</sup>
<i>EUR million</i>					
Gross official reserves (excluding gold)	3,404	4,325	4,709	8,764	9,111
Gross external debt	10,453	11,461	12,415	12,570	13,319
<i>% of GDP</i>					
Gross official reserves (excluding gold)	18.0	20.3	20.6	34.8	36.2
Gross external debt	55.2	53.7	54.3	50.0	53.0
<i>Import months of goods and services</i>					
Gross official reserves (excluding gold)	3.3	3.3	3.0	5.3	5.2

Source: Eurostat, national central bank, OeNB, WIIW.  
<sup>1)</sup> % of GDP 2002.

## 6 Slovenia: Progress in Combating Inflation

Slovenia's GDP growth in the first half of 2003 was 2.2% year on year. A deterioration in net exports, which was hit by weak external demand, was primarily responsible for this slowdown in growth. However, this downtrend was partly offset by the accelerated growth of domestic demand, while continued strong government investment in infrastructure supported investment growth. In addition, private consumption growth gathered momentum as well, which is likely to have come at the expense of savings given weaker real household income growth. Finally, there was also a spurt in public consumption growth.

Table 30

<b>Gross Domestic Product and Its Demand Components</b>						
	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Real year-on-year change in %</i>						
Gross domestic product	5.2	4.7	2.9	3.2	3.5	2.2
Private consumption	6.1	0.8	2.3	2.0	2.3	2.6
Public consumption	4.6	3.1	4.0	2.7	2.3	3.5
Gross fixed capital formation	19.1	0.2	-0.8	3.1	3.5	6.7
Exports of goods and services	1.7	12.7	6.4	6.0	7.2	2.6
Imports of goods and services	8.2	6.1	3.0	4.8	6.1	5.7

Source: Eurostat, national statistical office, OeNB, WIIW.

Despite the bleaker economic climate, there was a drop in the unemployment rate. Although average gross nominal wage growth slowed, real gross wage growth accelerated on a PPI basis, contributing to an increase in real unit labor costs. However, further progress was recently made in deindexing wages, and in the next few years real wage growth should lag behind productivity growth by at least one percentage point.

Table 31

### Labor Productivity, Wages, Producer Prices and the Exchange Rate

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Year-on-year change of period average levels in %</i>						
Gross production of industry (real)	-0.5	6.3	3.1	2.5	2.7	0.3
Labor productivity of industry (real)	3.1	8.5	3.7	5.7	5.8	2.7
Gross average wage of industry (nominal)	9.3	11.7	10.8	9.9	10.8	7.8
Unit labor cost of industry (nominal)	6.1	3.0	6.9	4.0	4.8	5.0
Producer price index (PPI) of industry	2.2	7.6	9.0	5.2	4.6	2.8
Consumer price index (CPI)	6.2	8.9	8.4	7.5	7.1	6.0
Exchange rate (nominal):						
SIT <sup>1)</sup> per 1 EUR, + = EUR appreciation	4.0	5.9	5.9	4.2	4.0	3.6
EUR per 1 SIT, + = SIT appreciation	-3.8	- 5.6	- 5.6	-4.0	- 3.9	-3.5
<i>Period average levels</i>						
Key interest rate per annum (in %)	8.0	8.7	10.8	7.7	7.7	6.6
Exchange rate (nominal):						
SIT <sup>1)</sup> per 1 EUR	193.63	205.03	217.19	226.22	228.35	232.12
EUR per 1 SIT	0.0052	0.0049	0.0046	0.0044	0.0044	0.0043

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIW.

<sup>1)</sup> SIT: Slovenian tolar.

Consumer price inflation in October 2003 fell to 4.8% year on year from 7.2% in December 2002. The main reasons behind this CPI reduction were restraint in raising administrative prices, the slowdown in the tolar's rate of depreciation and the temporary lowering of indirect excise taxes on energy, which moderated the second-round effects of energy price hikes.

The government plans to reduce the inflation rate from the current annual average of 5.5% to 4.5% in 2004 and 4.2% in 2005. The gradual adjustment of indirect taxes, below-average hikes in administered prices, a cautious wage policy, continued deindexation, measures designed to stimulate competition and the slowdown of the tolar's depreciation should help the government achieve its aim. It should be noted that Banka Slovenije, the Slovenian central bank, has a more ambitious disinflation target (4% in 2004, 3% in 2005).

During the first ten months of the year, the tolar's exchange rate relative to the euro trended along a linear downward path without much volatility. The Governor of Banka Slovenije's latest statements indicate that this policy of depreciation should be over by end-2004. Since Banka Slovenije explicitly observes a declared interest rate differential principle in its exchange rate policy, these exchange rate trends should be seen against the backdrop of interest rate developments. In 2003 Banka Slovenije cut its key interest rates in several stages. For instance, the main refinancing rate – the Bank's representative interest rate in force since February 2003 – was reduced from 7.25% to 5.25%. Over the coming months the central bank intends to gradually make further rate cuts in line with the expected fall in inflation. The resultant narrow-

Table 32

**Key Interest Rate, CPI Inflation and Nominal Exchange Rate****Changes against the Euro**

	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
	%					
Key interest rate (per annum)	8.0	10.0	7.8	7.8	7.3	5.5
CPI inflation (year on year)	8.0	8.9	7.0	7.2	7.2	5.0
Nominal year-on-year change of the exchange rate:						
SIT <sup>1)</sup> per 1 EUR, + = EUR appreciation	4.5	7.1	4.8	3.9	4.0	3.1
EUR per 1 SIT, + = SIT appreciation	-4.3	-6.6	-4.6	-3.8	-3.9	-3.0

Source: Bloomberg, Datastream, national statistical office, national central bank, OeNB, WIIW.

<sup>1)</sup> SIT: Slovenian tolar.

Table 33

**Monetary Developments**

	1999	2000	2001	2002	2003 1 <sup>st</sup> half
	<i>Nominal year-on-year change of the annual average stock in %</i>				
Broad money (incl. foreign currency deposits)	16.1	14.0	20.8	23.6	12.0
	<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>				
Net foreign assets of the banking system	1.8	3.4	10.1	11.1	5.8
Domestic credit (net) of the banking system	16.9	15.3	15.5	14.1	6.6
<i>thereof: claims on households</i>	7.3	4.4	2.1	1.6	1.4
<i>claims on enterprises</i>	8.4	9.9	10.6	7.2	8.0
<i>claims (net) on general government</i>	1.2	1.0	2.9	5.3	-2.9
Other domestic assets (net) of the banking system	-2.6	-4.7	-4.9	-1.6	-0.4

Source: National central bank, OeNB.

ing of the interest rate gap relative to the euro should allow the central bank to achieve its aim of slowing down the tolar's rate of depreciation.

Slovenia's fiscal policy remains one of the most balanced policies pursued by any acceding country. After posting a budget deficit of 2.4% of GDP (ESA 95) in 2002, the government is aiming to reduce this ratio to 1.95% in 2003. In the medium term (i.e. by 2006), the government intends to bring down the deficit to 1.3% of GDP.

Table 34

**Government Budget**

	1999	2000	2001	2002	2003	2004
	% of GDP					
<b>General government</b>						
Revenues (ESA 95) <sup>1)</sup>	..	..	43.1	41.5	41.6	42.2
Expenditures (ESA 95) <sup>1)</sup>	..	..	45.6	43.9	43.6	43.8
<i>thereof: interest payments</i>	2.4	2.4	2.3	2.2	1.5	1.5
Balance (ESA) <sup>2)</sup> <sup>3)</sup>	-2.2	-3.3	-2.8	-2.4	-2.0	-1.6
Primary balance (ESA 95) <sup>2)</sup>	0.2	-0.9	-0.5	-0.2	-0.5	-0.1
Balance (national methodology)	..	..	..	-3.0	-1.6	-1.8
Gross debt (ESA 95) <sup>2)</sup>	26.4	27.6	27.5	27.8	27.8	27.7

Source: European Commission, Eurostat, national ministry of finance, OeNB, WIIW.

<sup>1)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 2001: PEP 08/2002.

<sup>2)</sup> Data as far as possible according to ESA 95; 2002-04: PEP 08/2003; 1999-2001: Fiscal Notification of Slovenia of April 2003.

<sup>3)</sup> The balance given here for 2001 is derived from the Fiscal Notification of April 2003; it may differ from revenue and expenditure as given in the PEP 08/2002.

After posting a surplus of 1.7% of GDP in 2002, in the first eight months of 2003 the current account slid into a deficit of EUR 37 million (January to August 2002: +EUR 215 million). This downward movement was primarily attributable to the deterioration in the goods and services balance. Direct investment was disappointing, posting net outflows of EUR 137 million that were traceable, in particular, to increased investment by Slovenian nationals abroad. As a result of these unfavorable trends, the country's net external assets in August melted to EUR 374 million (1.6% of GDP) from EUR 1,100 million in December 2002. The increase in the banking sector's net foreign debt was primarily responsible for this deterioration. At EUR 2.77 billion (11.5% of GDP), the biggest net foreign debtor, however, remains the private nonbanking sector.

Table 35

**Balance of Payments**

	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	<i>EUR million</i>					
Merchandise exports	8,082	9,529	10,427	11,075	5,505	5,641
Merchandise exports: year-on-year change in %	- 0.4	17.9	9.4	6.2	4.1	2.5
Merchandise imports	9,249	10,761	11,118	11,332	5,631	5,924
Merchandise imports: year-on-year change in %	4.9	16.3	3.3	1.9	- 0.4	5.2
<b>Trade balance</b>	-1,167	- 1,232	- 691	- 257	- 127	- 283
% of GDP	- 6.2	- 6.0	- 3.2	- 1.1	- 1.1	- 2.4
Services balance	331	487	560	587	335	312
Income balance (factor services balance)	- 23	- 27	- 83	- 76	- 96	- 108
Current transfers	115	125	143	142	50	26
<b>Current account balance</b>	- 734	- 662	- 75	397	162	- 54
% of GDP	- 3.9	- 3.2	- 0.3	1.7	1.4	- 0.4
<b>Direct investment flows (net)</b>	55	76	413	1,849	627	- 54
% of GDP	0.3	0.4	1.9	7.9	5.5	- 0.5

Source: National central bank, OeNB.

At the end of March, Standard and Poor's upgraded Slovenia's rating for long-term foreign currency debt by one notch to A+. Moody's rating has remained unchanged at Aa3 since end-2002.

After the privatization of Nova Ljubljanska Banka in 2003, privatization activity slowed down in the year under review. Although the government's eco-

Table 36

**Gross Official Reserves and Gross External Debt**

	end-1999	end-2000	end-2001	end-2002	2003 end-June <sup>1)</sup>
	<i>EUR million</i>				
Gross official reserves (excluding gold)	3,148	3,390	4,868	6,653	6,835
Gross external debt	7,985	9,364	10,319	11,399	12,464
	<i>% of GDP</i>				
Gross official reserves (excluding gold)	16.7	16.5	22.3	28.5	29.3
Gross external debt	42.4	45.5	47.3	48.8	53.4
	<i>Import months of goods and services</i>				
Gross official reserves (excluding gold)	3.5	3.3	4.6	6.1	6.1

Source: Eurostat, national central bank, OeNB, WIW.

<sup>1)</sup> % of GDP 2002.

conomic program for the next three years underlined the need for structural changes in the financial sector, in particular, details on specific privatization plans have been few and far between. The privatization of Nova Kreditna Banka Maribor was postponed in 2002, and the privatization of the telecommunications company Telecom Slovenije will not now take place until 2005–06. Over the next two years, the energy sector will see strategies developed for privatizing at most 45% of shares in electricity producers and distributors.

## 7 Russia: Uncertainty from Yukos Affair despite Strong Fundamental Data and Faster Economic Growth

In the first half of 2003 Russia's real GDP growth accelerated to 7.0% year on year, almost a doubling of growth compared with the first half of 2002. In full-year 2002 the growth rate had come to 4.3%. The major driving force of growth is internal demand, with the sharp expansion of gross capital formation standing out in particular (+12.1% in the first nine months of 2003). The dynamic recovery of investment activity can, first, be attributed to continuing high world market prices for Russia's main export products (oil, natural gas and metals) and, as a result, to the growing revenues and profits of enterprises from the energy and metal industries. Second, Russia's long-lasting economic upturn plays a major role, together with positive expectations for the economy, which also contributed to the strong expansion of bank lending. Moreover, for the first time since the 1998 financial crisis, major Russian enterprises raised considerable volumes of capital abroad. Finally, past reform measures and (despite the latest events) greater overall political stability under President Putin prompted foreign direct investors to step up their activities in the country. FDI in Russia grew by 50% in the first half of 2003. However, the energy and metal industries together account for two-thirds of productive investment, which means that the investment boom is contributing to a growing imbalance in the country's economic structure.

Supported by substantial wage growth in the public sector (from a modest base) and by repeated pension adjustments, private consumption continues to grow healthily (first half of 2003: +7.9% year on year). Despite the slight rise in real exports, which was clearly stimulated by high oil prices, net exports contracted (first half of 2003: -1.9%), since real imports grew at a faster pace. In the first nine months of 2003 GDP expanded by 6.5% year on year, according to estimates by the Russian Ministry of Economic Affairs.

Table 37

<b>Gross Domestic Product and Its Demand Components</b>						
	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
	<i>Real year-on-year change in %</i>					
Gross domestic product	6.4	10.0	5.0	4.3	4.9	7.0
Private consumption	- 2.9	8.6	8.5	8.6	8.8	7.9
Public consumption	3.1	2.0	- 1.7	2.4	2.9	2.3
Gross fixed capital formation	6.4	18.1	10.5	3.0	3.1	11.6
Exports	11.2	9.5	3.6	10.2	11.2	11.6
Imports	-17.0	32.4	18.0	19.1	21.0	19.8

Source: National statistical office.

The unemployment rate (ILO methodology) reached 7.6% in August 2003. Unit labor costs are rising at a faster pace than inflation. In the meantime, the adverse impact on Russian industrial competitiveness is being weakened by the depreciation of the U.S. dollar, the major anchor currency for the ruble. In the period from January to September 2003, the real effective exchange rate of the ruble appreciated by 4% against a basket of currencies of Russia's major trading partners.

Table 38

### Labor Productivity, Wages, Prices and the Exchange Rate

	1999	2000	2001	2002	2002 2 <sup>nd</sup> half	2003 1 <sup>st</sup> half
<i>Year-on-year change of period average levels in %</i>						
Gross value added of the economy (real)	5.4	9.1	5.0	4.2	4.9	7.0
Labor productivity of the economy (real)	5.0	8.3	3.9	2.6	2.8	8.0
Gross average wage of the economy (nominal)	42.6	42.5	45.7	34.5	31.8	24.6
Unit labor cost of the economy (nominal)	35.9	31.6	40.2	31.0	28.2	15.4
GDP deflator	72.5	38.9	17.8	15.2	15.8	17.1
Consumer price index (CPI)	85.7	20.8	21.6	16.0	15.1	14.3
Exchange rate (nominal):						
RUR <sup>1)</sup> per 1 EUR, + = EUR appreciation	137.2	- 0.8	0.4	13.5	19.0	23.9
EUR per 1 RUR, + = RUR appreciation	- 57.8	0.8	- 0.4	-11.9	-16.0	-19.3
<i>Period average levels</i>						
Key interest rate per annum (in %)	57.1	32.0	25.0	22.7	21.3	18.2
Exchange rate (nominal):						
RUR <sup>1)</sup> per 1 EUR	26.24	26.03	26.13	29.65	31.43	34.52
EUR per 1 RUR	0.0381	0.0384	0.0383	0.0337	0.0318	0.0290

Source: Datastream, national statistical office, national central bank, OeNB, RECEP, WIIW.  
<sup>1)</sup> RUR: Russian ruble.

Despite a restrictive monetary policy, the CPI declined only slightly year on year from 15.1% in December 2002 to 13.1% in October 2003, which is largely attributable to the expansion of the quantity of money arising from the inflow of export revenues as well as the increase of bank loans to enterprises, and to the adjustments of tariffs and regulated prices. However, remonetizing trends can also be seen. At the end of August 2003 the government and the central bank confirmed the fight against inflation as the main task of the monetary authority. Its second priority is to limit the real effective appreciation of the ruble.

Table 39

### Key Interest Rate, CPI Inflation and Nominal Exchange Rate

#### Changes against the Euro

	1999 December	2000 December	2001 December	2002 September	2002 December	2003 September
%						
Key interest rate (per annum)	57.0	32.0	25.0	21.0	21.0	16.0
CPI inflation (year on year)	36.6	20.1	18.8	15.0	15.1	13.2
Nominal year-on-year change of the exchange rate:						
RUR <sup>1)</sup> per 1 EUR, + = EUR appreciation	15.6	- 7.4	6.9	15.6	20.8	11.1
EUR per 1 RUR, + = RUR appreciation	-13.5	8.0	- 6.5	-13.5	-17.2	-10.0

Source: Datastream, national statistical office, national central bank, OeNB, RECEP, WIIW.  
<sup>1)</sup> RUR: Russian ruble.

Table 40

<b>Monetary Developments</b>					
	1999	2000	2001	2002	2003 1 <sup>st</sup> half
	<i>Nominal year-on-year change of the annual average stock in %</i>				
Broad money (incl. foreign currency deposits)	56.7	58.4	43.4	31.2	38.7
	<i>Contributions to the nominal year-on-year change of broad money in percentage points</i>				
Net foreign assets of the banking system	32.3	63.5	39.9	18.5	25.6
Domestic credit (net) of the banking system	57.4	17.8	23.6	30.8	27.3
<i>thereof: claims on households</i>	29.5	-17.3	5.7	4.5	3.1
<i>claims on enterprises</i>	23.1	32.3	28.8	24.5	22.4
<i>claims (net) on general government</i>	4.9	2.8	-10.9	1.8	1.7
Other domestic assets (net) of the banking system	-33.0	-22.8	-20.1	-18.1	-14.3

Source: National central bank, OeNB, RECEP.

High raw material prices and the quickening recovery were reflected in the general government budget. In the first eight months of 2003 the federal budget posted a surplus of 2.7% of (pro rata) GDP, mainly due to booming revenues. The latest budget amendment envisages a surplus of 1.1% for full-year 2003. The budgetary fiscal reserve, which is to be converted into a stabilization fund following the Norwegian model, amounted to EUR 5.3 billion in September 2004. In mid-2003 the Russian gross foreign debt amounted to EUR 138.0 billion, or some 39% of GDP. In mid-October 2003, the State Duma approved the federal budget for 2004 in the second reading. Based on relatively realistic assumptions (e.g. oil price per barrel of Urals grade crude: USD 22), the budget envisages a surplus of 0.5% of GDP for the election year.

Table 41

<b>Government Budget</b>						
	1999	2000	2001	2002	2003	2004
	<i>% of GDP</i>					
<b>Central government</b>						
Revenues	12.7	15.4	17.6	20.3	18.5	17.9
Expenditures	14.0	13.2	14.6	18.8	18.0	17.4
<i>thereof: interest payments</i>	3.4	2.4	2.6	2.1	2.1	1.9
Balance	- 1.3	2.2	3.0	1.4	0.6	0.5
Primary balance	2.1	4.6	5.6	3.5	2.7	2.4
<b>General government</b>						
Balance (national methodology)	- 1.2	2.8	3.2	1.5	..	..

Source: OeNB, RECEP, Russian Economic Expert Group (Ministry of Finance of the Russian Federation), WIIW.

In the first nine months of 2003 Russia's current account surplus grew to EUR 25 billion (or some 10% of pro rata GDP). The trade surplus expanded to EUR 37 billion in the same period. Despite comprehensive debt servicing, the foreign exchange reserves held by the central bank climbed to some EUR 55.4 billion, or 11 months worth of imports, by October 2003.

In early October 2003 Moody's upgraded Russia's long-term foreign currency liabilities by two notches from Ba2 to Baa3, thereby awarding the country an investment grade credit rating. The rating agency justified this move by pointing to the credibility of Russia's macroeconomic policies and its sound debt management.

Table 42

**Balance of Payments**

	1999	2000	2001	2002	2002 1 <sup>st</sup> half	2003 1 <sup>st</sup> half
	<i>EUR million</i>					
Merchandise exports	70,861	113,598	113,705	113,416	53,121	56,041
Merchandise exports: year-on-year change in %	6.7	60.3	0.1	- 0.3	- 7.7	5.5
Merchandise imports	37,024	48,577	60,002	64,472	30,182	30,109
Merchandise imports: year-on-year change in %	- 28.5	31.2	23.5	7.5	8.9	- 0.2
<b>Trade balance</b>	33,743	65,129	53,703	48,944	22,939	25,932
% of GDP	18.4	23.1	15.5	13.4	13.4	14.9
Services balance	- 4,030	- 7,249	- 9,263	- 9,591	- 4,506	- 4,089
Income balance (factor services balance)	-15,091	-40,787	-27,565	-26,739	-15,030	-14,956
<b>Current account balance</b>	23,058	50,632	38,837	34,639	16,487	19,250
% of GDP	12.6	18.0	11.2	9.5	9.6	11.0
<b>Direct and portfolio investment flows (net)</b>	1,968	- 7,790	1,897	4,563	937	- 1,311
% of GDP	1.1	- 2.8	0.5	1.2	0.5	- 0.8

Source: National central bank, OeNB, RECEP, WIIW.

Table 43

**Gross Official Reserves**

	end-1999	end-2000	end-2001	end-2002	2003 end-June <sup>1)</sup>
	<i>EUR million</i>				
Gross official reserves (excluding gold)	8,406	25,739	36,585	41,988	52,724
% of GDP	4.6	9.1	10.6	11.5	14.4
	<i>Import months of goods and services</i>				
Gross official reserves (excluding gold)	2.7	6.4	7.3	7.8	10.5

Source: National central bank, national statistical office, OeNB, RECEP, WIIW.

<sup>1)</sup> % of GDP 2002.

The continuing recovery and the overall sound set of data reflect the best state of health the Russian economy has enjoyed since the end of the communist regime. However, the pace of structural reforms, a *sine qua non* for sustained economic growth, has slowed down in the last two years. First and foremost, this is attributable to the forthcoming parliamentary and presidential elections (in December 2003 and March 2004, respectively), albeit with President Putin the hot favorite for the presidency. Second, "easier" economic reforms (i.e. those meeting with less political and economic resistance) have already largely been implemented, with the result that only "tough nuts" remain, e.g. the reform of the "natural" monopolies, i.e. the electricity and gas utilities and railways sector, and the reform of the banking sector.

Most recently uncertainty has arisen in business circles from the ongoing investigations into the activities of Yukos, the Russian oil giant, and from the arrest of Mikhail Khodorovsky, its CEO, at the end of October. The list of charges against the oligarch includes tax evasion, fraud and embezzlement. In many observers' opinion, however, this is a politically motivated move that has the blessing of the Kremlin, as Khodorovsky was showing growing political ambitions and has frequently supported liberal opposition parties. This stands in

contrast to the informal “agreement” between Putin and the oligarchs, whereby the oligarchs’ noninvolvement in politics is rewarded by the authorities’ continuing to turn a blind eye to previous dubious or illegal methods of acquiring state assets.

In the week following Khodorovsky’s arrest, Moscow’s RTS (Russian Trading System) index, which had reached record levels, lost some 22% only to recover by 10% or so by November 11, 2003. The ruble remained relatively stable – thanks, in part, to interventions made by the central bank. In the short term, Russian bond spreads widened only to narrow again later. Analysts fear that capital flight abroad, after it had ceased in net terms in the first half of the year, will assume greater proportions once more. In addition, foreign direct investors could become (at least temporarily) more cautious again. President Putin has endeavored to limit the negative effects of the affair and has repeatedly emphasized that the authorities do not intend to challenge the “wild privatizations” of the 1990s in general.

Cutoff date for data: November 13, 2003.

SPECIAL FOCUS:  
EXCHANGE RATES  
IN ACCEDING COUNTRIES

# Assessing Equilibrium Exchange Rates in CEE Acceding Countries: Can We Have DEER with BEER without FEER? A Critical Survey of the Literature

Balázs Égert<sup>1)</sup>

## I Introduction

Recently, the much-heralded EU enlargement has focused considerable attention on how acceding countries should prepare for their subsequent euro area entry. In this context, one important issue at the center of policy debate is the introduction of an exchange rate mechanism, ERM II, which is consistent with the Maastricht criterion on exchange rate stability. Hence, the focus has swiftly shifted to the questions of how quickly and with which parity new Member States should join ERM II and subsequently the euro area. The latter question is closely related to the concept of the equilibrium real exchange rate, and the answer is bound to remain a challenge in the future.

This paper attempts to take stock of what is known about equilibrium real exchange rates in acceding countries by surveying the empirical literature. The roadmap of the paper is the following. Section 2 presents basic concepts and definitions of the exchange rate. Section 3 discusses the theoretical background and the operational toolbox of the equilibrium real exchange rate. Section 4 attempts to link the different approaches. Section 5 gives an overview of the empirical body of literature. Section 6 summarizes the findings. Finally, section 7 provides concluding remarks.

## 2 Basic Concepts and Definitions

The real exchange rate can be defined in two different ways. The first definition, termed the “internal real exchange rate,” refers to the ratio of nontradable prices to tradable prices

$$Q^{internal} = \frac{P^{NT}}{P^T} \quad (1),$$

where  $Q$  is the internal real exchange rate and  $P^{NT}$  and  $P^T$ , respectively, stand for the price level of the nontradable and tradable sectors.

This definition is appropriate for small, open developing countries whose trade consists chiefly of commodities. The internal real exchange rate does not include the nominal exchange rate, as the latter is assumed to be either fixed or to be driven by commodity prices in world markets. This is the reason why estimating the equilibrium “internal real exchange rate” provides little guidance on the equilibrium nominal exchange rate.

What is more relevant to our purposes is, however, the macro definition of the real exchange rate, also labeled the “external real exchange rate,” which is given as the nominal exchange rate multiplied by the foreign price level and divided by the domestic price level as follows:

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$$Q = \frac{E \cdot P^*}{P} \quad (2)$$

In this case, the nominal exchange rate  $E$  is expressed as units of domestic currencies per one unit of foreign currency. Thus, a rise in the exchange rate means a depreciation, while a drop indicates an appreciation. Note that this definition will be used throughout the whole paper.  $P$  and  $P^*$  denote the domestic and the foreign price levels. The real exchange rate ( $Q$ ) is the ratio of the foreign ( $EP^*$ ) and domestic price ( $P$ ) levels converted into the same unit of measure, i.e. domestic currency units. We will refer to the external real exchange rate as the real exchange rate in the remainder of this paper.

If the variables are expressed in indices, the real exchange rate shows the relative shift which has occurred between the foreign and domestic price levels over a given lapse of time.

The price level can be split into tradable and nontradable prices, which, after transforming variables into logarithms, can be written in the following way:<sup>1)</sup>

$$p = \alpha \cdot p^T + (1 - \alpha) \cdot p^{NT} \quad (3)$$

where  $\alpha$  stands for the share of tradable goods in the consumer price basket and  $(1 - \alpha)$  represents the share of nontradable goods. Introducing equation (3) into equation (2), and making some manipulations,<sup>2)</sup> the real exchange rate can be decomposed into three components:

- the nominal exchange rate ( $e$ )
- the ratio of foreign to domestic tradable prices (the internal real exchange rate) ( $p^{T*} - p^T$ )
- the ratio of the domestic to the foreign relative price of nontradable goods  $(1 - \alpha)(p^{NT} - p^T) - (1 - \alpha^*)(p^{NT*} - p^{T*})$

$$q = e + p^{T*} - p^T - [(1 - \alpha)(p^{NT} - p^T) - (1 - \alpha^*)(p^{NT*} - p^{T*})] \quad (4)$$

whereby  $e + p^{T*} - p^T$  is actually the real exchange rate for tradable goods. It also becomes evident that the internal real exchange rate is part of the external real exchange rate.

### 3 Theoretical Foundations of the Equilibrium Real Exchange Rate

#### 3.1 Purchasing Power Parity

There are several approaches to equilibrium real exchange rates. The first one, purchasing power parity (PPP), formalized in a string of papers by Cassel (1916a, b and 1918), tells us that the nominal exchange rate is the domestic price level divided by the foreign price level:

$$E^{PPP} = \frac{P}{P^*} \quad (5)$$

<sup>1</sup> Small letters refer to logarithms hereafter.

<sup>2</sup> Introducing equation (3) into equation (2) yields equation (1'):

$$q = e + \alpha^* \cdot p^{T*} + (1 - \alpha^*) \cdot p^{NT*} - [\alpha \cdot p^T + (1 - \alpha) \cdot p^{NT}] \quad (1')$$

With  $\alpha^* \cdot p^{T*} = p^{T*} - (1 - \alpha^*) \cdot p^{T*}$  and  $-\alpha \cdot p^T = -p^T + (1 - \alpha) \cdot p^T$ , we obtain:

$$q = e + p^{T*} - p^T - (1 - \alpha^*) \cdot p^{T*} + (1 - \alpha^*) \cdot p^{NT*} + (1 - \alpha) \cdot p^T - (1 - \alpha) \cdot p^{NT} \quad (2')$$

The rearrangement of equation (2') then gives equation (4).

PPP is supposed to determine the long-term nominal exchange rate. But in the shorter run, the nominal exchange rate prevailing in the forex markets may deviate from that suggested by PPP. In this event, the extent of the deviation might be thought of as an over- or undervaluation of the home currency. This can be illustrated by introducing equation (5) into equation (2):<sup>1)</sup>

$$Q = \frac{E}{E^{PPP}} \quad (6)$$

If the actual nominal exchange rate is higher than the one given by PPP ( $E > E^{PPP}$ ), i.e. the real exchange rate is higher than 1, the real and nominal exchange rates are undervalued whereas in the opposite case they are overvalued ( $E < E^{PPP}$ ). If  $E = E^{PPP}$ , the real exchange rate is equal to 1 and can be viewed as fairly valued in PPP terms.

The conjecture underlying PPP is that the law of one price (LOOP) holds for every good in the price basket. In accordance with LOOP, a given good should cost the same in the home and the foreign country when the price is expressed in the same currency ( $P_i = E \cdot P_i^*$ ). This is secured by the international good arbitrage mechanism, which impacts on prices and the nominal exchange rate so that LOOP holds at the end of the day. For good arbitrage to be effective, perfect competition must prevail both in home and foreign markets, there must be no trade barriers and capital movements must not be restricted.

There are a number of reasons why PPP might be misleading as a yardstick for assessing equilibrium real exchange rates, of which only the most important ones are enumerated below.

First, even though LOOP holds, if the composition and the weights of the price basket differ across countries, PPP is a flawed measurement, as it is akin to comparing apples with oranges and pears. Differences in the composition of the price basket can come from different consumer and production patterns: consumers may want to consume different goods or varying quantities of the same good and producers can manufacture different goods in different countries.

Second, LOOP may not work, which in turn leads to the failure of PPP, because perfect competition may not prevail: there are transport costs and differentiated products that may lead to pricing-to-market phenomena (Driver and Westaway, 2004; Haskel and Wolf, 2001).

Third and most importantly, the presence of nontradable goods in the price basket is bound to bring about a systematic deviation of the observed exchange rate from the exchange rate implied by PPP. This deviation is expected to be substantial especially when comparing countries at different stages of economic development. The reason for this is that nontradable prices in developing countries are far lower than in developed countries.

<sup>1</sup> Note that this formula is sometimes also referred to as the Exchange Rate Deviation Index (ERDI).  $Q$  is defined as units of local currency over one unit of foreign currency.  $1/Q$  is the real exchange rate given as units of foreign currency to one unit of domestic currency, and is also labeled as the comparative or relative price level or the exchange rate gap.

### 3.2 Trend Appreciation in Transition Economies

#### 3.2.1 Accounting for Market Nontradable Prices: The Balassa-Samuelson Effect

##### 3.2.1.1 A Brief Description

Consider two countries with the same nontradable price level (case 1) and that PPP holds for the open sector. The respective price levels are given by  $P_1$  and  $P^*$ . Next, consider the case (case 2) based on the same foreign country ( $P^*$  is constant) and in which, all things being equal, nontradable prices in the home country are lower than in the foreign economy (overall price level =  $P_2$ ) so that the domestic price level will be below that in case 1. As a corollary, the PPP-based nominal exchange rate will be lower in case 2 than in case 1. ( $P_2 < P_1$ , so that  $P_2/P^* < P_1/P^*$ ). In both cases, the actual nominal exchange rate ( $E$ ) is given by PPP in the open sector. This means that the real exchange rate in the first case will equal 1 (the real exchange rate is in equilibrium) while it will be higher than 1 in the second case (in equation (6), the real exchange rate is undervalued). However, if the price level of nontradables in the home country converges towards nontradable prices in the foreign country so that the ratio ( $P^{NT}/P^T$ ) is roughly ( $P^{NT^*}/P^{T^*}$ ) in the long run, the real exchange rate will systematically appreciate, since it is higher than 1 at the outset and will tend to decrease to 1 over time.

The theoretical backdrop of this trend appreciation is elaborated in the Balassa-Samuelson model (Balassa, 1964; Samuelson, 1964; henceforth referred to as the B-S effect). The model is based on an economy split into two sectors, producing tradable and nontradable goods. It is assumed that market forces are at work in both sectors. This has important implications, because in the public and other regulated sectors, wages and prices will not behave as described hereafter. First, PPP is assumed to be verified for the tradable sector. Hence, prices in this sector are given exogenously. Second, wages are linked to the level of productivity in the open sector. Third, wages tend to equalize across sectors so that the wage level in the closed sector is comparable to that in the open sector. Finally, prices in the sheltered sector depend on wages, i.e. on unit labor costs rather than on the level of productivity in this sector.

Let us now assume that the home country is the developing country with low productivity levels while the foreign country is the developed country with high productivity levels in the open sector. Prices for tradable goods are given by PPP in both countries. In the home country, low productivity in the open sector implies low wages in the same sector, which in turn implies low wages and low prices in the market-based closed sector. By contrast, high productivity in the open sector implies high wages<sup>1</sup>) in the same sector, which is reflected in high wages and high prices in the market-based closed sector. The true key to different market-driven nontradable prices and thus overall price levels should be sought in differing productivity levels.

If the home (developing) economy is able to catch up systematically with the foreign (developed) economy, productivity is expected to rise correspondingly in the open sector. When productivity improves faster in the open sector

<sup>1</sup> Higher productivity means that more goods can be produced using the same amount of inputs, i.e. labor and capital, so that the inputs' remuneration can be increased (i.e. higher wages) without putting competitiveness at risk (as prices are determined by PPP).

than in the market-based sheltered sector, market-determined nontradable prices are expected to rise because of the wage spillover from tradables to nontradables. This in turn gives rise to an increase in the overall price level. If the home country's productivity differential between the open and the market-based sheltered sector exceeds that of the foreign country, the price level will rise faster in the home country, implying a positive inflation differential. This in turn will be reflected in the appreciation of the home country's real exchange rate.

It is worth pausing to summarize the propositions of the B-S model:

- 1) Different productivity levels imply, via differences in market-based nontradable prices, different price levels expressed in the same currency;
- 2) The real and nominal exchange rate of low-productivity (typically developing) countries seem undervalued in PPP terms;
- 3) If productivity growth is higher in the open sector than in the sheltered sector, nontradable prices and thus the overall price level will rise (also referred to as structural inflation); and
- 4) Higher growth of the productivity differential in the home country than in the foreign country is reflected in faster increases in the price level, leading to the real appreciation of the home currency (convergence towards PPP).

However, these propositions hinge on the following assumptions:

- 1) Wages are linked to productivity in the open sector;
- 2) Wages tend to equalize across sectors; and
- 3) PPP holds for the open sector.

The last assumption has important implications: The entire appreciation of the real exchange rate deflated by the consumer price index (as a proxy for overall inflation) comes from increases in nontradable prices, and this can be fully ascribed to the B-S effect (the appreciation of the CPI-based real exchange rate). By contrast, in the event that PPP is not verified for the open sector and, say, the real exchange rate based on producer prices (as a proxy for tradable prices) also appreciates, the B-S effect can explain only the difference between the CPI- and the PPI-deflated real exchange rate.

### 3.2.1.2 Formal Derivation

It is possible to formally derive the relationship between productivity in the tradable sector relative to that in the nontradable sector (henceforth referred to as dual productivity) and the price of nontradable goods relative to that of tradable goods (henceforth referred to as the relative price of nontradable goods).

Based on a two-sector neoclassical framework with perfect capital mobility and with the interest rate assumed exogenous, we obtain the following relationship:

$$\hat{p}^{NT} - \hat{p}^T = \frac{\delta}{\gamma} \hat{\alpha}^T - \hat{\alpha}^{NT} \quad (7),$$

where circumflexes ( $\hat{\phantom{x}}$ ) stand for growth rates,  $\delta$  and  $\gamma$  denote the share of labor in the sheltered and open sectors, respectively.  $\hat{p}^{NT} - \hat{p}^T$  represents the growth

rate of the relative price of nontradable goods and  $\hat{\alpha}^T - \hat{\alpha}^{NT}$  is the growth rate of dual total factor productivity.<sup>1)</sup> The transformation of equation (4) into growth rates combined with equation (7) yields equation (8) if the share of tradables in the consumer price basket is the same in the home and foreign economies ( $\alpha = \alpha^*$ ):

$$\hat{q} = \hat{e} + \hat{p}^{T*} - \hat{p}^T - (1 - \alpha)[(\frac{\delta}{\gamma}\hat{\alpha}^T - \hat{\alpha}^{NT}) - (\frac{\delta^*}{\gamma^*}\hat{\alpha}^{T*} - \alpha^{NT*})] \quad (8),$$

where the growth rate of the real exchange rate equals the rate of growth of the real exchange rate for the open sector, and, most importantly, the difference between the growth rates of dual total factor productivity at home and abroad.

However, it may be more convenient to derive the above developed relationships in levels (as opposed to growth rates) and on the basis of average labor productivity (as opposed to total factor productivity):<sup>2)</sup>

$$\frac{P^{NT}}{P^T} = \frac{\gamma}{\delta} \cdot \frac{Y^T/L^T}{Y^{NT}/L^{NT}} \quad (9),$$

where Y and L denote output and labor and Y/L is the average labor productivity. Transforming equation (9) into logarithms leads to:

$$p^{NT} - p^T = const + (\alpha^T - \alpha^{NT}) \quad (10),$$

where *const* is a constant term containing  $\log(\gamma)$  and  $\log(\delta)$ . Applying equation (10) to equation (4) gives equation (11), provided  $\alpha = \alpha^*$ :

$$q = const + (e + p^{T*} - p^T) - (1 - \alpha)[(\alpha^T - \alpha^{NT}) - (\alpha^{T*} - \alpha^{NT*})] \quad (11),$$

where the real exchange rate is linked to the difference between dual average labor productivity at home and abroad (henceforth referred to as the dual productivity differential). Note that the constant term now contains  $\log(\gamma)$ ,  $\log(\delta)$ ,  $\log(\gamma^*)$  and  $\log(\delta^*)$  multiplied by  $(1 - \alpha)$ .

Such a derivation has two advantages. First, sectoral average labor productivity can be used on its own right and not as a proxy for sectoral total factor

1 The supply side of the two sectors is modeled by means of two different, constant-returns-to-scale Cobb-Douglas production functions:  $Y^T = A^T(L^T)^\gamma(K^T)^{(1-\gamma)}$  and  $Y^{NT} = A^{NT}(L^{NT})^\delta(K^{NT})^{(1-\delta)}$  where  $A^T, A^{NT}, L^T, L^{NT}, K^T$  and  $K^{NT}$  represent the level of total factor productivity, labor and capital in the open and closed sectors, respectively. Because of profit maximization, interest rates ( $i$ ) and nominal wages ( $w$ ) in both sectors equal the marginal products  $dY^T/dK^T, dY^{NT}/dK^{NT}, dY^T/dL^T$  and  $dY^{NT}/dL^{NT}$ , respectively:

$$i^T = \log(1 - \gamma) + a^T - \gamma(k^T - l^T) \quad (3')$$

$$i^{NT} = (p^{NT} - p^T) + \log(1 - \delta) + a^{NT} - \delta(k^{NT} - l^{NT}) \quad (4')$$

$$w^T = \log(\gamma) + a^T + (1 - \gamma)(k^T - l^T) \quad (5')$$

$$w^{NT} = (p^{NT} - p^T) + \log(\delta) + a^{NT} + (1 - \delta)(k^{NT} - l^{NT}) \quad (6')$$

Equations (3') to (6') are expressed in logarithmic terms. Tradable prices are exogenous because of perfect competition in the open sector. Given that capital is assumed to be fixed in the short run, the first order conditions (FOC) in the open sector determine the capital-labor ratio and the nominal wage. Wage equalization across sectors implies that this wage level is exogenous in the sheltered sector. In turn, the FOC in the sheltered sector give the capital-labor ratio in the sheltered sector and the price of nontradables relative to that of tradables. To obtain equation (7), equations (3') to (6') are totally differentiated and rearranged (for a step-by-step derivation, see Égert, 2003).

2 Given that the marginal productivity of labor is equal between the open and closed sectors, equations (3') and (4') can be equated based on which the relative price of nontradables can be expressed as follows:  $\frac{p^{NT}}{p^T} = \frac{\partial Y^T / \partial L^T}{\partial Y^{NT} / \partial L^{NT}}$ . A well-known feature of Cobb-Douglas production functions is that marginal productivity equals average productivity:  $\frac{\partial Y^T}{\partial L^T} = A^T \gamma (\frac{K^T}{L^T})^{(1-\gamma)} = \gamma \frac{Y^T}{L^T}$  and  $\frac{\partial Y^{NT}}{\partial L^{NT}} = A^{NT} \delta (\frac{K^{NT}}{L^{NT}})^{(1-\delta)} = \delta \frac{Y^{NT}}{L^{NT}}$ , which yields equation (9).

productivity.<sup>1)</sup> In addition, the terms  $\gamma$  and  $\delta$  are passed into the constant term. Second, the level relationship makes it possible to use the cointegration technique to estimate the long-run relationship between the real exchange rate and the dual productivity differential.<sup>2)</sup> According to the B-S model set out here, changes in dual productivity lead to changes in the relative price of nontradables, which, through increased overall inflation, lead to the appreciation of the real exchange rate. Because PPP holds for the open sector, competitiveness is not affected by the real appreciation. It is often argued in the literature that there is an equivalence between this type of appreciation (with fixed nominal exchange rates) and a real appreciation caused by the nominal exchange rate. If the appreciation of the nominal exchange rate proportionally decreases the price of tradables, PPP holds for the open sector, leaving competitiveness unaffected. The real exchange rate of the closed sector appreciates, implying the appreciation of the overall real exchange rate. However, two problems arise: (1) the B-S model does not contain any straightforward mechanism explaining nominal appreciation, and (2) if nominal appreciation occurs for any other reason, competitiveness in the open sector would deteriorate because the exchange rate passthrough is usually lower than unity.

### 3.2.1.3 Possible Extensions

The standard simple B-S framework can be extended as follows:

- 1) Along the lines proposed by Bergstrand (1991), the model can be augmented with demand-side variables, i.e. private consumption. It is argued that because of the high income elasticity of demand for nontradable goods, an increase in dual productivity accompanied by increasing disposable income per capita may result, in the long run, in rising consumption, which falls to an increasing extent on nontradable goods. Thus, demand-side pressure in the sheltered sector yields higher nontradable prices.
- 2) The standard B-S effect rests on a two-sector, two-input small, open economy model. According to Fischer (2002), a three-sector four-input model makes it possible to show that investment demand can also lead to a rise in the price of nontradable goods.
- 3) Holub and Čihák (2003) formally introduce tradable and nontradable capital alongside the risk premium to the model and show that the following factors can bring about a rise in relative prices: (1) a decrease in the risk premium, (2) an increase in nontradable capital per capita, (3) a rise of employment in the nontradable sector relative to total employment.

1 In equations (7) and (8), total factor productivity can be approximated by average labor productivity, which may, however, be a biased proxy. Labor productivity (LP) can be decomposed into (1) the capital-labor ratio, i.e. capital intensity (CI) and into (2) TFP ( $LP=CI+TFP$ ). Therefore, the level of labor productivity might be systematically higher or lower than TFP, with capital intensity working as a "leverage." In the event that capital intensity changes over time, the evolution of labor productivity will differ from that of TFP. Needless to add that if capital intensity differs across countries, labor productivity as a proxy for TFP will induce an additional bias when productivity developments are compared across countries. Therefore, it would be preferable to use equations (10) and (11) where average labor productivity can be used directly.

2 A specification in growth rates such as in equations (7) and (8) would imply that the cointegration technique (extensively used in the literature: see table 5a), which is meant to link variables that are nonstationary in levels but stationary in first differences, could not be applied because the growth rates may already render the series stationary.

### 3.2.2. The Real Exchange Rate in the Open Sector:

#### The Role of Tradable Prices and the Nominal Exchange Rate

Lommatzsch and Tober (2002b) and Égert et al. (2003), among others, documented that in selected transition economies, not only the CPI-based real exchange rate but also the PPI-deflated real exchange rate witnessed a certain trend appreciation from the early 1990s onwards and that the CPI- and PPI-based real exchange rates moved fairly closely together.<sup>1)</sup> Clearly, the traditional B-S effect cannot explain the appreciation of the real exchange rate deflated by the PPI (as a proxy for tradable prices) because its impact passes through the nontradable price channel. Indeed, the B-S effect that posits PPP to hold for tradable goods is meant to explain possible differences between changes in the overall inflation-based (CPI) and the tradable price-deflated (PPI) exchange rates.

- 1) The real exchange rate based on tradable prices may appreciate in the event of a substantial initial undervaluation at the onset of the systemic transformation process. Hence, the appreciation of the PPI- and CPI-based real exchange rates may reflect an adjustment towards equilibrium as proposed in Halpern and Wyplosz (1997) and in Krajnyák and Zettelmeyer (1998).
- 2) However, the source of the appreciation of the tradable price-based real exchange rate may be more closely related to the transformation process. At the beginning of transition, both domestic and foreign consumers tend to prefer foreign goods. However, with economic restructuring that entails productivity increases in the tradable sector, the home economy becomes capable of producing a growing number of goods of better quality. This is why the preference of domestic and foreign consumers shifts towards home goods. An increasing reputation and home bias allow higher prices to be set for the goods produced in the home economy both in the foreign and the domestic markets. Also, an improving export performance based on the aforementioned factors may lead to the appreciation of the nominal exchange rate (see Égert and Lommatzsch, 2003).

Thus, productivity gains could operate not just via nontradable prices, but also via the tradable price and the nominal exchange rate channels. If rises in tradable prices fueled by productivity advances are faster in the home economy than in the foreign one, the resulting positive inflation differential in tradable prices causes the real exchange rate based on tradable prices to appreciate. Similarly, the appreciation of the nominal exchange rate also leads to an appreciation of the tradable price-based real exchange rate.

- 3) Another kind of appreciation of the real exchange rate deflated by means of tradable prices can stem from the appreciation of the nominal exchange rate that is based on expected future productivity gains. Capital inflows related to productive foreign investment may trigger future productivity gains and an increase in future export revenues that could counterbalance today's deterioration of the current account. Most importantly, this kind of nominal appreciation will be an ex post equilibrium phenomenon only if productivity advances materialize and export revenues actually increase. In the opposite case, i.e. in the event that productivity gains do not materialize, an expect-

<sup>1</sup> Ito et al. (1997) and Lee and Tang (2003) provide evidence in favor of a tradable price-based real appreciation for Asian countries and for selected OECD countries, respectively.

- ation-driven nominal appreciation, viewed *ex ante* as an equilibrium phenomenon, may lead to an *ex post* overvaluation of the real exchange rate.
- 4) Another source of possible equilibrium appreciation of the tradable price-based real exchange rate may be the nontradable component of tradable goods. The price of tradable goods increases through their service component, the rise of which is driven by the traditional B-S effect.
  - 5) There is a more general problem. Inflation measures, usually the CPI, are likely to overstate the “true” rate of inflation. The four sources of an upward inflation bias are as follows: (1) consumer substitution, (2) outlet substitution, (3) quality improvements, and (4) new goods bias<sup>1)</sup> (Boskin et al., 1996; Gordon, 2000). Transition economies are even more prone to this bias than well-established market economies. Hanousek and Filer (2001a, 2001b) argue that in the Czech Republic, the bias due to quality changes may reach 50% of the CPI reported for food and goods and that the bias coming from the other sources are comparable to that measured for the U.S. economy and other industrialized countries. Although estimates are not available for other acceding countries and for the PPI, the quality issue may also be very important in this case. Hence, the measured appreciation of the real exchange rate may be larger than the one based on unbiased inflation measures.

### 3.2.3. The Role of Regulated Prices

The trend appreciation of the real exchange rate as described in the B-S model and changes in tradable prices are based on sectors and prices governed by market forces. Nevertheless, administered and regulated prices,<sup>2)</sup> which are composed mainly of services, represent a large portion of overall inflation, i.e. the consumer price index, especially in transition economies. Increases in these prices are usually the highest and are not related to productivity increases.<sup>3)</sup>

Because regulated items can be inputs for tradable and market nontradable goods, an increase in regulated prices may affect tradable goods’ competitive-

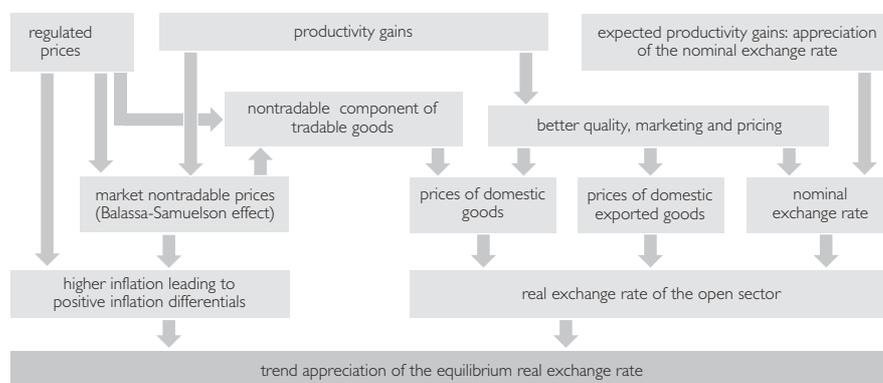
1 *Consumer substitution: changes in consumption patterns towards items with low price increases are not taken into account in the CPI. Outlet substitution: weights attributed in the CPI to different channels of distribution do not coincide with the observed patterns. The excessive weight of expensive traditional outlets at the expense of cheaper hypermarkets cause true CPI inflation to be overstated. Quality improvements: changes in prices due to quality changes are misconceived as price inflation. New goods bias: new goods are introduced into the CPI basket only with a delay.*

2 *The terms administered and regulated prices will be used interchangeably in the remainder of the paper.*

3 *Prices of regulated services including public transport, communication, energy and water supply were left largely unchanged at the outset of transition. In setting the price of regulated items, only operational costs were considered initially because the capital stock of the sectors concerned was inherited from the communist era and because of political considerations. Later on, also capital maintenance costs were considered to account for wear and tear. However, once general price liberalization was over, the progressive replacement of the capital stock at market prices, partly through privatization, led to huge increases in regulated prices because the cost of capital had to be taken into account as well (see Zavoico, 1995). This was all the more important as the regulated sectors tend to be very capital intensive. It appears that the adjustment of regulated prices is, however, not over yet. First, prices may still be below cost recovery in some cases. Second, governments still provide direct and indirect subsidies, which may be cut because of efforts to consolidate public finances and because of the need to comply with competition rules in the *acquis communautaire*. Finally, the need for additional capital investment to meet the quality of services required by EU standards may also imply further price increases (Égert, 2003). To dampen price increases, efficiency can be improved via privatization and market liberalization. In the case of industries where true market competition is not possible, an appropriate price regulatory framework should be implemented, as was the case in England and Wales (Saal and Parker, 2001).*

Chart 1

**Elements of the Appreciation of the Equilibrium Real Exchange Rate**



Source: Author.

ness directly and indirectly through the market-based nontradable component of tradable goods.

Yet, increases in regulated prices may not affect competitiveness and may also partly be viewed as an equilibrium phenomenon for two reasons. First, regulated prices were left unchanged at the onset of the transition period when other prices were set free. Therefore, a large increase in regulated prices may reflect a late catching-up with other prices, mainly with market services. It appears that this adjustment process has not finished yet, because the current prices of regulated services often do not allow cost recovery. Second, regulated prices may impact on tradable goods that do not enter international competition.

Chart 1 summarizes the elements of the trend appreciation of the equilibrium real exchange rate in transition economies.

### 3.3 The Fundamental Equilibrium Exchange Rate (FEER)

For small, open economies, it would be more straightforward to define the equilibrium real exchange rate in terms of a sustainable external position, i.e. a sustainable current account and sustainable external debt. The theoretical framework to the trend appreciation vaguely takes account of external sustainability by underscoring that the appreciation of the real exchange rate comes only from market nontradable price increases and that PPP is ensured for the open sector, thus securing the competitiveness of exports. However, it is easy to see that other factors besides productivity growth can play an essential role in current account and external debt sustainability, such as the real interest rate, fiscal policy or determinants of savings and investments.

The notion of the external sustainability-based equilibrium real exchange rate was first advocated by Nurkse (1945), and then elaborated by Artus (1978). Nevertheless, the concept gained popularity with a series of publications by Williamson (1985, 1994) that gave a fillip to theoretical and empirical research related to equilibrium real exchange rates. Williamson coined the expression Fundamental Equilibrium Exchange Rate (FEER) for the sustainable external account-based equilibrium real exchange rate. In accordance with

Williamson's definition, FEER is a real effective exchange rate that simultaneously secures internal and external balances for a given number of countries at the same time. Internal balance is defined as the nonaccelerating inflation rate of unemployment (NAIRU). Put differently, internal balance is reached when the economy functions at full capacity accompanied by low inflation. External balance is achieved when the balance of payments is in a sustainable position over a medium-term horizon, ensuring external debt sustainability.<sup>1)</sup>

When it comes to making FEER operational, there are two main questions to be answered. The first one is related to the determination of the potential output growth associated with low inflation. Two major avenues are open: Either historical GDP growth can be statistically decomposed into trend and cyclical components, e.g. using the Hodrick-Prescott (HP) filter or the Beveridge-Nelson decomposition, or economic theory can be used to determine the magnitude of potential growth. The second question to be addressed concerns the notion of what a sustainable current account is. First, a current account deficit can be considered sustainable if it is covered by long-term capital inflows and if it stabilizes the external debt-to-GDP ratio at a given level. It remains an open question, though, what the optimal level of this ratio is. Second, the current account can be viewed in terms of saving-investment balances ( $CA = S - I$ ). Accordingly, econometric models are estimated by regressing saving and investment on an array of explanatory variables, such as population growth, the fiscal position or openness ( $I = I(\bar{Z}_1), S = S(\bar{Z}_2)$ ), where  $\bar{Z}_1, \bar{Z}_2$  stand for vectors of explanatory variables).<sup>2)</sup> Fitted values for investment and saving are then used to derive medium-term values of the current account. This approach is also dubbed the Macroeconomic Balance Approach.

FEER has a close relative called Desired Equilibrium Exchange Rate (DEER). The difference between these related concepts is that in the case of DEER, external equilibrium is defined in terms of optimal policy. In other words, the current account target and the subsequent foreign debt should be in line with what policymakers deem optimal.

Turning our attention to how to derive the fundamental or desired equilibrium exchange rates, the following steps can be pinned down:

- 1) Determining the targeted current account position;
- 2) Estimating the elasticity of the current account to domestic and foreign output and to the real effective exchange rate ( $CA = f(Y, Y^*, REER)$ );
- 3) Working out the change in the real effective exchange rate (REER) that would place domestic and foreign output on their potential path and that would achieve the targeted current account. However, the simultaneous achievement of this triple goal is hardly possible. Therefore, it is normally assumed that internal balance both in the home and foreign economies is reached without the help of the real effective exchange rate;
- 4) Seeking the change in the real effective exchange rate that would make the current account, adjusted for internal balances (i.e. the current account that would prevail at potential output), move to its target value. The change

1 Bayoumi et al. (1994) define a horizon from four up to six years.

2 For more details, see e.g. Isard et al. (2001).

in the real effective exchange rate is tantamount to the total misalignment;  
and

- 5) Calculating the bilateral equilibrium nominal exchange rates. The current nominal effective exchange rate needs to be adjusted with the required change in the real effective exchange rate, and subsequently the bilateral nominal exchange rates are to be extracted.

### 3.4 The Natural Real Exchange Rate (NATREX)

Developed in a series of papers by Stein (1994, 1995 and 2002), the NATural Rate of EXchange (NATREX) approach distinguishes equilibrium real exchange rates at two horizons, a medium-run and a long-run equilibrium real exchange rate. In the medium run, the real exchange rate can be viewed at equilibrium when internal and external balances are achieved simultaneously, very much like in the FEER approach. The definition of internal balance is slightly different, because it is not defined in terms of NAIRU but rather at full capacity utilization, whereas external balance implies current account sustainability, such as:

$$CA - (S - I) = 0 \quad (12)$$

That is, the current account corresponds to net exports ( $NX$ ) minus net income payments/inflows related to foreign debt/assets, i.e. net factor income ( $CA = NX - i^* \cdot FDEBT$ ) should be equal to long-term net capital inflows determined by saving and investment decisions.

Let us now consider the investment and consumption functions and the determinants of the trade balance that are connected via the national account identity as in equation (16):

$$\frac{I}{Y} = f(\overset{+}{a}, \frac{\bar{K}}{Y}, \bar{r}, \overset{+}{Q}) \quad (13)$$

$$\frac{C}{Y} = f(\frac{\bar{K}}{Y}, \frac{FDEBT}{Y}, \bar{Z}) \quad (14)$$

$$NX = f(\overset{+}{Q}, \frac{\bar{D}}{Y}, \frac{\bar{D}^*}{Y}, \overset{+/-}{TOT}) \quad (15)$$

$$\frac{I}{Y} + \frac{C}{Y} + \frac{NX}{Y} = 1 \quad (16)$$

Investment ( $I$ ), consumption ( $C$ ), capital stock ( $K$ ), foreign debt ( $FDEBT$ ), the trade balance ( $NX$ ) and domestic and foreign demand ( $D, D^*$ ) are expressed in GDP terms ( $Y$ ). Investment increases with a rise in the rate of growth of total factor productivity ( $a$ ) and the depreciation of the real exchange rate ( $Q$ ) and decreases when capital stock and the real interest rate increase. Consumption, including both private and public consumption, is positively related to wealth, defined as capital stock ( $K$ ) minus foreign debt ( $FDEBT$ ): therefore, it is a positive function of capital and depends negatively on foreign debt.  $\bar{Z}$  denotes a vector of exogenous variables, the most important of which is the social thrift parameter that stands for the social (private and public) propensity to save. Finally, the trade balance improves with the depreciation of the real exchange rate. Furthermore, the trade balance is negatively related to domestic

demand, whereas it bears a positive sign with foreign demand. Substituting equations (13) – (15) into equation (16) and solving it for the real exchange rate ( $Q$ ) yields the medium-term equilibrium real exchange rate. In practice, equations (13) – (15) are estimated by means of econometric techniques and the estimated medium-term NATREX is given by applying the estimated parameters to the solution of the system.<sup>1)</sup>

In the NATREX model, a change in foreign debt and in the capital stock ( $K$ ) feed back into the macroeconomic balance. For instance, an increase in foreign debt resulting from a deteriorating current account position decreases wealth ( $K - FDEBT$ ), and this leads to a fall in consumption. As a consequence, import demand drops and the real exchange rate depreciates, which in turn ameliorates the current account and decreases foreign debt. This is indeed a feedback mechanism that stabilizes foreign debt.

What the NATREX approach indeed adds to FEER is that it also considers the stock of capital and the stock of net foreign debt in the long run and that it describes the path of the real exchange rate from medium-term equilibrium towards long-term equilibrium. Whilst the medium-term NATREX is obtained based on current values of the capital stock and foreign debt, the long-term equilibrium is derived when the stock of capital and the stock of foreign debt are stabilized at their steady state levels, given respectively in equations (17) and (18):

$$\frac{K}{Y} = \frac{1 + g}{\delta + g} \cdot \frac{I}{Y} \quad (17)$$

$$\frac{FDEBT}{Y} = \frac{1 + g}{g} \cdot \frac{CA}{Y} \quad (18)$$

where  $\delta$  denotes the rate of depreciation of the capital stock and  $g$  stands for the growth rate of GDP.

To illustrate the difference between the medium- and long-run real exchange rates, Stein (1995) considers two cases: (1) the propensity to save decreases and (2) productivity rises. In both cases, the medium-term NATREX appreciates. In the first case, a decrease in savings implies an increase in consumption, and this leads to a worsening of the current account and the foreign debt. In the second case, a productivity shock occurs that leads to a rise in investment. Similarly to the first case, this implies a larger current account deficit and thus an increase in the foreign debt. The resulting capital inflows cause the real exchange rate to appreciate, which restores the internal and external balances.

However, in the first case, the real exchange rate depreciates in the long run because increased foreign debt causes interest payments to rise. Indeed, the real exchange rate depreciates to improve the trade balance required to service the debt.

Contrary to a drop in the propensity to save, an increase in productivity may bring about an appreciation of the real exchange rate in the long run. Not only

<sup>1</sup> Equations (13) to (15) are normalized using actual output, which implies that the medium-run NATREX is the exchange rate that brings investment, consumption and net exports such as estimated in equations (13) to (15) in line with observed output (equation (16)). However, if equations (13) to (15) were normalized using potential output, the medium-term NATREX would be given as the exchange rate that equalizes medium-term aggregate demand with potential output (Karádi, 2003).

foreign debt rises in the medium term, so does capital stock. In turn, productivity increases further, and higher GDP growth results in higher savings. Given this development, foreign debt decreases and the real exchange rate appreciates in the long run to counterbalance the improving current account. At the same time, however, higher capital stock implies higher imports, which may offset some of the appreciation of the real exchange rate.

Recent attempts to estimate the structural form of the NATREX model include Detken et al. (2002) for the euro area and Karádi (2003) for Hungary. However, it is common practice to estimate a reduced-form equation of the model that includes the exogenous variables of the model. In this case, the estimation method is tantamount to the BEER approach presented below.

### 3.5 The Behavioral Equilibrium Exchange Rate (BEER)

The theoretical underpinning of the BEER approach as proposed by MacDonald (1997) and Clark and MacDonald (1998) rests on the uncovered interest rate parity (UIP):

$$E_t(e_{t+1}) - e_t = i_t - i_t^* \quad (19)$$

where  $E_t(e_{t+1})$  denotes the expected value of the nominal exchange rate in period  $t$  for period  $t + 1$ , and  $e_t, i_t, i_t^*$  stand for the current value of the nominal exchange rate and the domestic and foreign interest rates.<sup>1</sup> After subtracting the expected inflation differential  $((E_t(p_{t+1}) - p_t) - (E_t(p_{t+1}^*) - p_t^*)) = E_t(\Delta p_{t+1}) - E_t(\Delta p_{t+1}^*)$  from both sides of equation (19), we obtain the real interest parity:

$$E_t(q_{t+1}) - q_t = r_t - r_t^* \quad (20)$$

where  $r_t = i_t - E_t(\Delta p_{t+1})$ ,  $r_t^* = i_t^* - E_t(\Delta p_{t+1}^*)$  represent the domestic and foreign ex ante real interest rates,  $E_t(q_{t+1})$  stands for the expected real exchange rate in  $t$  for  $t + 1$ , and  $q_t$  is the observed real exchange rate in period  $t$ . Rearranging equation (20), we obtain that the observed real exchange rate is a function of the expected value of the real exchange rate in  $t$  for  $t + 1$  and the ex ante real interest differential.

$$q_t = E_t(q_{t+1}) - (r_t - r_t^*) \quad (20')$$

$E_t(q_{t+1})$  can be assumed to be the outcome of the expected values of the fundamentals, so that

$$q_t = E_t(\bar{x}_{t+1}) - (r_t - r_t^*) \quad (21)$$

where  $\bar{x}$  is the vector of fundamentals. In practical terms, the real exchange rate can be written as the function of long- and medium-term ( $x$ ) fundamentals and short-term variables ( $z$ ):

$$q_t = q_t(\bar{x}_t, \bar{z}_t) \quad (22)$$

Nevertheless, BEER can be considered rather as a statistical approach. The reason for this is that all econometric estimates aimed at estimating single equation-type relationships between the real exchange rate and the fundamentals can

<sup>1</sup> Recall that small letters denote variables transformed into logarithms.

be classified as falling into the BEER approach. Hence, testing reduced-form equations of different theoretical models is akin to proceeding with the econometric estimation as described hereafter.

The econometric estimation of the BEER approach comprises five stages:

- 1) Estimating the statistical long-run relationship between the real exchange rate, the fundamentals and short-run variables (single equation). This is tantamount to estimating real exchange rate determination models;
- 2) Calculating the actual misalignment. Short-term variables are set to zero and actual values of fundamentals identified in step 1) are substituted into the estimated relationship. The actual misalignment is given as the difference between the fitted and the actual value of the real exchange rate;
- 3) Identifying long-run or sustainable values for the fundamentals. (1) The long-term value of the fundamentals can be obtained by decomposing the series into permanent and transitory components (e.g. HP filter, Beveridge-Nelson decomposition). (2) Subjective evaluation of the long-term value (see Baffes et al., 1999) is also possible;
- 4) Calculating total misalignment. Long-term values of fundamentals are substituted into the estimated relationship relating the real exchange rate to the fundamentals, and short-term variables are set to zero again. Total misalignment is the difference between the fitted and the actual value of the real exchange rate. Total misalignment depends on the short-term effect and on the departure of fundamentals from their long-term value;
- 5) Deducing the nominal equilibrium exchange rate. The observed nominal exchange rate is adjusted for total misalignment (the nominal equilibrium exchange rate equals the observed nominal exchange rate minus misalignment)<sup>1</sup>; and
- 6) Alternatively, steps three and four may be replaced by a single step that consists in decomposing the fitted estimated long-term relationship into permanent and transitory components using the Gonzalo-Granger method. This version of the BEER can be referred to as the Permanent Equilibrium Exchange Rate (PEER).

It should be noted that the list of the theoretical models presented above is not exhaustive. Theoretical approaches labeled with the acronyms CHEER and ITMEER are left aside, as they are either not very useful or not used for developing countries (for a recent survey, see e.g. MacDonald, 2000, and Driver and Westaway, 2004). Furthermore, general equilibrium models applied to small, open economies (see Edwards, 1994) are also ignored in this paper, mainly because they use the internal real exchange rate, and thus cannot provide too much guidance on the external real exchange rate and thus the nominal exchange rate.

<sup>1</sup> Note that this is a highly simplified approach to deducing the nominal equilibrium exchange rate because it does not account for dynamic effects of a nominal adjustment. A sizeable change in the nominal exchange rate that would correct for real misalignments in period  $t$  may move the real exchange rate away from equilibrium because of the nominal adjustment's effects on domestic (and foreign) prices. Such an effect could be considered by examining nominal exchange rate pass-through (Darovas, 2001) or by using a structural model of the economy.

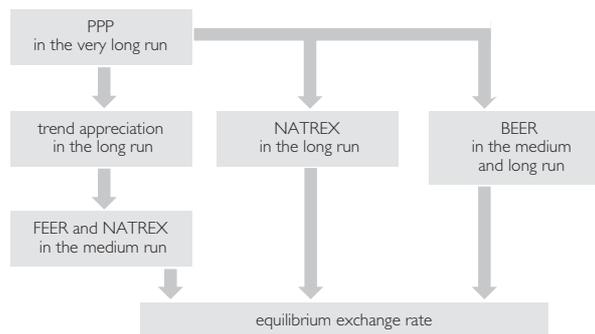
#### 4 The Connection Between Different Approaches

Thus far, we have presented the major models employed while estimating equilibrium real exchange rates. They can be structured as follows: PPP can be used in the very long run, i.e. in a secular context. The B-S effect, both in levels (PPP adjusted for differences in productivities) and dynamics (convergence towards the PPP level in the event of rapid growth) provides good guidance in the long run. Beside this nontradable price channel, a trend appreciation of the tradable price-deflated real exchange rate can also occur in the long run for the reasons developed earlier. FEER and medium-term NATREX ought to secure medium-term current account sustainability. The long-term NATREX, which considers adjustments of the capital and net foreign debt stocks toward their steady state level, is expected to hold over a longer horizon. BEER can be used in the medium and the longer run, as BEER specifications usually include elements of the trend appreciation. This is depicted in chart 2.

However, for a better understanding, it seems useful to go into more detail and to present the equilibrium real exchange rate also graphically.

Chart 2

##### Time Hierarchy of the Different Approaches



Source: Author.

In chart 3, the gray corridor represents what may be called the PPP zone. For countries at comparable levels of development, the level of the real exchange rate should be equal to 1, i.e. the price levels in the home and foreign countries should be equal when expressed in the same currency unit ( $EP^* = P$ , that is, absolute PPP holds). Nonetheless, because of differences in e.g. the tax system and wage policies and because of trade barriers and other market imperfections, the equilibrium real exchange rate fluctuates in a band of  $\pm\mu$  around 1. Also, differentiated goods allow for pricing-to-market practices, which may shift the PPP ratio (with the band around it) away from 1 even in the long run.

When countries at different stages of development are considered, the less developed country's real exchange rate is usually undervalued when using the PPP concept and, consequently, it is higher than 1.<sup>1)</sup> But this is an equilibrium undervaluation in PPP terms. At the same time, the real exchange rate is in equilibrium when taking into account the difference in the levels of dual productivity between countries. Point A represents this situation.

<sup>1</sup> The exchange rate is expressed as home currency units over one unit of foreign currency.

For these two cases, the absence of major changes in relative economic development, especially in relative dual productivity levels, would imply no major changes in the level of the equilibrium real exchange rate. PPP was difficult to verify even for such cases using standard time series econometric techniques to shorter time spans of 20 to 30 years. The use of secular time series and large panels appeared to show that real exchange rates are mean reverting, i.e. they return to their long-term value. The typical half-life, i.e. the time needed for the deviation vis-à-vis equilibrium to diminish by half, ranges from three to five years in the long time series and panel literature (Rogoff, 1996). However, a more plausible explanation to the PPP puzzle is about to emerge from the literature. Using threshold autoregressive (TAR) models, it is possible to show that within a band around equilibrium, such as shown in chart 3, the real exchange rate exhibits nonstationarity, i.e. it follows a stochastic trend because transaction costs are high enough to prohibit goods arbitrage. However, when the real exchange rate moves beyond a threshold over which profits to be realized from goods arbitrage exceed transaction costs, the real exchange rate tends to return to the PPP corridor,<sup>1)</sup> which may be different for individual countries. Typically, nonlinear adjustments towards the band are found to happen much faster when compared with the typical half-life of three to five years.<sup>2)</sup>

If one country experiences higher economic growth, and especially rapid increases in dual productivity that cause the price level to rise compared with those in the other countries, its equilibrium real exchange rate appreciates systematically. This reflects a successful catching-up with the other countries if this country starts from a less-developed stage. Alternatively, if it starts from a similar stage of development, it can also grow apart from the rest of the world. In chart 3, the equilibrium real exchange rate appreciates until it reaches, through points B and C, the PPP corridor of  $1 \pm \mu$ . The equilibrium appreciation itself is also a corridor because of transaction costs.

However, it may be that the real exchange rate is not in equilibrium when considering dual productivity levels. For instance, point A" shows the situation of the real exchange rate when it is undervalued not only in PPP terms but also when accounting for differences in dual productivity levels. This implies an initial undervaluation of the domestic currency that could call for a quick real appreciation towards levels given by productivity levels. By contrast, A' refers to the position in which the real exchange rate can be viewed as overvalued when differences in dual productivity levels are accounted for. As a consequence, the actual real appreciation should be lower than the equilibrium trend appreciation in line with productivity advances so as to compensate for this misalignment and to ensure that the real exchange rate returns into the "equilibrium corridor."

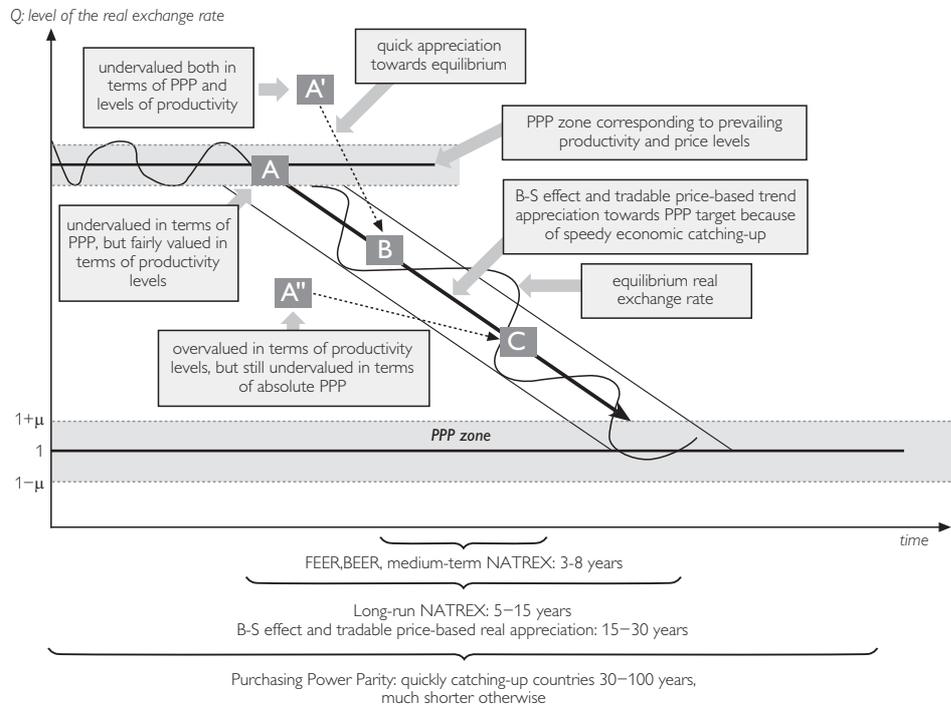
During periods of rapid changes in relative economic development levels, the equilibrium real exchange rate may exhibit a trending behavior over a period of 15 to 30 years. For such a period, PPP cannot be used as a yardstick. But it

1 The speed with which the real exchange rate returns to the band may be modeled in different ways. The TAR model assumes abrupt adjustment back to the band, whereas smooth transition autoregressive (STAR) and self-exciting threshold autoregressive (SETAR) models allow for smoother adjustment toward the band of inaction.

2 For an overview, see Sarno and Taylor (2002).

Chart 3

**Trend Appreciation of the Equilibrium Real Exchange Rate**



Source: Author.

may be indicative in periods over which relative economic performances equalize (Froot and Rogoff, 1994; Froot et al. 1995).

But 15 to 30 years is still far too long to interpret the equilibrium real exchange rate for policy purposes. The FEER approach provides a medium-term definition of the equilibrium real exchange rate which is compatible with current account sustainability. This implies that even during a period of trend appreciation, the equilibrium real exchange rate can depreciate or appreciate compared to the trend because of external imbalances.

Accordingly, not only the observed real exchange rate, but also the equilibrium real exchange rate can fluctuate within the band, and the latter can even exit the corridor so as to take account of the external position of the given economy. The reason for this is that productivity increases consider current account developments and net foreign indebtedness only implicitly by referring to competitiveness in the tradable sector. This is possibly not always sufficient to secure current account sustainability in the medium term. And that is why the BEER including these variables and especially the FEER approaches can explicitly tackle this issue in the medium run. It may be that in spite of the fact that the equilibrium real exchange rate appreciates in the longer run, it has to depreciate in the medium run so as to bring back the current account to its long-term value, which ensures a viable path for the foreign debt.

## 5 Surveying the Empirical Literature

Whereas the empirical literature related to real exchange rates in CEE acceding countries was limited to a relatively small number of contributions up to the late 1990s, quite a bit of ink has been spilled on the subject over the past few years. In this section, we attempt to overview this literature in a structured way.

In accordance with chart 3, absolute and relative PPP constitute the starting point of any analysis aimed at investigating equilibrium real exchange rates in acceding countries. As shown in table 1, the nominal exchange rate implied by PPP (given by the ratio of the domestic and German price levels) is far lower than the actual nominal exchange rate in eight acceding economies in 1996, 1999 and 2002. This means indeed that the real exchange rate is considerably undervalued (as it is higher than 1), as is the nominal exchange rate. This holds true vis-à-vis the Deutsche mark and subsequently the euro.

Table 1

	1996			1999			2002		
	PPP (1)	NER (2)	RER (2)/(1)	PPP (1)	NER (2)	RER (2)/(1)	PPP (1)	NER (2)	RER (2)/(1)
Estonia	5,76	18,04	3,13	13,85	34,60	2,50	14,88	32,70	2,20
	–	–	–	6,35	14,78	2,33	7,63	16,61	2,18
Hungary	35,76	101,40	2,84	100,66	237,20	2,36	118,30	257,90	2,18
Latvia	–	–	–	0,25	0,59	2,36	0,25	0,62	2,48
Lithuania	–	–	–	1,55	4,00	2,58	1,50	3,68	2,45
Poland	0,67	1,77	2,64	1,81	4,00	2,21	2,04	4,10	2,01
Slovakia	6,01	20,37	3,39	13,87	41,36	2,98	16,95	45,33	2,67
Slovenia	47,29	89,97	1,90	118,87	182,00	1,53	143,83	240	1,67

Source: Author's own calculations based on data obtained from NewCronos/Eurostat.

Note: PPP is the domestic to German price level ratio. Data on absolute price levels were obtained from NewCronos/Eurostat.

NER stands for the nominal exchange rate against the Deutsche mark in 1996 and against the euro in 1999 and 2002.

RER is the real exchange rate and is obtained as NER/PPP.

Table 1 in fact indicates that PPP does not hold true in levels. But it also indicates that the real exchange rate decreased somewhat from 1996 to 2002. Applying ocular econometrics to charts 4 and 5 also reveals real appreciation of the CPI-based real exchange rate for five acceding countries, to a differing extent though, throughout the 1993 to 2002 period. Therefore, the majority of empirical studies consider the B-S effect when investigating the real equilibrium exchange rate. However, as depicted in charts 4 and 5, the PPI-deflated real exchange rate also witnessed a strong appreciation over the period considered. And this implies that the B-S effect is bound to fail to explain the entirety of the real appreciation.

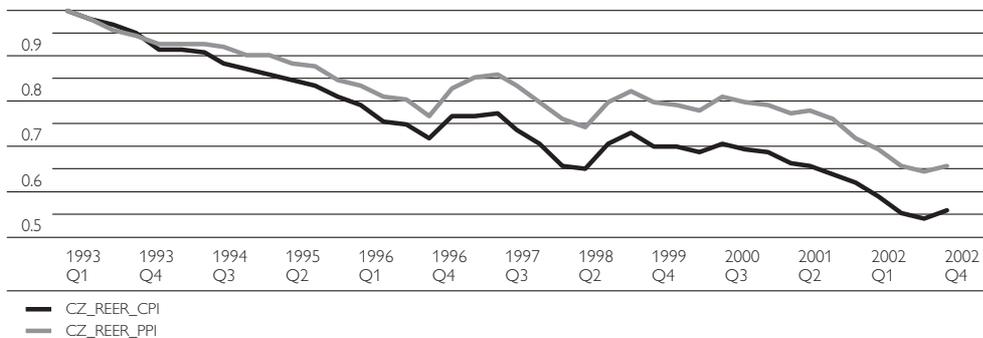
There are several criteria according to which the literature could be classified, namely the theoretical background and the econometric technique employed. The first criterion is related to the theoretical background underlying the empirical investigation. A first strand of the literature focuses on the simple B-S model. A second string of papers uses the BEER as a background. In general, while analyzing the B-S effect and especially the impact of productivity increases on prices and the real exchange rate, one has to bear in mind that the effect of productivity growth on the real exchange rate can be treated in different ways.

ASSESSING EQUILIBRIUM EXCHANGE RATES  
IN CEE ACCEDING COUNTRIES:  
CAN WE HAVE DEER WITH BEER WITHOUT FEER?  
A CRITICAL SURVEY OF THE LITERATURE

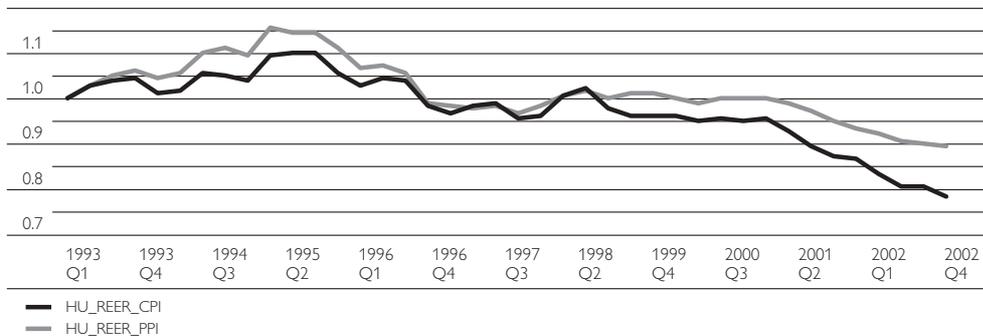
Chart 4

**CPI- and PPI-Based Real Effective Exchange Rates, 1993 to 2002**

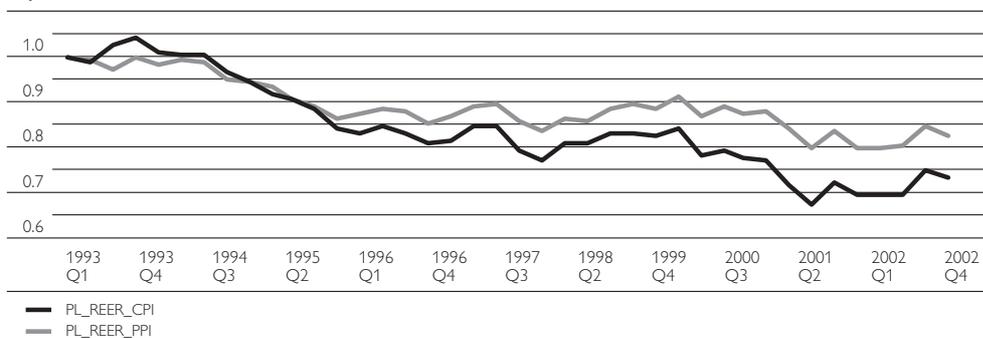
**a) Czech Republic**



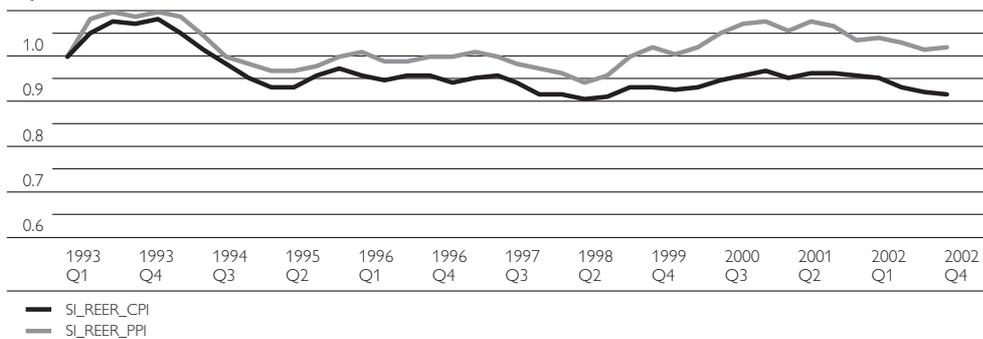
**b) Hungary**



**c) Poland**

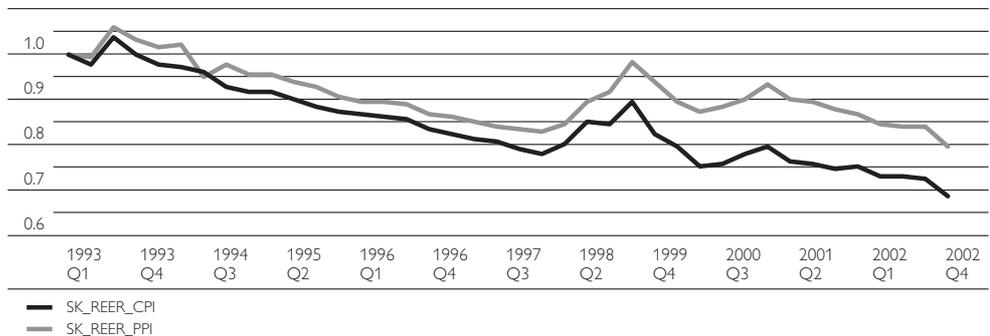


**d) Slovenia**



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e) Slovakia



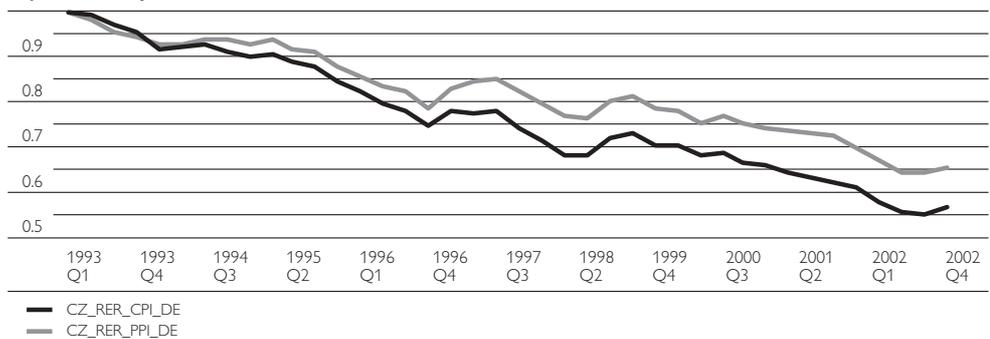
Source: Own calculations based on data obtained from the OECD's Main Economic Indicators Database.

Chart 5

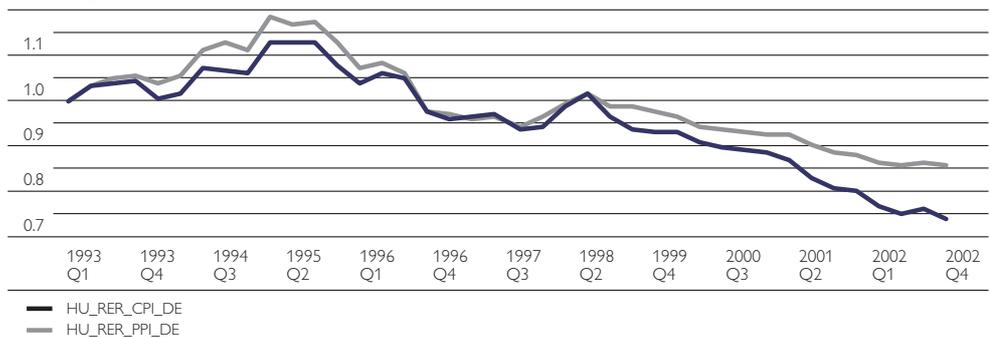
**CPI- and PPI-Based Real Exchange Rates**

**Vis-à-Vis the Deutsche Mark, 1993 to 2002**

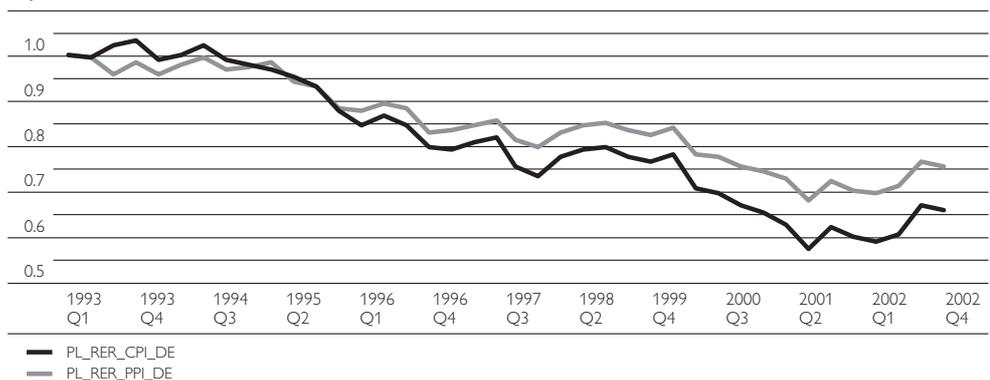
a) Czech Republic

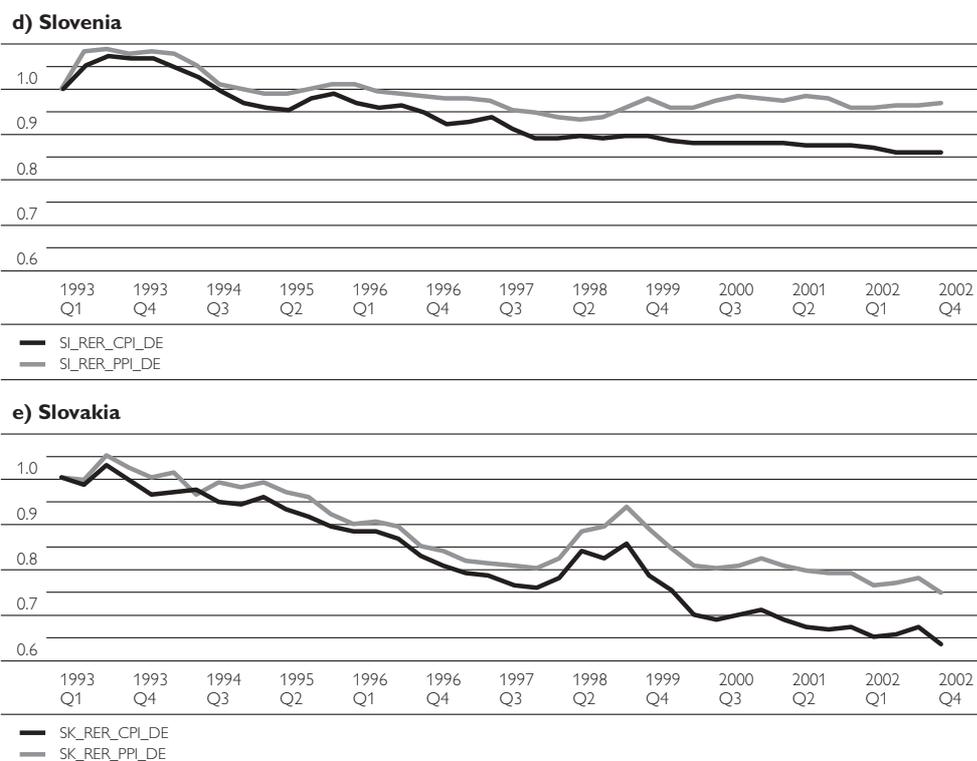


b) Hungary



c) Poland





Source: Own calculations based on data obtained from the OECD's Main Economic Indicators Database.

- 1) The most complete approach to the B-S model is to disentangle the two transmission mechanisms. In a first step, the relationship linking the dual productivity and the relative price of nontradable goods is looked at in the home country ( $(a^T - a^{NT}) \rightarrow (p^{NT} - p^T)$ ), where "a" stands for productivity. This can be referred to as the internal transmission mechanism). The second step considers the link between the dual productivity differential and the difference in the home and foreign relative price of nontradable goods (relative price differential henceforth) ( $(a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow (p^{NT} - p^T) - (p^{NT*} - p^{T*})$ ). It should be noted that usually no distinction is made between market and regulated nontradable prices. This could yield substantially biased estimates. The third and final stage of the analysis consists in investigating the relationship between the relative price differential and the real exchange rate ( $(p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER$ ). Steps 2 and 3 can be referred to as the external transmission mechanism. However, the drawback of this approach is that only one channel, i.e. market-based nontradable prices (see chart 1), through which productivity may have an impact on the real exchange rate is investigated. Therefore, the estimated coefficient for  $((p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER)$  is likely to be biased.
- 2) The second approach is limited to the exploration of the relationship  $(a^T - a^{NT}) \rightarrow (p^{NT} - p^T)$ . Underlying this approach is the consideration that it suffices to make sure that relative prices are connected to dual productivity. Estimating the productivity-driven relative price of nontradable goods separately, and thus overall inflation for the foreign country, enables

us to derive the inflation differential associated with the dual productivity differential. This in turn gives the extent of the real appreciation that could be justified by productivity gains.

- 3) The third approach is to link the dual productivity differential to the real exchange rate  $((a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow RER)$ . A slightly modified version is to regress the real exchange rate on the home country's dual productivity  $((a^T - a^{NT}) \rightarrow RER)$ . Although the overwhelming majority of studies interpret this relationship as the B-S effect by assuming the two transmission mechanisms described in approach 1 to be at work, it also incorporates the impact of productivity increases on the real exchange rate of the open sector as described previously. It should be noted that this approach, developed in section 3.2 appears, on economic grounds, to be the most reliable.
- 4) The fourth approach consists in analyzing the link between the relative price differential and the real exchange rate  $((p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER)$ . Hence, by omitting the link between dual productivity and the relative price of nontradables, it is tacitly assumed that dual productivity impacts properly on relative prices in the domestic economy as well as in the foreign country. It is worth mentioning that although the relationship  $(p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER$  is often considered an alternative to  $(a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow RER$ , given that the relative price differential is taken as proxies for the dual productivity differential, it does not stand for the same relationship, because productivity may also impact on tradable prices and the nominal exchange rate in the latter case. And most importantly, in the event that the relationship  $(p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER$  is found to be significant, it might well be a spurious one. If the coefficient is much higher than the share of market-driven nontradable prices in CPI, the estimated coefficient clearly reflects the positive inflation differential for tradable goods and other items such as regulated prices.

It deserves mention that while the first approach is mainly used when investigating the simple B-S model, the other three approaches can be employed, in principle, to both the simple B-S framework and the BEER approach.

Regarding estimations based on the FEER approach, two strands can be identified. The first avenue is the use of multinational macro models where the equilibrium real and nominal exchange rates are deduced for the set of countries included in the macro model. The real exchange rate of the home country is assumed to affect economic variables in other economies. However, it might be argued that developments in small economies such as the acceding countries are likely to have no impact whatsoever on the outside world. This is why the second avenue is to rely on a single-country structural model (which might of course be a module of a larger international macro model). Hence, interactions between the home and foreign economies are not taken into account. In addition to large macro models, one can also use partial models aimed at describing only the foreign trade of the home economy.

Now let us turn to the issue of the statistical techniques used (displayed in chart 2) to estimate the real exchange rate. The first and simplest approach is descriptive statistics, which is applied only to the simple B-S model and basically consists in computing yearly average growth rates for dual productivity (or the dual productivity differential) and the relative price of nontradables (or the

Table 2

Overview of Major Differences in the Estimation Methods			
Theory	Relationships tested	Statistical technique	Misalignment
Simple	$(a^T - a^{NT}) \rightarrow (p^{NT} - p^T)$	descriptive statistics	none
Balassa-Samuelson model	$(a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow (p^{NT} - p^T) - (p^{NT*} - p^{T*})$ $(p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER$ $(a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow RER$	time series panel cross-section	actual
BEER	$(a^T - a^{NT}) \rightarrow (p^{NT} - p^T)$ $(a^T - a^{NT}) - (a^{T*} - a^{NT*}) \rightarrow RER$ $(a^T - a^{NT}) \rightarrow RER$ $(p^{NT} - p^T) - (p^{NT*} - p^{T*}) \rightarrow RER$	time series panel: in-sample, out-of-sample	none actual total
FEER	multi-country model single-country model full-scale macro model model of foreign trade	structural models – 4 steps	total
NATREX		single equation structural model	medium-term long-term

relative price differential). Alternatively, data can be analyzed graphically to see whether the real exchange rate and the relative price differential are in line with the dual productivity differential.

It is common practice to use time series analysis both for the simple and the extended version of the B-S model. How it is used is described in detail in the section discussing BEER. Another way to estimate the simple and extended B-S model consists in employing panel estimation methods. Since the philosophy underneath the application of panel methods differs to some extent from that of the use of time series, we shall describe it more in detail below. The underlying idea is that the countries included in the panel should behave relatively similarly in the long run. This implies that the real exchange rate is assumed to react quite similarly to changes in its fundamentals in every country of the panel. The estimation of the relationship between the real exchange rate and its fundamentals yields average coefficients for the whole panel. If long-term homogeneity holds true for the panel, then the estimated average coefficients are expected to properly reflect the long-run behavior of the real exchange rate of individual countries and can thus provide a better estimate than what we could obtain by means of time series techniques.

The equilibrium real exchange rate can be derived the same way as for time series. First, the actual misalignment is determined. Second, total misalignment is obtained based on the long-term values of the fundamentals.

It is necessary to mention two types of panel estimations, namely in-sample and out-of-sample panel estimations. Underneath the in-sample approach lies the concept that the equilibrium real exchange rate is assessed for the countries included in the sample and for the period used for the estimation. By contrast, out-of-sample means that the empirical relationship linking the real exchange rate to its fundamentals is estimated using a given set of countries, but the equilibrium exchange rate will be computed for countries not included in the sample and/or for a different period<sup>1</sup>) by substituting the corresponding fundamentals series into the estimated equation.

<sup>1</sup> E.g. the panel includes countries A, B, C, . . . , M for 1960–90, and the equilibrium exchange rate is assessed for the case of countries N and L for the period 1995–2003.

Regarding the calculation of misalignment, the following patterns emerge from the literature:

- 1) Some papers simply do not compute misalignment. The sole aim of these papers is to show the empirical linkage through which the real exchange rate is connected with its fundamentals (real exchange rate determination, as in step 1 of BEER and panel estimations), i.e. to estimate real exchange rate determination.
- 2) Others calculate only actual misalignment. This is particularly the case in time-series and panel estimations.
- 3) Finally, another part of the BEER and panel literature also aims at identifying total misalignment. It should be noted that the FEER approach always produces total misalignment.

## 5.1 The Simple Balassa-Samuelson Framework

### 5.1.1 Studies Based on Descriptive Statistics

Kovács and Simon (1998) were among the first to give an estimate on the size of the B-S effect in Hungary. They use yearly data for the period 1991–96 obtained from national accounts and proceed to compute yearly changes in labor productivity both for the open and the sheltered sectors. The open sector is defined in terms of manufacturing whereas the sheltered sector contains the remaining sectors with the exception of agriculture, mining, electricity, public services, education, health and social services. The productivity differential between the open and sheltered sector, they obtain is then compared with the corresponding differential of a basket of foreign economies, corresponding roughly to Hungary's effective trading basket. They assume a proportionate relationship between dual productivity and the relative price of nontradable goods for Hungary as well as for the foreign basket. That is, a 1% change in dual productivity should translate into a 1% change in the relative price of nontradables. How large the impact of the increase in dual productivity is depends in the end on the share of nontradable goods in the price basket ( $1 - \alpha$ ) as given in equation (3) ( $p = \alpha \cdot p^T + (1 - \alpha) \cdot p^{NT}$ ). The higher this share is, the larger the impact on overall inflation and the larger the real appreciation attributable to the B-S effect are. Kovács and Simon (1998) employ the share of nontradables extracted from the national accounts (share of nontradable sectors in GDP) as well as that drawn from the CPI basket (share of nontradable goods in the price basket). The inflation due to productivity gains is calculated both for Hungary and for the foreign basket. The results indicate that the inflation differential due to the B-S effect is of the order of 2.9% to 3.1% when weights from national accounts are used and is 1.6% using weights obtained from the CPI.

Kovács (2001) updates the yearly dataset used in Kovács and Simon (1998). Using the same methodology, the author comes to the conclusion that the average yearly inflation differential and the real appreciation of the Hungarian forint consistent with the B-S effect was in the range of 0.8% to 2.2% over the period 1991–99.

Rother (2000) focuses on whether the B-S effect is at work in Slovenia. His analysis is based on quarterly sectoral data over the period 1993–98. For the calculation of dual productivity, the open sector consists of manufacturing whilst the sheltered sector is composed of the rest except agriculture, which

is excluded from the analysis. Figures for dual productivity are calculated for each year. This is then graphically compared with annual changes in the relative price of nontradable goods: If annual changes in dual productivity are roughly the same as those for the relative price of nontradables, this is viewed as a piece of evidence in favor of the B-S effect. This exercise is also performed for three other CEE countries, namely the Czech Republic, Estonia and Slovakia (for the periods 1994 to 1998, 1993 to 1997 and 1994 to 1998, respectively). Rother concludes that the B-S effect seems to hold in Slovenia and the Czech Republic, and to a much lesser extent in Estonia and Slovakia. Rother (2000) estimates that the rate of inflation due to the B-S effect ranges from 2.5% to 3% in Slovenia over the period under study. He considers a foreign benchmark composed of Austria, France, Germany and Italy, for which 1% is taken as the size of the B-S effect-driven inflation, a figure provided in Alberola and Tyrväinen (1998). The author concludes that the inflation differential and the real appreciation associated with the B-S effect amount to 1.5% to 2% (2.5% to 3% minus 1%). However, the conclusions can be mitigated because of the short time span used.

For a number of European countries, Sinn and Reutter (2001) attempt to determine the productivity-driven inflation conditional on the absence of deflation in the lowest-productivity economy, namely in Germany. In so doing, average yearly labor productivity figures for dual productivity are calculated based on national accounts data. The results suggest that this inflation rate would have been as high as 2.88%, 3.38%, 4.06%, 4.16% and 6.86% for the Czech Republic, Slovenia, Estonia, Poland and Hungary, respectively, for the periods 1994 to 1998, 1996 to 1999, 1994 to 1998, 1995 to 1998 and 1995 to 1998. Beside the use of very short time periods, one criticism that can be addressed is that the results are hard to compare due to different time periods, especially vis-à-vis the benchmark country, i.e. Germany, for which the time series covers the period 1979 to 1991.

Rosati (2002) engages in a similar exercise and computes yearly averages for dual productivity (based on average labor productivity) for the Czech Republic, Estonia, Hungary, Poland and Slovenia. The share of the nontradable sector in GDP, defined as the sectors excluding industry and, in a second step, also agriculture, is subsequently applied to these growth rates. Although the period under study is different, i.e. 1993 to 1999, results are roughly in line with those of Sinn and Reutter (2001). The domestic inflation implied by productivity gains amounts to 1.1% to 1.2% in the Czech Republic, 2.2% in Estonia, 3.9% to 4.3% in Hungary, 3.6% to 4.2% in Poland and 2.1% in Slovenia.

Backé et al. (2003) provide estimates concerning the average annual impact of dual productivity on overall inflation. In this study, inflation is defined in terms of the implicit GDP deflator (and not as consumer price inflation). Using annual national accounts data, average yearly changes in dual labor productivity are calculated for the Czech Republic, Hungary, Poland and Slovenia, with manufacturing being considered as the open sector and the rest representing the sheltered sector. The results are portrayed in table 3. Because this calculation is based on equation (7), the average labor productivity in the open sector is multiplied by the  $\delta/\gamma$  coefficient, which is higher than unity: This may partly explain the high figures for some of the countries compared to the rest of

the literature. The difference is considerable between the results for the Czech Republic, on the one hand, and Hungary, Poland and Slovenia, on the other. This is mainly because during the period under consideration, the change in the productivity differential was markedly lower in the Czech Republic than in the remaining countries.

Table 3

**Average Annual Change in Overall Inflation Attributable to Changes  
 in Dual Productivity, 1992 to 2000**

	Czech Republic	Hungary	Poland	Slovenia
	%			
1992–2000	0.79	5.58	9.43	3.48
1995–2000	0.35	3.84	9.76	3.88

Source: Backé et al. (2003, p. 61, table 3).

In a study commissioned by five CEE central banks, Kovács (2002) investigates the importance of the B-S effect for inflation and real exchange rates in the Czech Republic, Hungary, Poland, Slovakia and Slovenia. Different parts of the paper were written in the respective central banks, so that the results reported for different countries are not (fully) comparable. For instance, the paper does not contain productivity-based estimates for Poland and Slovakia. Nonetheless, the results for Hungary and Slovenia are comparable, and those for the Czech Republic can be translated into interpretable figures. The part on Hungary is based on the dataset used in Kovács (2001) updated until 2001. The productivity-driven inflation differential vis-à-vis Germany turns out to be 1.9% per annum on average over the period 1992–2001. For Slovenia, it is found that the corresponding figure is as low as 0.7% a year (the open sector is manufacturing; the sheltered sector is the rest, but energy, public services and agriculture are not considered). However, whereas the impact of dual productivity was close to 0% a year during 1991–96, it has been on an accelerating path since then (1.4% per annum). For the Czech Republic, the paper gives an indicative figure of 2.44% for dual productivity from 1994 to 2001. Hence, assuming that the average share of nontradable goods was 30% during the period under investigation, we obtain 0.7% for the magnitude of the inflation differential due to productivity gains in the Czech Republic. However, the inflation differential against Germany will be even lower if we assume positive B-S inflation in Germany.

Burgess et al. (2003) seek to determine the B-S effect-induced inflation differential in three Baltic countries vis-à-vis Germany and the euro area. Using yearly observations from 1997 to 2001, GDP per worker and total factor productivity (TFP) figures are compared to those in the euro area. The period averages multiplied by the share of market services in CPI yields an inflation differential of 0.6% and 0.5% for Estonia, 0.7% and 0.5% for Latvia and 0.5% and 0.3% for Lithuania. When the difference between average labor productivity between manufacturing and services is considered, the corresponding figures are 0.2%, 0.0% and 0.6% for Estonia, Latvia and Lithuania, respectively.

### 5.1.2 Time Series Studies

Golinelli and Orsi (2002) explore different facets of inflation in three acceding countries, notably in the Czech Republic, Hungary and Poland. The estimated inflation model contains three blocs, of which one aims at having a closer look at the relationship between the dual productivity differential and the CPI-deflated real exchange rate. Labor productivity series are based on monthly industrial production data. Hence, industry is considered the open sector whereas productivity changes in the sheltered sector are set to zero. Then, the difference between the domestic country's productivity and that of the euro area is constructed. Using the Johansen cointegration technique, robust cointegration relationships are established and estimated between the dual productivity differential and the real exchange rate, indicating that changes in the real exchange rate are linked to changes in labor productivity during the 1993–2000 period for the Czech Republic and the 1991–2000 period for Hungary and Poland. In a second step, the authors proceed to calculate the extent to which dual productivity might have contributed to overall inflation. They come up with 0.6% to 3.7% for Hungary, 4.4% to 5.8% for Poland and 3.3% to 5.3% for the Czech Republic.

Jazbec (2002) also uses the Johansen cointegration technique to shed light on whether inflation and real exchange rate movements are due to changes in dual productivity in the case of Slovenia. The study employs quarterly national accounts data for the period from the first quarter of 1993 to the second quarter of 2001 and constructs dual labor productivity as follows. The open sector includes industry; the sheltered sector contains the rest. Agriculture is excluded. The econometric tests show that dual productivity in Slovenia and the real exchange rate, based on the CPI and against the Deutsche mark have a long-term relationship. However, dual productivity is not compared with that of a foreign benchmark country. Furthermore, Slovenian CPI inflation (and not the relative price of nontradables) is regressed on dual productivity. The author reaches the conclusion that consumer price inflation is driven by productivity developments. The size of the B-S effect is not estimated.

Lommatzsch and Tober (2002a) examined five acceding countries. The objective of the paper is to analyze the link between dual productivity and the relative price of nontradables in the Czech Republic, Estonia, Hungary, Poland and Slovenia. For this purpose, the Engle-Granger cointegration technique is employed. For Estonia, labor productivity is constructed using national accounts data. The open sector is defined as industry, and the sheltered sector only includes construction, trade and finance. Labor productivity in the remaining countries is based on industrial production. Therefore, as in Golinelli and Orsi (2002), productivity growth in the sheltered sector is set equal to zero. Dual productivity and the relative price of nontradables appear to be connected through a cointegrating vector in Estonia, Hungary and Slovenia, whereas no long-term relationship is found for Poland and the Czech Republic. The paper does not provide estimates for the size of the inflation attributable to the B-S effect.

Mihaljek and Klau (2003) set out to investigate a somewhat different set of acceding countries containing the Czech Republic, Hungary, Poland, Slovakia and Slovenia. Furthermore, Croatia is also included in the sample. The analysis

rests on the use of labor productivity. The classification of the sectors into tradable and nontradable sectors seems unconventional, since beside manufacturing and mining, the sectors hotels, transport, storage and communication are also considered part of the open sector. The sheltered sector contains the remaining sectors, except agriculture and public administration. The period under investigation varies across countries (starting between 1992 and 1995 and ending in 2001 or the first quarter of 2002). The author examines the wage equalization process and finds that it seems to be violated only in Croatia and Slovakia. Therefore, the difference in sectoral wages (open/sheltered) between the home and the foreign countries is also included in the estimated specification along the lines of Alberola and Tyrväinen (1998). The authors motivate their analysis with equations (7) and (8) with  $\delta/\gamma$  being set to 1. The authors estimate the relationship between the inflation differential against the euro area (not the difference in relative prices) and the dual productivity differential using ordinary least squares (OLS) for levels and first differences. Also, the relative price of nontradables in the home country is regressed on dual productivity. Finally, period averages for the domestic productivity differential and the difference in productivity differentials are multiplied by the corresponding estimated coefficients to derive domestic inflation and the inflation differential vis-à-vis the euro area that can be imputed to the B-S effect. The estimates reported in table 4 below show that the derived home inflation is generally higher than the inflation differential due to the B-S effect. However, the inflation differential appears to be higher than domestic inflation for the Czech Republic and Slovenia. This is surprising because the foreign benchmark, i.e. the euro area, is the same for all the estimations.

Table 4

**The Balassa-Samuelson Effect as Reported in Mihaljek (2002)**

		Domestic inflation %	Inflation differential
Croatia	1995–2001	1.26	0.17
Czech Republic	1993–2001	0.32	0.98
Hungary	1994–2001	1.58	0.56
Poland	1994–2001	1.41	0.12
Slovakia	1995–2001	0.64	0.18
Slovenia	1992–2001	0.60	1.84

Source: Mihaljek and Klau (2003, pp. 10–11, tables 3 and 4).

Lojschová (2003) follows Mihaljek and Klau (2003) in that she regresses the inflation differential on the dual productivity differential. But contrary to Mihaljek (2002) and the rest of the literature, Lojschová's study employs quarterly sectoral TFP from 1996 to 2002 for the Czech Republic, Hungary, Poland and Slovakia. It should be noted that it is the only paper that properly tests equation (7) in first differences and using total factor productivity. However,  $\delta/\gamma$  is set to 1. With manufacturing representing the open sector and services and construction representing the sheltered sector, the author specifies two equations in addition to the standard equation. The first one includes the differential between domestic and foreign price inflation, whereas the second one contains the difference between foreign and domestic sectoral wage differences, as introduced by Alberola and Tyrväinen (1998) and used in Mihaljek (2002). The first modification is meant to allow for PPP not to hold for tradable goods,

whereas the second specification considers the case when wages do not equalize across sectors. Estimations are performed on time series in first differences by means of OLS and then using pooled and fixed-effect panel OLS for the four countries. Results suggest that the introduction of the tradable inflation differential sharply reduces the size of the coefficients of TFP, whereas the wage terms are found significant only for the case of Slovakia. These results provide strong evidence for the fact that overall inflation is driven less by productivity-driven service price inflation than other factors and that wages tend to equalize in all countries but Slovakia. At the beginning of the article, the author shows that Hungary and Poland exhibit much larger annual changes in dual productivity than the Czech Republic and Slovakia. Maybe as a consequence, the coefficients for dual productivity are found to be much lower for Hungary and Poland than for the Czech Republic and Slovakia. However, the author construes these coefficients as the average annual inflation due to dual productivity and argues that productivity-driven inflation is highest in Slovakia, followed by the Czech Republic, whereas Hungary and Poland have inflation rates close to zero. It should be borne in mind, however, that as absolute values of average productivity changes are not considered, the author's interpretation is fairly misleading.<sup>1</sup>)

Égert (2002a, b) investigates the case of five acceding economies. The papers make use of monthly and quarterly data for the Czech Republic, Hungary, Poland, Slovakia and Slovenia. Labor productivity is calculated using industrial production, and therefore changes in productivity are considered to be zero in the nontradable sector. This zero-productivity assumption holds in the event that changes in the productivity of the nontradable sector are alike in the home and foreign country. Otherwise, the results may be biased. Employing the Johansen (Égert, 2002a, b) and panel cointegration (Égert, 2002b) techniques, the author uncovers that changes in dual productivity lead to changes in the relative price of nontradable goods. However, because of the low share of nontradable items in the CPI basket, the impact of productivity improvements on overall inflation remains limited. The average inflation differential against Germany due to the B-S effect is then assessed based on descriptive statistics using the share of nontradables in the CPI and partly estimated coefficients. The results are as follows: 0% to 0.4% for the Czech Republic, 0.9% to 1.9% for Hungary, 0.8% to 2.4% for Poland, -0.4% to -0.1% for Slovakia and finally -0.2% to 0.7% for Slovenia. Although long-term relationships between the relative price differentials and the CPI-based real exchange rate could be established, the coefficients are considerably higher than the share of nontradables in the CPI would justify. It is argued that the appreciation of the real exchange rate is only partially explained by the B-S effect either because of the absence of productivity growth or due to the incomplete spillover of productivity gains into overall inflation.

Égert (2003) studies the case of Estonia over the period from the first quarter of 1993 to the first quarter of 2002 based on a fifteen-sector breakdown for GDP and a five-digit level CPI disaggregation with over 260 items. The analysis

<sup>1</sup> For instance, Darvas (2001, p. 26) shows that the estimated coefficient of the dual productivity variable is smaller for Hungary than for the other countries because dual productivity rose faster in Hungary than elsewhere.

reveals that all hypotheses of the B-S model are fulfilled for Estonia and that dual productivity has an important influence on nontradable prices. However, it is also shown that econometric results are sensitive to how sectors are classified into the open and closed sectors (that might partly explain the results in Mihaljek and Klau, 2003). Furthermore, it turns out that some sectors should be classified differently in Estonia than would be common practice. Dual productivity is connected to the relative price of market nontradables obtained by eliminating regulated nontradable prices. The size of the productivity-driven inflation is estimated at 4% to 5% at the outset and at 0.3% to 1% at the end of the period. It is argued that the potential long-term inflation rate is around 1% to 2%. The inflation differential due to the B-S effect is calculated both against Estonia's four major western European trading partners, namely Finland, Sweden, Germany and the U.K., and vis-à-vis Germany alone, and it is estimated at 0.2% to 1%. Finally, when assessing the equilibrium real exchange rate, the author stresses the need for using fully comparable real exchange rates adjusted for regulated prices and differing weights in the CPI across countries. At the end of the period, the majority of the real appreciation is found to be consistent with the B-S effect.

#### 5.1.3 Panel Studies

Halpern and Wyplosz (2001), a study commissioned by the UNECE, covers 12 transition economies (the CEECs, the Baltic states and the CIS) over an unbalanced period from 1991 to 1996–98. The paper attempts to disentangle the link between dual productivity and the relative price of nontradables and is therefore structured as follows:

- 1) First, the wage equalization process between the open (industry) and closed sectors (the remaining sectors excluding agriculture and construction) is analyzed. Wages tend to equalize in all countries but the CIS.
- 2) Second, the reasons for sectoral labor productivity increases are considered. The explanatory variables, namely sectoral investment and FDI, are found to have a strong impact on sectoral productivity.
- 3) Third, gross sectoral wages are investigated. The econometric analysis reveals that sectoral productivity, unemployment and the number of employees largely explain gross wages.
- 4) Fourth, the authors consider whether gross and net real wages are connected with one another.
- 5) Fifth, sectoral GDP is regressed on a number of supply- and demand-side variables.
- 6) Sixth, given that the hypotheses of the B-S model appear to be satisfied, more (econometric) attention is devoted to exploring the relationship between dual productivity and the relative price of nontradables defined as CPI over PPI. Indeed, productivity in the open sector and in the closed sector (taken separately), GDP per capita measured in purchasing power standards and the size of the inflation rate turn out to be significant for relative prices.
- 7) The last stage of the analysis is the substitution of average annual productivity growth rates, both in the open and the closed sector for all countries, into the estimated equation, which yields an average annual nontradable

inflation rate of 2.9% to 3.1%. According to Kovács (2002), this would imply an overall inflation rate of 1.2% (2.9% to 3.1% multiplied by the share of nontradable items in the CPI assumed to be 40%).

Flek et al. (2002) analyze the case of the Czech Republic. This is done in a panel framework based on an unbalanced panel composed of eight EU countries, namely Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, the U.K. and the Czech Republic. The period covered spans from 1986–92 to 1993–99 for the EU countries and from 1994–2001 for the Czech Republic. Based on annual data drawn from national accounts, and using manufacturing for the open sector and somewhat interestingly only construction for the closed sector, the relative price ratio determined using corresponding sectoral deflators is regressed first on dual productivity, and second on labor productivity in the open and closed sectors separately. The impact of dual productivity on the relative price of nontradables is found to amount to roughly 0.6. Finally, the influence of dual productivity growth is quantified using period average productivity figures and the share of tradable and nontradable sectors in

Table 5a

### Studies Using the Simple Balassa-Samuelson Framework

	Hypothesis tested	Link	Countries	Period	Variables
<b>Descriptive statistics</b>					
Backé et al. (2003)	none	1	CZ, HU, PL, SI	1992–2000, Y	LP, DEFL
Burgess et al. (2003)	none	1	EE, LV, LIT	1997–2001	TFP, LP
Kovács (2001)	PPP for tradables	1, 2	HU, PL, CZ	1991–1999, Y	LP
Kovács (2002)	none	2	CEEC5	1991/1995–2000/2001, Y, Q	LP, DEFL, REL (CPI), RER (DEM, EFF)
Kovács and Simon (1998)	PPP for tradables	1, 2	HU	1991–1996, Y	LP, DEFL
Rosati (2002)	none		CZ, EE, HU, PL, SI	1993–1999, Y	LP
Rother (2000)	none	1	SI, CZ, EE, SK	1993/1994–1997/1998, Y and Q	LP, DEFL
Sinn and Reutter (2001)	none	1	EE, HU, PL, SI, CZ	1994/1996–1998, Y	LP
<b>Time series</b>					
Égert (2002a)	PPP for tradables	1, 2, 3	CEEC5	1991/1993–2000, M	LP, rel. (CPI), RER (DEM, USD, EFF)
Égert (2002b) <sup>1)</sup>	PPP for tradables, wage equalization	1, 2, 3, 4a	CEEC5	1991–2001, Q	LP, rel. (CPI, PPI), RER (DEM, USD, EFF)
Égert (2003)	real wages, wage equalization, PPP for tradables	1, 2, 3	EE	1993–2002, Q	LP, rel. (CPI), RER (DEM, EFF)
Golinelli and Orsi (2002)	none	4a	HU, PL, CZ	1991:1/1993:1 2000:7, M	LP, rel. (CPI/IPP), RER (EUR)
Jazbec (2002)	none	4b	SI	1993:Q1–2001:Q2	LP, RER (DEM)
Lojschová (2003) <sup>1)</sup>	PPP for tradables, wage equalization	2b	CZ, HU, PL, SK	1996:Q1–2001:Q4	TFP, P, P*
Lommatzsch and Tober (2002a)	none	1	EE, CZ, HU, PL, SI	1994/1995–2001, Q	LP, DEFL
Mihaljek and Klau (2003)	wage equalization	1b, 2b	CZ, HR, HU, PL, SI, SK	1993/1996–2001/2002, Q	LP, rel. (CPI)
<b>Panel</b>					
Égert et al. (2003)	real wages, wage equalization, PPP for tradables	1, 2, 3	CEEC5, B3, CR	1995–2000, Q	LP, DEFL, rel. (CPI), RER (DEM)
Flek et al. (2002)	none	1	CZ + 8 EU countries	CZ: 1994–2001, EU: 1986–1999	LP, DEFL
Halpern and Wyplosz (2001)	real wages, wage equalization	1	CEEC5, B3, RU, RO, BG, KG	1991/1995–1998, Y	LP, GDP per capita, rel. (CPI)

<sup>1)</sup> These studies also use panels.

Notes: M, Q and Y indicate monthly, quarterly and yearly data. CEEC5 = Czech Republic, Hungary, Poland, Slovakia and Slovenia, B3 = 3 Baltic states, BG = Bulgaria, CZ = Czech Republic, EE = Estonia, HR = Croatia, HU = Hungary, LT = Lithuania, LV = Latvia, KG = Kyrgyzstan, PL = Poland, RO = Romania, RU = Russia, SK = Slovakia, SI = Slovenia.

Relationships: 1 =  $\text{prod}(T) - \text{prod}(NT) = > \text{relative prices}$ . 1b =  $\text{prod}(T) - \text{prod}(NT) = > p-p^*$ . 2 =  $(\text{prod}(T) - \text{prod}(NT)) - \text{prod}(T)^* - \text{prod}(NT)^* = > \text{relative prices home} - \text{relative prices abroad}$ . 2b =  $(\text{prod}(T) - \text{prod}(NT)) - (\text{prod}(T)^* - \text{prod}(NT)^*) = > \text{domestic inflation} - \text{foreign inflation}$ . 3 =  $\text{relative prices home} - \text{relative prices abroad} = > \text{real exchange rate}$ . 4a =  $(\text{prod}(T) - \text{prod}(NT)) - (\text{prod}(T)^* - \text{prod}(NT)^*) = > \text{real exchange rate}$ . 4b =  $(\text{prod}(T) - \text{prod}(NT)) = > \text{real exchange rate}$ .

Variables used: LP = average labor productivity, DEFL = relative prices based on GDP deflators, rel. (CPI) = relative prices based on CPI data, RER (DEM, USD, EFF) = real exchange rate against Germany, the U.S.A. or the effective trading basket, TFP = total factor productivity.

GDP. It is noteworthy that there is a mismatch between sectors used to compute dual productivity and relative prices and those employed to derive the share of tradable goods and nontradable goods in GDP. The outcome is that in the Czech Republic, the domestic inflation brought about by the B-S effect ranged from 0.05% to 0.29% from 1994 to 2001, and the inflation differential against Germany amounted to -0.22% to -0.04%.

Égert et al. (2003) implements the exercise done in Égert (2002b) for a larger sample including nine transition economies and with better data drawn from national accounts. After verifying the basic assumptions to the B-S model (wage equalization, relationship between productivity and real wages in the open sector), Pedroni panel cointegration tests are conducted and the panel FMOLS (fully modified ordinary least squares) technique is employed. They confirm, once again, that dual productivity differentials are strongly reflected in nontradable prices, especially when calculated on the basis of GDP deflators. The impact on consumer price inflation and consequently on the appreciation of the CPI-based real exchange rate is, however, limited on the grounds of the relatively small share of nontradable goods in the CPI basket (see figures in

Table 5b

### Studies Using the Simple Balassa-Samuelson Framework: Methods

	Econometric technique
<b>Time series</b>	
Égert (2002a)	Johansen cointegration
Égert (2002b)	Johansen cointegration
Égert (2003)	Johansen cointegration
Golinelli and Orsi (2002)	Johansen cointegration
Jazbec (2002)	Johansen cointegration
Lojschová (2003)	OLS in first differences
Lommatzsch and Tober (2002a)	Engle and Granger cointegration
Mihaljek and Klau (2003)	OLS, in levels and first differences
<b>Panel</b>	
Égert (2002b)	panel FMOLS; Pedroni panel cointegration
Égert et al. (2003)	panel FMOLS; Pedroni panel cointegration
Flek et al. (2002)	fixed-effect OLS
Halpern and Wyplosz (2001)	GLS
Lojschová (2003)	pooled and fixed effect OLS

Note: FMOLS = fully modified ordinary least squares, GLS = generalized least squares.

Table 5c

### Studies Based on Cross-Section Regression

	Countries	Coefficient	Year	Benchmark	R2
<b>Out-of-sample</b>					
DeBroeck and Sløk (2001)	149	0.41	1996	US	0.63
Maeso-Fernandez et al. (2003)	24 (OECD)	0.50	2002	EU-15	0.65
Maeso-Fernandez et al. (2003) <sup>1)</sup>	25 (OECD)	0.48	2002	EU-15	0.36
Pelkmans et al. (2000)	29 (OECD)	0.89	1996	Germany	0.88
<b>In-sample</b>					
Randveer and Rell (2002)	52	0.69	1996	Austria	0.83
Coudert and Couharde (2002)	120 <sup>2)</sup>	0.25	2000	EU-15	0.24
Čihák and Holub (2001)	22	1.00	1999	Germany	0.91
Čihák and Holub (2003)	21–33	0.88–1.00	1993, 1996, 1999	Germany	0.88–0.93
Čihák and Holub (2003)	103–106	0.56–0.62	1998	Germany	0.70–0.79
Čihák and Holub (2003)	22–30	0.86–0.94	1999, 2001	EU-15	0.79–0.87

<sup>1)</sup> GDP per worker in PPP terms is employed. The other studies apply GDP per capita in PPP terms.

<sup>2)</sup> Only those countries are included whose GDP per capita is lower than that of the euro area.

Notes: The coefficient is the slope coefficient from the regression:  $RelativePriceLevel = a + b * GDPperCAPITA$ ; out-of-sample means that the sample excludes transition economies; conversely, in-sample implies the inclusion of transition economies; R2 stands for the goodness-of-fit of the regression.

table 6). By contrast, tradable prices measured by means of the PPI contributed considerably to the real appreciation of the CPI-based real exchange rate. One possible reason for this is that productivity gains might also affect tradable prices through improved product quality and thus higher prices. At the same time, regulated prices were an important source of inflation and their presence might have biased the estimations.

Table 5 provides an overview of the studies on the variables, time period, country groups and the tested relationship. Table 6 summarizes the currently available estimates of the inflation differential and the implied appreciation of the real exchange rate that could be associated with productivity-fueled non-tradable price inflation. It should be noted that these figures can be viewed as the inflation differential if the inflation differential were set to zero, so that tradable inflation in the home country would be equal to that in the foreign economy.

These figures can be compared with the average appreciation of the real exchange rate in the respective countries over the period from 1993 to 2001. In accordance with Backé et al. (2003), Golinelli and Orsi (2002), Rosati (2002), Rother (2000) and Sinn and Reutter (2001), the real appreciation of the Slovene tolar is more than fully covered by the B-S effect-driven inflation differentials. At the same time, in the case of Hungary and Poland, the observed appreciation of the real exchange rate seems in line with productivity increases. For the Czech Republic and Estonia, appreciation appears twice as high as the one given by the B-S effect.

In contrast to the studies mentioned in the above paragraph, Burgess et al. (2003), Égert (2002a, b, 2003), Égert et al. (2003), Flek et al. (2002), Halpern and Wyplosz (2001), Kovács (2001), Kovács and Simon (1998), Kovács (2002) and Mihaljek and Klau (2003) suggest that even in Hungary and Poland only a fraction of the real appreciation could be explained by the inflation differential implied by productivity-driven nontradable inflation. Moreover, for the remaining countries, the real appreciation remains largely unexplained by the standard B-S effect.

#### 5.1.4 Studies Based on Cross-Section Data

The cross-section analysis is useful to determine where a given country is situated in chart 3, i.e. whether a country's real exchange rate is undervalued (point A'), fairly valued (point A) or overvalued (point A'') in terms of its relative productivity level. To see this, the relative price level of the home country vis-à-vis a benchmark economy (the reciprocal of the real exchange rate in levels as defined in footnote 1 on page 40) is to be regressed on the dual productivity level in the home country relative to that in the foreign benchmark. However, in practice, GDP per capita expressed in PPP terms is used, which is only a proxy for productivity.<sup>1)</sup> Table 6a summarizes the available studies and reveals that the slope coefficient varies between 0.5 and 1.0 (with the exception of Coudert and Couharde, 2002).

<sup>1</sup> First, it is a very rough proxy for dual labor productivity. Second, it can be a biased proxy for labor productivity if the labor market participation rates are very different in the home and the foreign economies.

Some studies go one step further and calculate fitted values of the relative price level of transition countries. The fitted value is then compared with the value observed for each country. De Broeck and Sløk (2001) calculate confidence intervals around the fitted values. The confidence intervals turn out to be rather large. In 1993, the real exchange rate in levels (relative price level) was undervalued in terms of productivity levels in the three Baltic states, the Czech Republic and Slovakia. At the same time, Hungary, Poland and Slovenia were located within the confidence intervals. By 1999, the three Baltic states had moved inside the confidence intervals, implying the correction of undervaluation, whereas the Czech Republic and Slovakia remained undervalued and Hungary, Poland and Slovenia did not move from within the band. Using the regression of De Broeck and Sløk (2001) for 2001, Burgess et al. (2003) find the three Baltic states to be fairly valued (they were within the confidence intervals).

Coudert and Couharde (2002), Randveer and Rell (2002) and Čihák and Holub (2001, 2003) also perform the same exercise but without confidence intervals. Therefore, their results are not fully comparable with those of De Broeck and Sløk (2001) and Burgess et al. (2003). Still, these results broadly confirm previous findings. According to Randveer and Rell (2002), the real exchange rate in Estonia was undervalued in 1993 but was fairly valued in 1999. Coudert and Couharde (2002) show that the real exchange rate of the Czech Republic and Slovakia were substantially undervalued in 2000. The real exchange rates of Estonia, Hungary and Slovenia, while also undervalued, were very close to the fitted values (regression line). Latvia, Lithuania and Poland appeared to have overvalued real exchange rates that were, however, also very

Table 6a

**Inflation Differential and the Real Appreciation  
 of the Exchange Rate Implied by the Balassa-Samuelson Effect,  
 Vis-à-Vis Germany the Euro Area**

	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Slovakia	Slovenia
	<i>percentage points</i>							
Backé et al. (2003); a	0.00		4.10			9.00		3.10
Golinelli and Orsi (2002); a	3.70		1.55			4.50		
Rosati (2002); a	0.55	1.60	3.50			3.75		1.60
Rother (2000); a								2.15
Sinn and Reutter (2001); a	2.30	2.80	6.30			3.60		2.80
Average	1.64	2.20	2.86			5.21		2.41
Burgess et al. (2003)		0.43		0.40	0.47			
Égert (2002a)	0.20		1.50			1.35	-0.10	0.60
Égert (2002b)	0.20		1.40			1.85	-0.70	-0.50
Égert (2003)		0.65						
Égert et al. (2003)	-0.20	0.10	0.75	-0.30	-0.10	1.60	1.50	0.70
Felk et al. (2002)	-0.29							
Halpern and Wyplosz (2001); a	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Kovács (2001)			1.50					
Kovács and Simon (1998)			1.60					
Kovács (2002)	0.10		1.90					0.70
Mihaljek and Klau (2003); a	-0.30		1.00			0.80	0.00	0.00
Average	0.04	0.45	1.28	0.23	0.32	1.24	0.26	0.35
Real appreciation 1993–2001	~5.00	~10.00	~3.00	~10.00	~10.00	~5.00	~4.00	~1.50

Source: Author's own calculations based on the original papers.

Note: Figures are average figures if a range is given in the original paper. a = the inflation differential against Germany computed using a Balassa-Samuelson implied inflation rate of 0.6% for Germany drawn from Égert, Ritzberger-Grünwald and Silgoner (2004, table 4).

Table 6b

**Undervaluation and Overvaluation  
in Terms of Relative Productivity Levels**

	Year	Undervalued	Fairly valued	Overvalued
De Broeck and Sløk (2001)	1993	CZ, EE, LV, LT, SK	HU, PL, SI	
	1999	CZ, SK	HU, EE, LV, LT, PL, SI	
Burgess et al. (2003) <sup>1)</sup>	1993	EE, LV, LT		
	2001		EE, LV, LT	
Randveer and Rell (2002)	1993	EE		
	1996–1999		EE	
Çoudert and Couharde (2002)	2000	CZ, EE, HU, SI, SK		LV, LT, PL
Čihák and Holub (2001, 2003)	1996, 1999	CZ, HU, SI, SK		PL

<sup>1)</sup> The authors use estimates of De Broeck and Sløk (2001).

Note: Acronyms as in the notes to table 5a.

close to the regression line. For 1996 and 1999, Čihák and Holub (2001, 2003) report similar results for the Czech Republic, Hungary, Poland, Slovakia and Slovenia.

Čihák and Holub (2001, 2003) show that the Czech relative price level is significantly lower than what the equation linking the relative price level and GDP per capita would imply. However, when the authors account for other factors, such as government activity and changes in the terms of trade, the relative price level of the Czech Republic turns out to be in line with its GDP per capita.

Cross-section data can be used not only to investigate levels but also to analyze inflation rates. Pelkmans et al. (2000) is an example for this. The authors proceed in two steps to derive an inflation rate that they link to the B-S effect. First, they run a regression between the relative price level and the GDP per capita for a set of 29 OECD countries for the year 1999. Second, the harmonized consumer price index of the euro area countries is regressed on the relative price level of the same set of countries. In addition, the core inflation rates are also regressed on the relative price level. The authors argue that the GDP per capita influences the relative price level, which in turn determines the rate of inflation. Observed GDP per capita figures of ten transition countries of Central and Eastern Europe are substituted into the first equation. The relative price level obtained this way is then used to derive the inflation rate implied by the second equation. The ten resulting inflation rates average 3.8% (equation based on the HICP) and 4.2% (equation based on core inflation).<sup>1)</sup> The average inflation rate thus derived for the transition economies is interpreted as the inflation rate that can be imputed to the B-S effect. The main problem with this approach is that it assumes that the catching-up economies used in the two estimated equations – Ireland, Portugal, Spain and Greece – higher dual productivity growth rates than countries with higher GDP per capita, which in turn explains the higher inflation rates. However, with the exception of Ireland, the changes in dual productivity in those countries were in fact below the EU average during the 1990s (Lommatzsch and Tober, 2003).<sup>2)</sup> Therefore,

<sup>1)</sup> Country-specific results are not reported in the paper.

<sup>2)</sup> Only Ireland experienced high growth in dual productivity in the late 1990s. Although the annual growth in average economy-wide labor productivity was over 3% in Greece, dual productivity was close to 1% per annum. More striking is the fact that average annual economic growth rates of above 3% in Spain and Portugal were not accompanied by corresponding changes in dual productivity (1% in Spain and about –2% in Portugal).

higher inflation rates cannot be linked to larger increases in dual productivity levels for these countries, which strongly mitigates the paper's results.

Čihák and Holub (2001) attempt to link the relative price structure to the relative price level of a given economy. The relative price structure is calculated as a weighted relative standard deviation of the relative price level of individual goods in the home country vis-à-vis the benchmark economy Germany.<sup>1)</sup> A cross-section regression performed for 22 European OECD and selected transition economies and for 1996 shows that the higher the relative price level, the lower the relative price coefficient. On the basis of the cross-section regression, the authors then calculate what relative price level would be implied if the transition economies were to reach the relative price structure of the least developed EU Member States, namely Greece, Portugal and Spain. For the Czech Republic, these calculations reveal an increase of 20% to 35% in the relative price level.

Also, in separate cross-section regressions, prices of 31 commodity groups are regressed on GDP per capita for 1996 using data for the same set of countries. Then, the authors use the derived coefficients for each commodity group to see the extent to which relative price levels of these commodity groups and thus the overall relative price level vis-à-vis Germany would change if the GDP per capita were to increase from a level of 55% in 1999 to a level of 65% relative to that in Germany. The result is in line with the earlier finding of an increase of 20% to 35%. Taking a horizon of ten years, the inflation rate implied by changes in relative prices would range from 1.7% to 2.7% a year in the Czech Republic.

Čihák and Holub (2003) update the estimates of Čihák and Holub (2001) using data for 1999 and complete it with estimates back to the 1980s (1980, 1985, 1990 and 1993). The results appear to be fairly robust. The authors establish several convergence scenarios for the Czech Republic based on which they argue that the relative price level would increase by 2.5% to 3.6% a year. This approach could be viewed as much broader than the usual B-S framework. First, it not only considers relative price adjustments of market-based nontradables but it also includes the whole gamut of prices, i.e. durable and semidurable goods, foods and regulated services. Second, these price adjustments are linked to productivity gains only in an indirect way.

## 5.2 BEER and PEER Studies

### 5.2.1 Time Series Studies

#### 5.2.1.1 Conventional BEER Studies

In a country study of Slovakia, the IMF (1998) sets out to estimate the equilibrium real exchange rate for Slovakia. The ingredients of the empirical relationship are the real exchange rate (the CPI-based, PPI-based, unit labor cost-based real exchange rates as well as the internal real exchange rate are considered), the share of public consumption and investment in GDP, the openness ratio,  $(X+M)/GDP$ , and real wages used as a proxy for productivity. In addition, M2 over GDP is also included to explain short-term fluctuations in the real exchange rate. The equations are estimated using OLS over the period from

1  $REL = \frac{\sqrt{\sum_{i=1}^n w_i (P_i - \bar{P})^2}}{\bar{P}}$ , where  $n$  is the number of individual prices, and  $P_i$  and  $\bar{P}$  stand for the relative price of individual items vis-à-vis Germany and the overall relative price level vis-à-vis Germany, respectively.

January 1990 to between February and June 1997 (with monthly data). According to step 2 of BEER, the short-term dynamic (M2) is set to zero and the actual values of the long-term fundamentals are substituted into the model. After determining the actual misalignment of the Slovak koruna, the paper comes to the conclusion that the currency was not overvalued during the period under study. This finding dissents from the general view that the large current account deficit was brought about by real overvaluation.

Avallone and Lahrèche-Révil (1999) analyze the equilibrium real exchange rate for the case of Hungary. A single equation including the CPI-based real exchange rate, public and private consumption in GDP, the terms of trade and GDP per capita as a proxy for productivity growth is estimated with the help of the Johansen cointegration technique over the period covering the first quarter of 1985 to the second quarter of 1997. The fitted values of the estimated equation are then compared with the actual real exchange rate (actual misalignment) that shows the absence of overvaluation over the whole period studied.

Beguna (2002) is one of the rare studies that analyzes the case of Latvia based on the Engle-Granger framework. The author regresses the CPI-based real effective exchange rate on the following variables: (1) the ratio of central government expenditures to GDP, (2) the terms of trade, (3) total trade to GDP, and (4) net FDI. Long-term values for fundamentals are obtained as five-quarter moving averages, and 1997 is chosen as the base year, i.e. the actual and estimated equilibrium exchange rates are set to be equal in 1997. The total misalignment derived for the period spanning 1994 to 2001 reveals only very small deviations from equilibrium. For instance, an overvaluation of as little as 2% appears from 1999 to end-2001.

Darvas (2001) investigates the exchange rate pass-through in the Czech Republic, Hungary, Poland and Slovenia. The exchange rate pass-through equation includes the adjustment of the real exchange rate toward its long-run value. Therefore, the author estimates a single equation of the real exchange rate vis-à-vis the Deutsche mark and based on core inflation series that exclude food, energy and administered items for the period running from the first quarter of 1993 to the first quarter of 2000. Two alternative measures of labor productivity are considered: (1) GDP per worker, and (2) the dual labor productivity differential. The other candidate fundamental variables considered in the paper are the terms of trade, net foreign assets to GDP, FDI to GDP, the difference between net foreign assets to GDP and FDI to GDP, the share of government expenditures in GDP and the German real interest rate. The final specifications are different across countries. Although the dual labor productivity differential enters the long-run relationship in all countries, it is the dual labor productivity differential that is found significant in Hungary and Slovenia whereas GDP per worker appears to work better for the Czech Republic and Poland. In addition, the terms of trade and FDI are included in the equation for the Czech Republic, and net foreign assets for Hungary. For Poland and Slovenia, only the German real interest rate is included beside the productivity variable, which is also used for the Czech Republic and Hungary. It turns out that an increase in the foreign real interest rate leads to an appreciation of the real exchange rate in the Czech Republic and Slovenia and to a real depreciation in Hungary and Poland. The unit root tests carried out on the residuals of the equations confirm that the var-

ables are cointegrated for the Czech Republic, Poland and Slovenia. In the case of Hungary, there is much less evidence for the presence of a cointegrating vector. The author does not calculate real misalignments.

Frait and Komárek (1999) draw on the NATREX model and estimate a reduced-form equation using the autoregressive distributed lag (ARDL) approach to identify a cointegrating vector for the Czech Republic. This long-term relationship contains the following variables: the CPI-based real exchange rate on the one hand, and an array of fundamentals, i.e. the terms of trade, real GDP growth approximating productivity, the world interest rate and the saving-to-GDP ratio. The equation is used to derive total misalignment. This is done by the substitution of the long-term value of fundamentals into the equation that indicates a slight overvaluation prior to the 1997 crisis, an undervaluation afterwards and a renewed overvaluation during 1998.

Filipozzi (2000) investigates the equilibrium real exchange rate of the Estonian kroon. It is possible to estimate a well-specified long-term relationship connecting the real effective exchange rate with the dual productivity differential, the share of investment in GDP, the trade balance over GDP and the nominal effective exchange rate. Filipozzi determines the extent of total misalignment by setting up several scenarios for the long-run values of the fundamentals for the period spanning the second quarter of 1993 to the second quarter of 1999. The results show that whereas the kroon was overvalued by 25% to 30% at the very outset, it appears only slightly overvalued by 5% at the end of the period.

Kemme and Teng (2000) set out to estimate the equilibrium exchange rate for Poland. An Engle-Granger-type cointegration relationship is tested for, using monthly data for the period from December 1990 to May 1999. Because monthly data were used, the following variables were introduced into the tested equation: (1) government expenditure over industrial production as a proxy for changes in the structure of aggregate demand, i.e. between private and public consumption, (2) capital inflows, (3) the current account, (4) the ratio of wages to producer prices to proxy the dual productivity differential and thus the B-S effect, and (5) the ratio of total trade to industrial production as a proxy for economic openness. Capital inflows are then dropped, as they prove to be insignificant. The difference between the estimated equilibrium real exchange rate deflated by the CPI, PPI, profits and wages, and the actual real exchange rate, i.e. the actual misalignment, indicates that the Polish currency was fairly valued or even slightly undervalued until the mid-1990s and then started to become overvalued in real terms. In mid-1999, misalignment was in a range of 2% to 10%, depending on the real exchange rate used, i.e. CPI-based, PPI-based, profit-based or wage-deflated. The misalignment appears smallest when using the CPI and is highest for the profit-based real exchange rate.

Randveer and Rell (2002) also cover Estonia. The data used span a somewhat different period than in Filipozzi (2000), i.e. the first quarter of 1994 to the fourth quarter of 2000. From a long list of possible long-term fundamentals, the dual labor productivity differential and the terms of trade seem to explain the real effective exchange rate of the kroon. The paper follows the five-step BEER analysis and computes total misalignment. The HP filter is implemented to uncover the long-term trend of fundamentals. The total mis-

alignment obtained in this way is adjusted with the use of a base year where the real effective exchange rate is supposed to be at equilibrium. For this purpose, the relationship between the price level and the income level is estimated for a panel composed of 52 OECD and transition countries taken together. It is assumed that the estimated coefficient of the income level (the price level is regressed on the income level) is the long-term value for all countries, as already explained. Then, the income level from 1994 to 2000 is substituted into the equation. The fitted value of the price level is subsequently compared with the actual price level. It turns out that the only year when the fitted value equals the actual value is 1996. Given this, total misalignment is “shifted” upwards so that misalignment is zero for 1996. The adjusted misalignment indicates an overvaluation of the kroon of roughly 30% in early 1994 and an overvaluation of approximately 4% to 5% in 2000. In 1999, there seems to be an undervaluation of 0% to 3%, which contrasts slightly with Filipozzi (2000). Finally, causality is tested for between the estimated misalignment on the one hand and exports, imports and investment on the other, which leads to the conclusion that misalignment might predict exports and investment.

Hinnosar et al. (2003) aim at assessing the BEER approaches for the case of Estonia using quarterly time series from 1995 to end-2002. The authors regress the real effective exchange rate on the dual labor productivity differential, net foreign assets and terms of trade. Two measures for labor productivity are used. The first considers agriculture and manufacturing as the open sector and the remaining sectors as the sheltered one, whereas the second also classifies hotels, restaurants, transport, storage and communication as belonging to the open sector. Altogether, twelve different specifications are tested using the Johansen cointegration technique, five of which are found to be properly specified in econometric terms. The first two include the real exchange rate and the two productivity measures; the third comprises a dummy variable to capture outliers when using the first productivity measures. These specifications are indeed in line with the B-S model. By contrast, the two last specifications include, in addition to the alternative productivity measures, the terms of trade and net foreign assets over GDP. Subsequently, applying HP-filtered series to the equations yields five misalignment series that reveal the following: From 1995 to 1998, the Estonian kroon was either undervalued or fairly valued, but in 1999, after the Russian crisis, it became clearly overvalued by about 4%. Then, the currency returned to equilibrium and appeared to be fairly valued in the fourth quarter of 2002.

Based on the Engle-Granger cointegration technique, Bitans (2002) investigates the case of Latvia for 1994 to 2001. The author finds it difficult to detect a long-term relationship using the real effective exchange rate and the real exchange rate against the Baltic states and other transition economies. By contrast, the real exchange rate vis-à-vis Latvia’s Western trading partners turn out to be connected to the dual productivity differential, openness and government expenditures over GDP. An increase in the dual productivity differential leads to a real appreciation whereas a rise in openness and government expenditure brings about real depreciation. The total misalignment measure does not actually reveal any major deviation from the equilibrium exchange rate in 2001. Bitans and Tillers (2003) update these results. They use the Johansen

cointegration technique and show that the real exchange rate vis-à-vis Latvia's Western trading partners (Germany, U.K., Denmark, Finland, Sweden and the Netherlands) is connected to net foreign assets, GDP per capita, the terms of trade and the real interest differential. Similarly to Bitans (2002), no real misalignment is found from 2001 onwards.

Kazaks (2000) also analyzes Latvia using an error correction model. The real effective exchange rate calculated on the basis of the CPI is found to be linked to labor productivity in industry in Latvia, the openness ratio, the unemployment rate and money velocity. The estimation is based on monthly data running from March 1993 to June 1998. Actual misalignment calculations show no misalignment in 1998.

Similarly, Vetlov (2002) examines the case of Lithuania. Using the Engle-Granger technique over the period 1994 to 2001, in addition to the dual productivity differential and openness, oil prices are also connected to the PPI-based real effective exchange rate. A rise in the dual productivity differential and oil prices cause the real exchange rate to appreciate whilst an increase in openness works in the opposite direction. The author then applies the HP-filtered values of the fundamentals to derive total misalignment, which reveals an undervaluation of about 7% at end-2001. Alternatively, eight different scenarios are considered to assess long-term values of the fundamentals, seven of which show an undervaluation ranging from 0% to 15%. By contrast, if the openness ratio is assumed to be 120%, an overvaluation of about 20% is found in the second quarter of 2001.

Rawdanowicz (2003) makes use of quarterly data covering the first quarter of 1995 to the second quarter of 2002 to assess the Polish zloty's equilibrium exchange rate. The variables included in the long-term relationship to the real effective exchange rate are the dual productivity differential against the EU-12 (based on industrial production), the terms of trade for Poland and the real interest rate differential. The fitted values of the long-term relationship and the actual real effective exchange rate are graphically presented for 1997 to 2000, showing the actual misalignment. The zloty seems undervalued in 1997 and overvalued by 1% to 10% in 1998 and 2001, and fairly valued in 2002. We note that the paper reports no details on the tests.

#### 5.2.1.2 BEER Studies Based on Differing Theoretical Backgrounds

The studies below adopt different approaches than the conventional BEER for their theoretical backdrop. However, given the similarity in the estimation technique with BEER, they are presented here.

Continuing along the lines of Alberola et al. (1999), Alberola (2003) seeks to connect the real effective exchange rate to the labor productivity in manufacturing relative to that in the foreign country and to net foreign assets, which are represented by cumulated current account balances. The Johansen cointegration technique is used to detect possible long-term relationships for the Czech Republic, Hungary and Poland over the first quarter of 1993 to the fourth quarter of 2002. Whereas an increase in the dual productivity differential yields an appreciation of the real effective exchange rate in all cases, an increasingly negative net foreign asset position leads to depreciation in Hungary and Poland while it results in an appreciation in the Czech Republic, which is con-

trary to what theory would suggest. The equilibrium real exchange rate is derived by applying the Gonzalo-Granger decomposition to the cointegration vectors. Results suggest an overvaluation of roughly 10% in 2001 followed by a sizeable undervaluation of 10% in 2002 for Poland. An increasing overvaluation is detected at the end of the period in the Czech Republic (10%) and Poland (12%).

Rahn (2003) follows the approach introduced in Alberola et al. (1999) and used in Alberola (2003) in that the real exchange rate is regressed on the difference in relative prices taken as a proxy for the dual labor productivity differential and net foreign assets proxied with cumulated current account balances for eight CEE acceding and two accession countries, namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia, and Bulgaria and Romania. The Johansen cointegration test is applied to determine whether the real effective exchange rate is linked to the relative price and the cumulated current account variables throughout the period from the first quarter of 1990 or 1993 to the first quarter of 2002. Cointegration is found only for the Czech Republic, Estonia, Hungary, Poland and Slovenia, implying that misalignment cannot be assessed for the remainder of the countries. In all cases, increasing net foreign assets are found to lead to real appreciation. The PEER approach is employed to obtain total misalignment in effective terms. The equilibrium real exchange rate and thus the misalignment vis-à-vis the euro is derived from the equilibrium real effective exchange rate by means of an algebraic transformation also used in Alberola et al. (1999). It turns out that the currencies of the Czech Republic, Estonia and Poland were overvalued by 10% to 15% against the euro, and somewhat less in effective terms in the first quarter of 2002. The Hungarian forint seems to be close to fairly valued in effective terms, but is 3% to 9% overvalued vis-à-vis the euro, whereas the Slovene tolar is found to be slightly undervalued, both against the effective benchmark and the euro.

Alonso-Gamo et al. (2002) seek to determine the total misalignment of the Lithuanian litas. Based on quarterly data stretching from the first quarter of 1994 to the third quarter of 2001, a cointegration relationship is estimated including the real effective exchange rate, the CPI-to-PPI ratio as a proxy for the relative price of nontradable goods relative to that of the trading partners, and net foreign assets over GDP. The estimated long-term relationship is subsequently decomposed into permanent and transitory components, with the permanent component being the equilibrium real exchange rate. The estimated equilibrium real exchange rate turns out to appreciate broadly hand in hand with the actual real exchange rate. The total misalignment determined based on the HP filter indicates an overvaluation of roughly 10% in 1994 and from 1999 to 2000 and an undervaluation of the order of 10% from 1995 to 1998 and of 5% in 2001.

Burgess et al. (2003) examine the case of the three Baltic states using the same framework as Alberola et al. (1999). For the period 1994 to 2002, a cointegration relationship is sought between the real effective exchange rate, on the one hand, and the CPI-to-PPI ratio and net foreign assets, on the other hand. Contrary to Rahn (2003), Burgess et al. could establish cointegration for all countries based on the Johansen cointegration framework. Also, increasing foreign liabilities lead to a real appreciation of the currencies. Furthermore,

the result that an increase in foreign liabilities leads to an appreciation of the real exchange rate is in contradiction not only with Rahn (2003) but also with Hin-nosar et al. (2003) and partly with Alberola (2003). Total misalignment indicates an undervaluation of about 3% in Estonia and an undervaluation of the Latvian and Lithuanian currencies of 6% in the first quarter of 2002. Note, however, that the confidence intervals around the estimate for Latvia make it difficult to conclude whether or not there is an over- or undervaluation. Burgess et al. (2003) determine a B-S effect close to zero for the three Baltic countries (section 5.1.1), and then estimate a BEER model on the basis of the CPI-to-PPI ratio as a proxy for the dual productivity differential. The BEER estimates could not detect any major real misalignment. This is an interesting outcome because it would imply that the substantial real appreciation of the currencies is captured by net foreign assets.

Égert and Lahrière-Révil (2003) aim at estimating the equilibrium real and nominal exchange rates for five selected Central and Eastern European transition economies, notably for the Czech Republic, Hungary, Poland, Slovakia and Slovenia. For this purpose, the FEER and BEER are combined. Three equations are estimated, the first for the internal balance (defined as the relative price of nontradable goods) and the second for the external balance (defined as the long-run sustainability of the current account). The third equation links the real effective exchange rate to the internal and external balances. Long-term equilibrium values for relative prices are determined using the dual productivity differential and private consumption, whereas the current account is regressed on terms of trade and the openness ratio. Long-run values for external and internal balances are subsequently substituted into the third equation. Comparing the fitted values of the third equation and the observable real effective exchange rates leads us to the observation that whilst the Hungarian and Slovenian currencies were not overvalued during the period from the first quarter of 1992 to the second quarter of 2001, the Czech, Polish and Slovak currencies turn out to be overvalued by approximately 15%, 15% and 8% at the end of the period under study. However, the base year problem arises: the rule for the choice of the base year is that the current account should have been in balance for that particular year, i.e. covered by FDI.

Lommatzsch and Tober (2002a) build on the observation that the real exchange rate based on the PPI appreciated almost as much as the CPI-deflated real exchange rate in the majority of acceding countries, especially in the Czech Republic, Hungary and Poland. They argue that this real appreciation might be an equilibrium phenomenon. The reason for this is the huge increase in export revenues brought about by changes in the composition of GDP, i.e. the shift in production towards goods of higher quality and improved technology. To test their conjecture, the authors first estimate export and import equations. The export equation includes labor productivity in industry, foreign output and export prices, while the import equation consists of final domestic demand, the fiscal position and oil prices. Next, a single equation is estimated for the PPI-based real exchange rate vis-à-vis Germany, which contains variables from the trade equations, net foreign assets and the real interest differential. The actual misalignment is subsequently determined the standard way. In every case, the first year is chosen as the base year. It appears that the Hungarian forint was

fairly valued during the sample period from the fourth quarter of 1995 to the fourth quarter of 2001, except for a short undervaluation period during the Russian crisis. By contrast, the real exchange rate in Poland turns out to be overvalued for most of the time, with the overvaluation reaching 10% at the end of the period. The Czech Republic seems to be a special case in that two different specifications give very different results. The first specification indicates the absence of an overvaluation, whereas the second specification suggests a huge overvaluation of the Czech koruna.

The theoretical underpinning in Rubaszek (2003a) is close to that of the FEER. The approach, which is labeled the Balance of Payment Equilibrium Exchange Rate (BPEER), rests on the balance of payment identity. The following fundamentals with an impact on the PPI-deflated real effective exchange rate are identified: domestic and foreign demand, proxied by domestic and foreign output, net foreign assets and the real interest rate differential towards the U.S.A. Nonetheless, the empirical assessment of the equilibrium real exchange rate has a lot in common with BEER. First, a cointegration relationship is estimated for the aforementioned fundamentals and the real effective exchange rate is determined based on the Johansen technique and using the fully modified ordinary least squares (FMOLS) estimator, which relies on the single-equation approach. The fitted values of the equation are rather similar to the actual real exchange rate. Second, long-term values of fundamentals obtained using the HP filter are employed in the estimated equation to derive the total misalignment. From 2001 until early 2002, the zloty appears to be strongly overvalued by up to 16%. However, by the end of 2002, the real exchange rate had converged to equilibrium and real misalignment dropped below 4%.

## 5.2.2 Panel Studies

### 5.2.2.1 Conventional Panel Studies

In perhaps one of the most cited papers on equilibrium real exchange rates in transition economies, Halpern and Wyplosz (1997) speculate that in the early years of transition, real exchange rates were well beneath their equilibrium value. Therefore, the real exchange rate is expected to appreciate (to correct this “undershooting”) until the equilibrium level is reached. Moreover, even if real exchange rates are close to their equilibrium value, there is still room for appreciation, since the equilibrium rate itself is expected to appreciate, mainly due to higher inflation rates. Yet, higher overall inflation can be explained by the B-S effect, the improvement in the quality of tradable goods and relative wage adjustments. To prove both conjectures, the authors first estimate a real dollar wage equation, i.e. relative wage adjustment including GDP per capita as a proxy for productivity, school enrollment, the share of agriculture in GDP and government consumption. This estimate is based on pooled time series for 80 countries at approximately the same level of development. Five observations are included for each country (1970, 1975, 1980, 1985 and 1990). Results suggest that GDP per capita, school enrollment and government consumption are positively related to dollar wages, while the agriculture-to-industry ratio and inflation have negative signs. They then determine the equilibrium dollar wage by substituting the corresponding time series (1990–96) for transition countries into the estimated equation and compare it with actual dol-

lar wages. The results are based on the implicit assumption that the wage and price levels are closely linked with each other. However, if this is not the case, the dollar wage equation cannot be used as a proxy for the real exchange rate.<sup>1)</sup> Results support the undershooting theory for all countries except Hungary and Slovenia. It is shown that by 1996, the real exchange rate had moved near its equilibrium level in Croatia, the Czech Republic, Poland, Slovenia and Hungary.

Begg et al. (1999) update the database used in Halpern and Wyplosz (1997): the number of countries is extended to 85 and the period is augmented with the observation for 1995. Additional variables such as the dependency ratio, the openness ratio, net foreign assets of the banking sector and of the economy, credit to the private sector and a number of regional dummies for OECD countries; former Soviet Bloc countries and CIS countries are added. They estimate the equilibrium dollar wage for 12 transition countries for the period from 1990 to 1997: in some countries, the equilibrium dollar wage does not seem to appreciate any more in 1996 and 1997. On the one hand, the currencies of the Baltic states and the Czech and Slovak Republics were substantially undervalued in real terms in the early 1990s but converged rapidly to their equilibrium value. On the other hand, the currencies of Hungary, Poland and Slovenia are fairly close to overvaluation from 1996 onward.

Krajnyák and Zettelmeyer (1998) follow in the footsteps of Halpern and Wyplosz (1997) in that they also estimate the equilibrium dollar wage using a large panel including 85 countries, of which 15 are transition economies. The database contains six annual observations for each country between 1990 and 1995. Likewise, the variables which are expected to capture real exchange rate movements are GDP per capita, school enrollment and the share of agriculture in GDP. In addition, a score of other variables is used to describe institutional settings, such as an indicator for government interventions, the fiscal regime, property rights and economic freedom. The results show that in the early 1990s, the equilibrium dollar wage appreciated in Bulgaria, the Czech Republic, Estonia, Hungary, Poland, Romania and Slovakia. At the same time, the observed dollar wage, which was undervalued at the beginning, converged to its equilibrium value.

De Broeck and Sløk's (2001) paper covers two groups of transition countries. The one we are interested in is that of EU accession and acceding countries, i.e. the three Baltic states, Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. Data are gathered on a yearly basis over the period 1991 to 1998. Using the pooled mean group estimator (PMGE), the CPI-based real effective exchange rate is regressed on the dual productivity differential vis-à-vis the export-weighted average dual productivity of 18 OECD countries. The productivity variable turns out to be significant. In addition, other variables are introduced to control for short- and long-term fluctuations caused by other fundamental factors. The openness and government balance variables are also found to impact on the real exchange rate. The more open the country is, the stronger the push towards depreciation is, and the higher the government deficit is, the larger the depreciation in real terms is. The terms

1 This is also valid for Begg et al. (1999) and Krajnyák and Zettelmeyer (1998).

of trade and fuel and nonfuel prices become insignificant in their estimates. The authors substitute the growth of the dual productivity differential in 1999 to the estimated equations and point out that, on average, the dual productivity differential contributed 1 percentage point to the inflation differential in this particular year.

Coricelli and Jazbec (2001) develop a two-stage model for real exchange rate determination that describes the pre- and posttransition periods. Subsequently, with the help of an unbalanced panel (1990/1995 to 1998) composed of 19 transition economies, the authors establish a relationship between the internal real exchange rate (the relative price of tradables in terms of nontradables – the reciprocal of the internal real exchange rate presented in section 2), on the one hand and dual productivity, the share of nontradable consumption in total private consumption, real government consumption over GDP (demand-side variables), employment in industry to employment in services, the EBRD's reform variable and a series of dummies standing for structural changes on the other hand. The variables are found to explain movements in the relative price of tradable goods. Nonetheless, the extent of their influence varies across countries. In the acceding countries, dual productivity accounts for nearly 50% of the relative price of tradable goods whereas the rest can be ascribed to the remaining demand-side and structural variables.

Dobrinsky (2003) is one of the rare papers that uses TFP based on capital stock estimates obtained with the aid of the permanent inventory method to explain changes in the real exchange rate. However, as capital stock is only estimated for the economy as a whole, no sectoral TFP is available. The author runs a panel regression between the CPI-deflated real effective exchange rate on the one hand, and the difference in productivities across the home and foreign country, augmenting the equation with some demand variable (GDP per capita measured in terms of PPP), M1 to GDP and dummy variables accounting for different exchange rate regimes on the other hand. Results obtained for 1993–99 indicate that TFP and the demand-side variable contribute importantly to explaining the appreciation of the real exchange rate of the 11 transition countries included in the panel.

In Kim and Korhonen (2002), the econometric estimation of the single equation, which is composed of the real exchange rate based on the CPI on the one hand and GDP per capita approximating productivity, the share of investment and public consumption in GDP and finally the openness ratio,  $(X+M)/GDP$ , on the other hand, is performed for two groups of nonacceding economies. The first group consists of 29 countries and is used to estimate a real exchange rate equation against the U.S. dollar for the period from 1975 to 1999. The second group contains 19 economies whose real effective exchange rate is taken into consideration for the period from 1980 to 1999. In both cases, one part of the panel is composed of industrialized economies whereas the second part rests on emerging countries. This choice is explained by the fact that acceding countries exhibit similar features compared with both types of economies (they have a trade pattern similar to that of developed countries and GDP per capita figures roughly as high as those in emerging countries). It should be mentioned that this is one of the rare papers in which the homogeneity condition among panel members is put to the test, and it turns out to hold. This

is crucial, since heterogeneity within the panel would invalidate the estimation results. The macroeconomic series of the Czech Republic, Hungary, Poland, Slovakia and Slovenia are then applied to the estimated equations. The graphic illustration shows that each country's actual real exchange rate is close to the estimated equilibrium real exchange rate against the U.S. dollar (within a range of  $\pm 5\%$ ) in 1999. The exception is Slovenia, where the currency appears to be overvalued by approximately 20% in 1999. The charts tell a different story about the effective real exchange rate. In 1999, the Polish and Slovak currencies are neither overvalued nor undervalued, whereas the Czech koruna is found to be undervalued by 10% and the Hungarian forint is overvalued by 40%. There are no results for Slovenia. The huge Hungarian overvaluation casts some doubt on the robustness of the results. This finding is all the more implausible in that the extent of the overvaluation, which was already 10% in 1994, widened from then on despite important macroeconomic adjustments in the mid-1990s.

Instead of the basic two-sector (nontradables/tradables) two-input (capital/labor) B-S model, Fischer (2002) uses a three-sector (nontradables/exports/imports) and four-input (capital/labor/two-skills) model. In this model, not only productivity but also investment demand can have an impact on nontradable prices. In a panel framework for eight to ten transition economies, the author then estimates the impact of productivity in industry, agriculture and services, total and public consumption and the terms of trade, and the influence of the real interest differential on the CPI-based real exchange rate. In alternative specifications, these variables appear to explain changes in the real exchange rate well. The author shows that 50% of the changes in the real exchange rate can be ascribed to productivity (half of which can be attributed to productivity in industry, and the other half to productivity in agriculture), 25% to consumption and 25% to the real interest differential. Fischer (2002) stresses that the indicated impact of productivity on real appreciation may be overestimated, given that investment demand also exerts an influence on nontradable prices. However, it should also be borne in mind that only part of the real appreciation comes through nontradable price channels, which mitigates the aforesaid results.

As opposed to the aforementioned panel studies, MacDonald and Wójcik (2002) set out to estimate the B-S effect extended with demand-side variables for a small panel composed of four acceding countries (the Czech Republic, Hungary, Slovakia and Slovenia). The authors report that the dual productivity differential and the difference in productivity of the domestic and foreign open sector significantly cause both the internal real exchange rate (relative price of nontradable goods in the home country) and the effective real exchange rate to appreciate. The magnitude of coefficients turns out to be different from that in other studies. There are two grounds for this. First, the productivity variable is calculated differently, with Austria being used as the foreign benchmark country. Second, the effective real exchange rate is regressed not on an effective productivity variable but rather on the dual productivity differential vis-à-vis Austria. The estimations also lend weak empirical support to what one might call the demand-side effect, i.e. the impact of total and private consumption on the real exchange rate. The authors document that productivity changes in the dis-

tribution sector and regulated prices also exert an influence on the real exchange rate. They argue that regulated prices may have weakened the effect of productivity on the real exchange rate.

Crespo-Cuaresma et al. (2003) investigate the monetary model for the case of five acceding countries (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) and one accession country (Romania) from 1994 to 2002. Using monthly data, the nominal exchange rate vis-à-vis the euro is regressed on the following variables: industrial production as a proxy for real output, the monetary aggregate M2, the nominal deposit interest rate and the relative price of nontradables proxied by the CPI/PPI ratio, which is meant to capture the B-S effect. It should be noted that in the monetary model augmented with the B-S effect, an increase in the relative price differential makes the nominal exchange rate appreciate. In the paper, all the variables are compared with the euro area based on the so-called synthetic euro. The econometric estimations rely on an extensive set of panel methods, such as panel FMOLS, DOLS (dynamic ordinary least squares) and PMGE (the pooled mean group estimator), and show that the explanatory variables are correctly signed. Next, the fitted values of the model are construed as the equilibrium exchange rate and are compared with the actual exchange rate. It appears that the Czech currency is overvalued from 2001 onwards and that overvaluation reached 16% in the last quarter of 2002. Similarly, the Polish zloty is found to be overvalued by 3% at end-2002, and the Slovene tolar is overvalued by 20.8%. By contrast, the Hungarian forint and the Slovak koruna turn out to be undervalued by 5.6% and 1.3% at the end of the period. Although using the monetary model allows the authors to directly derive nominal exchange rates, it is primarily a model for exchange rate determination and is thus difficult to relate to equilibrium exchange rates such as those discussed in previous sections of this article.<sup>1)</sup> Also, the monetary model requires de facto floating exchange rates, which may not have been the case in four countries of the sample, namely Hungary, Poland, Slovakia and Slovenia, during a sizeable part of the period under study. Finally, introducing the B-S effect is based on the assumption that PPP holds for tradable goods, which apparently is not the case in at least four countries of the sample as shown in chart 5.

#### 5.2.2.2 Studies Incorporating Foreign Debt or Multiple Models

Coudert (1999) seeks to estimate the equation containing the U.S. dollar-based, CPI-deflated real exchange rate on the one hand and the dual productivity differential and the foreign indebtedness ratio on the other. The relative price of nontradables and GDP per capita are used as a proxy for productivity. The panel is based on annual data for the period between 1977 and 1997 for a set of 16 emerging market economies in Asia, Latin America and Europe, including Hungary as the only acceding country. The results lend strong support to the fact that the stock of debt compared to GDP has a significant impact on real exchange rate movements in those countries. Furthermore, the results for Hungary also suggest the absence of sustained under- or overvaluation periods

<sup>1</sup> This is why this paper is not included in table 11.

during the whole period in general and during the period covering the 1990s in particular.

Covering 12 CEECs and the period 1990–98, Maurin (2001) considers the real exchange rate deflated by the CPI, on the one hand, and dual productivity, public consumption, real domestic interest rate and external debt, on the other hand. Assuming that progress in nontradable productivity equals zero, dual productivity is given by productivity advances in the open sector. Proxies for productivity are per capita GDP and the relative price of nontradables, that is, consumer prices compared to producer prices. Public consumption and external debt are expressed in terms of GDP. The key finding of the paper is that public consumption and external debt are correctly signed with positive and negative signs, respectively. The productivity coefficients are almost never significant whatever the proxy may be. We note that Maurin (2001) does not assess the equilibrium real exchange rate.

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Table 7

**Studies Using the BEER Approach**

	Background	Country	Period	Variables
<b>Time series</b>				
Alberola (2003)	BEER/PEER	CZ, HU, PL	1993–2003, Q	LP, NFA
Alonso-Gamo et al. (2002)	BEER	LT	1994–2002, Q	REL (CPI/PPI), NFA
Avallone and Lahrèche-Révil (1999)	BEER	HU	1985–1996, Q	CAPITA, TOT, PRIV, GOV
Beguna (2002)	BEER	LV	1994–2001, Q	GOV, TOT, OPEN, net FDI
Bitans (2002)	BEER	LV	1994–2001, Q	LP, OPEN, GOV
Bitans and Tillers (2003)	BEER	LV	1994–2002, Q	CAPITA, NFA, TOT, RIR
Burgess et al. (2003)	BEER	EE, LV, LT	1994–2002, Q	REL (CPI/PPI), NFA
Csajbók (2003)	BEER, NATREX, MB, FEER	HU	1994–2002, Q	LP, TOT, OPEN, NFA, GOV, RIR, risk premium
Darvas (2001)	BEER	CZ, HU, PL, SI	1993–2000, Q	LP, TOT, GOV, NFA, FDI, NFA-FDI, German real interest rate
Égert and Lahrèche-Révil (2003)	BEER*FEER	CEEC5	1992/1993–2001, Q	LP, PRIV, REL (CPI), CA, TOT, OPEN
Égert and Lommatzsch (2003)	BEER	CEEC5	1992/1994–2002, Q	LP, OPEN, FDEBT, RIR, REGD, GOV
Filipozzi (2000)	BEER	EE	1993–1999, Q	LP, CA/GDP, INV, NEER
Frait and Komárek (1999)	NATREX/BEER	CZ	1992–1999, Q	real GDP growth, TOT, RIR, savings
Hinnosar et al. (2003)	BEER	EE	1995–2002, Q	LP, TOT, NFA
IMF (1998)	BEER	SK	1990–1997, M	GOV, INV, OPEN, RWAGE
Kazaks (2000)	BEER	LV	1993–1998, M	LP, OPEN, unemployment rate, money velocity
Kemme and Teng (2000)	BEER	PL	1990–1999, M	government expenditure to industrial production, CA, wages to producer prices, total trade to industrial production
Lommatzsch and Tober (2002b)	BEER*structural equations	CZ, HU, PL	1994/1995–2001, Q	LP in industry, foreign output, RIR, NFA
Rahn (2003)	BEER/PEER	10 CEECs	1990/1993–2002, Q	REL (CPI/PPI), NFA
Randveer and Rell (2002)	BEER	EE	1994–2001, Q	LP, TOT
Rawdanowicz (2003)	BEER	PL	1995–2002, Q	LP, TOT, RIR
Rubaszek (2003a)	BPEER	PL	1994–2002, Q	domestic and foreign output, NFA, RIR
Vetlov (2002)	BEER	LT	1994–2001, Q	LB, OPEN, brent
<b>Panel</b>				
Begg et al. (1999)	BEER	85 countries	1970–1995, 5Y	CAPITA, OPEN, GOV, NFA, NFA in banking, private credits
Coricelli and Jazbec (2001)	own model	including CEECs, B3, BG, RU, RO, CEECs, B3, BG, HR, RO, 8 FSU	1990/1995–1998, Y	LP, PRIV on nontradables, GOV, number of employees in industry and in services, structural reforms
Coudert (1999)	BEER	16; HU is the only CEEC	1977–1997	REL (CPI/PPI), FDEBT
Crespo-Cuaresma et al. (2003)	monetary model	CEE5 + RO	1994–2002, M	nominal exchange rate EUR, industrial production, M2, CPI/PPI, deposit interest rates
De Broeck and Sløk (2001)	BEER	CEEC5, B3, BG, RO, FSU, MN, OECD	1991–1998, Y	LP, OPEN, public deficit, TOT, brent, monetary aggregates
Dobrinisky (2003)	BEER	CEEC5, B3, BG, RO	1993–1999, Y	TFP, GDP per capita, GOV, M1
Fischer (2002)	BEER	CEEC5, B3, BG, RO	1993/1994–1999, Y/Q	LP, PRIV, GOV, RIR, real raw material prices
Halpern and Wyplosz (1997)	BEER	CEEC5, BG, RO, RU, HR	1970–1990, 5Y	CAPITA, enrollment, agriculture to GDP, GOV, inflation
Kim and Korhonen (2002)	BEER	CEEC5	1991–1999, Y	CAPITA, INV, GOV, OPEN
Krajnyák and Zettelmeyer (1998)	BEER	CEEC5, B3, BG, RO, FSU	1990–1995, Y	CAPITA, enrollment, agriculture to GDP, structural indicators
MacDonald and Wójcik (2002)	BEER	CZ, HU, SK, SI	1995–2001, Q	LP in open, closed and distribution sectors, GOV, PRIV, TOTAL
Maurin (2001)	BEER	12 CEECs	1990–1998, Y	REG, RIR, NFA, RWAGE, CAPITA, FDEBT, RIR, GOV

Notes: FSU = Former Soviet Union, MN = Mongolia, RU = Russia, brent = price of crude brent, CA = current account to GDP, CAPITA = GDP per capita, DEFL = relative prices based on GDP deflators, FDEBT = foreign debt to GDP, GOV = public consumption to GDP, INV = investment to GDP, LP = average labor productivity, NEER = nominal effective exchange rate, NFA = net foreign assets to GDP, OPEN = openness ratio, PRIV = private consumption to GDP, REG = regulated prices, REGD = regulated price differential, REL (CPI) = relative prices based on CPI data, REL (CPI/PPI) = relative prices based on the CPI and PPI, RIR = real interest differential, RWAGE = real wage, TFP = total factor productivity, TOT = terms of trade, TOTAL = total consumption to GDP, 5Y = data for every fifth year.

Csajbók (2003) summarizes the results of the research project conducted at the Hungarian central bank aimed at estimating the equilibrium real exchange rate for Hungary based on four different theoretical approaches. The equilibrium real exchange rate is assessed using the NATREX, BEER, FEER and Macroeconomic Balance (MB) approaches. Remarkably, the NATREX model is not only estimated in its reduced form but also structurally as in Detken et al. (2002). The results of the different approaches suggest a possible overvaluation at end-2002.

Égert and Lommatzsch (2003) have two goals in mind. First, they provide some theoretical underpinning for the PPI-based real exchange rate and go for testing it by regressing not only the CPI-deflated but also the PPI-deflated real exchange rate on a set of variables, also including the foreign-debt-to-GDP ratio. The results are fairly similar for the CPI- and PPI-based real exchange rates, lending support to the formulated hypothesis. Second, they seek to assess in a systematic manner the sensitivity of the usual BEER estimates to different time series and panel cointegration techniques. It appears that the results are sensitive to the different estimation methods, the estimated equations and the size of the panel. Hence, a range is obtained for the equilibrium real exchange rate and the real misalignment, which may be rather large. What appears from the high number of estimated misalignments is that the Czech, Polish and Slovak currencies are likely to have been overvalued in the last quarter of 2002 whereas the Slovene tolar was slightly undervalued in that period. In the case of Hungary, results based on time series and panel estimates appear a little conflicting but overall they indicate an overvaluation in the fourth quarter of 2002.

### 5.3 Structural Models and the FEER

Šmídková (1998) uses the Czech module of the NIGEM model of the London-based National Institute for Economic and Social Research (NIESR) estimated upon quarterly data over the period of 1992 to 1996. Based on the FEER approach presented earlier in this paper, the author establishes two scenarios and determines two bands of overvaluation. These results suggest that the Czech koruna is overvalued compared to its estimated level by a band of between 0.4% to 6.8% and -1.4% to 5.4% in 1996.

Also using the NIGEM model, Šmídková et al. (2002) take a look at four other acceding countries besides the Czech economy, namely Estonia, Hungary, Poland and Slovenia. The trade equation of the NIGEM model is estimated for 1994 to 1999 on quarterly data and explicitly accounts for the trade liberalization that occurred in the five CEECs, the external indebtedness and the impact of FDI. It is argued that the initial level of external indebtedness has an influence on the equilibrium exchange rate, i.e. there is more room for equilibrium appreciation if the level of external debt is less important. By setting a target value of 60% over GDP to be reached by 2022, and implementing a sensitivity analysis, two estimated equilibrium real exchange rate corridors based on different assumptions are obtained for each single country. It turns out that the real effective exchange rate of the Czech koruna, well in the middle of the corridor in 1996, approached the stronger side of the corridor in late 1998 and remained very close to it until 2001, when it broke out. In 2002 it was clearly overvalued by some 8% to 9%.

Likewise, in Hungary, the real exchange rate was within the corridors until 2001 when it exited on the stronger edge and appeared overvalued by about 6% in mid-2002. The Polish currency exited the band in 2000, indicating misalignment, but remained only slightly overvalued until end-2001 and became misaligned by approximately 10% to 12% in 2002. Similarly, the Estonian kroon appears to have become overvalued from 1999 onwards; the maximum overvaluation occurred in 2002 with an estimated 13% to 14%. By contrast, no misalignment is found for the case of Slovenia, given that the tolar remained within the corridors. Note also that the Slovenian currency is situated closer to the weaker side of the corridor, indicating that the danger of an overvaluation is clearly more limited than that of an undervaluation.

Coudert and Couharde (2002) provide estimates on whether the currencies of five acceding economies, namely the Czech Republic, Estonia, Hungary, Poland and Slovenia, are under- or overvalued in 2000 and 2001 in effective terms and against the euro. Derived as indicated in the description of the FEER in section 3, the estimates are based on the NIGEM model, considering the possible impact of acceding countries on the outside world. Also, sensitivity analysis is carried out to check the robustness of the results. Of the misalignments, only the Polish misalignment stands out, as it exhibits overvaluations of 7% in 2000 and 3% in 2001. The other economies seem to have fairly valued currencies. It is worth noting that for the long-term current account target, estimates of Doisy and Hervé (2003) are used, which in turn are based on the Macroeconomic Balance approach.

Rubaszek (2003b) seeks to determine the FEER for the zloty/euro rate. In doing so, he uses a small model for Polish trade to derive trade elasticities. The target value for the current account deficit used in the paper is 3.6% of GDP, which is obtained by setting the foreign debt-to-GDP ratio to 39%. Under the baseline scenario that includes a USD/EUR value of 1.13, the author comes to the conclusion that the Polish zloty was overvalued by approximately 9% in the last quarter of 2002 and that it appears fairly valued in mid-2003.

Csajbók and Kovács (2002) examine possible misalignments for Hungary using the Hungarian module of NIGEM. The module is disconnected from the rest of the international model, as it seems a plausible assumption that given its small size, developments in the Hungarian economy will hardly affect foreign economies. Without providing precise figures, the authors point out that the FEER indicates the presence of overvaluation. In addition to this analysis, one big merit of the paper is that it illustrates possible changes in the FEER and the real exchange rate prior to and after euro adoption. In this context, they argue that prior to euro adoption, the FEER is likely to appreciate owing to the B-S effect and a one-off reduction of the risk premium. In contrast, because of the expected fiscal consolidation, the observed real exchange rate is expected to depreciate. In the post-euro adoption period, the risk premium and the trade channel are strong candidates to affect both the FEER and the real exchange rate. The risk premium channel is composed of a reduction in the risk premium and an increase of actual compared with potential output. The risk premium channel would appreciate the FEER. Unchanged in the shortterm, the FEER would appreciate in the longer run on the grounds of higher trade and growth brought about by EMU (trade channel).

Hinnosar et al. (2003) attempt to apply the FEER approach to Estonia. They find that the FEER model cannot be reasonably assessed mainly because of the lack of a long-run relationship between foreign trade and the real effective exchange rate. However, the paper fails to compare these outcomes with what is found in other papers based on the NIGEM model. Estonia is also included in the NIGEM model, and thus import and export elasticities are available. It might be of use to explain how these estimates in the NIGEM are derived.

## 6 What Have We Learned from the Literature?

### 6.1 Trend Appreciation of the Real Exchange Rate

The real exchange rate of the acceding countries has experienced strong appreciation from the outset of the transition process, although the extent of the appreciation has been very different across individual countries. It is a widely held view that this appreciation is largely due to the B-S effect and thus has not resulted in an overvaluation of the currencies. A first strand of papers (e.g. Sinn and Reutter, 2000; Rother, 2002; Golinelli and Orsi, 2002; Jazbec, 2002) supports this view. However, another string of papers, as shown in table 5c, has recently shown that, at best, half of this appreciation can be ascribed to the B-S effect (see Kovács, 2001, 2002; Flek et al., 2002; Égert, 2002a, b; Égert et al., 2003, and Mihaljek and Klau, 2003).<sup>1)</sup> The main reason for this finding is that PPP does not hold for the open sector, since the PPI-based real exchange rate (used as a proxy for the real exchange rate in the open sector) has also appreciated, though to a lesser extent than the CPI-based real exchange rate. The B-S effect is expected to explain the difference between the overall inflation-deflated (CPI) and the tradable price-based (PPI) real exchange rates.<sup>2)</sup>

The equilibrium appreciation of the real exchange rate, and thus the underlying inflation differential vis-à-vis Germany and the euro area that is imputable to the B-S effect, is found to amount to up to 2.0% in Hungary and Poland and is much lower in the other countries.<sup>3)</sup> In the Czech Republic and Latvia, it is close to zero.<sup>4)</sup> This finding has important implications: The B-S effect,

1 Curiously enough, even the first strand of papers finds a very low inflation differential for the Czech Republic that could be attributed to the B-S effect. This is because increases in overall and dual productivity in the Czech Republic were among the lowest in the transition countries. However, another explanation for this outcome may lie in statistical problems: The Czech Statistical Office may have considerably underestimated output in the Czech Republic (Filer and Hanousek, 2000). This is all the more possible as the Czech Republic was the biggest net FDI receiver among the transition economies not only in terms of FDI per capita but also regarding the absolute stock of FDI cumulated from 1991 to 2003, which amounts to nearly USD 42 billion (EBRD, 2003).

2 When using the CPI and PPI, this only holds if overall inflation is composed of tradable goods and market-based services, and if the tradable component of the PPI corresponds to that of the CPI.

3 Kovács (2003) argues that the B-S effect is not likely to exceed 2% per annum even in the longer run. Kozamernik (2003) makes model-based projections and concludes that the yearly inflation rate imputable to the B-S effect would range from 1% to 1.5% in Slovenia (0.4% to 0.9% in terms of an inflation differential vis-à-vis Germany).

4 One should not forget that these figures are based on past data. However, one may argue that the maximum value of 2% may be an upper limit even in the future. One reason for this is that productivity increases in the open sector may slow down as the acceding countries' productivity levels approach EU productivity levels. Also, productivity gains in the sheltered sector may pick up. Although the share of (market) services in the acceding countries' national and harmonized CPI (20% to 35%) is still lower than what we can observe in the EU (40% to 45%), it may only increase progressively with higher real income per capita, and would not exacerbate the B-S effect's impact on the CPI.

i.e. productivity-driven market service inflation, is likely to be no barrier to meeting the Maastricht criterion on price stability, defined as the average inflation rate (measured in terms of the harmonized CPI) of the three best-performing EU countries in terms of price stability plus 1.5%.<sup>1</sup>) However, this does not mean that the fulfillment of the criterion would pose no problem for tradable price inflation, and especially regulated price inflation may be of importance in this respect. Furthermore, it is interesting to see that catching-up EU countries such as Greece, Portugal and Spain recorded very low changes in dual productivity during the 1990s despite above-average economic growth coupled with above-average inflation rates. This may imply that mechanisms other than the B-S effect could be at work and bring about changes in relative price levels.

Notwithstanding the fact that the B-S effect can explain only part of the real appreciation of the transition countries' currencies, the currencies are not necessarily overvalued because:

- 1) The real exchange rate may have been over- or undervalued at the outset of transition. If it had been fairly valued, the actual real exchange rate would have appreciated faster than the equilibrium real exchange rate. Consequently, it would be overvalued by now. But Halpern and Wyplosz (1997) and Krajnyák and Zettelmeyer (1998) reported a strong undervaluation at the beginning of the transition period. This means that the "excess" appreciation of the actual real exchange rate (the difference between the appreciation of the actual and equilibrium real exchange rate) has only been a "corrective" convergence towards its equilibrium level.
- 2) There is a more compelling reason why the equilibrium real exchange rate could appreciate despite the low B-S effect. In transition economies, the adoption of new technology and higher productivity leads to higher supply capacities to produce goods of better quality. Due to improvements in the quality of goods and marketing, and because of a change in preferences towards domestic goods, pricing strategies result in higher tradable prices. It is hardly possible to filter these changes out of inflation, which brings about a real appreciation via a positive inflation differential in tradable goods. In addition, the real exchange rate based on tradable prices may also appreciate because of the adoption of new technologies and driven by expected productivity gains linked to capital inflows related to productive foreign investment. Note, however, that if expected productivity gains do not materialize, the real appreciation will not be an equilibrium phenomenon *ex post*.
- 3) Real appreciation induced by an increase in regulated prices of nontradable goods might also be viewed as an equilibrium phenomenon in as far as increases in regulated prices imply an approach towards the market-based service price level and do not lead to a deterioration of competitiveness.
- 4) Moreover, real exchange rates based on the CPI are not fully consistent. Using the same weights for tradable and nontradable goods in the CPI would result in a slightly higher appreciation. Beside the quality issue, price indices

<sup>1</sup> This is in contrast with the long held view, advocated by Szapáry (2000) among others, that acceding countries would not be able to fulfill the Maastricht criterion on price stability because of the B-S effect.

in transition economies are subject to other sources of upward biases (Filer and Hanousek, 2001a, 2001b), which may also overstate the “true” appreciation.

- 5) Tradable prices also contain market-determined nontradable components and elements of regulated items.<sup>1)</sup> Thus, part of the appreciation of the PPI-based real exchange rate could be attributed indirectly to the B-S effect and to increases in regulated prices. A trend increase in disposable income per capita results in an increased demand for nontradable goods of higher value. The distribution sector may also play a role here, as advocated in MacDonald and Ricci (2001) and as shown in MacDonald and Wójcik (2002). Lee and Tang (2003), however, mitigate the role the distribution sector may play in the real appreciation.

## 6.2 Small BEER and Big FEER

### 6.2.1 Is there Misalignment out There?

The difficulty we encounter with BEER and FEER is that very recent estimates are needed to assess the extent of misalignment of the real and the nominal exchange rate for ERM II entry. Of the few estimates at our disposal, some are already outdated (referring to e.g. 1997 or 1998). Another problem is that some of the countries are rather poorly covered. For instance, there are only a few estimates available for Latvia, Lithuania, Slovakia and Slovenia.

For the Czech Republic, the equilibrium exchange rate seems to be overvalued in 2001 and 2002, for the estimated real misalignment ranges from 0% to +20%. Poland also exhibits signs of a misalignment in 2001 and early 2002, which might have been reversed by the strong depreciation of the nominal exchange rate. In the case of Hungary, most estimates find no misalignment prior to the abandonment of the crawling peg. Since then, the nominal exchange rate has appreciated by more than 10% coupled with a positive inflation differential vis-à-vis its trading partners; this may have resulted in an above-equilibrium appreciation of the forint. This is widely acknowledged by available estimates. Although the Estonian kroon shows little sign of over- or undervaluation in 2000 and 2001, recent estimates for 2002 are more mixed on whether the real exchange rate is fairly valued or overvalued.

While these estimates might be suited to indicating whether or not a currency is overvalued, determining the precise size of a possible misalignment is a much harder task. In addition, a large number of available estimates refer to the real effective exchange rate. To obtain the equilibrium exchange rate vis-à-vis the euro, reliable information about the equilibrium USD/EUR cross rate is needed. This might also be subject to high uncertainty.

*1* Adjustments in regulated prices are predominantly increases in nonmarket-based nontradable prices. Because regulated items partly represent inputs for tradable goods, those adjustments contribute to an increase in tradable prices. For homogeneous goods that eventually enter international competition either because they are exported or because they are subject to import competition, an increase in their nonmarket- and market-based nontradable component may lead to a loss in competitiveness and thus could not be viewed as an equilibrium phenomenon.

Table 8

### The Magnitude of Real Misalignment

Country/author(s)	Year	Misalignment	Country/author(s)	Year	Misalignment
<b>Czech Republic</b>			<b>Latvia</b>		
Šmídková (1998)	1996	Eff: -1% to +5%	Kazaks (2000)	1998	Eff: NM
Begg et al. (1999)	1997	Eff: NM	Beguna (2002)	2001	Eff: -2%
Frait and Komárek (1999)	1998	Slightly +	Bitans (2002)	2001	Eff(EU): NM
Kim and Korhonen (2002)	1999	Eff: -10%	Burgess et al. (2003)	2002:Q1	Eff: -6%
Coudert and Couharde (2002)	2001	EUR: -3%/+1%	Bitans and Tillers (2003)	2002:Q4	Eff(EU): NM
Lommatzsch and Tober (2002b)	2001	Eff: 0%/+15%			
Égert and Lahrière-Révil (2003)	2001:Q2	Eff: +15%	<b>Lithuania</b>		
Šmídková et al. (2002)	2002	Eff: +8% to 9%	Vetlov (2002)	2001	Eff: -7%
Rahn (2003)	2002:Q1	Eff: +9.7%/+11%	Alonso-Gamo et al. (2002)	2002	Eff: -5%
	2002:Q1	EUR: +13.7%/+14.7%	Burgess et al. (2003)	2002:Q1	Eff: -6%
	2002:Q4	Eff: +10%			
Alberola (2003)	2002:Q4	EUR: +10% to 20%	<b>Poland</b>		
Égert and Lommatzsch (2003)	2002:Q4		Begg et al. (1999)	1997	Slightly +?
			Kim and Korhonen (2002)	1999	Eff: NM
<b>Estonia</b>			Kemme and Teng (2000)	1999	Eff: +2%/+10%
Begg et al. (1999)	1997	Eff: NM	Lommatzsch and Tober (2002b)	2001	Eff: +10%
Filipozzi (2000)	1999	Eff: +5%	Coudert and Couharde (2002)	2001	EUR: +3%/+5%
Randveer and Rell (2002)	2000	Eff: NM	Égert and Lahrière-Révil (2003)	2001:Q2	Eff: +11%
Coudert and Couharde (2002)	2001	Eff: NM	Rawdanowicz (2003)	2002	Eff: NM
Šmídková et al. (2002)	2002	Eff: +13% to 14%	Šmídková et al. (2002)	2002	Eff: +10% to +12%
Hinnosar et al. (2003)	2002	Eff: NM	Rahn (2003)	2002:Q1	Eff: +8%/+13%
Rahn (2003)	2002:Q1	Eff: +5%/+7%			
	2002:Q1	EUR: +10%/+12%	Alberola (2003)	2001:Q2	EUR: +13%/+17%
	2002:Q1	Eff: -3%		2002:Q4	Eff: +10%
Burgess et al. (2003)	2002:Q1			2001:Q2	Eff: -10%
			Rubaszek (2003a)	2001:Q2	Eff: +16%
				2002:Q4	Eff: +4.3%
			Rubaszek (2003b)	2002:Q4	EUR: +9%
				2003:Q2	EUR: NM
			Égert and Lommatzsch (2003)	2002:Q4	EUR: +0% to 6%
<b>Hungary</b>			<b>Slovakia</b>		
Avallone and Lahrière-Révil (1999)	1997	Eff: NM	IMF (1998)	1997	Eff: NM
Begg et al. (1999)	1997	Eff: slightly +	Begg et al. (1999)	1997	Eff: NM
Coudert (1999)	1997	USD: NM	Kim and Korhonen (2002)	1999	Eff: NM
Kim and Korhonen (2002)	1999	Eff: +40%	Égert and Lahrière-Révil (2003)	2001	EUR: +10%
Coudert and Couharde (2002)	2001	EUR: +2%/+4%	Égert and Lommatzsch (2003)	2002:Q4	EUR: +10%/+15%
Lommatzsch and Tober (2002b)	2001	Eff: NM			
Égert and Lahrière-Révil (2003)	2001:Q2	Eff: NM	<b>Slovenia</b>		
Csajbók and Kovács (2002)	2002	Eff: overvalued	Begg et al. (1999)	1997	Slightly +?
Šmídková et al. (2002)	2002	Eff: +6%	Coudert and Couharde (2002)	2001	EUR: +1%/+2%
Csajbók (2003)	2002	Eff: +3%/+10%	Égert and Lahrière-Révil (2003)	2001:Q2	Eff: NM
Rahn (2003)	2002:Q1	Eff: 3%/+5%	Šmídková et al. (2002)	2002	Eff: NM
	2002:Q1	EUR: +2.5%/+8.6%	Rahn (2003)	2002:Q1	Eff: -3%
	2002:Q4	Eff: +10%/+12%		2002:Q1	EUR: -6%
Alberola (2003)	2002:Q4	EUR: +0%/+8%		2002:Q4	EUR: -20%
Égert and Lommatzsch (2003)	2002:Q4		Égert and Lommatzsch (2003)	2002:Q4	

Note: Positive figures indicate overvaluation, Eff: in effective terms, EUR: against the euro, NM: no misalignment.

#### 6.2.2 Signs of the Estimated Coefficients

The divergence in the estimated misalignment may be due to several factors. Results for the BEER approach may vary considerably depending on the period underlying the estimations. Across different papers, the whole gamut of fundamentals is used, and, as a corollary, the outcome is sensitive to which particular fundamentals are included in the estimated model. The use of different fundamentals may be a result of different theoretical frameworks or may simply reflect ad hoc choices.<sup>1)</sup>

1 The fact that for the same country or for comparable panels, long-term relationships can be established, which include a different set of fundamentals, may also indicate that the real exchange rate may be linked to the fundamentals through multiple long-term relationships.

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Table 9 reveals that an increase in the dual productivity (differential) leads always to an appreciation of the real exchange rate. The terms of trade and public consumption to GDP also appear to be positively connected to the real exchange rate but the evidence is less robust, though. Much more controversial are net foreign assets and openness. For instance, an increase in net foreign assets is found to bring about an appreciation of the real exchange rate in Alonso-Gamo et al. (2002), Lommatzsch and Tober (2002) and Burgess et al. (2003), whereas Hinnosar et al. (2003) and Rahn (2003) find the opposite effect for Estonia. This finding of Hinnosar et al. (2003) and Rahn (2003) is largely confirmed by Rahn for the Czech Republic, Hungary, Poland and Slovenia, and by Alberola (2003) for Hungary and Poland. By contrast, an increase in net foreign assets turns out to result in a real appreciation of the

Table 9

**Signs of the Estimated Coefficients**

		Dependent variable Explanatory variables										
		PROD	CAPITA	NFA	OPEN	TOT	GOV	PRIV	RIR	INV	FDEBT	REGD
<b>Time series</b>												
Alberola (2003)	REER (CPI)	+ (LP)		+/-								
Alonso-Gamo et al. (2002)	REER (CPI)	+ (CPI/PPI)		-								
Avallone and Lahrèche-Révil (1999)	REER (CPI)		+		-	+	+	+				
Beguna (2002)	REER (CPI)				+	+	+					
Bitans (2002)	REER (CPI, PPI) EU	+ (LP)			-		-					
Bitans and Tillers (2003)	REER (PPI) EU		+	+		-						
Burgess et al. (2003)	REER (CPI)	+ (CPI/PPI)		-								
Csajbók (2003)	REER (CPI)	+ (LP)		+	+	+		+				
Darvas (2001)	RER (DEM)	+ (LP)		+				+/- <sup>1)</sup>				
Égert and Lahrèche-Révil (2003)	REER (CPI)	+ (CPI/PPI)										
Égert and Lommatzsch (2003)	RER (CPI, PPI) DEM, EUR	+ (LP)			-			+/-		+/-		+
Filipozzi (2000)	REER (CPI)	+ (LP)								+		
Frait and Komárek (1999)	REER (CPI)	+ (real GDP)				+						
Hinnosar et al. (2003)	REER (CPI)	+ (LP)		+		+						
IMF (1998)	REER (CPI, PPI)	+ (RWAGE)			+		-			-		
Kazaks (2000)	REER (CPI)	+ (LP)			-							
Lommatzsch and Tober (2002b)	REER (PPI)	+ (LP)		-					+			
Rahn (2003)	REER (CPI)	+ (CPI/PPI)		+								
Randveer and Rell (2002)	REER (CPI)	+ (LP)				+						
Rawdanowicz (2003)	RER (CPI) EU	+ (LP)				+			+			
Rubaszek (2003a)	REER (PPI)			+					+			
Vetlov (2002)	REER (PPI)	+ (LP)			-				-			
<b>Panel</b>												
Begg et al. (1999)			+		+		+					
Coricelli and Jazbec (2001)	P(t)/P(nt)	+ (LP)					+	+ <sup>2)</sup>				
Coudert (1999)	RER (CPI) US	+ (CPI/PPI)								-		
De Broeck and Sløk (2001)	REER (CPI)	+ (LP)			-							
Dobrinsky (2003)	RER (CPI) EU	+ (TFP)	+				+					
Égert and Lommatzsch (2003)	RER (CPI, PPI) EU	+ (LP)			-				+		+/-	+
Fischer (2002)	REER (CPI)	+ (LP)				-	+		+/-			
Halpern and Wyplosz (1997)	RER (CPI) US	+ (GDP/worker)	+				+					
Kim and Korhonen (2002)	REER (CPI); RER (CPI) US		+		-		+			+		
Krajnyák and Zettelmeyer (1998)	RER (CPI) US		+									
MacDonald and Wójcik (2002)	REER (CPI)	+ (LP)		+/-					+			+ <sup>3)</sup>
Maurin (2001)	REER (CPI)		+				+		+		-	

<sup>1)</sup> The foreign real interest rate.

<sup>2)</sup> The share of nontradable consumption in private consumption.

<sup>3)</sup> Regulated prices in the home country.

Note: + (-) means that an increase (decrease) in the given variables gives rise to an appreciation (depreciation) of the real exchange rate; REER (CPI) = real effective exchange rate based on the CPI; REER (PPI) = real effective exchange rate based on the PPI; RER (CPI) EU; RER (CPI) EUR; RER (CPI) US = real exchange rate against the EU, the euro and the U.S. economy, respectively; P(t)/P(nt) = the internal real exchange rate. See table 7 for the definition of the explanatory variables.

Czech currency. One reason why the sign on net foreign assets is so controversial is that capital inflows into productive sectors may have materialized in the form of productivity growth. Second, the sample period may be too short, so that real appreciation and net capital inflows occur simultaneously. Thus, the positive sign between net foreign assets and real appreciation may be merely a statistical artifact.

This may be understood for instance, in the framework of the NATREX model, according to which net foreign assets are endogenous. If investment rises in the open sector, capital inflows reflected in a decline in net foreign assets cause the real exchange rate to appreciate in the medium run. In the long run, when investment shorts working in the open sector, the trade balance ameliorates, resulting in an increase in net foreign assets. This leads to the appreciation of the real exchange rate in the second phase.

The same controversy holds true for openness. While the IMF (1998), Begg et al. (1999), Beguna (2002) and Csajbók (2003) find that an increase in the openness ratio leads to a real appreciation of the exchange rate, estimates in Avallone and Lahrière-Révil (1999), De Broeck and Sløk (2001), Bitans (2002), Kim and Korhonen (2002), Vetlov (2002), and Égert and Lommatzsch (2003) show the opposite to be the case. A negative sign (an increase in openness leads to a depreciation of the real exchange rate) reflects the traditional view according to which openness is an indicator of trade liberalization: Higher openness is associated with decreasing trade barriers, which raises imports more than exports. The deterioration in the trade balance makes the real exchange rate depreciate. However, an increase in openness can also represent improved supply capacities, which result in higher exports, and this can cause a real appreciation of the exchange rate. Nevertheless, this effect is expected to be captured by the productivity variables.

### 6.2.3 Parameter Distortion

The presence of an initial undervaluation would bias time-series and in-sample panel estimates of the equilibrium exchange rate because the slope coefficient estimated between the observed real exchange rate and the fundamentals would look different from the true slope coefficient linking the equilibrium real exchange rate to the fundamentals. This problem appears exacerbated in an in-sample panel setting if the initial undervaluations and the adjustment paths toward equilibrium are different across countries (Maeso-Fernandez et al., 2003).

But a more general problem, which does not apply only to transition economies, is that BEERs are models of real exchange rate determination in that they attempt to connect the observed real exchange rate to the fundamentals. Hence, empirically estimated coefficients are interpreted as equilibrium coefficients, which link the equilibrium exchange rate and the fundamentals, although they only represent the relationship between the observed real exchange rate and the fundamentals (the equilibrium relationship is assumed to equal the empirical long-term relationship). In this sense, real exchange rate determination models are used as models of equilibrium real exchange rates. As an outcome, the estimated coefficients from BEER models are likely to be biased and thus probably yield biased real misalignments, irrespective of whether or not they are based

on time series or panels. However, this bias is likely to be larger for estimates based on time series as well as on small and medium-size panels. As a consequence, the extent of a misalignment derived from the estimates might depend on how well the observed real exchange rate can be modeled using fundamentals. Furthermore, if no long-term relationship can be established between the observed real exchange rate and its fundamentals, this does not mean that there is no relationship between the equilibrium real exchange rate and the fundamental variables.

### 6.3 Time Series versus Panel Estimates

There is an apparent tradeoff between the use of time series and panel data. At best, time series span slightly more than 10 years, assuming no structural or smooth changes in the estimated relationships, and thus provide roughly 40 to 50 quarterly observations, which – from a strictly econometric point of view – might be insufficient.

It may be argued that employing panels data may increase the number of observations. Typically, three types of panels are used in the literature: small panels including 6 to 9 countries, medium-size panels composed of 20 to 30 countries and large panels containing up to 80 or 90 countries. In addition, panels may or may not include the countries under investigation. Small panels are typically in-sample panels, whilst medium and large panels can be both in-sample and out-of-sample panels.

However, a number of problems still remain. In general, medium-size in-sample panel studies use a heterogeneous set of countries. From an econometric viewpoint, using panel data makes sense if homogeneity is verified for the countries. A typical panel employed e.g. in Coricelli and Jazbec (2001) or in Halpern and Wyplosz (2001) contains countries such as the Czech Republic and Slovenia on the one hand and Mongolia and Kyrgyzstan on the other. Yet only Kim and Korhonen (2002) and Csajbók (2003) test for homogeneity in the panel they use. It is then pretty difficult to interpret a common coefficient obtained for a set of economies which are so different.

The escape route leads either through smaller panels composed of more homogeneous countries (De Broeck and Sløk, 2001; Dobrinszky, 2001) or huge panels (Halpern and Wyplosz, 1997; Krajnyák and Zettelmeyer, 1998). The problem indicated for the case of time series estimates remains in small panels, i.e. estimates stand for the relationship between the observed real exchange rate, rather than the equilibrium real exchange rate, and a set of other variables. Moreover, in small panels based on annual data, the number of observations might drop significantly. The large panel setting assumes that market economies behave very similarly in the long term, and the estimated coefficients should reflect this long-term average behavior. Therefore, these estimates could be applied to all countries. However, Maeso-Fernandez et al. (2003) argue that out-of-sample estimations do not provide a country-specific constant, and this could affect the level of the derived equilibrium real exchange rate when applied to individual countries.

A related issue here is how appropriate the estimation methods are. As shown in table 10, time series studies usually account for the nonstationary nature of the data and employ different cointegration techniques. In contrast

Table 10

**Econometric Techniques Used in the BEER Studies**

	Inference	Cointegration tests
<b>Time series</b>		
Alberola (2003)	FIML	Johansen's trace and max
Alonso-Gamo et al. (2002)	FIML	Johansen's trace and max
Avallone and Lahrèche-Révil (1999)	FIML	Johansen's trace and max
Beguna (2002)	OLS	error correction term
Bitans (2002)	OLS	residual-based; error correction term
Bitans and Tillers (2003)	FIML, OLS	Johansen's trace and max
Burgess et al. (2003)	FIML	Johansen's trace
Csajbók (2003)	OLS	residual-based unit root tests
Darvas (2001)	OLS	residual-based unit root tests
Égert and Lahrèche-Révil (2003)	FIML	Johansen's trace
Égert and Lommatzsch (2003)	OLS, DOLS, ARDL, FIML	residual-based; bounds testing approach; Johansen's trace
Filipozzi (2000)	FIML	Johansen's trace
Frait and Komárek (1999)	ARDL	error correction term
Hinnosar et al. (2003)	FIML	Johansen's trace: Cheung and Lai small sample adjustment
IMF (1998)	OLS	none
Kazaks (2000)	OLS	error correction model
Kemme and Teng (2000)	OLS	error correction term
Lommatzsch and Tober (2002b)	OLS	residual-based unit root tests
Rahn (2003)	FIML	Johansen's trace and max
Randveer and Rell (2002)	OLS	Johansen's trace; residual-based unit root tests
Rawdanowicz (2003)	FIML	Johansen's trace
Rubaszek (2003a)	FIML	Johansen's trace: Reimers small sample adjustment
Vetlov (2002)	OLS	error correction term
<b>Panel</b>		
Begg et al. (1999)	GLS	none
Coricelli and Jazbec (2001)	FE OLS	none
Coudert (1999)	FE and RE OLS	none
Crespo-Cuaresma et al. (2003)	FE OLS, FMOLS, DOLS, PMGE, MGE	Pedroni
De Broeck and Sløk (2001)	FE OLS, PMGE	error correction term for PMGE
Dobrinisky (2003)	GLS	none
Égert and Lommatzsch (2003)	FE OLS, DOLS, PMGE, MGE	Pedroni
Fischer (2002)	FE OLS, FE SUR, PMGE	Pedroni
Halpern and Wyplosz (1997)	FE OLS	none
Kim and Korhonen (2002)	FMOLS, PMGE, MGE	error correction term for PMGE
Krajnyák and Zettelmeyer (1998)	FE and RE OLS: in levels and 1 <sup>st</sup> differences	none
MacDonald and Wójcik (2002)	DOLS	none
Maurin (2001)	FE OLS: in levels and 1 <sup>st</sup> differences	none

Note: OLS = ordinary least squares; GLS = generalised least squares; DOLS = dynamic OLS; FMOLS = fully modified OLS; ARDL = auto-regressive distributed lags; FIML = full information maximum likelihood; PMGE = pooled mean group estimator; MGE = mean group estimator; FE OLS = fixed-effect OLS; RE OLS = random-effect OLS; FE SUR = fixed-effect seemingly unrelated regression.

to this is the observation that some of the panel studies do not consider nonstationarity and do not test for cointegration (see Halpern and Wyplosz, 1997; Coudert, 1999; and Coricelli and Jazbec, 2001; for fixed and random effect OLS and Begg et al., 1999, and Dobrinisky, 2003; for GLS). It is admittedly difficult to test for cointegration when the time series dimension of the panel is limited. However, this issue can be tackled by running the regression both in levels and in first differences (Krajnyák and Zettelmeyer, 1998, and Maurin, 2001) or by applying nonstationary panel techniques: De Broeck and Sløk (2001) and Kim and Korhonen (2002) use PMGE and MGE and consider a significant error correction adjustment parameter as evidence for cointegration. Crespo-Cuaresma et al. (2003) use a variety of estimation methods and systematically apply cointegration tests proposed by Kao (1999) to the residuals of the

long-term relationships. Following a similar approach, Égert and Lommatzsch (2003) employ panel cointegration tests developed by Pedroni (1999).<sup>1)</sup>

#### 6.4 Data and Measurement Problems

It is true to say that the literature is burdened with a number of measurement and methodological difficulties.

Because an increase in the dual productivity differential is transmitted onto the real exchange rate not only through market-based nontradable inflation as assumed by the standard B-S effect, but also via multiple channels related to tradable prices, the relative price differential appears to be an extremely poor proxy for the dual productivity differential. In particular, the CPI-to-PPI ratio often used in the literature (see e.g. Coudert, 1999; Alonso-Gamo et al., 2002; Burgess et al., 2003; Rahn, 2003) is even more affected by this problem given that the share of nontradable goods in the CPI is very low in the CEECs and because of the presence of regulated prices in the CPI.

In principle, labor productivity is given as output per total hours worked. In practice, however, the output-per-employee ratio is used. If there is a shift in full-time employment towards part-time employment (or vice versa), the number of employees is a poor proxy for total hours worked.

The classification of sectors into open and closed sectors is also surrounded by a great deal of uncertainty:

- 1) Different classifications may be reflected in different dual productivity figures. For instance, in Mihaljek and Klau (2003), the open sector includes hotels and restaurants, and transport, storage and communication, which entails larger dual productivity in the Czech Republic than in all the other acceding countries. This is in sharp contrast with other studies and with the estimates of the Czech central bank (see Kovács, 2002; Flek et al., 2002). Égert (2003) also shows that results are sensitive to how the open and the closed sectors are defined, and points out that one-size-fits-all techniques are not appropriate (a given sector can be viewed as tradable in one country and as nontradable in another one). As the B-S model posits PPP to hold in the tradable sector, goods arbitrage – the mechanism ensuring PPP – should be potentially possible in the tradable sector. This, too, might be limited in the case of e.g. tourism or storage<sup>2)</sup>, since one cannot buy two nights in a five-star hotel, say, in Tallinn and sell them in Berlin or in Paris.
- 2) Agriculture is also a very controversial issue. Some consider it a tradable sector while others do not. For instance, Fischer (2002) argues that half

<sup>1</sup> Although MacDonald and Wójcik (2002) use panel dynamic OLS, they do not report panel cointegration tests. Fischer (2002) reports coefficients on the basis of fixed-effect OLS, seemingly unrelated regression and PMGE but carries out Pedroni cointegration tests for the long-term relationship obtained using panel FMOLS.

<sup>2</sup> One may argue that there is no need for goods arbitrage. It suffices that the given good/service is exported and that it is exposed to international price competition. In the case of tourism, it would mean that hotels in Tallinn, Paris and Berlin would closely monitor each others' prices. However, the trouble with this argument is that prices in tourism are largely determined by local factors such as labor costs and property prices. In addition, tourism is a highly differentiated good and prices may depend largely on preferences. Although one and the same package holiday to Estonia may actually cost the same for both customers in Germany and customers in Austria, there is no straightforward mechanism to equalize the price a customer in Germany, Austria or elsewhere would pay for one package holiday to Tallinn and another package holiday to Paris.

Table 11

**Classification of Sectors into Open and Closed Sectors**

**in Transition Economies**

	Open sector	Closed sector
Alberola (2003)	manufacturing	not considered
Backé et al. (2003)	manufacturing	rest
Coricelli and Jazbec (2001)	industry and construction	rest, agriculture excluded
De Broeck and Sløk (2001)	industry and construction	rest, agriculture excluded
Dobrinsky (2003)	whole economy	
Égert (2002a,b)	industry	not considered
Égert et al. (2003)	industry	rest
	industry and agriculture	rest
Filipozzi (2000)	industry	rest, agriculture excluded
Fischer (2002)	industry and agriculture	rest
Flek et al. (2002)	manufacturing	construction
Golinelli and Orsi (2002)	industry	rest
Halpern and Wyplosz (2001)	manufacturing / industry	services, agriculture and construction excluded
		rest
Hinnosar et al. (2003)	manufacturing and agriculture	rest
	manufacturing, agriculture, hotels, restaurants, telecommunications and transport	
	manufacturing	services, agriculture and public services excluded
Kovács (2001, 2002), Kovács and Simon (1998)		services and construction
Lojschova (2003)	manufacturing	construction, trade, finance
Lommatzsch and Tober (2002a)	industry	rest
MacDonald and Wójcik (2002)	agriculture, mining, manufacturing, transport and communications	
Mihaljek and Klau (2003)	mining, manufacturing, hotels, transport, telecommunications	rest, agriculture and public administration excluded
Randveer and Rell (2002)	agriculture, manufacturing, hotels, transport	rest (mining)
Rother (2000)	manufacturing	rest, agriculture excluded
Rosati (2002)	industry / industry and agriculture	rest
Sinn and Reutter (2001)	manufacturing and agriculture	construction, energy, services

of the appreciation brought about by productivity gains can be attributed to productivity gains in agriculture. This is very questionable and is akin to saying that agriculture has a bellwether role during the catching-up process.

There is a more general statistical problem. Data definitions differ between individual acceding countries and between acceding and EU countries in spite of ongoing data harmonization. In fact, the harmonization process implies changes in data definitions over time. In addition, data revisions occur relatively often in acceding countries (the Czech Republic is a recent example), which might cast doubt on estimates derived using prerevision data. Finally, the same time series for the same country can exhibit differences depending on whether it is drawn from national statistics, from IMF or from OECD databases (Égert et al., 2003). Another problem to address in this context is that weights used to calculate effective exchange rates are adjusted to changes in foreign trade only with a considerable lag by certain institutions, which may bias not only the estimates but may also pose a problem when deriving the bilateral equilibrium exchange rate against the euro.

If indices such as the CPI or PPI, on which the real exchange rate is usually based, or import and export price indices (for determining the terms of trade) are used, the question that has to be addressed is how to determine the year in which the exchange rate may be viewed as in equilibrium. One can rely on several methods:

- 1) The counterfactual approach is based on a subjective evaluation of the real exchange rate, the current account and other factors; the year during which those variables are believed to be in equilibrium is selected. A typical criterion is the year in which the current account is fully financed by FDI (Filipozzi, 2000; Randveer and Rell, 2002; Lommatzsch and Tober, 2002; Égert and Lahrière-Révil, 2003). It is a question whether FDI linked to one-off privatization operations should be considered for this purpose or not. Clearly, the extent of the misalignment is likely to be sensitive to such judgments.
- 2) The nominal exchange rate implied by PPP is adjusted for differences in the level of productivity, which can be proxied by GDP per capita to derive the equilibrium nominal exchange rate for a particular year (usually for 1996 and 1999, as nonextrapolated data on price and productivity levels are available only for those years):  $\frac{P/P^*}{TFP/TFP^*}$  (see Brook and Hargreaves, 2001). A slightly more sophisticated version of this method is to use cross-section estimates when the relative price level or the real exchange rate gap is regressed on relative productivity, usually proxied by GDP per capita measured in PPP terms (De Broeck and Sløk, 2001; Randveer and Rell, 2002; Coudert and Couharde, 2002; Burgess et al. 2003; Čihák and Holub, 2001, 2003). Charts 6a and 6b show, however, that the result of such an exercise may be sensitive to the country sample, the year analyzed and the benchmark country.

However, it is noteworthy that some studies simply take the fitted values of the estimated relationship based on indices and do not seek to address the issue of base year.

Apart from the base year problem, another tricky issue for the BEER approach is how to tackle long-term values for fundamentals. One strand of papers simply assumes that actual values correspond to long-term values (see Lommatzsch and Tober, 2002). Others employ statistical methods to extract the trend component of the series (Filippozi, 2000; Randveer and Rell, 2002). Finally, model-based fitted values are also useful for this purpose (e.g. Rubaszek, 2003; Égert and Lahrière-Révil, 2003).

The FEER approach cannot escape these problems, either. Coudert and Couharde (2002) use in-sample panel estimates provided by Doisy and Hervé (2003) for seven transition economies to derive the long-term current account along the lines of the Macroeconomic Balance approach whereas Csajbók and Kovács (2002) consider the year 2000 as in equilibrium and use values for the current account from that year. Both methods rely heavily upon subjective expert evaluations. It should also be mentioned that the NIGEM model on whose basis FEER calculations are performed has a few shortcomings. First, it is a one-sector economy model. Second, some of the parameters are estimated using the panel of the five acceding countries (the Czech Republic, Estonia, Hungary, Poland and Slovenia), whilst others are calibrated.

More generally, it is often the case that the home country variable is not taken in terms of the foreign country (see Jazbec, 2002). As the very concept of the real exchange rate is based on the comparison of the domestic and foreign economies, variables ought to be computed as the ratio of the home country variable to the foreign country variable (see MacDonald, 1997; Clark and McDonald, 1998).

## 7 Concluding Remarks

All in all, assessing equilibrium real exchange rates for acceding countries appears to be no easy task. There is a great deal of model uncertainty related to the theoretical background and to the fundamentals chosen, and an array of methodological and statistical problems also renders the mission very complicated. But why should this task be easy if similar difficulties are encountered when estimating the equilibrium exchange rate of the euro or the U.S. dollar? According to the European Central Bank (2002), estimates of the equilibrium USD/EUR parity vary considerably within a range of 1.03 to 1.45. Consistent with this finding is the large degree of uncertainty with regard to the equilibrium value of the euro Detken et al. (2002) detect when using alternative theoretical models and econometric techniques.

However, it appears that a systematic assessment of the equilibrium exchange rate is necessary or even inevitable for countries contemplating entry in ERM II and an eventual adoption of the euro. Csajbók (2003) sets a good example by showing estimation results for Hungary based on different theoretical approaches such as BEER, FEER, Macroeconomic Balance and NATREX. Because of possible caveats of each approach and given that some of the approaches are model-based (FEER) whereas others are typically assessed using econometric estimation methods, they should be applied simultaneously. In addition, it also seems useful to conduct a systematic sensitivity analysis of econometric estimates employing different econometric techniques currently used in the literature for a set of acceding countries and applied to one and the same dataset, as in Égert and Lommatzsch (2003).

Thus, the answer to the question in the title of the paper, namely can we have DEER with BEER without FEER, is that we cannot possibly have DEER with BEER without FEER – and not even without NATREX.

## References

- Alberola, E. 2003.** Real Convergence, External Disequilibria and Equilibrium Exchange Rates in EU Acceding Countries. Banco de España. Mimeo.
- Alberola, E. and T. Tyrväinen. 1998.** Is There Scope for Inflation Differentials in EMU? Banco de España. Working Paper 9823.
- Alberola, E., S. G. Cervero, H. Lopez and A. Ubide. 1999.** Global Equilibrium Exchange Rates: Euro, Dollar, "Ins," "Outs," and Other Major Currencies in a Panel Cointegration Framework. IMF Working Paper 175.
- Alonso-Gamo, P., S. Fabrizio, V. Kramarenko and Q. Wang. 2002.** Lithuania: History and Future of the Currency Board Arrangement. IMF Working Paper 127.
- Artus, J. 1978.** Methods of assessing the long-run equilibrium value of an exchange rate. *Journal of International Economics* 8. 277–299.
- Avallone, N. and A. Lahrèche-Révil. 1999.** Le taux de change réel d'équilibre dans les pays en transition: le cas de la Hongrie. TEAM. University of Paris I – Sorbonne. Cahiers blancs 91.
- Backé, P., J. Fidrmuc, T. Reininger and F. Schardax. 2003.** Price dynamics in Central and Eastern European EU Accession Countries. *Emerging Markets Finance and Trade* 39(3). 42–78.
- Baffes, J., I. A. Elbadawi and S. A. O'Connell. 1999.** Single Equation of the Equilibrium Real Exchange Rate. In: Hinkle, L. and P. Montiel (eds.). *Estimating Equilibrium Exchange Rates in Developing Countries*. Washington D.C.: World Bank.

ASSESSING EQUILIBRIUM EXCHANGE RATES  
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CAN WE HAVE DEER WITH BEER WITHOUT FEER?  
A CRITICAL SURVEY OF THE LITERATURE

- Balassa, B. 1964.** The Purchasing-Power-Parity Doctrine: A Reappraisal. *Journal of Political Economy* 72(6). 584–596.
- Bayoumi, T., P. Clark, S. Symansky and M. Taylor. 1994.** The Robustness of Equilibrium Exchange Rate Calculations of Alternative Assumptions and Methodologies. In: Williamson, J. (ed.). *Estimating Equilibrium Exchange Rates*. Washington D.C.: Institute for International Economics. 19–60.
- Begg, D., Halpern, L. and C. Wyplosz. 1999.** Monetary and Exchange Rate Policies, EMU and Central and Eastern Europe. Forum Report on the Economic Policy Initiative 5. London: CEPR and New York, Prague: EastWest Institute.
- Beguna, A. 2002.** Competitiveness and the Equilibrium Exchange Rate in Latvia. EuroFaculty Working Paper in Economics 16. August. Riga: University of Latvia and EuroFaculty.
- Bergstrand, J. H. 1991.** Structural Determinants of Real Exchange Rates and National Price Levels: Some Empirical Evidence. *American Economic Review* 81(1). 325–334.
- Bitans, M. 2002.** Real Exchange Rate in Latvia: 1994–2001. Latvijas Banka Working Paper.
- Bitans, M. and I. Tillers. 2003.** Estimates of Equilibrium Exchange Rate in Latvia. Latvijas Banka. Analysis of the Real Exchange Rate in Latvia: 1994–2001. Latvijas Banka. Mimeo.
- Boskin, M. J., E. R. Dulberger, R. J. Gordon, Z. Griliches and D. W. Jorgenson. 1996.** Toward a More Accurate Measure of the Cost of Living. Final Report to the U.S. Senate Finance Committee from the Advisory Commission to Study the Consumer Price Index.
- Brook, A. M. and D. Hargreaves. 2001.** PPP-based Analysis of New Zealand's Equilibrium Exchange Rate. Reserve Bank of New Zealand Discussion Paper 1.
- Burgess, R., Fabrizio, S. and Y. Xiao. 2003.** Competitiveness in the Baltics in the Run-Up to EU Accession. IMF Country Report 114.
- Cassel, G. 1916a.** The Present Situation of the Foreign Exchanges. *Economic Journal* 26(101). 62–65.
- Cassel, G. 1916b.** The Present Situation of the Foreign Exchanges. *Economic Journal* 26(103). 219–323.
- Cassel, G. 1918.** Abnormal Deviations in International Exchanges. *Economic Journal* 28(112). 413–415.
- Čihák, M. and T. Holub. 2001.** Convergence of Relative Prices and Inflation in Central and Eastern Europe. IMF Working Paper 124.
- Čihák, M. and T. Holub. 2003.** Price Convergence to the EU: What Do the 1999 ICP Data Tell Us? Česká národní banka Working Paper Series 2.
- Clark, P. and R. MacDonald. 1998.** Exchange Rates and Economic Fundamentals: A Methodological Comparison of BEERs and FEERs. IMF Working Paper 67.
- Clark, P. and R. MacDonald. 2000.** Filtering the BEER – A Permanent and Transitory Decomposition. IMF Working Paper 144.
- Coricelli, F. and B. Jazbec. 2001.** Real Exchange Rate Dynamics in Transition Economies. CEPR Discussion Papers Series 2869.
- Coudert, V. 1999.** Comment définir un taux de change d'équilibre pour les pays émergents? *Economie Internationale*. 77. 1er trimestre. 45–65.
- Coudert, V. and C. Couharde. 2002.** Exchange Rate Regimes and Sustainable Parities for CEECs in the Run-up to EMU Membership. CEPII Working Paper 15.
- Crespo-Cuaresma, J., Fidrmuc, J. and R. MacDonald. 2003.** The Monetary Approach to the Exchange Rate in CEECs. Discussion Paper 14. Institute for Economies in Transition (BOFIT). Suomen Pankki.
- Csajbók, A. 2003.** The Equilibrium Real Exchange Rate in Hungary: Results from Alternative Approaches. Paper presented at the 2<sup>nd</sup> Workshop on Macroeconomic Policy Research. Magyar Nemzeti Bank. October 2–3.
- Csajbók, A. and M. A. Kovács. 2002.** FEER Enough? Magyar Nemzeti Bank. Mimeo.
- Darvas, Z. 2001.** Exchange Rate Pass-Through and Real Exchange Rate in EU Candidate Countries. Economic Research Centre of the Deutsche Bundesbank Discussion Paper 10.

- De Broeck, M. and T. Sløk. 2001.** Interpreting Real Exchange Rate Movements in Transition Countries. IMF Working Paper 56.
- Detken, C., A. Dieppe, J. Henry, C. Marin and F. Smets. 2002.** Model Uncertainty and the Equilibrium Value of the Real Effective Euro Exchange Rate. ECB Working Paper 160.
- Dobrinsky, R. 2003.** Convergence in Per Capita Income Levels, Productivity Dynamics and Real Exchange Rates in the EU Acceding Countries. *Empirica* 30(3). 305–334.
- Doisy, M. and A. Hervé. 2003.** Les déficits courants des PECO: quelles implications pour leur entrée dans l'Union européenne et la zone euro? *Economie Internationale* 93. 1<sup>er</sup> trimestre. 59–88.
- Driver, R. L. and P. F. Westaway. 2004.** Concepts of Equilibrium Real Exchange Rates. Bank of England Working Paper (forthcoming).
- EBRD. 2003.** Transition Report 2003.
- European Central Bank. 2002.** Economic Fundamentals and the Exchange Rate of the Euro. Monthly Bulletin. January. 41–53.
- Égert, B. 2002a.** Estimating the Impact of the Balassa-Samuelson Effect on Inflation and the Real Exchange Rate During the Transition. *Economic Systems* 26(1). 1–16.
- Égert, B. 2002b.** Investigating the Balassa-Samuelson Hypothesis in the Transition: Do We Understand What We See? A Panel Study. *Economics of Transition* 10(2). 273–309.
- Égert, B. 2003.** Nominal and Real Convergence in Estonia: The Balassa-Samuelson (Dis)connection: Tradable Goods, Regulated Prices and Other Culprits. Eesti Pank Working Paper 4.
- Égert, B. and A. Lahrèche-Révil. 2003.** Estimating the Equilibrium Exchange Rate of the Central and Eastern European Acceding Countries: The Challenge of Euro Adoption. *Weltwirtschaftliches Archiv* 139(4). 638–708.
- Égert, B. and K. Lommatzsch. 2003.** Equilibrium Exchange Rates in Acceding Countries: How Large Is Our Confidence (Interval)? Oesterreichische Nationalbank. Focus on Transition 2.
- Égert, B., I. Drine, K. Lommatzsch and C. Rault. 2003.** The Balassa-Samuelson Effect in Central and Eastern Europe: Myth or Reality? *Journal of Comparative Economics* 31(3). 552–572.
- Égert, B., D. Ritzberger-Grünwald and M. Silgoner. 2004.** Inflation Differentials in Europe: Past Experience and Future Prospects. Oesterreichische Nationalbank. Focus on Austria 1 (forthcoming).
- Filer, R. K. and J. Hanousek. 2000.** Output Changes and Inflationary Bias in Transition. *Economic Systems* 24(3). 285–294.
- Filippozi, F. 2000.** Equilibrium Exchange Rate of the Estonian Kroon, Its Dynamics and Its Impacts of Deviations. Eesti Pank Working Paper 3.
- Fischer, C. 2002.** Real Currency Appreciation in Accession Countries: Balassa-Samuelson and Investment Demand. Discussion Paper 8. Institute for Economics in Transition (BOFIT). Suomen Pankki.
- Flek, V., L. Marková and J. Podpiera. 2002.** Sectoral Productivity and Real Exchange Rate Appreciation: Much Ado About Nothing? Česká národní banka Working Paper Series 4.
- Frait, J. and L. Komárek. 1999.** Dlouhodobý rovnovážný reálný měnový kurz koruny a jeho determinanty. Česká národní banka Monetary Policy Division Working Paper 9.
- Froot, K. A. and K. Rogoff. 1994.** Perspectives on PPP and Long-Run Real Exchange Rates. NBER Working Paper 4952.
- Froot, K. A., M. Kim and K. Rogoff. 1995.** The Law of One Price Over 700 Years. NBER Working Paper 5132.
- Golinelli, R. and R. Orsi. 2002.** Modelling Inflation in EU Accession Countries: The Case of the Czech Republic, Hungary and Poland. In: Charemza, W. W. and K. Strzala. (eds.). *East European Transition and EU Enlargement: A Quantitative Approach*. Berlin: Springer Verlag. 267–290.
- Gordon, R. J. 2000.** The Boskin Commission Report and Its Aftermath. NBER Working Paper 7759.
- Halpern, L. and C. Wyplosz. 1997.** Equilibrium Exchange Rates in Transition Countries. IMF Staff Papers 44(4). 430–461.

ASSESSING EQUILIBRIUM EXCHANGE RATES  
IN CEE ACCEDING COUNTRIES:  
CAN WE HAVE DEER WITH BEER WITHOUT FEER?  
A CRITICAL SURVEY OF THE LITERATURE

- Halpern, L. and C. Wyplosz. 2001.** Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection. UNO Economic Survey of Europe. 227–239.
- Hanousek, J. and R. K. Filer. 2001a.** Consumers' Opinion of Inflation Bias Due to Quality Improvements in Transition in the Czech Republic. CERGE-EI Working Paper 184.
- Hanousek, J. and R. K. Filer. 2001b.** Evaluating Imperfections and Biases in Price Indexes during Transition. CERGE-EI Working Paper 186.
- Haskel, J. and H. Wolf. 2001.** The Law of One Price: A Case Study. NBER Working Paper 8112.
- Holub, T. and M. Čihák. 2003.** Price convergence: What can the Balassa-Samuelson Model Tell Us? Česká národní banka Working Paper Series 8.
- Hinnosar, M., R. Juks, H. Kaadu and L. Uusküla. 2003.** Estimating the Equilibrium Exchange Rate of the Estonian Kroon. Eesti Pank. Mimeo.
- International Monetary Fund. 1998.** Republic of Slovakia: Recent Economic Developments. IMF Staff Country Report 60.
- Isard, P., H. Faruquee, G. R. Kincaid and M. Fetherston. 2001.** Methodology for Current Account and Exchange Rate Assessments. IMF Occasional Papers 209.
- Ito, T., P. Isard and S. Symansky. 1997.** Economic Growth and Real Exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia. NBER Working Paper 5979.
- Jazbec, B. 2002.** Balassa-Samuelson Effect in Transition Economies: The Case of Slovenia. William Davidson Working Paper 507.
- Kao, C. 1999.** Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics*. 90(1). 1–44.
- Karádi, P. 2003.** Structural and Single Equation Estimation of the NATREX Equilibrium Real Exchange Rate of the Hungarian Forint. Magyar Nemzeti Bank. Mimeo.
- Kazaks, M. 2000.** Real exchange rate appreciation and loss of competitiveness. The Case of Latvia. Presented at the Second Seminar of Managing Economic Transition in Eastern Europe. May 24, 2000. University College London. School of Slavonic and East European Studies.
- Kemme, D. M. and W. Teng. 2000.** Determinants of the Real Exchange Rate, Misalignment and Implications for Growth in Poland. *Economic Systems* 24(2). 171–205.
- Kim, B. Y. and I. Korhonen. 2002.** Equilibrium Exchange Rates in Transition Countries: Evidence from Dynamic Heterogeneous Panel Models. Discussion Paper 15. Institute for Economies in Transition (BOFIT). Suomen Pankki.
- Kohler, M. 2000.** The Balassa-Samuelson Effect and Monetary Targets. In: Mahadeva, L. and G. Sterne (eds.). *Monetary Policy Frameworks in a Global Context*. London and New York: Routledge. 354–389.
- Kovács, M. A. 2001.** The Equilibrium Exchange Rate in Hungary. MNB Background Study 3. Budapest.
- Kovács, M. A. (ed.). 2002.** On the Estimated Size of the Balassa-Samuelson Effect in Five Central and Eastern European Countries. Magyar Nemzeti Bank Working Paper 5.
- Kovács, M. A. 2003.** How Real Is the Fear? Investigating the Balassa-Samuelson Effect in CEE5 Countries in the Prospect of EMU Enlargement. Presented at "Monetary Strategies for Accession Countries." Budapest. 27–28 February.
- Kovács, M. A. and A. Simon. 1998.** Components of the Real Exchange Rate in Hungary. Magyar Nemzeti Bank Working Paper 3.
- Kozamernik, D. 2003.** Long-Run Growth and Price Convergence: Implications of a Two-Sector Neoclassical Growth Model and Application to the Slovenian Case. *Prikladi in analize* 11(2). Banka Slovenije.
- Krajnyák, K. and J. Zettelmeyer. 1998.** Competitiveness in Transition Economies: What Scope for Real Appreciation? IMF Staff Papers 45. 309–362.
- Lee, J. and M. K. Tang. 2003.** Does Productivity Growth Lead to Appreciation of the Real Exchange Rate? IMF Working Paper 154.

- Lojschova, A. 2003.** Estimating the Impact of the Balassa-Samuelson Effect in Transition Economies. Institute for Advanced Studies Working Paper 140.
- Lommatzsch, K. and S. Tober. 2002a.** Monetary Policy Aspects of the Enlargement of the Euro Area. Deutsche Bank Research Working Paper 4.
- Lommatzsch, K. and S. Tober. 2002b.** What Is behind the Real Appreciation of the Accession Countries' Currencies? An Investigation of the PPI-Based Real Exchange Rate. Presented at "Exchange Rate Strategies during the EU Enlargement." Budapest. 27–30 November.
- Lommatzsch, K. and S. Tober. 2003.** The inflation target of the ECB: Does the Balassa-Samuelson effect matter? DIW Berlin. Mimeo.
- MacDonald, R. 1997.** What Determines Real Exchange Rates? The Long and Short of It. IMF Working Paper 21.
- MacDonald, R. 1998.** What Do We Really Know About Real Exchange Rates? Oesterreichische Nationalbank Working Paper 28.
- MacDonald, R. 2000.** Concepts to Calculate Equilibrium Exchange Rates: An Overview. Deutsche Bundesbank Discussion Paper 3.
- MacDonald, R. and L. Ricci. 2001.** PPP and the Balassa Samuelson Effect: The Role of the Distribution Sector. IMF Working Paper 38.
- MacDonald, R. and C. Wójcik. 2002.** Catching Up: The Role of Demand and Supply Side Effects on the Real Exchange Rate of Accession Countries. Oesterreichische Nationalbank. Focus on Transition 2. 38–57.
- Maeso-Fernandez, F., C. Osbat and B. Schnatz. 2003.** Towards the Estimation of Equilibrium Exchange Rates for CEE Acceding Countries: Methodological Issues and a Panel Cointegration Perspective. European Central Bank. ECB Working Paper (forthcoming).
- Maurin, L. 2001.** Fundamental Determinants of RER for Transition Countries. In: Stierle, M. H. and T. Birringer (eds.). Economics of Transition: Theory, Experiences and EU-Enlargement. Berlin: Verlag für Wissenschaft und Forschung. 427–442.
- Mihaljek, D. and M. Klau. 2003.** The Balassa-Samuelson Effect in Central Europe: A Disaggregated Analysis. BIS Working Paper 143. Basel and Comparative Economic Studies (forthcoming).
- Nurkse, R. 1945.** Conditions of International Monetary Equilibrium. Essays in International Finance. Princeton: International Finance Section, Princeton University. Republished in the Theory of International Trade. Philadelphia: Blackiston. 1949. 3–34.
- Pedroni, P. 1999.** Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. Oxford Bulletin of Economics and Statistics 61. Supplement 1. 653–670.
- Pelkmans, J., Gros, D. and J. N. Perrero. 2000.** Long-Run Economic Aspects of the European Union's Eastern Enlargement. The Netherlands Scientific Council for Government Policy Working Document 109.
- Rahn, J. 2003.** Bilateral Equilibrium Exchange Rates of the EU Accession Countries Against the Euro. Discussion Paper 11. Institute for Economics in Transition (BOFIT). Suomen Pankki.
- Randveer, M. and M. Rell. 2002.** The Relationship Between Competitiveness and Real Exchange Rate in Estonia. Eesti Pank Research Paper.
- Rawdanowicz, Ł. W. 2003.** Poland's Accession to EMU: Choosing the Exchange Rate Parity. CASE Studies & Analyses 247. December 2002, and forthcoming in: De Souza, L. V. and B. Van Aarle (eds.). The Euro Area and the New EU Member States. New York: Palgrave Macmillan.
- Rogoff, K. 1996.** The Purchasing Power Parity Puzzle. Journal of Economic Literature 34(2). 647–668.
- Rosati, D. K. 2002.** The Balassa-Samuelson Effect in the EU Candidate Countries. In: Roger, G. and A. Inotai (eds.). Trade, Integration and Transition. Budapest: The World Bank and Institute for World Economics. Hungarian Academy of Sciences. 58–77.

ASSESSING EQUILIBRIUM EXCHANGE RATES  
IN CEE ACCEDING COUNTRIES:  
CAN WE HAVE DEER WITH BEER WITHOUT FEER?  
A CRITICAL SURVEY OF THE LITERATURE

- Rother, C. P. 2000.** The Impact of Productivity Differentials on Inflation and the Real Exchange Rate: An Estimation of the Balassa-Samuelson Effect in Slovenia. IMF Country Report. Republic of Slovenia: Selected Issues 56. April. 26–39.
- Rubaszek, M. 2003a.** A Model of Balance of Payments Equilibrium Exchange Rate: Application to the Zloty. Narodowy Bank Polski. Mimeo.
- Rubaszek, M. 2003b.** The Optimal ERM II Central Parity for the Polish Zloty. Narodowy Bank Polski. Mimeo.
- Saal, D. and D. Parker. 2001.** Productivity and Price Performance in the Privatised Water and Sewerage Companies of England and Wales. *Journal of Regulatory Economics* 20(1). 61–90.
- Samuelson, P. 1964.** Theoretical Notes on Trade Problems. *Review of Economics and Statistics* 46(2). 145–154.
- Sarno, L. and M. P. Taylor. 2002.** *The Economics of Exchange Rates*. Cambridge University Press.
- Sinn, H. W. and M. Reutter. 2001.** The Minimum Inflation Rate for Euroland. NBER Working Paper 8085.
- Stein, J. L. 1994.** The Natural Real Exchange Rate of the US dollar and Determinants of Capital Flows. In: J. Williamson (ed.). *Estimating Equilibrium Exchange Rates*. Institute for International Economics. 133–176.
- Stein, J. L. 1995.** The Fundamental Determinants of the Real Exchange Rate of the U.S. Dollar Relative to Other G-7 Countries. IMF Working Paper 81.
- Stein, J. L. 2002.** The Equilibrium Real Exchange Rate of the Euro: An Evaluation of Research. CESifo Economic Studies. *Zeitschrift für empirische Wirtschaftsforschung* 43(3). 349–381.
- Stein, J. L. and G. C. Lim. 2002.** Introduction to “Exchange rates in Europe and Australasia: Fundamental determinant, adjustments and policy implications.” *Australian Economic Papers* 41(4). 329–341.
- Šmídková, K. 1998.** Estimating the FEER for the Czech Economy. Czech National Bank Institute of Economy Working Paper Series 87.
- Šmídková, K., R. Barrell and D. Holland. 2002.** Estimates of Fundamental Real Exchange Rates for the Five EU Pre-Accession Countries. Česká národní banka Working Paper Series 3.
- Szapáry, G. 2000.** Maastricht and the Choice of Exchange Rate Regime in Transition Countries During the Run-up to EMU. Magyar Nemzeti Bank Working Paper 07.
- Vetlov, I. 2002.** Analysis of the Real Exchange Rate and Competitiveness in Lithuania. Eesti Pank Research Paper.
- Williamson, J. 1994.** Estimates of FEERs. In: Williamson, J. (ed.). *Estimating Equilibrium Exchange Rates*. Washington D.C.: Institute for International Economics. 177–244.
- Zavoico, B. 1995.** A Brief Note on the Inflationary Process in Transition Economies. IMF. Mimeo.

# Equilibrium Real Exchange Rates in Acceding Countries: How Large Is Our Confidence (Interval)?

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## I Introduction

The upcoming enlargement of the European Union catapulted the issue of equilibrium exchange rates for CEE acceding countries into the limelight of policy discussion. In contrast with Denmark and the UK, the new Member States do not have an opt-out clause from the obligation to adopt the euro at some point in the future. Sooner or later, it will therefore be necessary to assess what exchange rate might be best suited for entry to ERM II and for the irrevocable conversion rate.

In accordance with the Maastricht Treaty, important prerequisites for participation in monetary union are low inflation and a stable exchange rate for at least two years before examination of convergence. A considerably undervalued exchange rate parity could, however, make it very difficult to attain low inflation. At the same time, fixing the exchange rate at an overvalued level against the euro would most probably require adjustment mechanisms that harm growth and thus real convergence. The irrevocable conversion rate should therefore trigger neither inflation caused by too large an undervaluation, nor an immediate loss of competitiveness caused by overvaluation. This is all the more important since with fully liberalized capital accounts as a background, financial markets may be eager to test the chosen parity especially in the presence of policy mixes in the acceding countries that are perceived as unsustainable. This may induce exchange rate fluctuations incompatible with the criterion on exchange rate stability.

However, assessing equilibrium real exchange rates is no easy task. As argued earlier in this issue of Focus on Transition,<sup>4)</sup> a systematic analysis that includes all the alternative theoretical and statistical approaches is necessary for us to judge equilibrium real exchange rates confidently. But there are virtually no such studies for acceding countries.<sup>5)</sup> One exception is Csajbók (2003), who, in the spirit of Detken et al. (2002), makes use of different approaches to the equilibrium real exchange rate such as the Natural Rate of Exchange (NATREX), the Behavioral Equilibrium Exchange Rate (BEER) and different versions of the Fundamental Equilibrium Exchange Rate (FEER) to derive a range of real misalignments<sup>6)</sup> (defined as the difference between the equilibrium and the observed real exchange rates) for the case of Hungary. Although Csajbók (2003) employs all important theoretical approaches, the empirical investigation is rather limited.

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4 *Égert (2003a).*

5 *However, it should be noted that this is also the case for other developed and developing countries.*

6 *The term real misalignment is defined in the literature as the difference between the observed and the equilibrium real exchange rate.*

This can only mark the beginning of a systematic assessment. Indeed, in this paper, an attempt is made to contribute to the systematic evaluation of equilibrium rates in acceding countries. For five acceding countries from Central and Eastern Europe, notably the Czech Republic, Hungary, Poland, Slovakia and Slovenia, reduced-form estimations of the real exchange rate are performed. Emphasis is laid more on the comparison of the results of different estimation methods than on different theoretical approaches. A number of time series and panel cointegration methods are employed, which leaves us with a score of estimates. This enables us to examine the uncertainty surrounding estimates of equilibrium exchange rates and the size of the real misalignment.

Our approach to the real exchange rate is in line with BEER, as in MacDonald (1997) and Clark and MacDonald (1998), i.e. the choice of the variables included in the reduced-form equation is in principle based on a number of standard models of the real exchange rate (see MacDonald, 1997; Clark and MacDonald, 1998).

However, in the case of transition economies, special attention should be devoted to the appreciation of the real exchange rate that most of these countries witnessed in the aftermath of their economic transformation from plan to market. The traditional view is that the Balassa-Samuelson (B-S) effect, based on market service inflation fueled by productivity increases in the open sector, is capable of explaining this. Recent research, however, has attributed a strikingly low relevance to the B-S effect. Indeed, a sustainable appreciation of the real exchange rate can also result from changes in regulated prices, and most importantly, from the appreciation of the tradable price-based real exchange rate.<sup>1)</sup> Taking account of tradable prices appears to be crucial, given that in a number of transition economies the real exchange rate deflated by means of tradable prices (proxied with the producer price index) appreciated nearly as much as the real exchange rate based on overall inflation (proxied with the consumer price index). In this paper, a theoretical model is introduced that provides an explanation for this phenomenon.

The rest of the paper is organized as follows: Section 2 presents the theoretical framework for the appreciation of the real exchange rate based on the price of tradable goods. Section 3 offers some stylized facts on real exchange rates in transition economies. In section 4, the reduced-form equation is discussed. Section 5 describes the dataset and the econometric techniques. Section 6 then interprets the estimation results followed by the presentation of the derived real misalignment. Finally, section 7 concludes.

## 2 Theoretical Motivation

Let us consider a two-country, two-good framework where the external equilibrium is defined as a balanced trade account without taking account of capital flows. The traditional elasticities approach focuses on modeling the effects of real exchange rate variation on the trade balance. This paper introduces technology change and studies its effects on the trade balance and the real exchange rate.

<sup>1</sup> For an overview, see Égert (2003a).

The supply sides of the home and foreign economies can be described as functions of capital, labor and total factor productivity, which in turn depends on technology  $T$ . The level of technology is initially higher in the foreign than in the domestic economy. This implies higher GDP per capita in the foreign country. Each country produces one good and consumes both. The two goods are at least imperfect substitutes, so that purchasing power parity (PPP) does not hold and demand for the respective good depends primarily on its price. Let us now assume that while  $T^* > T$  (the asterisk denotes the foreign economy), technology changes faster in the domestic economy ( $dT > dT^*$ ). Hence, GDP growth is higher in the domestic economy due to technological catching-up.

Demand for the domestic good depends on technology. With increasing technological content, demand for the domestic good increases both in the domestic and the foreign economy. This can be motivated by utility functions where both goods are included in each economy, and where the utility of consuming the domestic good is a positive function of technology: the higher the technological content, the higher the utility. In addition, it is assumed that in the home country, demand for the foreign good is negatively linked to the technological content of the domestic good. It does not affect the demand for the foreign good in the foreign economy, though.

Prices are assumed to be fixed in the respective currency, so that the relative price of the domestic and foreign goods is given by:

$$Q = \frac{P^* \cdot E}{P} \quad (1)$$

where  $Q$  and  $E$  denote the real and nominal exchange rates, defined as units of domestic currency per one unit of foreign currency.  $P$  represents prices and the asterisk stands for the foreign economy. Based on these assumptions, one can derive the impact of changes of technology on the nominal and thus the real exchange rate.

The equilibrium condition we posit is that the trade account is balanced:

$$TB = 0 = P \cdot X - P^* \cdot E \cdot M \quad (2)$$

where  $X$  and  $M$  denote exports from and imports to the home economy, respectively. Equation (2) can be rewritten as follows:

$$P \cdot X = P^* \cdot E \cdot M \quad (3)$$

Changes in the trade balance occur if any of its determinants change:

$$\frac{dP}{P} + \frac{dX}{X} = \frac{dP^*}{P^*} + \frac{dE}{E} + \frac{dM}{M} \quad (4)$$

Using circumflexes for growth rates, equation (4) would look like this:

$$\hat{p} + \hat{x} = \hat{p}^* + \hat{e} + \hat{m} \quad (5)$$

As both domestic and foreign prices are assumed to be fixed, a change in the trade balance can be linked to a change in either the nominal exchange rate or determinants of imports and exports, which reduces equation (5) to:

$$\hat{x} = \hat{e} + \hat{m} \quad (6)$$

Exports of the home economy depend positively on foreign income and the technological content of the domestic good whereas they are negatively linked

to the price of the domestic good relative to that of the foreign good, i.e. the nominal exchange rate:

$$X = f(Y^*, T, \frac{\bar{P}}{E}) \quad (7)$$

How a change in the nominal exchange rate, technology and foreign demand influences exports can be shown using the total differential of the export function (7):

$$dX = \frac{\partial X}{\partial Y^*} dY^* + \frac{\partial X}{\partial T} dT + \frac{\partial X}{\partial \frac{\bar{P}}{E}} \left( -\frac{P}{E^2} \right) dE \quad (8)$$

Dividing equation (8) by  $X$  and rearranging terms,<sup>1)</sup> a change in exports is given as:

$$\hat{x} = \varepsilon_{Y^*}^x \cdot \hat{y}^* + \varepsilon_T^x \cdot \hat{t} + \varepsilon_E^x \cdot \hat{e} \quad (9)$$

where  $\varepsilon_{Y^*}^x, \varepsilon_T^x$  and  $\varepsilon_E^x$  denote the elasticity of demand for exports to changes in the three variables. In a similar manner, one can establish the elasticities of import demand to changes in domestic income, technology and the price of the foreign good. Imports are a positive function of domestic income and depend negatively on the technological content of domestic goods and the price of the foreign good expressed in domestic currency units:

$$M = f(\bar{Y}, \bar{T}, (P^* E)) \quad (10)$$

Totally differentiating equation (10) and then dividing the obtained equation by  $M$  and rearranging terms yields:<sup>2)</sup>

$$\hat{m} = \varepsilon_Y^m \cdot \hat{t} + \varepsilon_T^m \cdot \hat{t} + \varepsilon_E^m \cdot \hat{e} \quad (11)$$

The substitution of equations (9) and (11) into equation (6) gives:

$$\varepsilon_{Y^*}^x \cdot \hat{y}^* + \varepsilon_T^x \cdot \hat{t} + \varepsilon_E^x \cdot \hat{e} = \hat{e} + \varepsilon_Y^m \cdot \hat{t} + \varepsilon_T^m \cdot \hat{t} + \varepsilon_E^m \cdot \hat{e} \quad (12)$$

Assuming zero growth in the foreign economy ( $dY = 0$ ), the influence of a change in technology on a change in the nominal exchange rate can be written as follows:

$$\frac{\hat{e}}{\hat{t}} = \frac{\varepsilon_T^x - \varepsilon_T^m - \varepsilon_Y^m}{1 + \varepsilon_E^m - \varepsilon_E^x} \quad (13)$$

The elasticity of imports to the nominal exchange rate is negative whereas the elasticity of exports to the nominal exchange rate is positive. Therefore, both elasticities diminish the denominator ( $1 + \varepsilon_E^m - \varepsilon_E^x$ ). The denominator will become negative if the sum of  $\varepsilon_E^m$  and  $\varepsilon_E^x$  is larger than 1 ( $\varepsilon_E^m + \varepsilon_E^x > 1$ ). This appears to be a reasonable assumption because it is a restatement of the Marshall-Lerner condition.<sup>3)</sup> Hence, if  $\varepsilon_E^m + \varepsilon_E^x > 1$ , the effect of the change

1  $\frac{dX}{X} = \frac{\partial X}{\partial Y^*} \cdot \frac{dY^*}{Y^*} + \frac{\partial X}{\partial T} \cdot \frac{dT}{T} + \frac{\partial X}{\partial \frac{\bar{P}}{E}} \cdot \left( -\frac{P}{E^2} \right) \cdot \frac{dE}{E} \cdot \frac{E}{E}$  (9')

$\frac{dX}{X} = \frac{\partial X}{\partial Y^*} \cdot \frac{Y^*}{Y^*} \cdot \frac{dY^*}{Y^*} + \frac{\partial X}{\partial T} \cdot \frac{T}{T} \cdot \frac{dT}{T} + \frac{\partial X}{\partial \frac{\bar{P}}{E}} \cdot \left( -\frac{P}{E^2} \right) \cdot \frac{E}{E} \cdot \frac{dE}{E}$  (9'')

2  $\frac{dM}{M} = \frac{\partial M}{\partial Y} \cdot \frac{\partial Y}{\partial T} \cdot \frac{dT}{T} + \frac{\partial M}{\partial T} \cdot \frac{T}{T} + \frac{\partial M}{\partial P^* E} \cdot P^* \cdot \frac{dE}{E} \cdot \frac{E}{E}$  (11')

$\frac{dM}{M} = \frac{\partial M}{\partial Y} \cdot \frac{\partial Y}{\partial T} \cdot \frac{T}{T} + \frac{\partial M}{\partial T} \cdot \frac{T}{T} \cdot \frac{dT}{T} + \frac{\partial M}{\partial P^* E} \cdot P^* \cdot \frac{E}{E} \cdot \frac{dE}{E}$  (11'')

3 Aglietta et al. (1999) and Aglietta et al. (2003) provide empirical evidence in favor of the fact that the Marshall-Lerner condition is verified in the transition countries of Central and Eastern Europe.

in technology on the nominal exchange rate depends on the numerator. The first term in the numerator,  $(\varepsilon_T^x)$ , which represents the elasticity of exports to changes in technology, is positive. The second term,  $(\varepsilon_T^m)$ , the elasticity of imports to changes in technology, is negative. The last term,  $(\varepsilon_Y^m)$ , the elasticity of imports to domestic output, is positive. For the numerator to become positive, the combined effect of the export and import elasticities to technological change has to exceed the import elasticity to domestic output:

$$\varepsilon_T^x - \varepsilon_T^m > \varepsilon_Y^m \quad (14)$$

If the denominator is negative and the numerator is positive, a change in the domestic technology brings about a decrease in the nominal exchange rate, i.e. a real appreciation, given that prices are fixed in the respective currency. Let us consider the decomposition of the real exchange rate:

$$Q = E \frac{P^{T*}}{P^T} - \left( (1 - \alpha) \frac{P^{NT}}{P^T} - (1 - \alpha^*) \frac{P^{NT*}}{P^{T*}} \right) \quad (15)$$

where  $Q$  and  $E$  are the real and nominal exchange rates expressed as domestic currency units to one unit of foreign currency (decrease = appreciation, increase = depreciation), and  $P^T$ ,  $P^{NT}$  and  $\alpha$  denote tradable and nontradable prices, and the share of tradable goods in the consumer price index. Thus, the real appreciation ( $Q$  decreases) would occur through an appreciation of the real exchange rate of the tradable sector ( $E \frac{P^{T*}}{P^T}$ ) with a decrease in  $E$ . Under the equilibrium condition of  $TB = 0$ , such an appreciation could be viewed as an equilibrium phenomenon similar to the B-S effect, which also leads to an equilibrium appreciation.

The level of and changes in productivity can be taken as an approximation of the level of and changes in technology ( $T$  and  $dt$ ). Hence, the testable relationship of our model is as follows:

$$Q = f(PROD) \quad (16)$$

where  $PROD$  is the productivity in the tradable sector in the home economy relative to that in the foreign economy. The expected sign is negative, implying that an increase (decrease) in the productivity variable causes the real exchange rate to appreciate (depreciate).

### 3 Some Stylized Facts and the Role of Foreign Capital

The model developed above shows that in addition to productivity-induced market-based service price inflation along the lines of the B-S model, successful catching-up may also entail real appreciation based on an improvement of supply capacities and of the quality of tradable goods. Several transition economies in Central and Eastern Europe have indeed recorded an appreciation of the real exchange rate measured in terms of tradable prices.<sup>1)</sup>

According to most models of open economies, an appreciation of the tradable price-deflated real exchange rate is followed by a loss of competitiveness and entails a worsening of the trade balance and thus the current account.

<sup>1</sup> *Tradable prices are proxied by the Producer Price Index (PPI). See Égert (2003a) for charts. It should be noted that whereas the PPI-deflated real exchange rate appreciated steadily in the Czech Republic, Poland and Slovakia, it did not appreciate much in Slovenia and it did so only at a later stage of the transition period in Hungary.*

Although most of the transition countries have been running large current account deficits, there have been episodes of improvements in the trade balance and the current account in spite of the real appreciation of the exchange rate. Export revenues measured in foreign currency have indeed experienced tremendous growth and have risen nearly as much as imports.

At the beginning of the transition process, the countries produced goods of lower quality and lower technological content, in particular when compared with more developed countries.<sup>1)</sup> The liberalization of foreign trade necessitated a substantial nominal and real devaluation of the currencies, because exports broke down after the dissolution of the Council for Mutual Economic Assistance (CMEA) and imports surged due to pent-up demand for foreign goods. Uncertainties surrounding demand for foreign currency coupled with fast trade liberalization led policymakers to prefer a devaluation larger than external imbalances would have required, as argued in Rosati (1996). For instance, the devaluation of the Polish zloty against the U.S. dollar in early 1990 resulted in an exchange rate that was roughly 20% weaker than the then prevailing black market rate (Rosati, 1994).

These devaluations may have led to or may have amplified initial undervaluation, also detected in Halpern and Wyplosz (1997) and Krajnyák and Zettelmeyer (1998) by means of panel estimations. It could therefore be argued that part of the real appreciation over the last ten years or so reflects adjustment towards equilibrium. However, this explanation appears insufficient. If the initial devaluation had been too large, the correction towards the pretransition levels should have occurred within the next few years. Instead, real appreciation in both CPI and PPI terms proved to be a rather steady process. Chart 1 shows the development of the real exchange rate vis-à-vis Germany since 1985. Notwithstanding the fact that prices and exchange rates in the 1980s basically reflected the intentions of the planning authorities, important insights can be gained about the process of real appreciation since the start of transition.

Real devaluation was sharpest in the Czech Republic (Czechoslovakia prior to 1993), where market-based information or world market-relative prices played a rather limited role in determining the planned price and exchange rate system, and where the uncertainties as regards the markets' assessment of competitiveness were highest. Note that the devaluation was lowest in Hungary, where some market-oriented reforms were introduced from the late 1960s. Furthermore, because price liberalization for items included in the CPI basket started in the mid-1980s, the CPI-deflated real exchange rate started appreciating earlier than the real exchange rate based on the PPI.

Therefore, the huge initial devaluation may have been necessary because domestic supply lacked competitiveness in domestic and foreign markets. In all three countries the devaluation proved to be rather lasting, possibly because the currencies were strongly overvalued when entering transition from plan to market and thus facing the challenge of market forces.

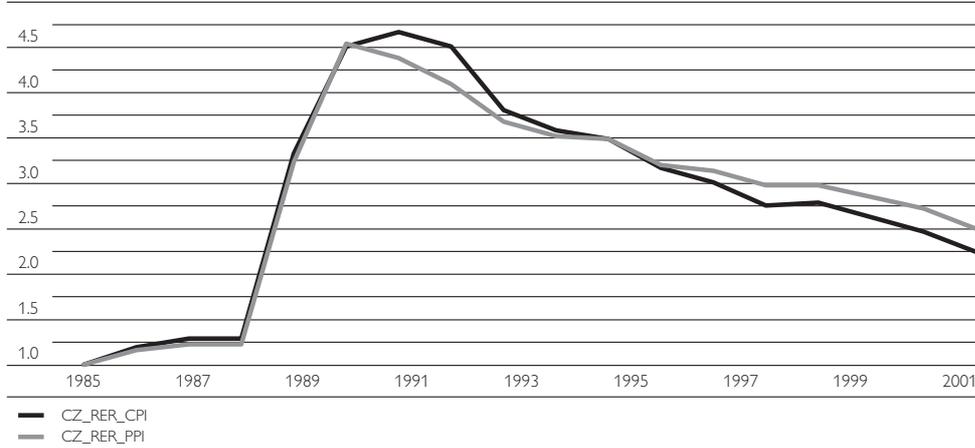
The real exchange rate may appreciate if domestic supply capacities and product quality increase, i.e. during the transition and catching-up process. The transition from plan to market entails a change in incentive structures

1 For recent empirical evidence, see e.g. Dulleck et al. (2003).

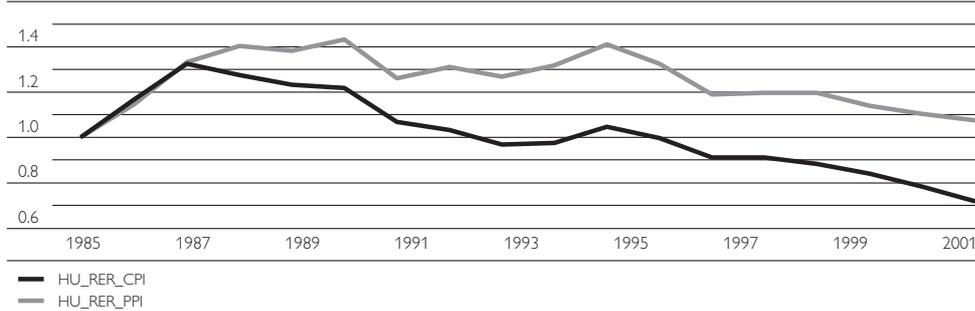
Chart 1

**Real Exchange Rates vis-à-vis the Deutsche Mark from the late 1980s**

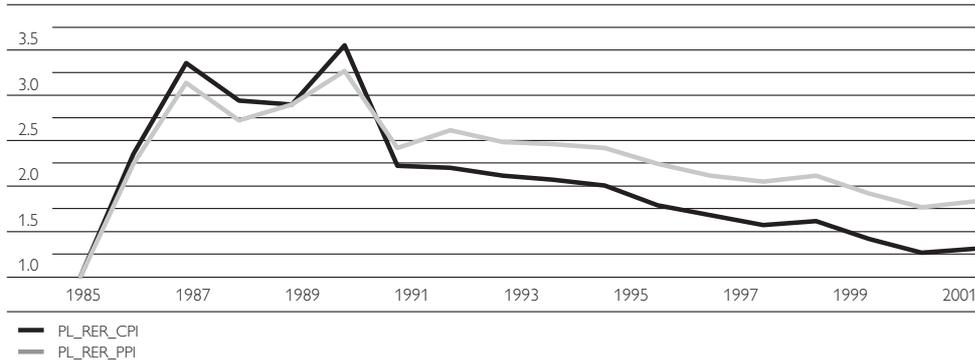
**a) Czech Republic**



**b) Hungary**



**c) Poland**



Source: IMF IFS Statistics, OECD Main Economic Indicators and Česká národní banka.  
Note: RER is the real exchange rate.

and a reallocation of existing resources. And this already improves supply. However, a sustained catching-up process requires investments in human as well as fixed capital, and quality improvements are needed in capital stock, technology, managerial and organizational skills and in infrastructure.

In this regard, foreign capital and in particular foreign direct investment (FDI) can play a very beneficial role. In the transition countries, FDI gave rise to very rapid changes in the composition of GDP and especially of manufactured goods. A marked shift occurred from predominantly low-quality, low value-

added, and labor- and raw material-intensive goods towards products of increasingly higher quality and higher value added that triggered increased foreign demand for these products. This may have at the same time supported simultaneous economy-wide quality improvement of goods and services, even if changes in the domestically orientated goods and services may have occurred more slowly. Hence, both exported goods and those sold primarily in domestic markets have changed markedly in quality. It should, however, be underlined that exported goods can differ to a large extent from those sold in the domestic market, with regard to both quality and technological content.

Rapid improvement in quality then raised prices, which through the replacement of low-quality goods for high-quality goods in the price basket led to a rise in the price level. In principle, such changes in the price level should not be reflected in inflation rates and thus the real appreciation of the currency. Nevertheless, adjusting inappropriately for quality improvements may result in higher inflation of tradable goods and the subsequent appreciation of the PPI-based real exchange rate.

Prices may also increase and thus the real exchange rate may appreciate when quality improvements go in tandem with a better reputation. The outset of transition was characterized by a strong bias towards imported foreign goods. With an ameliorating quality and better marketing of domestically manufactured goods and with a higher capacity of countries to produce goods of the more preferred foreign brands,<sup>1)</sup> the bias towards imported goods may become weaker. In other words, domestic and foreign demand for goods produced domestically increases.

While exported goods enter the trade balance directly and increase export revenues, the higher quality of domestic goods sold in domestic markets reduces the income elasticity of import demand<sup>2)</sup> and thus impacts on the trade balance indirectly. In this context, higher prices are an accompanying phenomenon of the growth in non-price competitiveness. Changes in non-price competitiveness of goods produced in the home country and improving supply capacities could indeed reverse the strong initial devaluation and lead to a steady appreciation of the real exchange rate measured in PPI and CPI terms.

Chart 2 below shows that the five selected transition countries have witnessed, over the period from 1995 to 2002, a strong increase in export revenues expressed in Deutsche mark at current prices. More specifically, Hungary and Poland featured the highest increases, whereas export growth proved slowest in Slovenia despite the fact that the real exchange rate appreciated least in this country.<sup>3)</sup>

The transition countries' export performance indeed seems to be closely related to privatization strategies and to attitudes towards FDI inflows. Foreign direct investment has had particularly beneficial effects on exports, which became the engine of economic growth.<sup>4)</sup> FDI helped economic restructuring

1 This means that consumers would buy goods of well-known foreign brands they prefer vis-à-vis the domestic brands. Goods of the well-known foreign brands are produced in the country rather than imported.

2 At the same income level, import demand will be lower because residents will consume more domestically produced goods instead of imported goods.

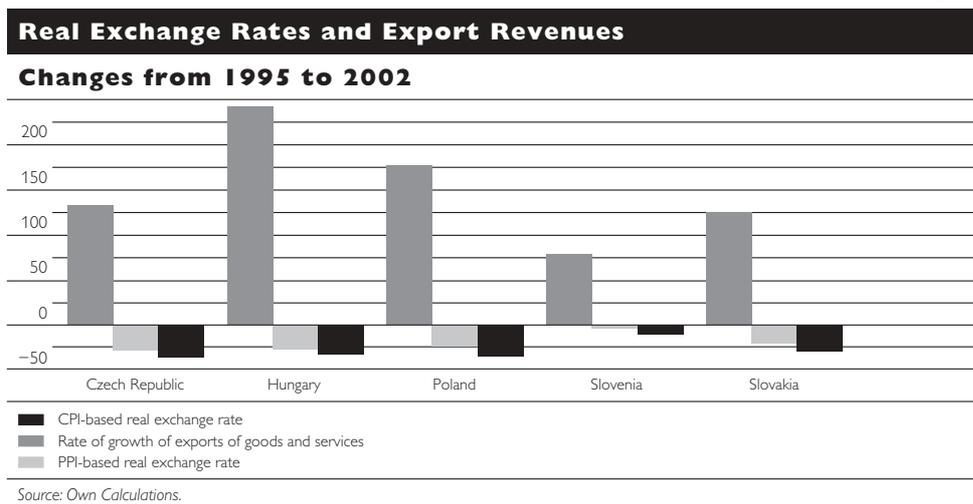
3 Growth in export revenue was also pronounced in 1993 and 1994. However, real appreciation was less marked.

4 See e.g. Darvas and Sass (2001), Sgard (2001), Campos and Coricelli (2002) and Benacek et al. (2003).

by financing fixed capital investment and by implementing state-of-the-art technology and Western-style organizational structures and schemes. But most importantly, FDI in manufacturing often aimed at export sectors and hence created new export capacities. Foreign involvement made access to foreign markets easier. However, because countries adopted different strategies towards privatization and capital inflows, the extent to which they benefited from FDI differs strongly. Privatization in Hungary relied heavily on sales to foreign investors whereas in the Czech Republic foreign capital started to pour in on a wider scale only after reforms accelerated in 1997. Political instability in Slovakia prevented direct investment inflows until 1998 and Slovenia hesitated to open up its economy to foreign investment until quite recently.<sup>1)</sup>

For this reason, the observed appreciation of the real exchange rate based on tradable prices could reflect improving supply capacities. Changes in supply capacities and thus real appreciation may have been faster in countries where foreign investors contributed more to economic restructuring.

Chart 2



#### 4 Reduced-Form Equation

Equation (12) shown in section 2 can be completed with variables suggested by standard models.<sup>2)</sup> This gives the following reduced-form equation of the real exchange rate:

$$Q = f(\overline{PROD}, \overline{REG}, \overline{RIR}, \overline{FDEBT}, \overline{OPEN}, \overline{TOT}, \overline{GOV}) \quad (13)$$

The real exchange rate ( $Q$ ) is computed both on the basis of the CPI and PPI. A decrease (increase) denotes an appreciation (depreciation) of the real exchange rate.

Labor productivity in industry ( $PROD$ ) is expected to be negatively related to the real exchange rate, i.e. an increase (decrease) in productivity should lead to an appreciation (depreciation) of the real exchange rate. Labor productivity

<sup>1</sup> Note, however, that exports and imports to GDP were much higher in Slovenia at the beginning of the 1990s. This higher basis effect could explain lower export growth.

<sup>2</sup> See e.g. MacDonald (1997) and Clark and MacDonald (1998).

primarily stands for higher supply capacities that can lead to an appreciation through the channel of higher quality and changes in preferences in line with increasing technological content of and thus demand for the domestic good in the domestic and foreign economies. The sector that is likely to benefit most from technological catching-up and that produces most exported goods is industry. However, changes in technology and preferences may not only be limited to domestic tradables, but may span all goods and services in the economy as a whole. In this case, higher supply capacities will be reflected in higher real GDP (*GDP*). Therefore, real GDP will be used as a fourth proxy for productivity. However, labor productivity in industry also captures the traditional B-S effect that operates through service prices. But, as summarized in Égert (2003a), this effect is rather limited due to the small share of nontradables in the acceding countries' CPI basket.

The *differential in regulated prices vis-à-vis Germany (REGD)* is also included. In transition economies, regulated prices rose fastest among the components of the CPI over the last ten years or so. On the one hand, regulated prices constitute a cost-push factor, which may erode competitiveness if it raises the price of traded goods. On the other hand, however, only part of the regulated prices directly affect traded goods costs, so a correction of the real exchange rate may not be needed to maintain external balance. Furthermore, a rise in regulated prices lowers disposable income and should thus reduce imports. In sum, an increase (decline) in regulated prices is expected to bring about an appreciation (depreciation) of the real exchange rate.

The *real interest rate differential (RIR\_CPI, RIR\_PPI)* indeed reflects imbalances between investment and savings and is expected to be negatively connected to the real exchange rate, implying that an increase leads to real appreciation of the currency.

*Foreign debt as a percentage of GDP (FDEBT)* should lead to a depreciation of the real exchange rate due to higher interest payments to the rest of the world.

*Openness (OPEN)* is traditionally viewed as an indicator of trade liberalization. Increasing openness indicates a higher degree of trade liberalization. Because it comes through the abolishment of trade barriers and thus allows foreign products to enter the country more freely, an increase in openness is expected to worsen the trade balance. Hence, a rise in openness is expected to yield a depreciation of the real exchange rate. However, openness can also stand for higher exports resulting from increasing supply capacities and can thus be negatively connected with the real exchange rate. Nonetheless, we think that this effect should be captured by the productivity variables. Thus, the expected sign of the openness variables is positive.

The *terms of trade (TOT)*, determined as export prices over import prices, do not have an obvious sign. If exports and imports have low price elasticities, like primary or very differentiated goods, an increase in the terms of trade would imply an increase in export revenues and hence an amelioration of the trade balance, which could result in an appreciation of the nominal and thus the real exchange rate. But increasing export revenues would also lead to higher income, and because higher income could imply more consumption of nontradables, a demand side-driven increase in the relative price of nontradables is also

likely to make the real exchange rate appreciate. By contrast, in the event that exports are price sensitive, an increase in the terms of trade would not necessarily yield an improved trade balance. As a result, a combination of price elasticities of domestic supply and foreign demand might or might not lead to an increase in trade when export prices increase. So whether an increase in the terms of trade will bring about real appreciation or depreciation remains uncertain.

The expected sign of *government debt to GDP (GOV)* is not clear-cut. If an increase in the public debt is due to increasing public spending on nontradable goods, it is expected to lead to an appreciation of the real exchange rate through the relative price channel. However, if government spending falls more heavily on tradable goods, no appreciation occurs. Moreover, in the event that public debt is on an unsustainable path, the real exchange rate may depreciate mainly because of the depreciation of the nominal exchange rate. The depreciation related to government debt may dominate the appreciation in the long run and if government debt exceeds a given threshold, even in the medium term.

## 5 Data and Econometric Issues

### 5.1 Data

The dataset used in the paper consists of quarterly time series for the Czech Republic, Hungary, Poland, Slovakia and Slovenia. The period spans the first quarter of 1993 to the fourth quarter of 2002. The dataset also includes Croatia, Estonia, Latvia and Lithuania, which are used for the panel estimations. The period runs from the first quarter of 1995 to the fourth quarter of 2002 for Croatia and from the first quarter of 1994 to the fourth quarter of 2002 for the Baltic countries.

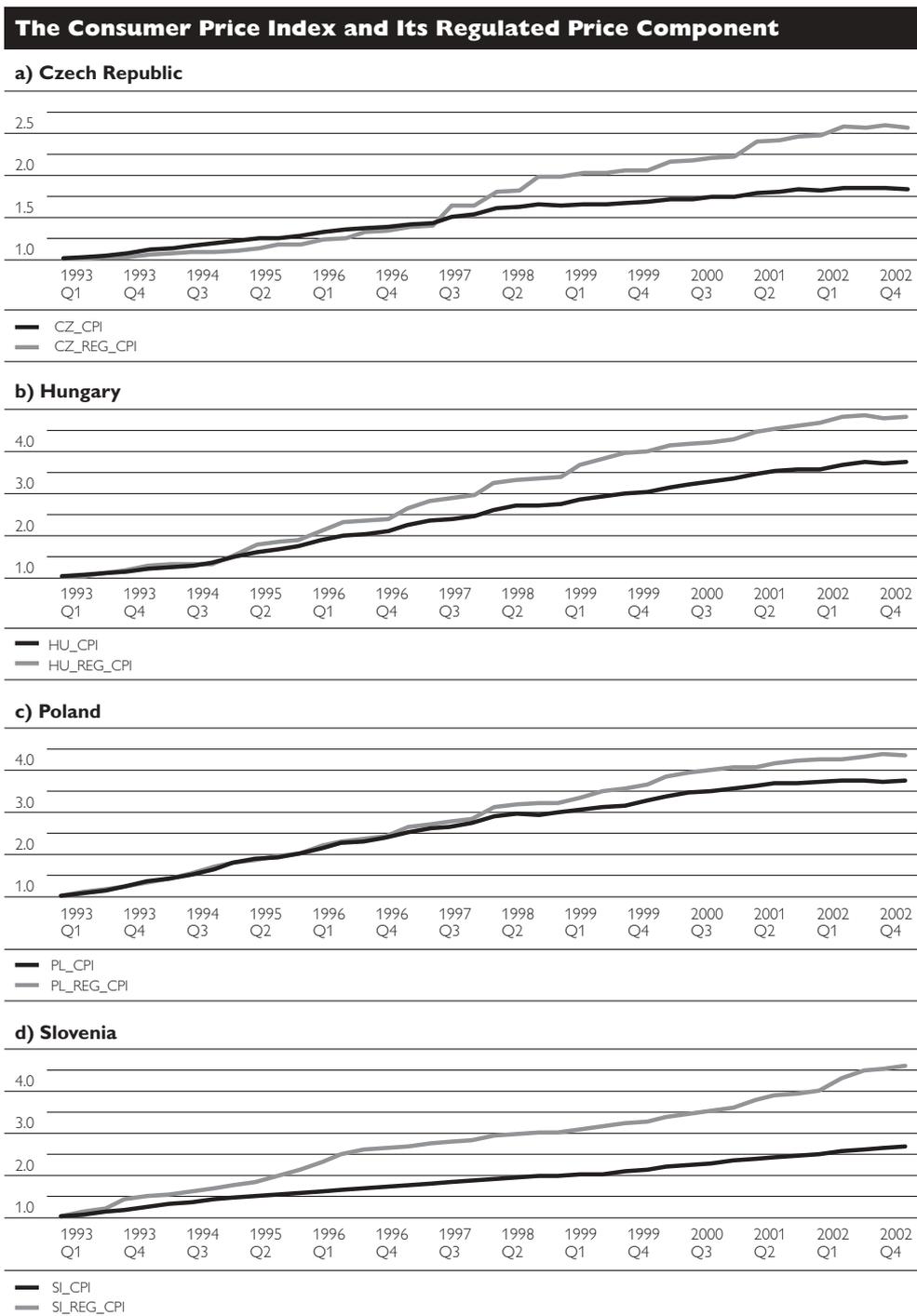
*Average labor productivity* is computed as labor productivity in the home country relative to labor productivity in Germany. Three measures are used. PROD1 is calculated using industrial production over industrial employment obtained from the Main Economic Indicators of the OECD or the International Financial Statistics of the IMF. PROD2 is based on similar data but drawn from the WIIW. Finally, PROD3 is obtained as value added over sectoral employment in industry obtained from national accounts. Although representing the same series, PROD1 and PROD2 may even differ markedly in some countries. Value added in industry and industrial production-based measures turn out to exhibit significantly different developments; however, without obvious causes or regularities across countries. Note also that PROD1 starts only in 1995 for Estonia and no data for PROD2 is available for the Baltic states. Furthermore, real GDP in the domestic and the reference economies is also used as a proxy for productivity.

The *differential of regulated prices* in the home country and those in Germany are mainly based on regulated prices provided by national sources. Thus, series come from the respective national banks for the Czech Republic, Hungary and Poland. Regulated prices for Germany are obtained from the Federal Statistical Office of Germany. The series for Estonia corresponds to that used in Égert (2003b). For the cases of Slovenia, Slovakia, Croatia and Latvia, regulated prices are proxied by rents. In Lithuania, the price series on fuel and electricity serve as a proxy. Regulated prices are expected to impact not only on the

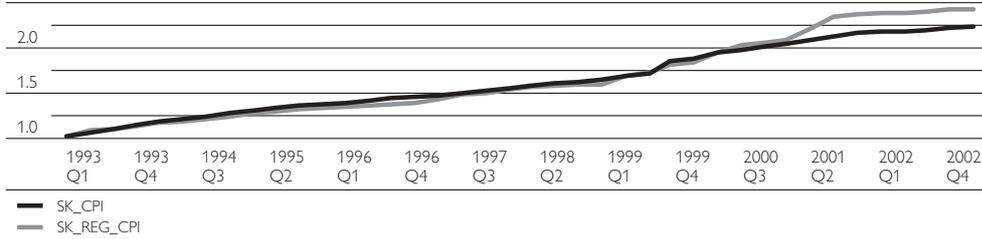
EQUILIBRIUM REAL EXCHANGE RATES  
 IN ACCEDING COUNTRIES:  
 HOW LARGE IS OUR CONFIDENCE (INTERVAL)?

CPI-deflated real exchange rate, but also on the real exchange rate based on the PPI. The reason for this is that producer price indices in the countries under investigation contain prices of domestic energy and water suppliers, which are partly regulated. Also, cost pressure related to increased (regulated) input prices is likely to impact on producer prices.

Chart 3



e) Slovakia

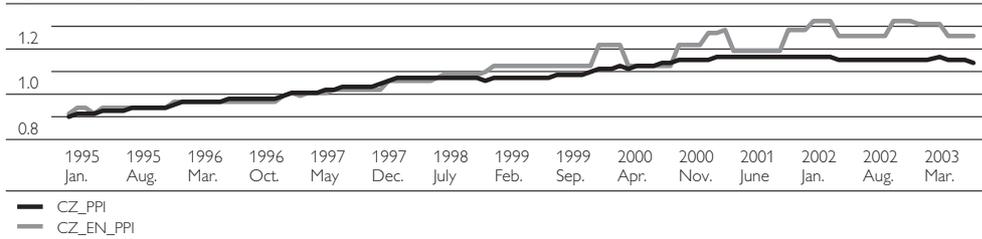


Source: National central banks.  
Note: REG is the regulated price component of the CPI.

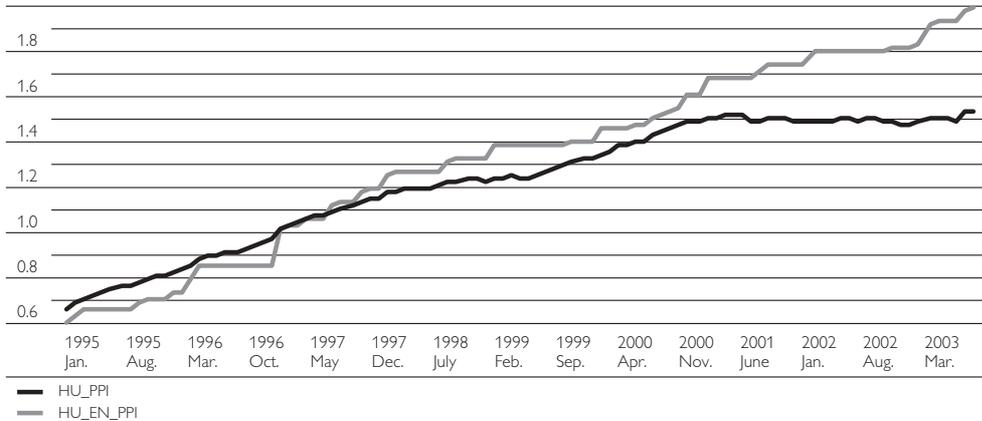
Chart 4

The Producer Price Index and Its Regulated Price Component

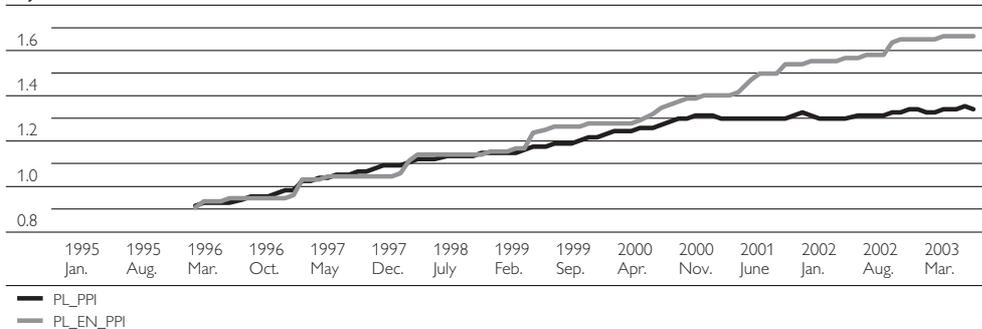
a) Czech Republic



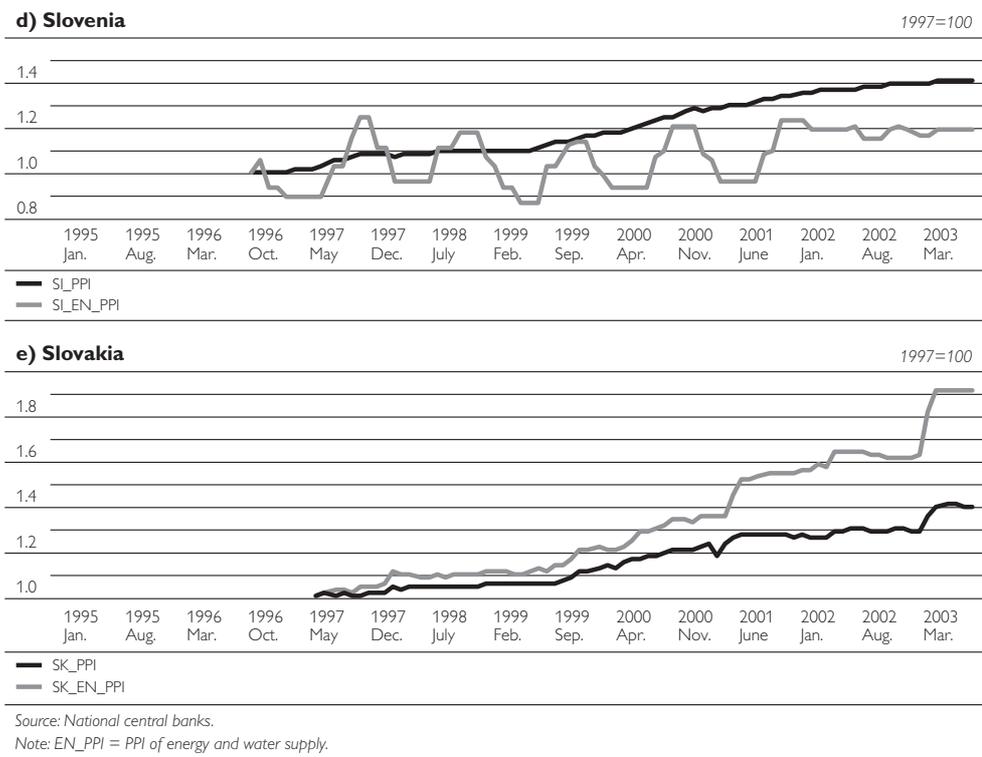
b) Hungary



c) Poland



EQUILIBRIUM REAL EXCHANGE RATES  
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The other variables used in the paper are (a) the *real interest differential* towards Germany computed as the one-year treasury bill yield in period  $t$  divided by the CPI or the PPI, both of which are year-on-year figures from year  $t-1$  to year  $t$ ; (b) *gross foreign debt* as a percentage of GDP; (c) *government debt* as a percentage of GDP (calculated as the cumulated government deficit over GDP); (d) *openness* computed as nominal exports and imports of goods and services expressed in terms of nominal GDP; (e) the *terms of trade* obtained as export prices over import prices. Data on the terms of trade are available only for the Czech Republic, Hungary and Poland.

The source of these data is NewCronos (Eurostat), Main Economic Indicators (OECD), International Financial Statistics (IMF) and the monthly database of the WIIW. Note that all series are seasonally adjusted if needed. Regulated prices are an exception, because their frequent and perhaps erratic adjustments are not primarily related to seasonal factors. Furthermore, the series are taken in natural logarithms and are normalized to 1994 except for the real interest differential.

## 5.2 Testing Procedure

It is professional wisdom that a large number of macroeconomic time series are integrated of order 1. This is tested for by employing conventional Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. If the series turn out to be  $I(1)$  processes, the appropriate estimation technique to use is the cointegration approach. In this paper, we use four different types of cointegration techniques:

The Engle and Granger (EG) technique, dynamic ordinary least squares (DOLS), popularized by Stock and Watson (1993), the autoregressive distrib-

uted lag (ARDL) approach of Pesaran et al. (2001) and the maximum likelihood estimator of Johansen. The EG approach to cointegration is based on the following static equation:

$$Y_t = \beta_0 + \sum_{i=1}^n \beta_i X_{i,t} + \varepsilon_t \quad (16)$$

Equation (16) does not account for the endogeneity of the regressors and serial correlation in the residuals. This is corrected for, using DOLS, which includes leads and lags of the regressors in first differences:

$$Y_t = \beta_0 + \sum_{i=1}^n \beta_i X_{i,t} + \varepsilon_t + \sum_{i=1}^n \sum_{j=-k_1}^{k_2} \gamma_{i,j} \Delta X_{i,t-j} + \varepsilon_t \quad (17)$$

with  $k_1$  and  $k_2$  denoting, respectively, leads and lags. The error correction form of the ARDL model is given in equation (18) where the dependent variable in first differences is regressed on the lagged values of the dependent and independent variables in levels and first differences:

$$\Delta Y_t = \beta_0 + \rho(Y_{t-1} + \sum_{i=1}^n \beta_n X_{i,t-1}) + \sum_{j=1}^{l_1} \eta_j \Delta Y_{t-j} + \sum_{i=1}^n \sum_{j=0}^{l_2} \gamma_{i,j} \Delta X_{i,t-j} + \varepsilon_t \quad (18)$$

where  $l_1$  and  $l_2$  are the maximum lags. In the EG and DOLS approaches, whether or not  $Y$  and  $X$  are cointegrated is examined by testing for unit root in the residuals and applying critical values tabulated in MacKinnon (1996). In contrast to this, Pesaran et al. (2001) employ a bounds testing approach. Using conventional F-tests, the null of  $H_0: \rho = \beta_1 = \dots = \beta_n = 0$  is tested against the alternative hypothesis of  $H_1: \rho \neq 0, \beta_1 \neq 0, \dots, \beta_n \neq 0$ . Pesaran et al. (2001) tabulate two sets of critical values, one for the case when all variables are  $I(1)$ , i.e. upper bound critical values and another one when all variables are  $I(0)$ , i.e. lower bound critical values. Critical values are provided for five different models, of which model (3) with unrestricted intercept and no trend will be used in the paper. If the test statistic is higher than the upper bound critical value, the null of no cointegration is rejected in favor of the presence of cointegration. On the other hand, an F-statistic lower than the lower bound critical value implies the absence of cointegration. In the event that the calculated F-statistic lies between the two critical values, there is no clear indication of the absence or existence of a cointegrating relationship.

Nonetheless, in the presence of more than one cointegration relationship, the aforesaid single-equation approaches may not be able to identify the additional cointegrating relationships. Therefore, the Johansen cointegration technique is used for testing for the number of cointegrating vectors in a vector autoregression (VAR) framework. In the event that only one long-term relationship is found using the trace statistics, the maximum likelihood estimates are used as a robustness check in the following form:

$$Y_t = (m_0 + m_1 t + (1 + \alpha \beta') Y_{t-1}) - \sum_{i=1}^{p-1} \Phi_i \Delta Y_{t-i} + \varepsilon_t \quad (20)$$

where  $Y$  represents the vector including the dependent and the independent variables.

We first conduct a general-to-specific model selection strategy that involves top-down and bottom-up F presearch coupled with a sample split analysis so as to identify blocks of statistically significant variables.<sup>1)</sup> Departing from all variables described in section 4, the general-to-specific approach to model selection is performed. The residuals of the models chosen are subsequently checked for stationarity in line with the EG approach, and the selected models are taken as an input for the estimation of the DOLS and ARDL. Leads and lags are determined on the basis of the Schwarz, Akaike and Hannan-Quinn information criteria.

The VAR-based Johansen approach is used to verify the number of cointegration relationships that might link the variables. The detection of a single long-term relationship that turns out to be stable over time then validates results of the single-equation methods. The Johansen technique involves the verification of the roots of the VAR model (to ensure stationarity of the autoregressive processes), tests for normality and serial correlation. Furthermore, both the rank of cointegration and parameter constancy are analyzed.

Beside time series techniques, panel techniques are applied to the panel composed of up to nine countries. Analogously to the time series analysis, stationarity is tested for by means of the panel unit root test proposed by Im et al. (2003) (IPS henceforth). The t-bar statistic is constructed as a mean of individual ADF statistics to test the null hypothesis of a unit root.

Subsequently, panel cointegration tests are employed to detect long-term relationships and to estimate the corresponding coefficients. For this purpose, the residual-based tests of the Engle and Granger type developed in Pedroni (1999) are used. Pedroni (1999) develops seven tests, of which the first four statistics are based on pooling along within-dimension whereas the last three tests rest on pooling along between-dimension. Only the last three tests (group rho-statistic, group pp-statistic, group ADF-statistic) will be employed because they allow for heterogeneity in the autoregressive term. According to Pedroni (1999), of the seven tests, the group ADF-statistic is the most powerful for small samples. Coefficients of the cointegrating vector are then determined using pooled OLS, fixed effect OLS, fixed effect DOLS, the Pooled Mean Group Estimator (PMGE) and the Mean Group Estimator (MGE) proposed by Pesaran et al. (1999). For DOLS, leads and lags are determined on the basis of the Schwarz and Akaike information criterion, and a lag structure of 1 is imposed alternatively (DOLS[1,1]). The same applies to the choice of the lag structure of PMGE and MGE (PMGE[1,1] and MGE[1,1]).<sup>2)</sup>

1 In the top-down procedure, F-tests are carried out on blocks of regressors, which are organized in an increasing order in terms of their  $t^2$ -values until the null hypothesis is rejected. In the bottom-up procedure, F-tests are performed for regressors put in a decreasing order in terms of their  $t^2$ -values until the null is not rejected. The sample split analysis analyzes the significance of the variables in two subsamples. The model is considered robust if significance is also conserved in the two subsamples. This model selection was conducted using PcGets.

2 For a discussion of panel unit root and cointegration tests and the estimation methods, see e.g. Banerjee (1999) and Baltagi and Kao (2000). For recent applications, see e.g. Crespo-Cuaresma et al. (2003) and Maeso-Fernandez et al. (2003).

## 6 Results

### 6.1 Time Series

Because conventional unit root tests, i.e. ADF and PP tests, indicate that most of the series are not stationary in levels but turn out to be stationary in first differences, the cointegration techniques developed earlier appear to be the most appropriate approach to test for long-term relationships connecting the real exchange rate to the underlying fundamentals.

We set out to test two sets of equations. First, the CPI-based real exchange rate is regressed on the gamut of variables described earlier. In this case, the productivity variable is likely to impact on the real exchange rate through three different channels: (1) the traditional B-S effect, (2) the indirect B-S effect through an increase in the service prices as inputs, and (3) tradable prices because of improved quality and reputation. Second, the PPI-deflated real exchange rate is regressed on the same set of variables. If labor productivity proves to be important in both relationships, the indirect B-S effect, and most importantly, the increase in tradable prices brought about by productivity changes, make the real exchange rate appreciate systematically. The theoretical framework developed earlier is supported if the two sets of equations yield similar results for labor productivity.

Employing the EG, DOLS, ARDL and Johansen cointegration techniques, estimations are performed for the period 1994–2002 for the Czech Republic, Hungary and Poland, and for 1993–2002 for Slovakia and Slovenia.

#### 6.1.1 The Czech Republic

Results obtained for time series are reported in tables 1 to 5. With regard to the Czech Republic, the specification including the difference in labor productivity, the differential in regulated prices and foreign debt is retained as the most reliable and economically most compelling one. This specification appears remarkably robust, given that all methods detect the presence of a cointegrating vector linking the aforementioned variables. It should be noted that although the Johansen trace statistic indicates the presence of two cointegrating vectors, the stability test on the number of cointegrating vectors shows only one stable vector. Moreover, all these variables are found to be statistically significant, have the expected sign, and the size of the estimated coefficients based on different techniques is fairly comparable. These observations apply not only to the equations including the CPI-based real exchange rate but also to those in which the PPI-deflated real exchange rate is used.

The fact that the estimated coefficients for the difference in productivity are very similar for the CPI- and PPI-based real exchange rate equations lends strong empirical support to the theoretical framework according to which real appreciation comes mainly through tradable prices. The coefficients tend to be lower for the PPI-based real exchange rate especially when the EG and ARDL techniques are employed. This may indicate that the CPI-based real exchange rate appreciates more than the PPI-based real exchange rate due to changes in the relative price of market nontradable items.

The differential in regulated prices enters both the CPI- and PPI-based specifications, and an increase in the differential results in an appreciation of the corresponding real exchange rates. Nonetheless, when the CPI-based real exchange

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rate is used, the estimated coefficients are clearly higher than in the case of the PPI-deflated real exchange rate. This may indicate that the difference between the CPI- and PPI-based real exchange rates may be partly explained by the differential in regulated prices.

As regards foreign debt, a rise (fall) induces a depreciation (appreciation) of the real exchange rate, and the estimated coefficients are rather similar for the CPI- and the PPI-based equations.

Table 1a

<b>Cointegration Tests for the CPI-Based Real Exchange Rate, Czech Republic, 1994–2002</b>											
EG		DOLS				ARDL (1,1)				JOH	
		SIC, HQ (0,1)		AIC (1,1)		SIC, AIC, HQ		M3, k=3			
SIC	1	−5.199**	3	−5.528**	3	−5.339**	6.84**		R=0	73.04***	RS ok
AIC	1	−5.199**	3	−5.528**	3	−5.339**			R=1	32.23***	AC ok
HQ	1	−5.199**	3	−5.528**	3	−5.339**			R=2	8,99	JB 0.016
									R=3	0,01	ST 1
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	
PROD2	−0.701	−5.510	−0.948	−7.198	−1.021	−6.568	−0.793	−4.108	−0.649	−16.641	
REGD	−0.362	−6.713	−0.361	−3.674	−0.379	−2.667	−0.471	−3.066	−0.457	−32.643	
FDEBT	0.190	4.089	0.292	4.043	0.308	3.063	0.326	3.514	0.278	18.533	

Note: \*, \*\* and \*\*\* denote the presence of cointegration at the 10%, 5% and 1% levels, respectively. EG represents the Engle and Granger residual-based tests. SIC, AIC and HQ in the first column of the table stand for the Schwarz, Akaike and the Hannan-Quinn information criteria based on which the lag length is selected for the ADF tests applied to the residuals of the EG and DOLS equations. The lag length is chosen so that it minimizes the information criteria. It is shown in the first column of each method (column 2 for EG, column 4 for DOLS, etc.). Below DOLS and ARDL stand the information criteria based on which leads and lags (DOLS) and lags for  $dY$  and  $dX$  (ARDL) are chosen (shown in parentheses). The test statistic shown below ARDL is the F-statistic as in Pesaran et al. (2001). JOH represents the Johansen cointegration technique.  $k$  stands for the lag length chosen for the VAR. The trace-test statistics are given below. In the last column, RS and AC are roots of the model and autocorrelation. "ok" indicates that the inverse roots of the model are lower than 1 and the absence of serial correlation in the residuals. JB stands for Jarque-Bera multivariate normality tests. A figure higher than 0.05 indicates that normality could not be rejected. Finally, ST indicates the number of cointegration relationship(s) that turn out to be stable over time.

Table 1b

<b>Cointegration Tests for the PPI-Based Real Exchange Rate, Czech Republic, 1994–2002</b>											
EG		DOLS (1,1)				ARDL (1,1)				JOH	
		SIC, AIC, HQ		SIC, AIC, HQ		SIC, AIC, HQ		M3, k=3			
SIC	1	−5.122**	4	−5.604**	6.163**			R=0	84.06***	RS ok	
AIC	1	−5.122**	4	−5.604**				R=1	39.56***	AC ok	
HQ	1	−5.122**	4	−5.604**				R=2	9,23	JB 0.012	
								R=3	0,06	ST 1	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	
PROD2	−0.632	−5.155	−0.974	−6.791	−0.716	−3.927	−0.699	−19.971			
REGD	−0.220	−4.227	−0.210	−1.596	−0.317	−2.334	−0.359	−25.643			
FDEBT	0.189	4.236	0.259	2.793	0.293	3.145	0.278	19.857			

Note: As for table 1a.

### 6.1.2 Hungary

The results for Hungary are reported in tables 2a and 2b. They are less robust when compared with those of the Czech Republic in that the cointegration tests reach no clear consensus on whether or not the variables are linked through a long-term cointegration relationship. In particular, the EG and on some occasions the ARDL technique could not detect the presence of cointegration. However, the DOLS, the Johansen and in some cases the ARDL techniques reveal that both the CPI- and the PPI-deflated real exchange rates are connected to the difference in labor productivity, foreign debt and openness.

The coefficients are statistically significant and correctly signed. Thus, an increase (decrease) in labor productivity leads to an appreciation (depreciation) of both the CPI- and the PPI-based real exchange rate. This indeed confirms our

conjecture stipulating the role of tradable prices in the appreciation of the real exchange rate. The estimated coefficients for the CPI-based specification are, in most cases, larger than those found for the PPI-deflated real exchange rate. This shows that the higher appreciation of the CPI-deflated real exchange rate may be a result of a rise in the price of market nontradables, i.e. the B-S effect.

The differential in regulated prices does not enter the equation. Because of possible multicollinearity between labor productivity and the differential in regulated prices, the coefficient may also capture the impact of regulated prices on the PPI- and CPI-based real exchange rates.

Foreign debt and the openness ratio work in the opposite direction, as they are positively related to both the CPI- and PPI-based real exchange rates. Hence, an increase in these variables yields a depreciation of the real exchange rate.

Table 2a

**Cointegration Tests for the CPI-Based Real Exchange Rate in Hungary, 1994–2002**

	EG		DOLS				ARDL (1,2)		JOH		RS no AC ok JB 0.002 ST 1
			SIC (1,3)		AIC, HQ (2,3)		ARDL_SIC		M3, k=3		
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	
SIC	0	-2.136	1	-4.848**	1	-6.825**	3.466 <sup>a</sup>		R=0	74.14***	
AIC	0	-2.136	4	-4.834**	4	-4.690**			R=1	20,46	
HQ	0	-2.136	4	-4.834**	4	-4.690**			R=2	7,77	
									R=3	1,18	
PROD3			-2.344	-12.020	-2.489	-7.493	-2.099	-3.164	-2.099	-22.570	
FDEBT			0.811	9.482	0.908	6.795	0.622	2.551	0.730	19.211	
OPEN			0.590	6.855	0.633	4.052	0.434	2.346	0.511	13.447	

Note: As for table 1a.

Table 2b

**Cointegration Tests for the PPI-Based Real Exchange Rate in Hungary, 1994–2002**

	EG		DOLS				ARDL		JOH		RS no AC ok JB 0.110 ST 1?		
			SIC, HQ (2,3)		AIC (3,3)		SIC (1,0)		AIC, HQ (1,1)			M3, k=3	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat		Coeff	t-stat
SIC	0	-2.747	1	-5.936**	1	-8.101**	2.109	4.032*		R=0	45.09**		
AIC	0	-2.747	1	-5.936**	3	-5.068**				R=1	20,24		
HQ	0	-2.747	1	-5.936**	3	-5.068**				R=2	8,16		
										R=3	3,58		
PROD3			-1.967	-5.821	-2.951	-2.735		-0.902	-2.077	-1.098	-7.572		
FDEBT			0.958	7.041	1.319	3.636		0.401	1.677	0.549	9.305		
OPEN			0.486	3.059	0.927	1.916		0.004	0.029	0.056	1.000		

Note: As for table 1a.

**6.1.3 Poland**

As far as Poland is concerned, the long-term relationships include labor productivity, government debt, openness and the real interest differential. Cointegration is found with all methods except for the EG technique when applied to the CPI-based real exchange rate. Productivity is found to impact on both the CPI- and PPI-based real exchange rates. This supports our conjecture. The reason for the large differences in the size of the estimated coefficients in the case of the CPI- and the PPI-based equations is likely to be very similar to what we observed for Hungary, i.e. the influence of the B-S effect and regulated prices.

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The negative sign of the real interest differential shows that a rise (fall) in this variable results in the appreciation (depreciation) of the real exchange rate. This finding is in sharp contrast with the cases of the Czech Republic and Hungary, where the real interest differential is not found to enter the long-term relationship significantly. As shown in table 3, openness leads to a depreciation of the real exchange rate. A rise in government debt is found to cause a depreciation of the real exchange rate. However, in the PPI-based specification, it becomes significant only when the Johansen technique is employed.

Table 3a

<b>Cointegration Tests for the CPI-Based Real Exchange Rate in Poland, 1994–2002</b>										
EG		DOLS (0,0)		DOLS (1,0)		ARDL (1,0)		JOH		
		SIC, HQ		AIC		SIC, AIC, HQ		M3, k=3		
SIC	0	-4.057	0	-5.311**	2	-5.825**	6.144**	R=0	73.66**	RS no
AIC	3	-3.880	0	-5.311**	2	-5.825**		R=1	36.67	AC ok
HQ	0	-4.057	0	-5.311**	2	-5.825**		R=2	18.52	JB 0.102
								R=3	6.58	ST 1
								R=4	1.08	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
PROD1			-1.249	-9.958	-1.080	-7.966	-1.614	-5.281	-1.060	-12.990
GOV			1.879	3.682	1.416	2.340	3.548	3.543	1.785	5.235
OPEN			0.341	3.026	0.350	2.938	0.474	2.460	0.411	5.630
RIR_CPI			-0.011	-5.063	-0.013	-5.680	-0.010	-2.222	-0.016	-12.308

Note: As for table 1a.

Table 3b

<b>Cointegration Tests for the PPI-Based Real Exchange Rate in Poland, 1993–2002</b>										
EG		DOLS (0,0)		DOLS (0,1)		ARDL (1,1)		JOH		
		SIC		AIC, HQ		SIC, AIC, HQ		M3, k=3		
SIC	0	-6.283**	2	-6.401**	2	-6.569**	7.935**	R=0	85.55**	RS no
AIC	0	-6.283**	2	-6.401**	2	-6.569**		R=1	39.85	AC ok
HQ	0	-6.283**	2	-6.401**	2	-6.569**		R=2	12.57	JB 0.296
								R=3	4.72	ST 1
								R=4	0.03	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
PROD1	-0.433	-4.054	-0.521	-5.067	-0.581	-5.069	-0.497	-4.753	-0.548	-6.683
GOV	-0.568	-1.337	-0.156	-0.347	0.452	0.852	-0.047	-0.122	0.220	6.377
OPEN	0.170	2.302	0.187	2.768	0.229	3.130	0.182	3.559	0.153	2.732
RIR_PPI	-0.009	-6.450	-0.009	-6.820	-0.010	-7.048	-0.009	-5.230	-0.007	-5.833

Note: As for table 1a.

#### 6.1.4 Slovakia

For Slovakia, it turned out to be highly complicated to find a relationship based on the reduced-form equation (13) that could be considered reasonable on economic and econometric grounds. Only real GDP, government debt and regulated prices enter the long-term relationship. It seems that government debt and GDP reflect similar developments: Until 1998, the reform process was rather sluggish in Slovakia, and public expenditures increased much faster than GDP.<sup>1)</sup> The expansionary fiscal policy then became unsustainable, and the

1 Real public consumption expenditure measured as in the national accounts increased by 50% between 1993 and 1997, compared with 25% growth of real GDP. See Beblavy (2002) for more details on Slovakia's exchange rate policy.

Slovak koruna had to be floated in 1998. After a period of turbulence in which the real exchange rate depreciated and government spending and GDP also decelerated, a more coherent reform strategy including the attraction of large FDI was implemented. This marked the return to higher growth and higher government spending. Therefore, the only relationship which appears to be stable over the whole period studied is the one including government spending to GDP and regulated prices.

Table 4a

**Cointegration Tests for the CPI-Based Real Exchange Rate in Slovakia, 1993–2002**

	EG		DOLS (0,0)		ARDL (2,0)		JOH	
	SIC	AIC, HQ	SIC	AIC, HQ	SIC	AIC, HQ	M3, k=3	
SIC	1	-3.710*	2	-3.851*	5.686**		R=0	10,67
AIC	2	-3.718*	2	-3.851*			R=1	2,54
HQ	1	-3.710*	2	-3.851*			R=2	0,03
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat		
GDP	-0.602	-5.580	-0.610	-5.361	-0.655	-2.863		
REGD	-0.343	-5.571	-0.346	-5.389	-0.333	-3.247		

Note: As for table 1a.

Table 4b

**Cointegration Tests for the PPI-Based Real Exchange Rate in Slovakia, 1993–2002**

	EG		DOLS (0,0)		ARDL (2,0)		JOH	
	SIC	AIC, HQ	SIC	AIC, HQ	SIC	AIC, HQ	M3, k=3	
SIC	2	-4.113**	2	-4.014**	4.654*		R=0	14,91
AIC	2	-4.113**	2	-4.014**			R=1	5,59
HQ	2	-4.113**	2	-4.014**			R=2	0,19
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat		
REGD	-0.310	-3.922	-0.318	-3.780	-0.303	-2.512		
GOV	-1.305	-4.667	-1.284	-4.307	-1.312	-2.255		

Note: As for table 1a.

**6.1.5 Slovenia**

In Slovenia, one relationship can be detected which connects the real exchange rate to the real interest differential and regulated prices. As expected, an increase (decrease) in regulated prices is found to bring about an appreciation (depreciation). However, the sign of the real interest differential does not correspond to our expectation, as an increase leads to a depreciation of the real exchange rate.

This finding can be explained to a large extent by monetary and exchange rate policies in Slovenia (Capriolo and Lavrac, 2003), which have aimed at a balanced current account and a corresponding real exchange rate position.

It should be noted that for Slovenia, much as for Slovakia, no meaningful relationship could be determined for the PPI-based real exchange rate. This suggests that contrary to the other countries, mainly to the Czech Republic, Hungary and Poland, the moderate appreciation could be largely attributed to factors other than productivity catching-up. It is worth mentioning that Slovenia has – deliberately – attracted the least FDI in terms of GDP during the period from 1993 to 2002.

Table 5

Cointegration Tests for the CPI-Based Real Exchange Rate in Slovenia, 1993–2002									
	EG		DOLS (2,3)		ARDL (2,3)		JOH		
			SIC, AIC, HQ		SIC, AIC, HQ		M3, k=3		
SIC	0	-5.041***	1	-6.695***	10.127**		R=0	63.26***	
AIC	1	-4.092***	1	-6.695***			R=1	21.41***	
HQ	0	-5.041***	1	-6.695***			R=2	6.18***	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	
CONST	-0.107	-12.280	-0.144	-9.020	-0.111	-1.812	RS		ok
REGD	-0.158	-16.225	-0.131	-8.946	-0.160	-3.281	AC		ok
RIR_CPI	0.004	6.683	0.005	5.480	0.001	0.474	JB		0.504

Note: As for table 1a.

### 6.2 Panels

The panel investigation is carried out on different panels to check for robustness of the results. First, the panel cointegration tests are performed on a panel composed of the five countries (panel 5) dealt with above, and this for the periods 1993 to 2002, 1994 to 2002 and 1995 to 2002. Subsequently, the three Baltic countries, Estonia, Latvia and Lithuania, are added to the panel (panel 8), for which econometric tests are performed for the periods running from 1994 to 2002, 1995 to 2002 and 1996 to 2002. Finally, the panel is enlarged to nine members with the inclusion of Croatia (panel 9) and is investigated for the periods 1995 to 2002, 1996 to 2002 and 1997 to 2002.

Seven specifications are estimated for each panel and for each time period. They are based upon the results of the time series analysis and are thus combinations of the variables found to be significant in the time series tests (see table 6). Note that each specification is estimated using the different productivity measures alternatively (PROD1, PROD2, PROD3, GDP), and for the CPI and the PPI-based real exchange rate. For panels including eight and nine countries, only PROD1 and PROD3 are used because of the lack of data. As discussed in section 5.2, 11 different econometric specifications are estimated,<sup>1)</sup> which leaves us with a total of 3,696 estimated equations.<sup>2)</sup>

Table 6

Estimated Panel Specifications						
	Y	X1	X2	X3	X4	X5
Eq1:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	FDEBT	OPEN
Eq2:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	FDEBT	GOV
Eq3:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	OPEN	GOV
Eq4:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	FDEBT		
Eq5:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	FDEBT	
Eq6:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	GOV	
Eq7:	RER_CPI	PROD1/PROD2/PROD3/GDP	RIR_CPI	REGD	OPEN	

Note: Y is the dependent variable; X is the explanatory variable.

1 Pooled OLS, fixed effect OLS and DOLS, PMGE and MGE based on three alternative lag structures.  
2 For each panel, 462 equations are estimated (3[periods] \* 2[CPI,PPI specification] \* 7[specifications as in table 10] \* 11[econometric specifications: pooled OLS, fixed effect OLS, DOLS [AIC, SIC, HQ], PMGE [AIC, SIC, HQ] MGE [AIC, SIC, HQ]]. For panel 5, four alternative measures for productivity are used whereas for panels 8 and 9, only two are used (462\*[4+2+2]).

After running the equations, Pedroni cointegration tests are applied to the residuals of the long-term relationship. In a score of cases, the cointegration tests find strong evidence for long-run relationships for specifications based on the CPI-based real exchange rate for all three panels. The productivity measures, whether they be PROD1, PROD2, PROD3 or GDP, are always negatively related to the real exchange rate, i.e. an increase in productivity leads to a real appreciation based on the CPI. And this holds true regardless of the time period, the number of countries included and the specification of the estimated equation.

Selected results based on panel DOLS estimates are shown in table 7 for panel 5. These reveal that the estimated coefficient for labor productivity is statistically significant and has the expected sign, irrespective of whether the CPI- or the PPI-based real exchange rate is employed. This strongly supports the view that for panel 5 the appreciation of the real exchange rate is to a large extent due to changes in tradable prices induced by productivity increases. The size of the coefficient seems to be systematically higher for the CPI-based real exchange rate when compared with that obtained for the PPI-based real exchange rate. Thus, productivity-induced service price inflation also contributes to real appreciation to some extent.

Generally speaking and based on the whole set of estimations, similarly to labor productivity, regulated prices are also found to contribute to real appreciation in all tested relationships. Moreover, an increase in openness most often leads to a real depreciation. The sign of foreign debt and government debt differs across specifications and applied methods. When foreign debt leads to a real appreciation, we do not consider this to be an equilibrium phenomenon. Rather, in the chosen time period the inflow of capital might have caused upward pressure on the exchange rate, and its negative impact on the exchange rate due to debt servicing will materialize only at a later point.

Table 7

**Selected Panel Estimates for Panel 5, DOLS**

	PROD	RIR	REG	FDEBT	OPEN	GOV	Cointegration test (p-value)		
							p5	p6	p7
<b>Equation 3</b>									
CPI, 1993–2002, PROD2 (1,1)	-0.6 (-6.14)	-0.004 (-4.73)	-0.07 (-2.02)		0.13 (2.35)	-1.27 (-7.64)	0.000	0.075	0.296
PPI, 1993–2002, PROD2 (1,1)	-0.38 (-4.78)	-0.003 (-4.54)	-0.06 (-2.08)		0.08 (1.82)	-0.65 (-4.49)	0.001	0.012	0.025
<b>Equation 5</b>									
CPI, 1993–2002, PROD 3 (1,1)	-0.47 (-4.00)	-0.001 (-2.29)	-0.17 (-4.13)	0.23 (3.40)			0.000	0.000	0.001
PPI, 1993–2002, PROD3 (1,1)	-0.22 (-4.02)	-0.002 (-2.70)	-0.11 (-2.90)	0.20 (3.18)			0.001	0.000	0.000
<b>Equation 6</b>									
CPI, 1995–2002, PROD1 (0,0)	-0.31 (-3.58)	-0.004 (-3.61)	-0.13 (-3.48)			-1.38 (-6.76)	0.001	0.040	0.091
PPI, 1995–2002, PROD1 (0,1)	-0.17 (-2.25)	-0.004 (-4.59)	-0.13 (-4.03)			-0.62 (-3.58)	0.001	0.003	0.013
<b>Equation 7</b>									
CPI, 1994–2002, PROD2 (0,0)	-0.84 (-7.19)	-0.004 (-3.93)	-0.12 (-2.65)		0.23 (3.52)		0.000	0.008	0.010
PPI, 1994–2002, PROD2 (1,1)	-0.46 (-4.46)	-0.004 (-2.36)	-0.17 (-2.19)		0.46 (2.26)		0.000	0.000	0.000

Note: PROD1 and PROD2 stand for labor productivity in industry measured by industrial production, PROD3 uses value added from national accounts. Leads and lags are shown in parentheses in column 1. Figures in columns 2 to 6 are estimated coefficients of the denoted variables in the tested relationship. t-statistics are in parentheses below the estimated coefficients. p5, p6 and p7 denote respectively the group rho-Statistics, the group PP-Statistics (nonparametric) and the group ADF-Statistics (parametric) proposed by Pedroni (1999).

### 6.3 Real Misalignments

On the basis of the estimated time series and panel equations, the second step of the analysis consists in determining the estimated equilibrium real exchange rate. This is done using three sets of values of the fundamentals: (1) actual values, (2) long-term values obtained by means of the Hodrick-Prescott filter with the smoothing parameter set at the standard 1600, and (3) those computed by means of a smoothing parameter of 100. The latter distinction is done to see to what extent radically different smoothing parameters can affect the fitted value. Having done this, in a next step the total real misalignment is computed as the difference between the estimated equilibrium and the observed real exchange rates. First, in a rather “benign neglect” way, the fitted values and the derived real misalignments are taken as such. Nonetheless, given that some of the series used in the estimations are indices, the question of the basis or reference year is to be addressed. Indeed, one needs to determine a year over the period under investigation during which the real exchange rate can be viewed as fairly valued. Judging from the external position of the countries, 1993 is taken as the reference year for the Czech Republic and Slovenia, whereas 1994 is chosen for Poland and Slovakia. For Hungary, two years, namely 1992 and 1997, are picked out. This enables us to check for the sensitivity of the base year assumption.

For the time series case, real misalignments could be determined only for the Czech Republic, Hungary and Poland because no useful specification was found for Slovakia and Slovenia. First, actual real misalignment is derived for the CPI-based real exchange rate on the basis of different econometric specifications as presented in section 6.1. Then, total real misalignment is computed by the substitution of the long-term values of the fundamentals that are calculated by means of two different HP filters. The results are reported in tables 8a to 8c.

In the Czech Republic, actual real misalignment is very close to total real misalignment; both indicate an overvaluation of the real exchange rate by up to 12% in the last quarter of 2002. Results derived based on the reference year 1993 show a higher overvaluation than when no reference year is used. But more strikingly, substantial differences exist for the same specification estimated on the basis of alternative econometric techniques. For instance, when the base year is set to 1993 and an HP filter with a smoothing parameter of 1600 (line 6, table 8a) is used, a difference of 6 percentage points can be observed between the lower end, i.e. 4.01% (DOLS with leads and lags being chosen with the Akaike information criterion), and the higher end, i.e. 10.29% (obtained using the EG approach). Even more astonishing is the fact that using DOLS with a different structure of leads and lags yields two real misalignment figures, the difference between which is as high as over 3 percentage points. This is something that can also be observed for Hungary and Poland.

In Hungary, actual real misalignment ranges from  $-10\%$  to  $+10\%$ . Nevertheless, what we are really interested in is total real misalignment. Although apparently sensitive to the choice of the reference year, total real misalignment figures clearly indicate an overvaluation of the Hungarian currency in the fourth quarter of 2002.

In Poland, the real exchange rate was overvalued according to figures shown in table 8c. The results appear relatively insensitive to the choice of the base year.

Table 8a

**Real Misalignments Based on Time Series**

**in the Fourth Quarter of 2002, Czech Republic**

Base year		EG	DOLS_SIC	DOLS_AIC	ARDL	JOH
Actual real misalignment in %						
None	ORIG	7.81	4.43	3.61	4.41	5.16
1993	ORIG	12.94	8.78	5.76	7.44	11.17
Total real misalignment in %						
None	HP1600	6.03	2.68	0.00	1.17	4.28
None	HP100	7.49	3.73	1.11	2.10	5.29
1993	HP1600	10.29	7.16	4.01	4.90	8.51
1993	HP100	11.35	7.13	3.92	5.61	9.63

Table 8b

**Real Misalignments Based on Time Series**

**in the Fourth Quarter of 2002, Hungary**

Base year		DOLS_SIC	DOLS_AIC	ARDL	JOH
Actual real misalignment in %					
None	ORIG	- 9.24	-11.43	- 6.03	- 1.58
1997	ORIG	- 0.01	- 1.77	2.26	2.65
1992	ORIG	7.54	5.49	7.87	10.45
Total real misalignment in %					
None	HP1600	7.94	6.23	5.94	10.64
None	HP100	4.27	2.10	4.38	7.47
1997	HP1600	5.53	3.82	6.01	7.66
1997	HP100	2.52	0.57	4.57	5.09
1992	HP1600	19.33	17.90	16.22	20.82
1992	HP100	17.70	16.04	16.25	19.51

Table 8c

**Real Misalignments Based on Time Series**

**in the Fourth Quarter of 2002, Poland**

Base year		DOLS_SIC	DOLS_AIC	ARDL	JOH
Actual real misalignment in %					
None	ORIG	10.82	13.43	17.31	4.83
1994	ORIG	18.47	22.29	25.91	12.44
Total real misalignment in %					
None	HP1600	8.77	13.86	10.82	9.71
None	HP100	12.65	16.97	17.94	9.93
1994	HP1600	10.72	15.84	12.49	11.24
1994	HP100	14.81	19.25	19.91	11.67

Table 8d

**Summary of Real Misalignments in the Fourth Quarter of 2002**

	Czech Republic	Hungary	Poland
Number of observations	20	24	16
%			
Mean	5.32	9.52	13.54
Confidence interval (CI)	1.39	2.60	1.73
Mean - CI	3.93	6.92	11.80
Mean + CI	6.70	12.12	15.27
Jarque-Bera (p-value)	0.727	0.264	0.51

Note: ORIG signifies use of the original data series.

To sum up the extent of a possible overvaluation of the currencies, table 8d provides some descriptive statistics for the fourth quarter of 2002, namely the means, confidence intervals, mean  $\pm$  confidence intervals, and Jarque-Bera normality tests for total real misalignment. The use of confidence intervals makes sense only if the sample follows normal distribution. The mean of the overvaluation is between 4% to 7% in the Czech Republic, amounts to 7% to 12% in Hungary and ranges from about 12% to 15% in Poland.

A similar exercise is conducted for the panel setting. At the point of departure, we have nearly 2,000 estimated equations for the CPI-based real exchange rate, which are based on (1) the specifications of table 8, (2) the alternative productivity measures, (3) different panel estimation techniques, (4) the three panels, i.e. panel 5, panel 8 and panel 9, and (5) different time periods for each panel (see footnote 2 on page 128). Of these nearly 2,000 equations, those that fulfilled the two criteria (1) the panel cointegration tests reject the null of the absence of cointegration, and (2) all coefficients are statistically significant were chosen. Of the nearly 2,000 equations estimated, only a fraction appears to meet these selection criteria. We made sure that equations from panel 5, panel 8 and panel 9 are represented equally in the sample, leaving us approximately 80 equations. We used the selected equations to compute the actual and total real misalignments for the five acceding countries.

The observed series and the long-term values obtained by means of the two HP filters are substituted into the estimated equation. For each country, the simple fitted values and the reference year are used. As a result, six sets of real misalignments, each composed of roughly 80 observations, are derived for each country. Given the use of two different reference years, nine samples are derived for Hungary. Note that if an increase in foreign debt is found to cause an appreciation of the real exchange rate, foreign debt is not considered for the derivation of the real misalignment any longer (its coefficient is set to 0). The real interest differential is not considered when deriving actual and total real misalignment.

According to the Jarque-Bera tests shown in table 9, the Czech, Slovak and Slovene samples are all normally distributed. When no reference year is used, the mean of real overvaluation ranges from 17% to 27% for the Czech Republic for the last quarter of 2002. Note that results differ slightly depending on whether actual or long-term values of fundamentals (obtained using the HP filter) are used. However, when the reference year is set to 1993, the range of real overvaluation shifts upwards to 29% to 33%. Also, the range diminishes from about 10 percentage points to 4.5 percentage points, and the results appear neutral both for actual and total real misalignments. Similarly, sizeable overvaluation is detected for Slovakia. In the absence of a reference year, the real overvaluation lies between 20% and 30% and narrows to 24% to 31% when 1994 is employed as a base year.

In contrast to the Czech Republic and Slovakia, real undervaluation is found for Slovenia, the mean of which varies from 1% to 6.5% without a reference year and from 6.5% to 12% with the base year set to 1993, and this for the last quarter of 2002.

For Hungary, the confidence interval around the mean does not indicate a clear undervaluation or overvaluation without a reference year or with 1997

Table 9

**Real Misalignments against the Euro, Panel Estimates**

**Fourth Quarter of 2002**

	ACTUAL			TOTAL		
	ORIG	HP1600	HP100	ORIG_BY	HP1600_BY	HP100_BY
Number of observations	83	83	83	83	83	83
<b>Czech Republic</b>						
Reference year	—	—	—	1993	1993	1993
Mean in %	18.43	24.95	24.23	30.42	31.19	31.10
Confidence interval (CI) in %	2.10	1.71	1.62	1.58	1.78	1.58
Mean – CI in %	16.33	23.24	22.61	28.84	29.41	29.52
Mean + CI in %	20.53	26.66	25.85	32.00	32.97	32.68
Jarque-Bera (p-value)	0.295	0.185	0.314	0.394	0.185	0.346
<b>Hungary</b>						
Reference year	—	—	—	1997	1997	1997
Mean in %	5.34	– 2.19	– 1.18	– 2.94	– 2.42	– 1.52
Confidence interval (CI) in %	2.63	2.54	2.59	3.00	2.68	2.81
Mean – CI in %	2.71	– 4.73	– 3.76	– 5.93	– 5.10	– 4.33
Mean + CI in %	7.97	0.35	1.41	0.06	0.25	1.28
Jarque-Bera (p-value)	0.831	0.002	0	0.127	0.043	0.041
Reference year	—	—	—	1992	1992	1992
Mean in %	—	—	—	– 7.94	– 6.97	– 6.19
Confidence interval (CI) in %	—	—	—	3.12	2.85	2.95
Mean – CI in %	—	—	—	–11.07	– 9.82	– 9.14
Mean + CI in %	—	—	—	– 4.82	– 4.12	– 3.25
Jarque-Bera (p-value)	—	—	—	0.001	0	0
<b>Poland</b>						
Reference year	—	—	—	1994	1994	1994
Mean in %	3.30	3.87	4.94	6.03	4.78	5.53
Confidence interval (CI) in %	2.17	1.66	1.69	1.84	1.70	1.82
Mean – CI in %	1.13	2.21	3.25	4.19	3.08	3.71
Mean + CI in %	5.47	5.53	6.62	7.88	6.48	7.34
Jarque-Bera (p-value)	0.026	0.009	0.003	0.022	0.05	0.031
<b>Slovakia</b>						
Reference year	—	—	—	1994	1994	1994
Mean in %	23.38	26.73	25.91	26.43	27.64	27.20
Confidence interval (CI) in %	3.35	3.29	3.16	3.04	3.25	3.15
Mean – CI in %	20.03	23.44	22.75	23.39	24.39	24.06
Mean + CI in %	26.73	30.02	29.08	29.47	30.89	30.35
Jarque-Bera (p-value)	0.0949	0.3867	0.6137	0.622	0.503	0.5971
<b>Slovenia</b>						
Reference year	—	—	—	1993	1993	1993
Mean in %	– 3.87	– 2.36	– 2.73	–10.00	– 8.66	–10.19
Confidence interval (CI) in %	2.59	1.88	1.85	2.30	2.16	2.24
Mean – CI in %	– 6.47	– 4.23	– 4.59	–12.29	–10.82	–12.44
Mean + CI in %	– 1.28	– 0.48	– 0.88	– 7.70	– 6.50	– 7.95
Jarque-Bera (p-value)	0.905	0.155	0.174	0.205	0.118	0.09

Note: Negative (positive) figures represent an undervaluation (overvaluation). Confidence intervals are at the 5% significance level. ACTUAL is actual misalignment; TOTAL is total misalignment. BY is the base year.

being the base year. In the former case, real misalignment ranges from a 4.7% undervaluation to an 8% overvaluation, whereas in the latter case, the range is – 6% to +1%. However, the use of 1992 as a reference year shifts the extent of real misalignment towards an undervaluation of –11% to –3%. But none of the total real misalignment samples and actual real misalignment when 1992 is used as a base year turn out to be normally distributed. Hence, the corresponding confidence intervals are difficult to be interpreted.

As for Poland, the means of the distributions indicate a slight overvaluation in the last quarter of 2002. Note that the results seem to be affected little by the reference year. The overvaluation around the sample mean amounts to 1% to 8%. Nevertheless, and once again, normality cannot be rejected at the 5% level only when the HP filter with a smoothing parameter of 1600 and the reference

year 1994 are used. In this case, the confidence interval indicates an overvaluation of 3% to 6.5%.

It is noteworthy that the results for the Czech Republic and Hungary are different from those obtained using time series estimates. As a matter of fact, panel results indicate an overvaluation of 17% to 33% whereas time series estimates yield an overvaluation of 4% to 7% for the Czech Republic. While panel estimates are indecisive regarding the direction of a possible real misalignment, time series estimates suggest a clear overvaluation of 7% to 12% for Hungary.

This outcome may come about because panel estimates represent average long-term coefficients for the panel members, and factors that could not be established to have systematically affected the real exchange rate for the time series case can turn out to be important, on average, for the panel. To put it another way, country-specific variables could be dampened, and at the same time, factors not important to individual countries may be emphasized (either by including new variables or by using differently sized coefficients) within the panel framework.

Regulated prices are a case in point. Based on time series techniques, the differential in regulated prices is not included in the estimated relationship for Hungary and Poland. Nonetheless, regulated prices are always significant in the panel setting. Therefore, they are used to derive values of the equilibrium real exchange rate for all countries and thus affect the size of the real misalignment.

## 7 Conclusion

The issue of equilibrium exchange rates has produced a large echo in recent times. The new EU Member States can be expected to enter ERM II some time after EU accession, but not necessarily upon accession. For entering ERM II, an appropriate central parity should be set for which the equilibrium exchange rate could serve as a yardstick.

In this article, an attempt was made to compare estimates of the equilibrium real exchange rates of five acceding countries of Central Europe. In the choice and in the interpretation of the tested relationships, special attention was paid to the appreciation of the real exchange rate based on tradable prices. We developed a theoretical framework which provides a formal explanation for this. During the catching-up process and phases of higher growth, improvement in supply capacities and in the quality and reputation of goods produced in the home economy may result in a trend increase of both the CPI- and PPI-deflated real exchange rates, in addition to the traditional source of trend appreciation, namely productivity-fueled increases in market-based service prices (B-S effect).

Our results support the idea that the equilibrium appreciation of the real exchange rate in the transition economies is based not only on higher service prices, but also on higher prices of domestically produced tradable goods. Taking labor productivity in industry or in the overall economy as a proxy for increasing supply capacities, econometric tests show that labor productivity is found to be the most stable determinant not only of the overall inflation-based real exchange rate but also of the real exchange rate measured in terms of tradable prices, proxied by PPI.

A score of time series and panel cointegration techniques as employed to assess real exchange rate determination for the Czech Republic, Hungary, Poland, Slovakia and Slovenia. For time series estimates, it is possible to find long-term relationships between fundamentals and the real exchange rate vis-à-vis Germany for the Czech Republic, Hungary and Poland. Nonetheless, alternative measures for labor productivity are found to perform differently across countries and cannot be taken as equivalent to one another. Also, beside labor productivity, the included variables differ considerably across the three countries. In contrast to the aforesaid three economies, it is a very hard task to find any economically sound long-term relationships for Slovakia and Slovenia. These two countries could be considered economies for which it is difficult to establish the role of fundamentals in real exchange rate determination.

Going beyond the verification of the theoretical model, the size of total real misalignments is derived on the basis of time series estimates obtained on the basis of time series spanning the period from 1993 or 1994 to 2002. Total real misalignments turn out to be sensitive to the econometric technique and the base year assumption in particular in Hungary. For all three countries, the results indicate a real overvaluation vis-à-vis the euro in the last quarter of 2002: by 4% to 7% for the Czech Republic, 7% to 12% for Hungary and 12% to 15% for Poland.<sup>1)</sup>

Panel estimates based on different estimation techniques, panel sizes and model specifications leave us with a number of real misalignments that indicate an overvaluation of 16% to 30% for the Czech Republic, of 20% to 30% for Slovakia and of 1% to 8% for Poland in the last quarter of 2002. An undervaluation ranging from 1% to 12% is found for Slovenia, and real misalignments are between -5% (undervaluation) to +8% (overvaluation) for Hungary for the fourth quarter of 2002.

The conflicting results between time series and panel estimates regarding the size (Czech Republic and Poland) or partly even the direction of the real misalignment (Hungary) may be due to the fact that country-specific factors may be crucial, and their neglect in the panel framework can substantially change the derived real misalignment. Moreover, differences are also marked when comparing the results of different econometric methods or time periods.

To conclude, estimates of the equilibrium real exchange rates and the underlying real misalignments are fairly sensitive to the chosen econometric method, period and model specification and to differences in the included variables. Therefore, further research is needed to systematically evaluate the sources of different results. In particular, medium-size and large panels are needed, as is a structural model-based assessment.

*1 It should be noted that the real misalignment figures obtained for the last quarter of 2002 cannot be applied compared with the real and nominal exchange rates that currently prevail because both the prices and the nominal exchange rate (the real exchange rate) and the underlying fundamentals may have changed in a way that makes past misalignments difficult to interpret today.*

## References

- Aglietta, M., C. Baulant and V. Coudert. 1999.** Compétitivité et régime de change en Europe centrale. *Revue économique* 50(6). 1221–1236.
- Aglietta, M., C. Baulant and S. Moatti. 2003.** Les PECO devant la tentation de l'euro. *Economie internationale* 93. 1<sup>er</sup> trimestre. 11–36.
- Baltagi, B. H. and C. Kao. 2000.** Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey. In: Baltagi, B. H. (ed.): *Nonstationary Panels, Panel Cointegration and Dynamic Panels*. *Advances in Econometrics* 15. Elsevier Science. 7–51.
- Banerjee, A. 1999.** Panel Data Unit Root Tests and Cointegration: An Overview. *Oxford Bulletin of Economics and Statistics* 61. Supplement 1. 607–629.
- Benacek, V., L. Prokop and J. A. Visek. 2003.** Determining factors of the Czech foreign trade balance: Structural issues in trade creation. *Czech National Bank Working Paper* 3.
- Beblavy, M. 2002.** Exchange Rate and Exchange Rate Regime in Slovakia: Recent Developments. *ICEGEC Working Paper* 5. Budapest.
- Campos, N. and F. Coricelli. 2002.** Growth in Transition: What we know, what we don't and what we should. *Journal of Economic Literature* 40(3). 793–836.
- Capriolo, G. and V. Lavrac. 2003.** Monetary and exchange rate policies in Slovenia. *Ezoneplus Working paper* 17G (Working paper 17 Supplement).
- Clark, P. and R. MacDonald. 1998.** Exchange Rates and Economic Fundamentals: A Methodological Comparison of BEERs and FEERs. *IMF Working Paper* 67. May. Washington D.C.
- Crespo-Cuaresma, J., J. Fidrmuc and R. MacDonald. 2003.** The Monetary Approach to Exchange Rates: Panel Data Evidence for Selected CEECs. *Focus on Transition*. Vienna: Oesterreichische Nationalbank (2). 138–151.
- Csajbók, A. 2003.** The Equilibrium Real Exchange Rate in Hungary: Results from Alternative Approaches. Paper presented at the 2<sup>nd</sup> Workshop on Macroeconomic Policy Research. Magyar Nemzeti Bank. October 2–3, 2003.
- Detken, C., A. Dieppe, J. Henry, C. Marin and F. Smets. 2002.** Model Uncertainty and the Equilibrium Value of the Real Effective Euro Exchange Rate. *ECB Working Paper* 160. July.
- Darvas, Z. and M. Sass. 2002.** Changes in Hungarian Foreign Trade and Trade Balance with the European Union. In: Pavlos Karadeloglou (ed.). *Enlarging the EU: The Trade Balance Effect*. Hampshire, England: Palgrave Macmillan Publisher. 51–88.
- Dulleck, U., N. Foster, R. Stehrer and J. Wörz. 2003.** Dimension of Quality Upgrading. Evidence for CEECs. *University of Vienna Department of Economics Working Paper* 14.
- Égert, B. 2003a.** Assessing Equilibrium Exchange Rates in CEE Acceding Countries: Can We Have DEER with BEER without FEER? A Critical Survey of the Literature. *Focus on Transition*. Vienna: Oesterreichische Nationalbank (2). 40–107.
- Égert, B. 2003b.** Nominal and Real Convergence in Estonia: The Balassa-Samuelson (Dis)Connection – Tradable Goods, Regulated Prices and Other Culprits. *Bank of Estonia Working Paper* 4.
- Halpern, L. and C. Wyplosz. 1997.** Equilibrium Exchange Rates in Transition Countries. *IMF Staff Papers* 44(4). 430–461.
- Im, K. S., M. H. Pesaran and Y. Shin. 2003.** Testing for unit roots in heterogeneous panels. *Journal of Econometrics* 115(1). 53–74.
- Krajnyák, K. and J. Zettelmeyer. 1998.** Competitiveness in Transition Economies: What Scope for Real Appreciation? *IMF Staff Papers* 45(2). 309–362.
- MacDonald, R. 1997.** What Determines Real Exchange Rates? The Long and Short of It. *IMF Working Paper* 21. January. Washington D.C.
- MacKinnon, J. G. 1996.** Numerical Distribution Functions for Unit Root and Cointegration Tests. *Journal of Applied Econometrics* 11(6). 601–618.

- Pedroni, P. 1999.** Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics* 61. Supplement 1. 653–670.
- Pesaran, M. H., Y. Shin and R. J. Smith. 2001.** Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 16(3). 289–326.
- Rosati, D. 1994.** Output decline during transition. *Economics of Transition* 2(4). 419–441.
- Rosati, D. 1996.** Exchange rate policies during transition from plan to market. *Economics of Transition* 4(1). 159–186.
- Sgard, J. 2001.** Direct foreign investments and productivity growth in Hungarian firms, 1992–1999. CEPII Working Paper 19. December.
- Stock, J. and M. W. Watson. 1993.** A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica* 61(4). 783–820.

# The Monetary Approach to Exchange Rates: Panel Data Evidence for Selected CEECs

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## 1 Introduction

Applied research on the economics of exchange rates experienced a revival during the 1990s partly because the new panel nonstationary methods provided a more efficient research method than e.g. time series analyses. One key area of application involved testing the purchasing power parity hypothesis using nonstationary panel methods (see for example Frankel and Rose, 1995, and MacDonald, 1996). In this paper, we use various panel cointegration estimators to estimate a variant of the monetary model of the exchange rate using data from six transition countries (the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia). We extend the basic monetary model to capture the Balassa-Samuelson (B-S) effect, which is generally found to play an important role in transition countries (see for example MacDonald and Wójcik, 2003). Furthermore, we take into account the fulfillment of the uncovered interest parity condition in transition economies, since these countries were characterized by important capital market imperfections during our sample period.

Among our conclusions are the following: We show that the augmented monetary model provides a good description of nominal exchange rate trends and find a significant B-S effect; although deviations from the uncovered interest parity are also significant, we document that the size of this effect is rather small.

Finally, we consider the issue of the integration of selected transition countries into Economic and Monetary Union (EMU). Fidrmuc and Korhonen (2003) and Fidrmuc (2004) show that the euro area and the CEECs can be increasingly considered an optimum currency area. Furthermore, Kočenda (2001) and Kutan and Yigit (2003) demonstrate increasing similarities in the real and monetary developments between the euro area and the CEECs.

The paper is structured as follows. The next section introduces the monetary model of the exchange rate, augmented with a B-S effect. Section 3 describes our panel data set, while section 4 contains a set of unit root tests. Section 5 presents several estimates of the monetary model. Section 6 concludes.

## 2 The Monetary Model of the Exchange Rate

The monetary model of the exchange rate has become something of a work-horse in the exchange rate literature. Empirical analyses are usually based on a reduced form generated from an ad hoc framework comprising money demand functions in the home and foreign country. Although this approach has been criticized, we nonetheless follow it here, since it produces a reduced form which is very similar to that derived in an optimizing framework (such as that of Lucas, 1982).

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The monetary model is usually presented as a two-country, two-money, two-bond (where the bonds are assumed to be perfect substitutes) model in which all goods are tradable and the law of one price (LOOP) holds. Money demand relationships are given by standard Cagan-style log-linear relationships:

$$m_t^D - p_t = \beta_0 y_t - \beta_1 i_t, \quad (1)$$

$$m_t^{D*} - p_t^* = \beta_0 y_t^* - \beta_1 i_t^*, \quad (1')$$

where  $\beta_0, \beta_1 > 0$ ,  $m^D$  denotes money demand,  $p$  denotes the price level,  $y$  is output,  $i$  the interest rate, lowercase letters indicate that a variable has been transformed into natural logarithms (apart from the interest rate), and an asterisk denotes a foreign magnitude. For simplicity, we assume that the income elasticity,  $\beta_0$ , and the interest semielasticity,  $\beta_1$ , are equal across countries. If it is additionally assumed that money market equilibrium holds continuously in each country:

$$\begin{aligned} m_t^D &= m_t^s = m_t, \\ m_t^{D*} &= m_t^{s*} = m_t^{s*}, \end{aligned}$$

then using these conditions in (1), and rearranging for relative prices, we obtain

$$p_t - p_t^* = m_t - m_t^* - \beta_0(y_t - y_t^*) + \beta_1(i_t - i_t^*). \quad (2)$$

On further assuming that the purchasing power parity (PPP) theory or LOOP holds for relative prices, we obtain a baseline monetary equation as

$$s_t = m_t - m_t^* - \beta_0(y_t - y_t^*) + \beta_1(i_t - i_t^*). \quad (3)$$

In words, the nominal exchange rate,  $s$ , is driven by the relative excess supply of money. Holding money demand variables constant, an increase in the domestic money supply relative to its foreign counterpart produces an equi-proportionate depreciation of the currency. Changes in output levels or interest rates have an effect on the exchange rate indirectly through their effect on the demand for money. Thus, for example, an increase in domestic income relative to foreign income, *ceteris paribus*, produces a currency appreciation, while an increase in the domestic interest rate relative to the foreign rate generates a depreciation.

However, the PPP assumption necessary to derive (3) is clearly not tenable given the extant empirical evidence, which suggests that the mean reversion of real exchange rates is too slow to be consistent with PPP (see, for example, Froot and Rogoff, 1995, and MacDonald, 1995). One important explanation for the persistence in real exchange rates is the existence of real factors, such as the B-S effect, which drive the nominal exchange rate away from its PPP-defined level. Indeed, MacDonald and Ricci (2001) have demonstrated the importance of this effect in explaining the persistence of the real exchange rates of a group of industrialized countries. Since such real effects are likely to be at least as important for the current group of accession countries, we incorporate a B-S effect into the monetary equation.

Following Clements and Frenkel (1980), a B-S effect may be incorporated into the monetary equation in the following way. Assume that overall prices

in the home and foreign country are a weighted average of the price of traded and nontraded prices:

$$p_t = \alpha p_t^T + (1 - \alpha) p_t^{NT} \quad (4)$$

$$p_t^* = \alpha p_t^{T*} + (1 - \alpha) p_t^{NT*} \quad (4')$$

where  $p$  now represents overall prices, incorporating both traded and non-traded components,  $p^T$  represents the price of traded goods,  $p^{NT}$  is the price of nontraded goods and  $\alpha$  denotes the weight (for simplicity we assume the same weights in both countries). Consider the definition of the real exchange rate (LOOP holds in the tradable sector), defined with respect to overall prices (i.e. the CPI):

$$q_t \equiv s_t - p_t + p_t^*, \quad (5)$$

where  $q$  is the real exchange rate. We define a similar relationship for the price of traded goods as:

$$q_t^T \equiv s_t - p_t^T + p_t^{T*}. \quad (6)$$

Using (4), (5) and (6), the following expression may be obtained for the real exchange rate

$$q_t = q_t^T - (1 - \alpha)[(p_t^{NT} - p_t^T) - (p_t^{NT*} - p_t^{T*})]. \quad (7)$$

Using expression (7) in (2), we may obtain the following equation,

$$s_t = m_t - m_t^* - \beta_0(y_t - y_t^*) + (\beta_1(i_t - i_t^*) - (1 - \alpha)[(p_t^{NT} - p_t^T) - (p_t^{NT*} - p_t^{T*})]). \quad (8)$$

where the nominal exchange rate is predicted to appreciate as the relative price of nontraded to traded goods rises.

### 3 Data Description

Although we have access to monthly data for the period January 1993 to December 2002, our analyses will concentrate on the subperiod September 1994 to March 2002. This allows us to estimate the monetary model with panel cointegration methods and a balanced sample.<sup>1)</sup>

We have included six Central and Eastern European countries in our data sample: the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia.<sup>2)</sup> It is important to bear in mind that several of the countries in our panel moved from adjustable pegged exchange rates to a managed or free-floating regime during the sample period, so that our sample period does not represent a homogeneous exchange rate regime. The official changes took place in 1997 in the Czech Republic, in 1998 in Slovakia and in 2000 in Poland. In all these cases, however, the official change followed after previously widening the fluctuation bands to up to  $\pm 15\%$ . The introduction of floating exchange rates was necessitated by currency crises in the Czech Republic (see Horvath and

1 Estimations with the longer, unbalanced sample were used to check the robustness of the parameter estimates to the inclusion of earlier transition periods. Although the parameters remain in the range of those presented for the balanced sample, for some countries the use of the sample back to 1993 affects the conclusions on the current position of the nominal exchange rate with respect to the equilibrium rate.

2 Although we have data on all ten accession countries, in this paper we focus on countries with relatively flexible exchange rate regimes.

Jonas, 1998) and Slovakia. However, the time series on nominal exchange rates do not seem to display a structural break related to the exchange rate regime change, although the variance of several variables was higher around periods of currency crises in the case of the Czech Republic and Slovakia.

While the exchange rate regimes of our group of CEECs were relatively flexible during the whole period, Hungary followed a narrow-band crawling peg system up to May 2001 (that is, during the whole analyzed period). Therefore, it could be argued that Hungary should be excluded from our data sample. However, our robustness analyses do not indicate that this is necessary.

The variables in our data set comprise the nominal exchange rate vis-à-vis the euro (expressed as local currency units per euro), the money stock (M2) and industrial production. Furthermore, we include deposit interest rates and the ratio of consumer prices to producer prices to capture the deviations from the uncovered interest parity and the B-S effect, respectively. All conditioning variables are defined as deviations from the corresponding variables for the euro area.<sup>1)</sup> In instances where we introduce time dummies into our models, the euro numeraire is of course removed. All variables except interest rates (see the definition of interest rates below) were indexed as 100 to the base year 1995 and are converted into logs. As far as possible, data on the CEECs are taken from the IMF's International Financial Statistics. This database is complemented by national sources and publications of The Vienna Institute for International Economic Studies (WIIW).

An extended time series for the euro was obtained by using the so-called synthetic euro, that is, the ECU excluding the currencies of those countries which did not introduce the euro in 1999 (or 2000 in the case of Greece): Denmark, Sweden and the U.K. Given this definition, there should be no structural break in 1999 for any of the countries.

Nominal exchange rates in our group of CEECs fluctuated significantly during the sample period. In general, the currencies of CEECs depreciated during the first part of the sample, and we can see a stabilization of nominal exchange rates (with the exception of Romania and Slovenia) in some countries around 1998. Thereafter, nominal exchange rates started to appreciate in the Czech Republic (in 2000), Hungary (2001), Poland (2001) and Slovakia (2002).

#### 4 Panel Unit Root Tests

Given the long-run positive inflation differential between the euro area and the CEECs, we would expect all nominal variables to display a clear trend pattern. A similar feature is expected for industrial production, given the real convergence of CEECs to the EU's income level. Standard unit root tests for single time series confirm that the majority of the individual time series are I(1) processes.<sup>2)</sup> As is now well known, adding a cross-sectional dimension to unit root tests can potentially improve the quality of these tests significantly by increasing their power.<sup>3)</sup> Furthermore, an important contribution of panel unit root tests

1 We used data for Germany as a proxy for the euro area as well. The results, which are available from the authors on request, do not substantially differ from presented results.

2 The results of the Augmented Dickey-Fuller test (ADF test) and the test according to Kwiatkowski et al. (1992) are available from the authors on request.

3 Baltagi and Kao (2000) and Banerjee (1999) provide detailed surveys of panel unit root tests.

is that the resulting test output can be normalized to statistics that have limiting standard normal distributions. According to Baltagi and Kao (2000), this phenomenon is due to the fact that individual data units along the cross-sectional dimension can act as repeated draws from the same distribution.

Quah (1992 and 1994) and Levin and Lin (1992 and 1993) have significantly influenced the discussion of panel unit root tests for a panel of individuals  $i = 1, \dots, N$ , where each individual contains  $t = 1, \dots, T$  time series observations. Quah (1992) proposed a panel version of the Dickey-Fuller test (DF test) without fixed effects.<sup>1</sup> Levin and Lin extended this test for fixed effects, individual deterministic trends and serially correlated errors. The resulting test is a panel version of the DF test

$$\Delta y_{i,t} = \rho y_{i,t-1} + \alpha_{mi} d_{mt} + \varepsilon_{i,t}, \quad (9)$$

where  $d_m$  stands for the set of deterministic variables (fixed effects or joint intercept, individual deterministic trends and time dummies) with coefficient vectors  $\alpha_m$ . Levin and Lin show that their test statistic ( $t$ -statistic) converges to standard normal distribution as  $T \rightarrow \infty$ , and  $N \rightarrow \infty$  with  $N/T \rightarrow 0$ . However, it was found that the asymptotic mean and variance of the unit root test statistic vary under different specifications of the regression equation. Therefore, the majority of applications (see for example Kočenda, 2001) used Monte Carlo simulations to compute critical values which corresponded fully to the analyzed panels. This also represented an important limit to general empirical applications.

Based on this criticism, Levin et al. (2002) proposed a new test (Levin, Lin and Chu, or LLC test) based on orthogonalized residuals and the correction by the ratio of the long-run to the short-run variance of  $y$ . The calculation of the LLC test involves three steps. In the first step, two regressions are run to generate orthogonalized residuals

$$\Delta y_{i,t} = \sum_{l=1}^{P_i} \pi_{1,il} \Delta y_{i,t-l} + \alpha_{1,mi} d_{mt} + e_{i,t}, \quad (10a)$$

$$y_{i,t} = \sum_{l=1}^{P_i} \pi_{2,il} \Delta y_{i,t-l} + \alpha_{2,mi} d_{mt} + v_{i,t}, \quad (10b)$$

where  $d_m$  again stands for the set of deterministic variables with coefficient vectors  $\alpha_1$  and  $\alpha_2$  in the specifications (10a) and (10b), respectively. The lag order  $P_i$ , which may be different for individual cross-section units, is specified in individual ADF regressions

$$\Delta y_{i,t} = \delta_i y_{i,t-1} + \sum_{l=1}^{P_i} \theta_{il} \Delta y_{i,t-l} + \alpha_{mi} d_{mt} + \varepsilon_{i,t}. \quad (11)$$

The residuals from regressions (10a) and (10b) have to be normalized by regression standard errors estimated for (11) to control for heterogeneity

<sup>1</sup> This model specification corresponds fully to income convergence to the group's average analyzed in Quah's application. The test proposed by Quah (1992), however, is meant to be used in what he calls "data fields," that is, panels with large  $N$  and large  $T$ .

between the panel units. These adjusted residuals, denoted by  $\tilde{\varepsilon}$  and  $\tilde{v}$ , are finally used to estimate the panel  $t$ -statistic as

$$\tilde{\varepsilon}_{i,t} = \delta \tilde{v}_{i,t-1} + \hat{\varepsilon}_{i,t}. \quad (12)$$

The conventional  $t$ -statistic for the coefficient  $\delta$  has a standard normal limiting distribution if the underlying model does not include fixed effects and individual trends. Otherwise, this statistic has to be corrected using the first and second moments tabulated by Levin et al. and the ratio of the long-run variance to the short-run variance, which accounts for the nuisance parameters present in the specification. The limiting distribution of this corrected statistic is normal as  $N \rightarrow \infty$  and  $T \rightarrow \infty$ , while  $\sqrt{N}/T \rightarrow 0$  or  $N/T \rightarrow 0$ , depending on specified models. Furthermore, the Monte Carlo simulation shows that the test is appropriate also for panels of moderate size ( $N$  between 10 and 250 individuals and  $T$  between 25 and 250 periods), which are close to our panel.

The generality of the Levin-Lin type tests has made them a widely accepted panel unit root test. However, Levin and Lin have an important homogeneity restriction in their tests, namely the null assumes that  $\rho_i = \rho = 0$  against the alternative  $\rho_i < 0$  for all individual units  $i$ . As far as this result also reflects the possible speed of convergence, the Levin and Lin type tests are likely to reject the panel unit root.

Im et al. (2003) address this homogeneity issue, proposing a heterogeneous panel unit root test (*IPS* test) based on individual *ADF* tests. They propose average *ADF* statistics for fixed  $T$ , which is referred to as the  $\tilde{t}$ -bar statistic,

$$\tilde{t} - bar_{NT} = \frac{1}{N} \sum_{i=1}^N \tilde{t}_{iT}. \quad (13)$$

Furthermore, they show that this statistic can be normalized by tabulating the first two moments of the distribution of  $\tilde{t}$ . The resulting standardized  $\tilde{t}$ -bar statistic, denoted by  $Z_{\tilde{t}bar}$ , has  $N(0,1)$  distribution as  $T \rightarrow \infty$  followed by  $N \rightarrow \infty$ . By construction of the heterogeneous panel unit root test, the rejection of the null of the panel unit root does not necessarily imply that the unit root is rejected for all cross-sectional units, but only for a positive share of the sample. The *IPS* test does not provide any guidance on the size of this subgroup.

Finally, Hadri (2000) presents an extension of the test of Kwiatkowski et al. (1992), the KPSS (Kwiatkowski-Phillips-Schmidt-Shin), to a panel with individual and time effects and deterministic trends (PKPSS test), which has as its null the stationarity of the series. Similarly to the time-series framework, the PKPSS test is based on a decomposition of cross-sectional series into the following components (for simplicity, we exclude the deterministic trend from the discussion here)

$$y_{it} = r_{it} + \varepsilon_{it}, \quad (14)$$

where the first term

$$r_{it} = r_{it-1} + u_{it}, \quad (15)$$

is a random walk for cross-sectional units that is reduced to fixed effects under the null of stationarity. This implies that  $\sigma_{ui} = 0$  under the null of stationarity.

Following Kwiatkowski et al. (1992), Hadri defines a Lagrange multiplier test (LM),

$$LM = \frac{\frac{1}{N} \sum_{i=1}^N \frac{1}{T^2} \sum_{t=1}^T S_{it}^2}{\hat{\sigma}_\varepsilon}, \quad (16)$$

where  $S_i$  is defined as the partial sum of the residuals in a regression of  $y$  on fixed effects.

$$S_{it} = \sum_{j=1}^t e_{ij} \text{ and } t = 1, 2, \dots, T. \quad (17)$$

The denominator of the LM statistic is the long-run variance of the residuals,  $\varepsilon_{it}$ . If residuals display no serial correlation, the long-run variance can be estimated simply by the variance of the residuals from the KPSS equation. However, the long-run variance has to be estimated separately in the more common cases of serial correlation using a number (which can also be determined endogenously) of covariances of the residuals and their weights. Unfortunately, the outcome of the KPSS test may be relatively sensitive to this lag truncation. As in the previous tests, the panel version of the KPSS test can be normalized to  $N(0,1)$  as  $T \rightarrow \infty$  and  $N \rightarrow \infty$ .

In general, our estimates of the panel unit root tests confirm that the variables contain a unit root (see table 1). The panel version of the KPSS is perhaps most clear-cut on this issue, as it rejects the null of stationarity for exchange rates, money supply, real industrial production and the CPI-to-PPI ratio. A similar result applies to the IPS (Im-Pesaran-Shin) test, although there is some evidence with this test that the money supply is stationary when time dummies are not included. However, their inclusion would seem to be important for our sample, given the importance of events like the Russian crisis.<sup>1)</sup> Although the LLC test produces a rejection of the unit root hypothesis for exchange rates and M2, as we have pointed out, the homogeneity assumption of this test means that its small sample properties are not as appealing as those of the other tests, and we therefore conclude that our variables are  $I(1)$ .

Table 1

<b>Panel Unit Root Tests, September 1994 to March 2002</b>					
	Exchange Rate	Money (M2)	Industrial Production	Interest Rates	Price Ratio (CPI to PPI)
IPS test	- 0.928	- 7.092 <sup>3)</sup>	- 0.116	-0.131	0.608
IPS <sup>TD</sup> test	0.595	- 1.535	- 0.367	-5.252 <sup>3)</sup>	- 1.506 <sup>1)</sup>
LLC test	- 2.512 <sup>3)</sup>	- 7.516 <sup>3)</sup>	- 0.189	0.361	- 0.625
LLC <sup>TD</sup> test	- 3.187 <sup>3)</sup>	- 3.360 <sup>3)</sup>	- 0.354	-2.742 <sup>3)</sup>	- 0.153
PKPSS test	14.301 <sup>3)</sup>	18.513 <sup>3)</sup>	10.361 <sup>3)</sup>	8.413 <sup>3)</sup>	14.509 <sup>3)</sup>
PKPSS <sup>TD</sup> test	15.136 <sup>3)</sup>	16.720 <sup>3)</sup>	13.243 <sup>3)</sup>	5.372 <sup>3)</sup>	6.207 <sup>3)</sup>

<sup>1)</sup> Denote significance at the 10% level.  
<sup>2)</sup> Denote significance at the 5% level.  
<sup>3)</sup> Denote significance at the 1% level.  
 Note: TD denotes the inclusion of time dummies. IPS test with two lags (based on the maximum number of lags implied by SIC for the individual tests); PKPSS test with lag truncation of six lags. The panel includes the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. All explanatory variables are defined as a deviation of individual countries from the euro area time series. All variables except interest rates are in logs. Variables are seasonally adjusted where necessary (money supply, industrial production).

1 Backé and Fidrmuc (2000) find significant effects of the Russian crisis especially on Slovakia, Hungary and Poland.

## 5 Estimation of the Long-Run Monetary Model

The empirical work on exchange rate determination has been strongly influenced by Meese and Rogoff (1983), who compared the predictive abilities of a variety of exchange rate models. The key result of this paper was that structural models are generally not able to outperform simple naïve forecasts as made for example by a random walk. Although the subsequent research has produced some better results (see MacDonald and Taylor, 1993 and 1994), the generally accepted view is that (nominal) exchange rates cannot be robustly modeled in the short run. Furthermore, tests of purchasing power parity have cast significant doubt on the behavior of real exchange rates (see Rogoff, 1996). However, new hopes emerged in the 1990s with the application of panel unit root tests and panel cointegration. Testing purchasing power parities for various panels has become one of the major application fields of these methods. Husted and MacDonald (1998) and Groen (2000) have shown that the monetary model has good in-sample properties in panel data sets for industrialized countries. Here we apply panel econometric methods to estimate the monetary model for a group of CEECs.

Following our discussion in section 2, equation (8) may be expressed in a form suitable for econometric estimation as

$$s_{it} = \mu_i + \theta_t + \psi(m_{it} - m_t^*) - \delta(y_{it} - y_t^*) + \eta(i_{it} - i_t^*) - \pi(p_{it} - p_t^*) + \varepsilon_{it}, \quad (18)$$

where  $m$ ,  $y$  and  $i$  were defined before as money supply, output and interest rates. Price indices,  $p$ , are defined as differentials between the CPI and the PPI, and  $\varepsilon$  is the disturbance term. Various specifications of the model include fixed and/or time effects (denoted by  $\mu$  and  $\theta$ , respectively) or a common intercept. The coefficient of money supply,  $\psi$ , is expected to be close to unity, but we do not impose this condition in the estimations.

There appears to be a significant B-S effect in the CEECs, corresponding to the catching-up process.<sup>1</sup> The Balassa-Samuleson effect is proxied by including the ratio of consumer prices to producer prices into (18). If consumer prices are assumed to be a composite of tradable and nontradable prices, and producer prices are identified with tradables, the ratio proxies the development of nontradable prices in the economy. As table 2 shows, this variable has a very significant effect on the nominal exchange rate in various specifications.

The previous section showed that the exchange rates and the right-hand side variables are I(1). Furthermore, the monetary model predicts that these variables should be cointegrated. Therefore, we consider several approaches to estimating the long-run (cointegrating) relationship between the variables. Kao and Chen (1995) show that the panel ordinary least squares (OLS) estimator is asymptotically normal, but it is still asymptotically biased. Although they propose a correction for this bias, it has been found that this correction does not tend to perform very well in reducing the bias in small samples. Therefore, some authors have proposed alternative methods of panel cointegration estimation.

Pedroni (1996 and 2001) proposes the fully modified OLS estimator (FMOLS), while Kao and Chiang (2000) recommend the dynamic OLS

<sup>1</sup> Égert (2003) provides a very recent overview of the Balassa-Samuelson effect in CEECs.

(DOLS). Pedroni's FMOLS corrects for endogeneity and serial correlation to the OLS estimator. Similarly, DOLS uses the future and past values of the differenced explanatory variables as additional regressors.

Kao and Chiang show that both estimators have the same (normal) limiting properties, although they are shown to perform differently in empirical analyses. The FMOLS does not improve the properties of the simple OLS estimator in finite samples. Correspondingly, Baltagi and Kao (2000) consider DOLS to be more promising for the estimation of panel cointegration.

As an alternative to the previous methods, Pesaran et al. (1999) propose a pooled mean group estimator (PMGE). A particular advantage of the PMGE is that it also provides estimates of the short-run dynamics, which is ignored by simple OLS, FMOLS and DOLS.

The results for the individual estimators of the monetary model of exchange rates are listed in table 2 with and without fixed effects and time dummies. Furthermore, we present a DOLS specification accounting for the contemporaneous correlation in the errors across countries by a seemingly unrelated regression (SUR). The long-run elasticities for the PMGE corresponding to the columns PMGE and PMGE-T (including time dummies) are based on the estimates from a partial adjustment model of the type

$$\Delta s_{it} = \mu_i + \zeta_i [s_{it} - \psi(m_{it} - m_t^*) + \delta(y_{it} - y_t^*) - \eta(i_{it} - i_t^*) + \pi(p_{it} - p_t^*)] + \varepsilon_{it}, \quad (19)$$

where the correction to equilibrium (given by the parameter  $\zeta$ ) is allowed to differ across countries.<sup>1</sup>) Furthermore, we also estimated the country-specific short-run dynamics (not reported in table 2).

It can be seen that the basic features of the monetary model (the sign and absolute value range) are very robust to the estimation method. All variables have the expected signs and are highly significant. The performance of panel methods is much better than estimations using standard vector error correction models (VECMs).<sup>2</sup>)

The coefficient on the money supply term is close to unity in all specifications, with the exception of the estimates derived using the PMGE and FMOLS. Also, the effect of the interest rate is estimated uniformly between the various specifications. Although the uncovered interest parity condition does not seem to hold for the CEECs, the resulting effect of the interest rate remains very low. Given the definition of the interest rate and the fluctuation of the dependent variable, the interest rate has a negligible effect on exchange rates. As expected, real industrial production enters with a negative sign. Although the coefficient is highly significant for all specifications, the DOLS specification with time dummies reduces the coefficient by one half, and both FMOLS specifications yield very low coefficients. By contrast, the coefficient on industrial production is close to  $-1$  for the PMGE specification.

The price ratio is found to have a very important effect on the exchange rates. In the majority of specifications (DOLS and PMGE, but not FMOLS), the estimated elasticity is larger than unity. Thus, a 1 percentage point increase

1 All estimates of  $\zeta_i$  in the specification are negative and significant, providing evidence that the long-run equilibrium implied by the monetary model actually behaves like an attractor for nominal exchange rates.

2 The results for individual VECMs are available upon request from the authors.

in nontradable prices (consumer prices above producer prices) leads to a nominal exchange rate appreciation of about 1.5 percentage points, although the FMOLS estimates suggest a smaller slope of only 0.5 percentage points or even 0.2 percentage points. Thus, the DOLS estimates seem to be consistent with available estimates of the B-S effect (see Halpern and Wyplosz, 2001).

Finally, we test whether the estimated relationships are true cointegrating vectors in table 3. Following Engle and Granger's approach, Kao (1999) proposed several tests based on a homogenous panel version of the residual Dickey-Fuller test. First tests are based on a Dickey-Fuller-type equation for residuals estimated in the above specifications

$$\hat{\varepsilon}_{it} = \rho \hat{\varepsilon}_{it-1} + v_{it}, \quad (20)$$

where  $\hat{\varepsilon}_{it}$  are residuals computed from the various specifications of (18) and (19). Kao's panel cointegration tests are based both on the autoregressive coefficient,  $\rho$ , (denoted by  $DF_\rho$ ) and on the corresponding  $t$ -statistic ( $DF_t$ ). Furthermore, they consider the endogeneity relationship between the regressors and residuals, which is adjusted by the long-run conditional variance of the residuals (see Kao et al., 1999). The corresponding test statistics for the autoregressive coefficients and the  $t$ -statistics are denoted by  $DF_\rho^*$  and  $DF_t^*$ , respectively.

Furthermore, Kao proposes a panel version of the residual ADF test based on

$$\hat{\varepsilon}_{it} = \gamma \hat{\varepsilon}_{i,t-1} + \sum_{j=1}^p \pi \Delta \hat{\varepsilon}_{i,t-j} + v_{it}. \quad (21)$$

The ADF test uses the  $t$ -statistic on the autoregressive coefficient,  $\gamma$ , which is again corrected for a possible endogeneity relationship between the regressors and the residuals.

With the exception of the  $DF_t^*$  test, which is insignificant for all specifications, the remaining statistics show nearly the same picture.<sup>1</sup>) On the one hand,

Table 2

**Panel Cointegration Estimation of the Monetary Model, September 1994 to March 2002**

	OLS	FE	FE-T	FMOLS	FMOLS-T	DOLS	DOLS-T	DOLS-SUR	PMGE	PMGE-T
Money supply	0.815 -76.156	0.817 -80.021	0.874 -53.868	0.459 -22.273	0.975 - 7.075	0.860 -72.910	0.886 -51.346	0.844 -116.189	0.567 -5.870	0.300 -1.780
Industrial production	- 0.403 (-10.390)	- 0.477 (-11.364)	- 0.329 (- 6.888)	- 0.010 (-12.979)	- 0.074 (-14.632)	- 0.388 (- 8.498)	- 0.250 (- 4.713)	- 0.487 (- 17.908)	-1.106 (-2.914)	-0.323 (-3.349)
Interest rates	0.001 - 4.252	0.002 - 4.569	0.002 - 5.316	0.007 -10.572	0.009 -14.534	0.004 - 5.364	0.005 - 6.068	0.003 - 4.815	0.008 -2.609	0.003 -2.023
Price ratio	- 1.843 (-18.471)	- 1.408 (-15.870)	- 1.405 (-11.351)	- 0.534 (-13.500)	- 0.199 (- 8.480)	- 1.555 (-16.870)	- 1.632 (-11.334)	- 1.392 (- 24.711)	-1.049 (-2.320)	-1.306 (-3.861)
Observations per country	91	91	91	91	91	91	91	91	91	91
Total number of observations	546	546	546	546	546	546	546	546	546	546
Fixed effects	no	yes	yes	yes						
Time effects	no	no	yes	no	yes	no	yes	no	no	yes

Notes: The panel includes the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. All explanatory variables are defined as a deviation of individual countries from the euro area time series. All variables except interest rates are in logs. Variables are seasonally adjusted if necessary (money supply, industrial production).  $t$ -statistics are in parentheses. The PMGE column corresponds to the estimates of the long-run elasticities in a partial adjustment monetary model. The PMGE and PMGE-T columns correspond to the long-run elasticities in the error correction representation of an ARDL( $p, q, r, s$ ) model for the nominal exchange rate, where the lag length is chosen through AIC.

1 We used NPT 1.3 for the panel cointegration tests (see Chiang and Kao, 2002), reflecting the comments on potential errors in this program by Hlouskova and Wagner (2003).

Table 3

**Residual Panel Cointegration Tests, September 1994 to March 2002**

	OLS	FE	FE-T	FMOLS	FMOLS-T	DOLS	DOLS-T	DOLS-SUR	PMGE	PMGE-T
$DF_p$ test	-2.890 <sup>3)</sup>	-2.949 <sup>3)</sup>	-2.261 <sup>2)</sup>	0.452	-3.093 <sup>3)</sup>	-3.682 <sup>3)</sup>	-3.842 <sup>3)</sup>	-3.366 <sup>3)</sup>	-2.807 <sup>3)</sup>	1.226
$DF_t$ test	-2.290 <sup>2)</sup>	-2.352 <sup>3)</sup>	-1.616 <sup>1)</sup>	1.338	-2.506 <sup>3)</sup>	-3.128 <sup>3)</sup>	-3.296 <sup>3)</sup>	-2.795 <sup>3)</sup>	-2.202 <sup>2)</sup>	2.184
$DF_p$ test <sup>1)</sup>	-8.317 <sup>3)</sup>	-8.391 <sup>3)</sup>	-7.177 <sup>3)</sup>	-2.464 <sup>1)</sup>	-8.459 <sup>3)</sup>	-9.569 <sup>3)</sup>	-9.777 <sup>3)</sup>	-9.080 <sup>3)</sup>	-8.129 <sup>3)</sup>	-1.159
$DF_t$ test <sup>1)</sup>	-0.771	-0.884	-0.372	3.641	0.740	-1.190	-1.109	-1.092	1.055	5.016
Panel ADF test	-2.256 <sup>2)</sup>	-2.254 <sup>2)</sup>	-2.307 <sup>2)</sup>	-1.072	-2.992 <sup>3)</sup>	-2.737 <sup>3)</sup>	-3.045 <sup>3)</sup>	-2.451 <sup>3)</sup>	-2.033 <sup>2)</sup>	-0.679

<sup>1)</sup> Denote significance at the 10% level.

<sup>2)</sup> Denote significance at the 5% level.

<sup>3)</sup> Denote significance at the 1% level.

Notes: See table 2.

the panel cointegration tests for DOLS, DOLS with time dummies and DOLS with SUR errors confirm the stationarity of the residuals. We should recall here that these specifications are also closer to the theoretical predictions on the coefficients than the other formulations. On the other hand, the tests reject a cointegrating relationship for fully modified OLS and pooled mean group estimators with time dummies. There are mixed results for the remaining specifications.

## 6 Conclusions

We analyze the development of exchange rates in six CEECs (Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia) between 1994 and 2002. During this period, nearly all CEECs moved from adjustable pegged exchange rates to a managed or free-floating regime. Currently, only Hungary keeps an exchange rate peg to the euro with wide bands ( $\pm 15\%$ ), while Slovenia follows a de facto crawling peg to the euro.

As a result, the sample period analyzed here is not based on a homogeneous exchange rate regime. Nevertheless, we find that nominal exchange rates fluctuated significantly during the whole sample period. In general, the currencies of the CEECs depreciated during the first part of the sample. We can see a stabilization of nominal exchange rates (with the exception of Romania and Slovenia) around 1998. Thereafter, extended periods characterized by significant nominal appreciation can be seen in the Czech Republic, Hungary, Poland and Slovakia. Our sensitivity analyses confirm the general robustness of the results despite some different behavior of exchange rates between the CEECs.

The nominal exchange rates as well as our set of macroeconomic variables are found to be nonstationary, as shown by several panel unit root tests. The panel version of the unit root test according to Kwiatkowski et al. (1992) and the test according to Im et al. (2003) seems to be more appropriate for empirical analyses of transition economies than Levin and Lin-type panel unit root tests. In particular, the former tests are not based on the homogeneity assumption. Furthermore, the inclusion of time dummies is found to be important to deal with common shocks to transition economies (e.g. the Russian crisis).

Since nominal exchange rates as well as our set of explanatory variables are found to be nonstationary, we use various panel cointegration estimators (OLS, dynamic OLS, fully modified OLS, and the pooled mean group estimator) to test the monetary model of exchange rates extended by the B-S effect. The results for dynamic OLS are closer to the theoretical predictions derived by

our model than alternative estimators. This confirms earlier sensitivity analysis of various methods of panel cointegration estimation for small panels which can be found in the literature.

We show that the monetary model of exchange rates provides a relatively good explanation of the behavior of nominal exchange rates in our panel. The nominal exchange rates can be described mainly by the trend in money supply and real industrial production. We also find a significant B-S effect, to which we can attribute about 2 or 3 percentage points of the annual exchange rate appreciation. This is comparable to the estimated effects available in the literature (see Halpern and Wyplosz, 2001). Although we find some evidence for interest rate determination of exchange rates, the size of this effect is generally not important.

## References

- Backé, P. and J. Fidrmuc. 2000.** The Impact of Russian Crisis on Selected Central and Eastern European Countries. In: Komulainen, Tuomas and Iikka Korhonen (eds.). *Russian Crisis and Its Effects*. Helsinki: Kikumora Publications. 199–238.
- Baltagi, Badi H. and Chihwa Kao. 2000.** Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey. Mimeo. Syracuse University.
- Banerjee, Anindya. 1999.** Panel Data Unit Roots and Cointegration: An Overview. *Oxford Bulletin of Economics and Statistics* 61 (Special Issue Nov. 1999). 607–629.
- Chiang, M. H. and C. Kao. 2002.** Nonstationary Panel Time Series Using NPT 1.3 – A User Guide. Center for Policy Research, Syracuse University. <http://www.maxwell.syr.edu/maxpages/faculty/cdkao/working/npt.html>. Retrieved on April 30, 2003.
- Clements, K. W. and J. A. Frenkel. 1980.** Exchange Rates, Money, and Relative Prices: The Dollar-Pound in the 1920s. *Journal of International Economics* 10(2). 249–262.
- Égert, B. 2003.** Assessing Equilibrium Real Exchange Rates in Accession Countries: Can We Have DEER with BEER without FEER? Focus on Transition 2. Vienna: Oesterreichische Nationalbank.
- Fidrmuc, J. 2004.** The Endogeneity of the Optimum Currency Area Criteria, Intra-Industry Trade, and EMU Enlargement. *Contemporary Economic Policy* 22(1). 1–12.
- Fidrmuc, J. and I. Korhonen. 2003.** Similarity of Supply and Demand Shocks Between the Euro Area and the CEECs. *Economic Systems* 27(3). 313–334. (forthcoming).
- Frankel, J. A. and A. K. Rose. 1995.** A Panel Project on Purchasing Power Parity: Mean Reversion Within and Between Countries. *Journal of International Economics* 40. 209–224.
- Froot, K. A. and K. Rogoff. 1995.** Perspectives on PPP and Long-Run Real Exchange Rates. In: Ronald W. Jones and Peter B. Kenen (eds.). *Handbook of International Economics Vol. 3*. Amsterdam: North Holland. 679–747.
- Groen, J. 2000.** The Monetary Exchange Rate Model as a Long-Run Phenomenon. *Journal of International Economics* 52(2). 299–319.
- Hadri, K. 2000.** Testing for Stationarity in Heterogenous Panel Data. *Econometrics Journal* 3(2). 148–161.
- Horvath, J. and J. Jonas. 1998.** Exchange Rate Regimes in the Transition Economies: Case Study of the Czech Republic 1990–1997. Working Paper B11. Bonn: Center for European Integration Studies (ZEI).
- Halpern, L. and C. Wyplosz. 2001.** Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection. *Economic Survey of Europe* 1. 227–239.
- Hlouskova, J. and M. Wagner. 2003.** Some Bugs in NPT 1.3. Center for Policy Research, Syracuse University. <http://www.maxwell.syr.edu/maxpages/faculty/cdkao/working/npt.html>. Retrieved on April 30, 2003.

- Husted, S. and R. MacDonald. 1998.** Monetary Models of the Exchange Rate: A Panel Perspective. *Journal of International Financial Markets, Institutions and Money* 8. 1–19.
- Im, K. S., M. H. Pesaran and Y. Shin. 2003.** Testing for Unit Root in Heterogenous Panels. *Journal of Econometrics* 115(1). 53–74.
- Kao, C. 1999.** Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics* 90(1). 1–44.
- Kao, C. and B. Chen. 1995.** On the estimation and inference of a cointegrated regression in panel data when the cross-section and time-series dimensions are comparable. Manuscript. Department of Economics, Syracuse University.
- Kao, C. and M. H. Chiang. 2000.** On the Estimation and Inference of Cointegrated Regression in Panel Data. *Advances in Econometrics* 15. 179–222.
- Kao, C., M. H. Chiang and B. Chen. 1999.** International R&D Spillovers: An Application of Estimation and Inference in Panel Cointegration. *Oxford Bulletin of Economics and Statistics* 61(4). 693–711.
- Kočenda, E. 2001.** Macroeconomic Convergence in Transition Countries. *Journal of Comparative Economics* 29(1). 1–29.
- Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin. 1992.** Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How Sure Are We That Economic Time Series Have a Unit Root? *Journal of Econometrics* 54(1–3). 159–178.
- Kutan, A. M. and T. M. Yigit. 2003.** Nominal and Real Stochastic Convergence Within the Transition Economies and to the European Union: Evidence From Panel Data. Helsinki: Suomen Pankki, Institute for Economies in Transition (BOFIT). Workshop on Transition Economics, April 11 to 12, 2003.
- Levin, A. and C. F. Lin. 1992.** Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. San Diego: University of California, Department of Economics. Working Paper 23.
- Levin, A. and C. F. Lin. 1993.** Unit Root Tests in Panel Data: New Results. San Diego: University of California, Department of Economics. Working Paper 56.
- Levin, A., C. F. Lin and C. S. J. Chu. 2002.** Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics* 108(1). 1–24.
- Lucas, R. E. 1982.** Interest Rates and Currency Prices in a Two-Country World. *Journal of Monetary Economics* 10(3). 335–360.
- MacDonald, R. 1995.** Long-Run Exchange Rate Modeling: A Survey of the Recent Evidence. *IMF Staff Papers* 42(3). 437–489.
- MacDonald, R. 1996.** Panel Unit Root Tests and Real Exchange Rates. *Economics Letters* 50. 7–11.
- MacDonald, R. and L. Ricci. 2001.** PPP and the Balassa Samuelson Effect: The Role of the Distribution Sector. *IMF Working Paper* 01/38.
- MacDonald, R. and M. P. Taylor. 1993.** The Monetary Approach to the Exchange Rate. *IMF Staff Papers* 40(1). 89–107.
- MacDonald, R. and M. P. Taylor. 1994.** The Monetary Model of the Exchange Rate: Long-Run Relationships, Short-Run Dynamics and How to Beat a Random Walk. *Journal of International Money and Finance* 13. 276–290.
- MacDonald, R. and C. Wójcik. 2003.** Catching Up: The Role of Demand, Supply and Regulated Price Effects on the Real Exchange Rates of Four Countries. *CESifo Working Paper* 899.
- Meese, R. A. and K. Rogoff. 1983.** Empirical Exchange Rate Models of the Seventies. *Journal of International Economics* 14. 3–24.
- Pedroni, P. 1996.** Fully Modified OLS for Heterogenous Cointegrated Panels and the Case of Purchasing Power Parity. *Indiana University Working Paper* 96–020.
- Pedroni, P. 2001.** Purchasing Power Parity Tests in Cointegrated Panels. *Review of Economics and Statistics* 83(4). 727–731.

- Pesaran, H. M., Y. Shin and R. P. Smith. 1999.** Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association* 94. 621–634.
- Quah, D. 1992.** International Pattern of Growth: Persistence in Growth Country Disparities. Mimeo. London: London School of Economics.
- Quah, D. 1994.** Exploiting Cross-Section Variation for Unit Root Inference in Dynamic Data. *Economics Letters* 44(1–2). 9–19.
- Rogoff, K. 1996.** The Purchasing Power Parity Puzzle. *Journal of Economic Literature* 34(2). 647–668.

# Challenges for EU Acceding Countries' Exchange Rate Strategies after EU Accession and Asymmetric Application of the Exchange Rate Criterion

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## I Introduction

It is almost certain that on May 1, 2004, the ten acceding countries (ACs), i.e. the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and the Slovak Republic, will accede to the European Union.

Upon entry, these new member countries will start a formal monetary integration process that will lead eventually to the adoption of the euro. The main steps in this monetary integration process are laid down in the *acquis communautaire*. However, the concrete implementation of this official roadmap for all these individual countries and the appropriate timing is still an issue of public and academic discussion as well as the topic of an ongoing dialogue between the ACs and the European Union including the Eurosystem, i.e. the European Central Bank and the national central banks of the euro area.

This paper explains the official roadmap for monetary integration and discusses possible designs of the EU acceding countries' exchange rate strategies prior to euro area entry.

The paper is structured as follows: Section 2 gives a short description of the current monetary and exchange rate strategies. Section 3 describes the European Union's official roadmap for the further monetary integration of EU acceding countries after EU accession as well as the objectives and main features of the exchange rate mechanism II, ERM II. Moreover, it outlines the necessary adjustments to current exchange rate regimes for ERM II participation. Section 4 then discusses economic challenges for EU acceding countries' exchange rate strategies after EU accession, and section 5 focuses on the economic function of ERM II in that context and considers the possible timing of ERM II entry. Section 6 examines the application of the convergence criterion on the exchange rate in the Treaty establishing the European Community (the Treaty). Section 7 concludes.

## 2 Current Monetary and Exchange Rate Strategies in EU Acceding Countries

Currently, of the EU acceding countries:

- Two countries have a currency board arrangement (CBA) with a peg to the euro, namely Estonia and Lithuania;
- Two countries have a narrow-band fixed peg against currency baskets, namely Latvia (SDR basket) and Malta (EUR/GBP/USD basket);
- Two countries have a wide-band fixed peg to the euro, namely Cyprus and Hungary;

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- Three countries have a managed float, namely the Czech Republic, Slovakia and Slovenia. The latter has maintained a tightly managed float orientated on the uncovered interest rate parity since the very beginning of its transformation; and
- One country has a free-float exchange rate regime, namely Poland.

While the CBAs as well as the narrow-band fixed pegs constitute cases of pure exchange rate targeting, the wide-band fixed peg in Hungary, the managed float in the Czech Republic and the free float in Poland are combined with direct inflation targeting, whereas the managed-floating regimes in Slovakia and in Slovenia are coupled with multi-indicator monitoring.

### **3 The Official Roadmap for Monetary Integration and ERM II**

#### **3.1 The Official Roadmap for Monetary Integration**

The European Union's *official roadmap* provides for *three stages* of monetary integration after EU accession.

In a *first stage*, upon entering the European Union, the new Member States also become members of the Economic and Monetary Union as "Member States with a derogation." Based on the agreements reached during the accession negotiations, their formal legal status will be similar to that of Sweden, but different from that of the United Kingdom and Denmark, since the latter two countries have an "opt-out clause." While the new Member States will not take part in EMU to the full extent, as they cannot immediately join the euro area, they are already required to observe a number of obligations embodied in the stability architecture of EMU: They generally have to bring into line their economic and monetary policies with the overall goals of EMU. Thus, in principle, they are obliged to pursue the adoption of the euro as a goal to which their policies have to be oriented. However, the main policy challenge is to design an appropriate speed for this process. Their central banks will be represented in the General Council of the ESCB and will take part in monetary policy coordination within the EU. The new Member States will participate in the coordination of economic policies and in multilateral fiscal surveillance. Moreover, they must treat their exchange rate policies as a matter of common interest, as the functioning of the single market must not be weakened by real exchange rate misalignments or excessive nominal exchange rate fluctuations. The ACs may continue their existing exchange rate regimes or may follow any other exchange rate regime as long as this requirement is respected.

The *second stage* in the new Member States' monetary integration is participation in the exchange rate mechanism ERM II, which is voluntary and therefore does not have to start promptly after joining the EU, but can take place at a later point in time. Nevertheless, the new Member States can be expected to join the mechanism. Indeed, it is the right of a new Member State to join ERM II upon request any time after accession, subject to the agreement on the level of the central rate and the width of the fluctuation band in accordance with the common procedure. On the other hand, participation in ERM II is a necessary, albeit not sufficient condition to fulfill the convergence criterion on the exchange rate.

In this second stage, the new Member States have to fulfill, inter alia, the convergence criterion on the exchange rate so that they may adopt the euro. The convergence criterion on the exchange rate is stipulated by the Treaty provisions, including the respective protocol.

The *third and final stage* of monetary integration will be participation in the euro area, i.e. full participation in EMU, following the adoption of the euro upon fulfillment of all convergence criteria.

### 3.2 The Objectives and Main Features of ERM II

The *legal basis for ERM II* is the resolution of the European Council on the establishment of an exchange rate mechanism in the third stage of EMU passed in Amsterdam on June 16, 1997. This resolution puts the euro at the center of the new mechanism and enumerates the following *principles and objectives*, inter alia, for ERM II:

- As lasting convergence of economic fundamentals is a prerequisite for sustainable exchange rate stability, all Member States must pursue disciplined and responsible monetary policies directed towards price stability as well as sound fiscal and structural policies.
- A stable economic environment is necessary for the good functioning of the single market and for higher investment, growth and employment. The single market must not be endangered by real exchange rate misalignments or by excessive nominal exchange rate fluctuations between the euro and the other EU currencies, which would disrupt trade flows.
- The exchange rate mechanism will help to ensure that Member States outside the euro area participating in the mechanism orient their policies to stability and foster convergence, which will help them in their efforts to adopt the euro. It will provide those Member States with a reference for their conduct of sound economic policies in general and monetary policy in particular.
- At the same time, the mechanism will also help to protect both the Member States outside and those inside the euro area from unwarranted pressures in the foreign exchange markets. In such cases, the mechanism may assist Member States outside the euro area participating in it when their currencies come under pressure in combining appropriate policy responses, including interest rate measures, with coordinated intervention.
- The exchange rate mechanism will also help to ensure that Member States seeking to adopt the euro after January 1, 1999, receive treatment equal to that of countries that have adopted the euro in fulfilling the convergence criteria.
- It should be ensured that any adjustment of central rates is conducted in a timely fashion to avoid significant misalignments.
- Furthermore, sufficient flexibility is allowed, in particular, to accommodate the varying degrees, paces and strategies of economic convergence of Member States outside the euro area that join the mechanism. Exchange rate policy cooperation may be further strengthened by allowing closer exchange rate links, particularly narrower fluctuation bands, wherever and to the extent that these are appropriate in the light of progress towards convergence.

According to the resolution, the *main features* of ERM II include:

- A central rate against the euro for the currency of each Member State outside the euro area participating in the exchange rate mechanism; this central rate is a fixed but adjustable peg.
- A standard fluctuation band of  $\pm 15\%$  around the central rate (defined in terms of national currency units per euro).
- Intervention at the margins that will in principle be automatic and unlimited, with very short-term financing available. However, the ECB and the central banks of other participants could suspend intervention if this were to conflict with their primary objective.
- The flexible use of interest rates and the possibility of coordinated intramarginal interventions.
- Decisions on the level of the central rate will be taken by mutual agreement of the ministers of the euro area Member States, the ECB and the ministers and central bank governors of the non-euro area Member States participating in the new mechanism, following a common procedure involving the European Commission. All parties to the mutual agreement will have the right to initiate a confidential procedure aimed at reconsidering central rates.
- On a case-by-case basis, formally agreed fluctuation bands narrower than the standard one and backed up in principle by automatic intervention and financing may be set by mutual agreement at the request of the non-euro area Member State concerned.

Based on the resolution, an *agreement* between the ECB and the national central banks of the Member States outside the euro area was established that lays down the operating procedures for ERM II. In particular, this agreement specifies the rules for marginal as well as for unilateral or coordinated intramarginal interventions, and the terms and conditions of the Very Short Term Financing facility for marginal and intramarginal interventions.

### 3.3 The Acceding Countries' Current Exchange Rate Regimes and ERM II

The European Union's *informal Ecofin*, i.e. the council of the ministers of finance and the governors of the central banks of EU member countries, in its statement of April 5, 2003, entitled "Acceding countries and ERM II," underlines that decisions are taken on a case-by-case basis at the time of entry in the mechanism, given the differences in the economic situation among new member countries, and that these decisions are to ensure equal treatment between new and current Member States.

Basically, the standard ERM II can accommodate a range of very different exchange rate strategies. There are some regimes, however, which the European Union's informal Ecofin in its statement of April 5, 2003, does consider incompatible with ERM II. These are in particular a free float without any band, a crawling peg or a peg to a currency other than the euro. Moreover, the European Union reserves the right to a case-by-case assessment of the compatibility of CBAs.

Taking the standard feature of ERM II, the  $\pm 15\%$  fluctuation band around a central rate, as the reference point, the following *changes to current exchange rate regimes* will be necessary for entering ERM II:

- The wide-band fixed peg regimes of  $\pm 15\%$  of Cyprus and Hungary can be considered to be already broadly in line with the ERM II requirements (referred to as ERM II shadowing). Only some institutional details may have to be adjusted, for instance the rules of decision-making for the exchange rate regime.
- The CBAs which pursue a euro peg, if considered compatible, will only have to be complemented with multilaterally supported wide bands, while the CBAs can be continued as a unilateral commitment.
- The narrow-band fixed peg regimes have to switch to the euro as the anchor currency from their current peg to currency baskets (Latvia: SDR as a basket, Malta: EUR/USD/GBP basket). In addition, they have to add multilaterally supported wide bands, complementing their unilateral commitment to a narrow band.
- Both managed-floating and free-floating regimes have to be complemented with a central rate and limited by wide bands. Thereby, countries with a managed-float regime have to enhance (Czech Republic and Slovakia) or to modify (Slovenia) their explicit taking into account of the exchange rate in the economic policy framework, while Poland, which has a free-float regime, has to start to take into account the exchange rate more explicitly.

It has to be highlighted that, independently of the type of exchange rate regime currently operated, a common agreement with all the parties has to be reached on the *level of the central rate*.

A major challenge for entering ERM II is finding a central rate against the euro. Ideally, the central parity rate should be as close to the equilibrium exchange rate as possible, as adjustments of the central rate should rather be an exception. This will preserve the role of the central rate as a guiding anchor for exchange rate and inflation expectations and will avoid knock-on effects on market perceptions of other participating member countries' central rates.

However, it is not easy to define the equilibrium exchange rate: there are various methods and approaches to empirically calculate this rate. Thus, most probably a range of potential equilibrium exchange rates will be offered at the time of decision-making.

In procedural terms, one should be aware of the problem that setting an entrance rate with one country will have implications for the bilateral exchange rates of this country against other new member countries not participating in ERM II. To some extent, this problem will be tackled on the basis that all EU member countries will attend the decision-making, even though not all will have the right to vote.

#### **4 Economic Challenges for New EU Member Countries' Exchange Rate Strategies**

##### **4.1 The Objective of Eventual Euro Area Entry**

The official roadmap for the monetary integration of the new EU member countries has not been left unchallenged. In particular, some representatives of EU acceding countries and several academics have voiced *doubts* about ERM II participation as a necessary condition for joining the euro area. It has been proposed that the new member countries should be allowed to switch

directly from the current exchange rate regime to the euro – without being required to participate in ERM II prior to adopting the euro.

On the other hand, it is quite remarkable that most proposals dissenting from the official roadmap concur with this roadmap in that they *share the objective* that these countries should join the monetary union in the foreseeable future. There is a kind of consensus that for all the new member countries the benefits of participation in monetary union eventually outweigh the corresponding costs. In general terms, it is argued that only within the single currency area can the benefits of the single market be reaped to the full extent. In particular, the following *benefits* of belonging to the single currency area are highlighted: first, the lowering of transaction costs; second, the elimination of several kinds of risks related to having an own currency; and third, the decrease of interest rates, which is usually not followed in an equally quick manner by further disinflation or enhanced deflation, and the resulting cheaper access to financing. Finally, the import of credibility is also mentioned sometimes. The high trade openness of the acceding countries combined with their high share of trade with the euro area (and even more so with all the countries of the enlarged European Union) in total foreign trade enhances the importance of these benefits.

However, apart from this tentative consensus on the merits of the monetary union and thus on the objective of eventually adopting the euro, the discussion centers on the optimal path to achieve this objective. For a more comprehensive economic assessment of possible appropriate exchange rate strategies, it seems useful to recall the economic challenges involved in the future integration and catching-up process of the acceding countries.

#### **4.2 The Need for Adjustability of the Exchange Rate after Accession**

In general, participation in the single currency area also entails certain costs and risks that should not be overlooked. These risks include first of all the risk of a misalignment resulting from entering the monetary union at an overvalued rate or from the occurrence of an adverse asymmetric external shock. This risk is compounded by the fact that countries will no longer be able to adjust nominal exchange rates. It remains doubtful whether all the other adjustment mechanisms will work sufficiently flexibly and quickly. Second, there is the risk of boom-bust cycles that arises from the decline in real interest rates. An interest rate shock in the form of negative real interest rates could lead to a boom with excessive indebtedness and asset bubbles that finally ends in rising default premia and a severe credit crunch. This risk is combined with the fact that countries will no longer be able to use an independent monetary policy to accommodate shocks.

In the case of the ACs, it has to be added that most of these countries still have to complete their transition process and are in the midst of a far-reaching integration and a long-term catching-up process. Thus, their equilibrium exchange rates will be subject to gradual changes and (potentially adverse) shocks over time.

Clearly, most ACs have far lower GDP-per-capita levels than the current euro area countries, primarily reflecting lower productivity levels. The long-term process of catching-up in productivity levels leads to the gradual

appreciation of the equilibrium real exchange rate, which should be neutral with respect to competitiveness, even though productivity-fueled rises in market-based nontradable prices may feed through to some moderate extent to the prices of tradables, in as far as nontradables are used as inputs for tradables.

On the other hand notwithstanding available estimates of the degree of business cycle synchronization already achieved, it has to be stressed that EU accession itself, i.e. the entrance into the single market, will definitely constitute an asymmetric external shock, given the differences in the sheer size of the economies. The immediate economic implications for the current EU are rather limited, considering that the ten acceding countries' nominal GDP amounts to only 6% of the euro area's GDP, with Polish GDP accounting for half of this amount. In addition, the acceding countries' share in euro area foreign demand is about 11%, while the share of their exports to the euro area in their total exports is around two-thirds. As the acceding countries' share in euro area foreign demand is only slightly less than that of the U.S.A., which is about 12.5%, the impact of accession cannot be considered negligible for the euro area. However, the impact for the new member countries will be more sizeable by far.

Neither the short-term direction, nor the short- or long-term size of the effects of this shock, nor the dynamic profile of these effects can be sufficiently known today. Despite already advanced liberalization in many areas and impressive progress achieved with economic transition and integration, the effects may show up in significant shifts both in the current account and in the capital and financial account. These effects would in turn imply a shift in the equilibrium exchange rate.

Thus, it cannot be ruled out that during the first years after accession the current account balance may deteriorate significantly. In such a case, downward adjustability of the exchange rate may be economically sensible. Apart from any institutional or political consideration, this supports the official roadmap for monetary integration. Indeed, from this point of view, an additional test phase is sensible also for countries with a CBA or a narrow-band fixed peg that have successfully operated a de facto monetary union for many years and might even fulfill all the other convergence criteria. Rather, the adjustability of the exchange rate and its potential role as a shock absorber should be preserved for some years beyond EU accession.

The risk should not be neglected that negative economic consequences may arise not only for new entrants, but also for the current euro area as a whole from (1) premature, i.e. economically and thus socially and politically unsustainable euro area participation, or (2) entrance at an irrevocable conversion rate that significantly deviates from reasonable estimates of the equilibrium exchange rate. The need to minimize this risk corresponds to the economic reasoning behind the Treaty provision that the Commission and the ECB have to examine the achievement of a high degree of sustainable convergence in their convergence reports to the Council before a country can join the euro area and that the criteria to be fulfilled include, inter alia, the criterion on the exchange rate. In particular, the convergence criteria relate to certain periods during which the reference levels have to be met to ensure sustainability in nominal

convergence. The irrevocable conversion rate should be at an exchange rate level that has proven to be compatible with the balanced development of the macroeconomic fundamentals during a certain period of time.

#### **4.3 The Need to Avoid Excessive Exchange Rate Flexibility after Accession**

Capital inflows may continue to be sizeable or may even grow, driven by EU accession in particular and by the long-term catching-up process in general. Moreover, their structure may change, shifting from FDI flows towards portfolio flows and bank deposits that are sensitive to interest rate differentials. In this context, it should be remembered that transition arrangements on capital and financial account liberalization with respect to financial flows were neither formally requested nor mutually agreed during the accession negotiations. These capital inflows may exert excessive appreciation pressure that is not in line with the fundamentals and may cause excessive fluctuations of the exchange rate. In addition, these capital flows may imply the risk of fundamentally unwarranted speculative attacks and of the sudden reversal of accumulated inflows, for instance triggered by international financial contagion and abrupt changes in market perceptions. Thus, sharp depreciations may also occur. It is a matter of fact that these exchange rate risks have as a necessary precondition the maintenance of an own currency. In short, the risk cannot be excluded that the national currency itself becomes a source of instability that introduces instability into other macroeconomic variables. Indeed, the acceding countries are too small and their economies too open for them to afford completely neglecting the impact of the exchange rate on inflation, competitiveness and general external sector development. This certainly applies also to those acceding countries which pursue a direct inflation targeting framework.

An independent monetary and in particular interest rate policy may have strong repercussions on the exchange rate, which may lead to periods of excessively tight monetary conditions when interest rates are raised. The strong impact of the interest rate policy on the exchange rate makes the idea that the market freely determines the "right" level of the exchange rate illusory. Moreover, the shallowness of the foreign exchange market is an additional hurdle for the market to find the equilibrium exchange rate, leading to high short-term volatility and overshooting medium-term swings of the exchange rate. High exchange rate fluctuations imply an increase in the cost of hedging. High volatility, overshooting swings and sizeable hedging costs weaken the development of real trade links. In addition, any excessive appreciation which may result from very restrictive monetary policies or unusually large capital inflows can have severely detrimental effects on competitiveness, in particular that of the domestic-owned part of the economy, fostering the emergence of a "dual economy" structure. Furthermore, the existing foreign currency-denominated debt in general and the incurred substantial foreign currency-denominated (net) liabilities of the nonfinancial corporate sector in several ACs in particular have made these economies vulnerable to overly large exchange rate swings that imply sharp depreciations, while periods of appreciation may mislead expectations and cause excessive further indebtedness.

Thus, it may be economically sensible to aim at avoiding excessive exchange rate movements. In particular, preventing the currency from appreciating too

much, i.e. from appreciating to an extent that is not in line with the fundamentals of the economy, would reduce the risk of sudden downward corrections in the future. It goes without saying that both gradually accumulating sizeable appreciation and sudden downward corrections may be harmful for economic performance as well as for real and financial economic links.

#### **4.4 The Double Challenge for Exchange Rate Policy after Accession**

The challenge to exchange rate policy is indeed twofold: it must allow for adjustability of the exchange rate in line with the fundamentals for some years ahead, while at the same time preventing the currency from appreciating or fluctuating excessively, i.e. out of line with the fundamentals. Both premature entrance into the single currency area and excessive flexibility have to be avoided. However, warning against excessive exchange rate flexibility should not be confounded with advocating that a country should renounce all flexibility or should not implement fundamentally required adjustments to its exchange rate regime's central rate in a timely manner.

It follows that – from an economic point of view – it is not only sensible to maintain an own currency as a policy tool, but also to actually adjust the exchange rate or to let the exchange rate adjust as far as is fundamentally necessary. Simultaneously, market pressures that are not fundamentally justified (e.g. as a result of one-off transactions in shallow markets or of speculative attacks that might be triggered, for instance, by contagion) should be avoided and resisted, as opposed to exercising benign neglect on the exchange rate. To this end, all countries that do not pursue a unilateral commitment to a currency board should probably consider actively using interest rate policy as well as exchange rate management coupled with sterilization operations to prevent the currency from fluctuating or appreciating excessively. For countries with a free-floating regime, this would require a transformation of the current exchange rate strategy into a managed float.

*Exchange rate management* need not be limited to on-market transactions. In particular, the possible practice of handling sizeable one-off transactions between the state and the central bank off market in order not to distort the foreign exchange market deserves attention. The approach applied to foreign currency-denominated privatization proceeds may be useful for the implementation of increasingly sizeable EU transfers as well. While it is true that potential sterilization measures may be costly, this need not necessarily be the case, but depends on the sign and size of the interest rate spread vis-à-vis the euro area. Usually the sign will be positive, so sterilization operations will normally involve costs. Still, the actual size of these costs depends on the size of the interest rate spread, apart from the transaction volumes involved. On the other hand, the opportunity costs of not intervening should not be neglected, as the valuation losses avoided by preventing further appreciation with the help of interventions have to be set against the usually negative interest income resulting from sterilization that is necessitated by these interventions.

Clearly, the possible exchange rate policy sketched out above entails a *double role for interest rate policy*, which is then simultaneously a tool for targeting the exchange rate and achieving domestic stabilization. Put differently, central bank interest rate policy will face the simultaneous task of achieving

and maintaining price stability and of contributing to managing the exchange rate. At the same time, the monetary and exchange rate policy has to take into account the general economic development as well as, in particular, the external balance. Even though the interest rate channel of the monetary transmission mechanism may be considered to be still weak, it seems to have become stronger in recent years and will probably strengthen further in the years to come. Its importance should, hence, not be neglected. The challenge for setting key policy rates is to strike a balance between avoiding too large interest rate differentials and avoiding too low real interest rate levels. In order to avoid overburdening interest rate policy and to alleviate its double role, there are two complementary options. First, an active exchange rate management by both off-market and on-market interventions on the foreign exchange market has to be accorded an important role. Second, it is important to develop a broader range of policy instruments that could partly substitute for the role of the interest rate in counteracting domestically generated external imbalances and inflation. This relates, for instance, to the adjustments of wage policy institutions and fiscal policy structures. More generally, prudent fiscal policy would probably ease the double-tasking of interest rate policy and be conducive to reducing the scope of risks related to the exchange rate.

It is obvious that the challenge of conducting such a macroeconomic policy mix is formidable. However, it is still more promising than following the seemingly easy solutions of quickly adopting the euro or letting the currency float completely freely.

## **5 ERM II Participation**

In principle, the above-mentioned challenges can be tackled both outside and within ERM II. Correspondingly, the exchange rate policy sketched out above that would strive to respond to these challenges can be conducted outside and within ERM II.

### **5.1 ERM II as a Useful Convergence Framework**

Basically, *ERM II* aims at fostering (nominal and real) convergence within the European Union by supporting some degree of exchange rate stability, as an announced central rate provides guidance to participants in foreign exchange markets and anchors expectations. At the same time, ERM II provides for sufficient flexibility to accommodate varying degrees and strategies of economic convergence and to avoid real exchange-rate misalignments, as it comprises a wide standard band of  $\pm 15\%$  and foresees the adjustability of the central rate under a multilateral agreement if necessary according to the fundamentals. The wide bands leave a margin for catching-up-related equilibrium appreciation and room for flexible nominal exchange rate responses to shocks. Moreover, the mechanism entails not only common automatic and unlimited foreign exchange interventions at the margins, but also voluntary (unilateral or coordinated) intramarginal interventions, combined with the flexible use of interest rate policy. Finally, the multilateral nature and the ultimate exit, i.e. conversion to the euro, make ERM II less subject to the weaknesses usually attributed to (unilateral) intermediate regimes, like the lack of an exit strategy. Thus, it may be considered a *useful opportunity* in terms of economic policy, which

is oriented towards achieving real and sustainable nominal convergence, and it should not be seen as a mere waiting room or a pure legal requirement for the adoption of the euro. It follows that it may turn out to be advisable to stay within ERM II for a longer term than just the minimum period that is legally required.

ERM II is sometimes viewed as being an intermediate exchange rate regime that is subject to the risk of speculative attacks. While it is certainly true that ERM II is formally an intermediate exchange rate regime, it has to be stressed that its standard design is not a narrow-band fixed peg, but a wide-band fixed peg, which is probably *less vulnerable* to speculative attacks than the narrow-band fixed peg. Moreover, the *risk* of fundamentally unwarranted speculative attacks on the band ceilings, fundamentally unwarranted implying that the central rate is relatively close to the probably only slightly upward-moving equilibrium exchange rate, may be considered to be *rather limited*, given (1) a wide rather than narrow fluctuation band, and (2) flexible and timely active exchange rate management and interest rate policy. In particular, it seems recommendable to avoid a pure free float within the band and to act beforehand in time to avoid a dilemma at the upper end of the band.

## 5.2 The Timing of Entrance into ERM II

The *timing of entrance into ERM II* has to be assessed on a case-by-case basis, taking into account the empirical facts. The appropriate entry time depends on the specific features of individual countries, inter alia on the type of exchange rate regime in place.

First, in the case of currency board arrangements and fixed-peg regimes – whether they are combined with a narrow or a wide band – any realignment in the form of central rate adjustments or regime changes such as a widening of the band may trigger market reactions that entail the risk of significant overshooting. Such realignments or regime changes could probably be handled more safely within ERM II than outside ERM II. Indeed, the need for adjustment might arise as a result of the asymmetric shock of EU accession. Thus, countries with such exchange rate regimes may be inclined to enter ERM II sooner rather than later. However, it would be an equally viable option to take a wait-and-see attitude, reserving the option to combine any adjustment that may arise as necessary after integration into the single market with the entrance into ERM II and the setting of the central rate. This approach would aim to avoid an adjustment of the central rate within ERM II.

Clearly, any decision with regard to ERM II entrance timing ultimately has to be taken on a case-by-case basis, taking into account all the other country-specific factors and in particular any signs of potentially already existing misalignments.

During ERM II participation of countries which maintain a CBA or a narrow-band fixed-peg exchange rate regime as a unilateral commitment, all available indicators are to be observed carefully for indications of any fundamental need for a realignment or regime change, in order to implement necessary adjustments within the framework of multilateral procedures in a timely manner. Indeed, complementing the vigilant attitude of the new member countries, a regular common monitoring exercise will take place within the

General Council of the ESCB. Moreover, according to the Resolution of the European Council establishing ERM II, the multilateral surveillance of macro-economic policies under Article 99 of the Treaty will be organized, *inter alia*, with a view to avoiding real exchange rate misalignments (or excessive nominal exchange rate fluctuations). In this way, ERM II may constitute a “training room” that offers the possibility to counteract in a timely fashion emerging misalignments by adjusting macroeconomic policies and/or to actually implement any exchange rate realignments which may be fundamentally necessary.

Second, in the case of a managed-floating regime without any central rate and fluctuation bands, it may be economically sensible to stay outside ERM II for some time after EU accession. One argument is to avoid establishing formal limits to exchange rate flexibility precisely during the period after EU accession when enhanced downward flexibility of the exchange rate might be required.

On the other hand, one can put forward arguments that it is better to enter ERM II sooner rather than later. First, the setting of a central rate, which ERM II entry requires, may provide a useful guidance to the markets and may stabilize expectations. Second, the standard ERM II will usually provide for enough flexibility to allow for possibly required depreciations or appreciations, given (1) its wide band and (2) its built-in possibility of any adjustments in the central rate that are fundamentally required. Third, as already mentioned, the risk of fundamentally unwarranted speculative attacks on the band ceilings may be considered to be rather limited. Fourth, it should not be left unmentioned that ERM II participation also includes the component of multilateral marginal interventions. While it is true that the ECB has the right to suspend these interventions if they were to conflict with the primary goal of price stability in the euro area, the relatively small size of the new member countries' foreign exchange markets reduces the probability of such a conflict. Moreover, the probability that a realignment procedure would be initiated in response to market pressures that are not fundamentally justified can be assessed as rather low.

With respect to the necessary introduction of bands when entering ERM II, the perceived value added of participating in ERM II on balance depends probably on the assessment of (1) the probability of unwarranted market pressures on the upside versus on the downside, (2) the extent to which these probabilities are changed by the adoption of a wide band, and (3) the available exchange rate management capabilities, in particular for intramarginal action in a timely manner.

Hence, the overall assessment of the appropriate ERM II entrance timing has to be done on a case-by-case basis, after a comprehensive analysis of all relevant empirical facts.

## **6 The Convergence Criterion on the Exchange Rate and the Experience of ERM and ERM II**

Article 121 (*ex Article 109j*) provides the framework for the adoption of the euro. The convergence reports that the European Commission and the ECB have to prepare will include an examination of the achievement of a high degree of sustainable convergence, by reference to the fulfillment of the following criteria:

- “The achievement of a high degree of price stability: this will be apparent from a rate of inflation that is close to that of, at most, the three best performing Member States in terms of price stability;
- The sustainability of the government financial position: this will be apparent from having achieved a government budgetary position without a deficit that is excessive as determined in accordance with Article 104(6);
- The observance of the normal fluctuation margins provided for by the exchange rate mechanism of the European Monetary System, for at least two years, without devaluing against the currency of any other Member State;
- The durability of convergence achieved by the Member State and of its participation in the exchange rate mechanism of the European Monetary System, as reflected in the long-term interest-rate levels.”

In addition, according to Article 121, these reports must also take account of the development of the euro, the results of the integration of markets, the situation and development of the balances of payments on current account and an examination of the development of unit labor costs and other price indices.

Article 3 of the Protocol on the Convergence Criteria, i.e. Protocol No. 21 (ex 6) of the Treaty, stipulates the following: “The criterion on participation in the exchange rate mechanism of the European Monetary System referred to in the third indent of Article 121(1) of this Treaty shall mean that a Member State has respected the normal fluctuation margins provided for by 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’s bilateral central rate against any other Member State’s currency on its own initiative for the same period.”

The final decision on the fulfillment of the conditions for joining the euro area will be taken by the Council (Ecofin) of the EU by a qualified majority, on a proposal from the European Commission, after consultation with the European Parliament and discussion in the European Council, and on the basis of the convergence reports of the European Commission and the ECB.

Before the 1993 ERM crisis, the prevailing  $\pm 2.25\%$  fluctuation bands<sup>1)</sup> provided a yardstick for interpreting the criterion on exchange rate stability: A currency was viewed to meet the criterion insofar as its bilateral nominal exchange rates vis-à-vis the other participating currencies were kept within a tunnel of 4.5% around the central parity without severe tensions. Thus, at the time when the Maastricht Treaty was drafted and ratified, the main questions addressed by the criterion were primarily (1) whether a currency succeeded in staying within the given narrow band with or without severe tensions, and (2) whether the central rate was devalued on the initiative of the country itself. In particular, the challenge to maintain a unilateral formal or informal narrow band after a potential widening of the multilateral band was not seriously considered at that time.

However, because of the widening of the bands to  $\pm 15\%$  in August 1993, which was prompted by the exchange rate crisis and hence took place before the Maastricht Treaty entered into force on November 1, 1993, the interpretation of the criterion became less clear cut. It is evident that exchange rate

1 Italy was an exception, as the lira was allowed to fluctuate in a band of  $\pm 6\%$  against the other participating currencies.

fluctuations of 30% are too wide to be economically interpretable. Therefore, and not surprisingly, the wording of the criterion "*the normal fluctuation margins . . . without severe tensions*" has given rise to alternative but not necessarily conflicting views when interpreting the criterion.

### 6.1 What Do Past Convergence Reports Tell Us?

In accordance with the *equal treatment principle*, the way the criterion was interpreted in the past will also determine how it will be applied to any EU member country still outside the euro area in the future. This appears to be confirmed in point 8 of the statement of the informal Ecofin meeting of April 2003: "*The assessment of the fulfilment of the Maastricht convergence criteria and the procedures to be followed for the introduction of the euro will ensure equal treatment between future Member States and the current participants in the euro area. A minimum stay of two years in the mechanism prior to the convergence assessment without severe tensions is expected. Moreover, the assessment of exchange rate stability against the euro will focus on the exchange rate being close to the central rate while also taking into account factors that may have led to an appreciation, in line with what was done in the past.*" Therefore, it is of great interest to analyze the past convergence reports with a particular emphasis laid on how the criterion on exchange rate stability was interpreted.

In its 1998 convergence report, the *European Monetary Institute* (EMI) considered a currency stable if it was traded close to its unchanged central parity.<sup>1)</sup> In the report, all bilateral exchange rates are considered, using a ten-day moving average based on daily data at business frequency.<sup>2)</sup> Whether or not severe tensions characterized the foreign exchange market of a given country was assessed based on so-called tension indicators such as exchange rate volatility and short-term interest rate differentials. Exchange rate volatility was calculated against the Deutsche mark,<sup>3)</sup> whereas the three-month interbank interest rates of the country under consideration were compared with a weighted average of the rates of five countries, namely Austria, Belgium, Germany, the Netherlands and France. However, it should be noted that no explicit guidance was provided to clarify what "traded close to" meant and how much exchange rate volatility and how big an interest rate differential would have meant a breach of the criterion on exchange rate stability.

According to the 1998 convergence report of the European Commission, the widening of the fluctuation margins was originally meant to be transitory so as to prevent the complete collapse of ERM. At the same time, the report also acknowledges that because no officially announced return to the  $\pm 2.25\%$  bands occurred, the wider bands should somehow be accounted for in the convergence assessment. In its report, the European Commission introduced the concept of a median currency. The median currency is defined as the currency whose deviation from its ECU central parity was the "median" deviation among

1 "... in the assessment of exchange rate developments the emphasis is placed on exchange rates being close to the central rates." EMI (1998), pp. 37.

2 EMI (1998), pp. 53.

3 "Annualised monthly standard deviation of daily percentage changes of the exchange rate against the DEM, in percentages" EMI (1998), pp. 53.

the participating currencies. In more practical terms, for each participating country,<sup>1)</sup> the deviation of the bilateral exchange rate against the ECU from its official ECU central parity is determined. Subsequently, the countries are ranked and the 6<sup>th</sup> out of the 11 participating currencies is chosen in the ranking. For any given currency, its official bilateral central parity against the median currency is derived as the cross rate of the official ECU central parities of this given currency and the median currency. Similarly, its bilateral exchange rate against the median currency is derived as the cross rate of the bilateral exchange rates against the ECU of this given currency and the median currency. Then, the deviation of the bilateral exchange rate against the median currency from the official bilateral central parity against the median currency is calculated. It should be noted that the median currency is chosen on a daily basis, implying that the currency chosen as the median currency could have changed day by day. Furthermore, deviations are measured in terms of daily data and not on the basis of a ten-day moving average.

Only one current euro area Member State, namely Greece, went through ERM II. The practice of the EMI in its 1998 convergence report is followed by its successor, the ECB, when analyzing the state of convergence of Greece in 2000 and that of Sweden in 2000 and 2002 (ECB, 2000, and ECB, 2002). Both in the ECB's and in the European Commission's convergence report on Greece, exchange rate stability is assessed in two stages. In a first step, exchange rate stability is analyzed in the ERM according to the practices in EMI (1998) and European Commission (1998). The second stage then involves the investigation of the Greek drachma's developments against the euro.

While both the European Commission and the ECB are required to prepare a convergence report when a given country is analyzed to see whether it complies fully with the Maastricht criteria, it is the European Commission that makes a direct recommendation to the Council. However, this does not mean that the final decision by the Council will correspond to this proposition.

Table 1

**Analysis of the Criterion on Exchange Rate Stability by the EMI/ECB  
 and the European Commission in Their Convergence Reports**

	European Commission	EMI/ECB
<b>ERM</b>		
Reference period	two years for all countries: March 1996 to February 1998	two years: March 1996 to February 1998 except for Italy and Finland (15 and 16.5 months)
Reference currency	median currency	bilateral
Reference fluctuation band	±2.25% and ±15%	"close to parity"
Reference time series	daily exchange rate	ten-day moving average
Tension indicators	duration and size of large deviations  size of forex interventions	exchange rate volatility against the Deutsche mark short-term interest rate differential against a basket of five participating currencies
<b>ERM II</b>	the reference currency is the euro; otherwise the same	the reference currency is the euro; otherwise the same
<b>Decision-making</b>	recommendation to the EU Council as to whether a given country complies fully with the Maastricht criteria	

1 Before the entry of Greece the following countries were already participating in ERM: Austria, Belgium, Denmark, France, Finland, Germany, Ireland, Italy, the Netherlands, Portugal and Spain.

## 6.2 Widening the Horizon of the Analysis

The following benchmark currency could theoretically be used to gauge the variation of the exchange rates in the ERM and whether or not a given country meets the criterion on exchange rate stability:

- the ECU
- the median currency proposed by the European Commission
- bilateral exchange rates (no benchmark currency) used by the EMI/ECB
- the strongest currency of the system
- the Deutsche mark
- the synthetic euro (only ex post and only for information)

### 6.2.1 Evaluation Based on the ECU

The examination of maximum deviations against the ECU reveals that there was indeed a more narrowly defined implicit nominal exchange rate target. Instead of the  $\pm 15\%$  bands, all countries involved in the ERM two years prior to the launch of the euro<sup>1)</sup> made considerable efforts to keep their currency in a band of  $\pm 2.25\%$ .

Table 2

#### Maximum Deviations from the Official Central Parity

#### of the ECU in the ERM, 1996 to 1998

	01. 03. 1996 – 28. 02. 1998 <sup>1)</sup> )				17. 03. 1998 – 31. 12. 1998			
	daily observations		ten-day moving average		daily observations		ten-day moving average	
	APPR	DEPR	APPR	DEPR	APPR	DEPR	APPR	DEPR
	%							
Austria	<b>4.034</b>	<b>2.808</b>	<b>3.904</b>	2.221	2.022	-0.162	1.681	-0.282
Belgium	<b>4.411</b>	<b>2.833</b>	<b>4.199</b>	2.215	1.765	-0.126	1.594	-0.268
Denmark	- 2.103	<b>3.513</b>	-1.980	<b>2.840</b>	-1.249	0.607	-1.121	0.492
France	<b>2.346</b>	<b>2.661</b>	1.900	<b>2.499</b>	1.991	-0.205	1.662	-0.346
Finland	<b>2.431</b>	<b>3.091</b>	2.086	<b>2.550</b>	1.169	0.566	0.789	0.377
Germany	<b>4.083</b>	<b>2.803</b>	<b>3.870</b>	2.183	1.926	-0.140	1.660	-0.271
Ireland	<b>10.061</b>	0.253	<b>9.694</b>	0.018	<b>2.964</b>	-0.978	2.772	-1.299
Italy	1.100	<b>2.660</b>	0.754	<b>2.384</b>	1.359	0.545	0.980	0.251
Netherlands	<b>4.793</b>	<b>2.923</b>	<b>4.515</b>	2.216	1.980	-0.095	1.642	-0.255
Portugal	<b>3.692</b>	<b>2.676</b>	<b>3.151</b>	1.983	1.948	0.038	1.638	-0.220
Spain	<b>5.247</b>	2.204	<b>4.950</b>	1.557	1.929	0.794	1.636	-0.486

Source: Authors' own calculations.

<sup>1)</sup> For Finland the period starts on October 15, 1996, for Italy on November 25, 1996, the respective dates of (re)joining the ERM. Hence, this table follows the reference period definition for Finland and Italy applied by the EMI, as opposed to that applied by the European Commission.

<sup>2)</sup> The date format used is day/month/year.

Note: APPR and DEPR refer to the maximum appreciation and depreciation, i.e. to the maximum deviation from the central rate on the strong side ("appreciation") and on the weak side ("depreciation") of the multilateral  $\pm 15\%$  fluctuation band. Negative values for appreciation (depreciation) mean that the exchange rate stayed in the other part (weaker/stronger) part of the fluctuation band. Values higher than 2.25 are marked in bold font.

During the reference period of March 1996 to February 1998 and of October/November 1996 to February 1998 in the case of Finland and Italy, almost all currencies exceeded the implicit 2.25% narrow band on the stronger side. The same applies to the weaker side, as the currencies depreciated against

1 The reference period considered in the European Monetary Institute's convergence report is March 1, 1996, to February 28, 1998. Finland and Italy are two exceptions: Finland joined the ERM on October 15, 1996, whereas Italy rejoined the club on November 25 the same year. Hence, Finland spent only 16.5 months and Italy a mere 15 months before examination. The EMI considered only the period the two countries spent in the ERM as the reference period. By contrast, the European Commission examined the period from March 1996 to February 1998 for Finland and Italy.

the ECU central parities. On March 17, 1998, a multilateral parity adjustment took place that witnessed the devaluation of 2.68% of the central parity of all but one participating currencies and a revaluation of the Irish pound of 3.09%. Afterwards, the 2.25% on the weaker side of the fluctuation band was strictly respected.

The reason for this lies in the fact that the ECU was a composite currency that also included the nonparticipating pound sterling. But at the same time, countries such as Austria and Finland that joined the EU in 1995 and subsequently participated in the ERM were not considered in the ECU. The reason for the depreciation above the 2.25% limit is explained by the strong 25% appreciation of the pound sterling against the Deutsche mark over the period 1996–98 that was reflected in the bilateral exchange rates against the ECU because of the high share of the British currency in the ECU basket.<sup>1)</sup> This may have been the reason for the fact that the ECU was not used as the benchmark for evaluating the fulfillment of the convergence criterion.

### 6.2.2 Evaluation Based on the Median Currency

Maximum deviations from the median currency's official bilateral central parities are given in table 3, which indicates much narrower bands than in the case of the ECU. Asymmetry seems less pronounced in this case. However, excess deviation on the weaker side of the band is a feature only at the outset of the reference period March 1996 to February 1998. Indeed, this excess deviation disappears for all countries concerned, i.e. France, Finland, Ireland and Italy, if the period October 1996 to February 1998 is taken as the basis for evaluation.

Table 3

#### Maximum Deviations from the Median Currency, 1996 to 1998

	APPR	DEPR
	%	
Austria	0.310	0.470
Belgium	0.440	0.440
Denmark	0.040	1.410
France	0.050	2.350
Finland	3.740	4.210
Germany	0.340	0.460
Ireland	10.910	4.210
Italy	1.840	7.820
Netherlands	0.930	0.300
Portugal	2.760	1.360
Spain	2.610	0.000

Source: European Commission (1998), pp. 157.

Note: APPR and DEPR refer to the maximum appreciation and depreciation. Italy and Finland are considered as if they had participated in the ERM from March 1996.

### 6.2.3 Evaluation Based on Pairwise Bilateral Exchange Rates

It appears useful to have a quick look at the pairwise bilateral exchange rates of ERM participants. The  $\pm 4.5\%$  bilateral bandwidth provided by the use of the median currency is widely reflected in bilateral data.

<sup>1</sup> It should also be noted that the appreciation of the Irish pound had an effect. However, because of its low weight in the ECU basket, its overall impact was eclipsed by the pound sterling.

On the weaker edge, the French franc and the Irish pound exited the 2.25% mark against six and five fellow currencies, respectively. As in the case of the median currency, this happened at the very beginning of the reference period for a very limited period of time. However, following the definition of the reference period used by the European Commission (1998), that is, considering Finland and Italy as if they had participated in the ERM from March 1996, would lead to the conclusion that both currencies depreciated by more than 2.25% against the bilateral central parities adopted upon their entry in the ERM for a number of consecutive months before their formal entry in the ERM.

On the stronger side of the band, the most obvious excess deviation is that of Ireland, as the Irish pound appreciated by more than 10% against the other currencies following the aforementioned ephemeral depreciation against the majority of currencies at the outset. In addition, the Finnish markka, the Portuguese escudo and the Spanish peseta also underwent an appreciation of more than 2.25% vis-à-vis five currencies.

Table 4

**Maximum Deviations from the Bilateral Central Parity, 1996 to 1998**

	Austria	Belgium	France	Finland	Ireland	Italy	Netherlands	Portugal	Spain
%									
Austria	—	0.100	2.200	-0.200	<b>3.900</b>	1.100	0.000	1.100	0.100
Belgium	0.400	—	<b>2.500</b>	-0.200	<b>4.200</b>	1.100	0.100	1.400	0.200
France	0.200	0.300	—	-0.100	1.900	0.600	0.300	0.000	-0.200
Finland	<b>3.000</b>	<b>3.100</b>	<b>3.600</b>	—	-0.300	<b>3.000</b>	<b>2.900</b>	1.400	2.100
Ireland	<b>11.800</b>	<b>11.900</b>	<b>12.500</b>	<b>10.000</b>	—	<b>11.300</b>	<b>11.700</b>	<b>10.300</b>	<b>10.700</b>
Italy	1.800	1.900	<b>2.500</b>	0.400	-2.300	—	1.700	0.700	0.900
Netherlands	0.800	0.500	<b>2.800</b>	-0.200	<b>4.600</b>	1.300	—	1.800	-0.200
Portugal	<b>2.900</b>	<b>2.800</b>	1.700	1.200	<b>3.500</b>	<b>3.000</b>	<b>2.500</b>	—	<b>2.900</b>
Spain	2.000	<b>2.400</b>	<b>3.300</b>	0.200	<b>5.100</b>	1.400	1.700	<b>2.400</b>	—

Source: EMI (1998), pp. 53, 119, 134, 149, 167, 195, 211, 227, 242.

Note: Lines indicate the maximum appreciation of the currency of the given country against the other countries. Automatically, columns show the maximum depreciation of the currency of the given country against the other countries. The period considered is March 1996 to February 1998. For Finland and Italy, the reference period starts on October 14, 1996, and on November 25, 1996, respectively, which is in accordance with the practice of the EMI. Figures are obtained using ten-day moving averages. Values exceeding 2.25% are marked in bold font.

#### 6.2.4 Evaluation Based on the Strongest Currency of the System

Clearly, one important aspect of employing the median currency is not to use the strongest currency as the benchmark, which would have meant very large deviations of all currencies against the Irish pound from September 1996 onwards.

#### 6.2.5 Evaluation Based on the Deutsche Mark

The main reason why the European Commission used the median currency rather than the Deutsche mark is that taking the Deutsche mark as the benchmark would explicitly acknowledge the stability of the latter. By contrast, the use of the median currency would also allow, at least theoretically, for the Deutsche mark to be weak. However, the median currency closely mirrors the Deutsche mark. The Austrian, Belgian, Danish and Dutch currencies were very closely clustered with the Deutsche mark; therefore bearing in mind the strong appreciation of the Irish pound, and at some point in time that of the Finnish markka, the Portuguese escudo and the Spanish peseta, the median currency was always part of the cluster, i.e. either the Deutsche mark or one of its "proxies" (table 5).

Table 5

Composition of the Median Currency		
	Number of days of the reference period (March 1996 to February 1998)	%
Total	503	
of which the median currency was:		
DKK	181	35.98
DEM	90	17.89
NLG	77	15.31
ATS	42	8.35
No median currency	30	5.69
FRF	28	5.57
BEF	27	5.37
PTE	10	1.99
ESP	9	1.79
ITL	8	1.59
IEP	1	0.20
DKK+DEM+NLG+ATS+BEF	417	82.9

Source: Authors' own calculation based on data provided by the European Commission.

Note: When the Finnish markka joined the ERM, the number of participating currencies increased to 12, which made the calculation of the median currency impossible. This period lasted until the Italian lira reentered the ERM (from October 14, 1996, to November 22, 1996, i.e. 30 days).

The ERM was built around the Deutsche mark. Although it was not explicitly called the benchmark currency, tension indicators were based on either the Deutsche mark (exchange rate volatility) or the cluster around it (interest rate differential).

Table 6

### Maximum Deviations from the Official Bilateral Central Parity against the Deutsche Mark in the ERM, 1996 to 1998

	01. 03. 1996 to 28. 02. 1998				25. 11. 1996 to 28. 02. 1998			
	daily observations		ten-day moving average		daily observations		ten-day moving average	
	APPR	DEPR	APPR	DEPR	APPR	DEPR	APPR	DEPR
	%							
Austria	0.382	1.079	0.081	0.432	0.054	0.091	0.022	0.049
Belgium	0.473	0.192	0.387	0.116	0.182	0.158	0.120	0.116
Denmark	0.044	1.892	0.042	1.234	0.044	1.892	0.042	1.234
France	0.294	<b>2.321</b>	0.224	2.131	0.294	1.298	0.224	1.040
Finland	<b>3.668<sup>1)</sup></b>	<b>4.421<sup>1)</sup></b>	<b>2.978<sup>1)</sup></b>	<b>4.033<sup>1)</sup></b>	<b>3.668</b>	0.164	<b>2.978</b>	-0.189
Ireland	<b>10.943</b>	<b>4.073</b>	<b>10.581</b>	<b>3.869</b>	<b>10.943</b>	-2.726	<b>10.581</b>	-2.986
Italy	<b>2.274<sup>1)</sup></b>	<b>7.756<sup>1)</sup></b>	1.846 <sup>1)</sup>	<b>7.250<sup>1)</sup></b>	<b>2.274</b>	2.005	1.846	1.258
Netherlands	1.121	0.743	0.864	0.131	0.562	0.743	0.474	0.131
Portugal	<b>3.024</b>	1.640	<b>2.744</b>	1.045	<b>3.024</b>	0.684	<b>2.744</b>	0.060
Spain	<b>2.734</b>	0.415	<b>2.330</b>	0.079	<b>2.370</b>	0.122	1.849	-0.225

Source: Authors' own calculations.

<sup>1)</sup> In accordance with the methodology applied by the European Commission.

Note: APPR and DEPR refer to the maximum appreciation and depreciation. Negative values mean that the market exchange rate remained in the other side of the band. Values higher than 2.25% are marked in bold font.

### 6.3 Summarizing the Features of Exchange Rate Developments in the ERM

When the structure of the ECU and especially the pound sterling is controlled for, the following features emerge:

- First, depreciation against the central parity beyond the 2.25% on the weaker side of the band occurred only at the onset of the reference period. These cases occurred in early 1996, and no excessive depreciation against the central parity happened after November 25, 1996, the date of Italy's reentry. The timing of the deviation appears important, i.e. it is possible that if deviations of the same size had taken place at the end of the reference

- period, they would have led to the conclusion in the convergence reports that the criterion on exchange rate stability was not fulfilled.
- Furthermore, the depreciation of the French franc shrinks below 2.25% when applying the ten-day moving average to the nominal exchange rate series.
  - Third, while the 2.25% limit on the weaker side is reasonably well respected in every participating country, the exchange rate appreciated by between 2.25% and 10% against the central parity in Finland, Ireland, Italy, Portugal, Spain and Denmark.

#### 6.4 ERM II and the Case of Greece and Denmark

Greece became a member of the ERM on March 16, 1998, just shortly after the end of the reference period used in the European Commission's and the EMI's convergence reports in 1998 and stayed in ERM II until Greece adopted the euro on January 1, 2001. Following an up-front devaluation of 12.3% of the central parity (by setting the central parity at ERM entry below the market rate prevailing at that time), the market rate remained constantly on the stronger side of the fluctuation band, both in ERM and ERM II, with the exchange rate coming as close as 5% to the stronger edge.

Table 7

#### Greece Maximum Deviation from the ECU Central Parity, March 1998 to December 1998

	17. 03. 1998 to 31. 12. 1998			
	daily observations		ten-day moving average	
	APPR	DEPR	APPR	DEPR
Greece	8.557	-1.681	8.428	-2.479

Source: Authors' own calculations.

Note: APPR and DEPR refer to the maximum appreciation and depreciation. Negative values mean that the market exchange rate remained on the other side of the band. Negative values mean for appreciation (depreciation) that the exchange rate stayed in the other part (weaker/stronger) part of the fluctuation band.

Denmark's experience in ERM II is somewhat different from that of Greece. First, Denmark is still in ERM II. Second, the Danish currency has been extremely close to the central parity of the euro since the very beginning with a de facto fluctuation band of less than  $\pm 1\%$  and a formal multilaterally agreed narrow band of  $\pm 2.25\%$ . Probably, such a narrow fluctuation band can be maintained only with the help of a flexible interest rate policy and foreign exchange interventions by the central bank.

Table 8

#### Greece and Denmark in ERM II: Minimum and Maximum Deviations from the Euro Central Parity, 1999 to between 2000 and 2003

	daily observations		ten-day moving average	
	APPR	DEPR	APPR	DEPR
	%			
Denmark	0.799	0.593	0.474	0.119
Greece	8.557	-1.681	8.428	-2.479

Note: Greece: January 1, 1999, to December 31, 2000; Denmark: January 10, 1999, to April 14, 2003.

### 6.5 Changes in the Official Central Rates in the ERM and ERM II

The experience of the present EU Member States in the euro area shows that the only adjustments in the central rates both during the respective reference periods and in the time up to the adoption of the euro were the multilaterally agreed revaluations of the Irish pound (once) and of the Greek drachma (twice).

Consequently, the convergence reports considered the corresponding element of the convergence criterion, which stipulates that the examined Member State must not have devalued its currency's bilateral central rate against any other Member State's currency on its own initiative during the reference period, as fulfilled.

Moreover, the central rate prevailing on the last day before the adoption of the euro was taken as the irrevocable conversion rate in all cases.

Given past experience and the possible need for realignments, it has to be underlined that there should be no presumption that the initial central rate will be the ultimate conversion rate for euro adoption.

## 7 Conclusions

This paper explained the official roadmap for monetary integration and discussed the possible designs of EU acceding countries' exchange rate strategies prior to euro area entry. In view of the economic challenges that accession to the single market and the future catching-up process of the acceding countries involves, the official roadmap of the European Union for monetary integration seems to strike a suitable balance between the various needs. In particular, participation in ERM II can be understood as a useful convergence framework. The basic principle governing the examination of the achievement of a high degree of sustainable convergence with reference to the fulfillment of the convergence criteria will be the equal treatment of the individual new member countries among each other and by comparison to the current EU member countries.

## References

- Begg, D., B. Eichengreen, L. Halpern, J. von Hagen and C. Wyplosz. 2002.** Sustainable Regimes of Capital Movements in Accession Countries. CEPR Policy Paper 10.
- Bofinger, P. and T. Wollmershäuser. 2002.** Managed Floating: Theory, Practice and ERM II. Paper presented at the High Level Scientific Conference of the ICEG European Center: Budapest. November 27 to 30, 2002.
- Borowski, J. 2003.** Potential Benefits of Poland's EMU Accession. Focus on Transition 1. Vienna: Oesterreichische Nationalbank.
- Canales Kriljenko, J. I. 2003.** Foreign Exchange Intervention in Developing and Transition Economies: Results of a Survey. IMF Working Paper 95.
- Crespo-Cuaresma, J., B. Égert and T. Reininger. 2003.** Transmission of Monetary Policy in EU Acceding Countries: Interest Rate Pass-Through in the Czech Republic, Hungary and Poland. Paper presented at the Conference "Financial Intermediation in the New Europe: Economics, Policies and Institutions" of the Università Commerciale Luigi Bocconi. Milano. September.
- Égert, B. 2003.** Assessing Equilibrium Exchange Rates in CEE Acceding Countries: Can We Have DEER with BEER without FEER? A Critical Survey of the Literature. Focus on Transition 2. Vienna: Oesterreichische Nationalbank.
- Eichengreen, B. 2003.** The Accession Economies' Rocky Road to the Euro. Paper presented at the East-West Conference 2003 of the OeNB and the JVI. Vienna. November.

- European Central Bank. 2000.** Convergence Report 2000.
- European Central Bank. 2002.** Convergence Report 2002.
- European Central Bank. 2003.** Policy Position of the Governing Council of the European Central Bank on Exchange Rate Issues relating to the Acceding Countries.
- European Commission. 1998.** Convergence Report 1998.
- European Commission. 1999a.** Treaty establishing the European Community. Annexed protocols and declarations. In: European Commission: Economic and Monetary Union, Compilation of Community Legislation.
- European Commission. 1999b.** Resolution of the European Council on the establishment of an exchange-rate mechanism in the third stage of economic and monetary union, Amsterdam, 16 June 1997. In: European Commission: Economic and Monetary Union, Compilation of Community Legislation.
- European Commission. 1999c.** Agreement of 1 September 1998 between the European Central Bank and the national central banks of the Member States outside the euro area laying down the operating procedures for an exchange rate mechanism in stage three of economic and monetary union. In: European Commission: Economic and Monetary Union, Compilation of Community Legislation.
- European Commission. 2000.** Convergence Report 2000.
- European Commission. 2002.** Convergence Report 2002.
- European Monetary Institute. 1998.** Convergence Report.
- Fidrmuc, J. and I. Korhonen. 2001.** Similarity of Supply and Demand Shocks Between the Euro Area and the Accession Countries. Focus on Transition 2. Vienna: Oesterreichische Nationalbank.
- Havlik, P. 2003.** EU enlargement: Growth, competitiveness and some challenges facing the future member states. WIIW current analysis and country profiles 20. Chapter 5. 7–12.
- IMF. 2003.** Monetary and Exchange Affairs Department: Guidelines for Foreign Exchange Reserve Management: Accompanying Document. March 26.
- Informal Ecofin. 2003.** Acceding Countries and ERM II. Athens. April 5.
- Kowalewski, P. 2003.** The economic debate on acceding countries' current exchange rate strategies. Mimeo.
- Podkaminer, L. 2003.** Accession Countries adopting the Euro: Why and When. Unpublished manuscript of The Vienna Institute for International Economic Studies (WIIW).
- Reininger, T., F. Schardax and M. Summer. 2002.** Financial System Transition in Central Europe: The First Decade. SUERF Studies 16.
- Rose, A. K. 2002.** The Effect of Common Currencies on International Trade: A Meta-Analysis. <http://www.haas.berkeley.edu/~arose/>. Retrieved in March 2003.
- Rose, A. K. and E. van Wincoop. 2001.** National Money as a Barrier to International Trade: The Real Case for Currency Union. *American Economic Review* 91(2). 386–390.



S T U D I E S

# Seigniorage in Selected Acceding Countries: Current Situation and Future Prospects on the Road towards Monetary Integration

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## I Introduction

This paper examines the seigniorage income of six acceding countries – the Czech Republic, Estonia, Hungary, Poland, Slovakia and Slovenia – in the period from 1998 to 2002, comparing it with that of the euro area. Furthermore, the paper discusses whether the selected countries could raise their seigniorage revenues by following an expansive monetary policy course; it also examines how the prospective joining of the euro area could affect the seigniorage revenues of these countries.

This paper is structured as follows: After defining seigniorage and the monetary base in section 2, section 3 examines the components and the counterparts of the monetary base in the selected acceding countries. In section 4, we calculate the seigniorage revenues of the selected acceding countries for the period from 1998 to 2002. After assessing the future development of seigniorage in acceding countries, we address the question whether these countries could gain more seigniorage if they raised their inflation rate. Section 5 presents a simulation on how euro area membership would probably influence the seigniorage revenues of the selected countries. Finally, section 6 concludes.

## 2 Definition of Seigniorage and Monetary Base

### 2.1 Definition of Seigniorage

As central banks are solely responsible for money issuance and have the power to demand that commercial banks hold balances with the central bank, seigniorage is the monopoly profit of central banks. There are several definitions of seigniorage. The most widespread definition in the earlier literature (e.g. Fischer, 1980) uses *monetary seigniorage*, which is the increment of the monetary base over a defined period (usually a year). According to this definition, the increment of the monetary base could be regarded as profit of the central bank after deducting the costs that arise from the creation of the monetary base, e.g. the interest the central bank pays on the balances of commercial banks. Whenever the monetary base contracts, the central bank would be considered as suffering a loss. This concept does not correspond to the current, generally accepted accounting rules, as these consider the components of the monetary base repayable liabilities. An increase in repayable liabilities can be regarded as profit only in unlawful pyramid schemes. The ambition of all countries in this survey is to join the euro area. In this case, the national banknotes will be exchanged for euro banknotes; this process can be seen as the central bank paying back the monetary base to the general public. In a more permissive sense, monetary seigniorage could be regarded as profit if the counterpart of the increase in the monetary base were unmarketable government debt. This is, however, not the case in the countries under investigation. Central bank legislation in these countries prohibits direct financing of the government by the central bank.

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The recent literature (e.g. Kun, 1996; Holub, 2001; Tymoczko, 2001; Schobert 2001; Hochreiter and Rovelli, 2002) prefers the concept of *fiscal seigniorage*, which refers to the yield on the counterparts of the monetary base after deduction of costs. Halpern and Neményi (2002), however, calculate monetary seigniorage. A comprehensive survey of the literature can be found in Lange (1995) and a transparent description of all concepts in Hochreiter and Rovelli (2002).

The European System of Central Banks (ESCB) uses the terms *seigniorage* and *monetary income* as synonyms, the use of the term “monetary income” being more frequent. According to Article 32.1 of the Statute of the European System of Central Banks and of the European Central Bank, monetary income is “the income accruing to the national central banks in the performance of the ESCB’s monetary policy function.” This definition is closely related to the concept of fiscal seigniorage because issuing money and requiring commercial banks to hold reserves with the central bank are monetary policy functions. There is a difference, however: Monetary policy functions include interventions that may be very costly and may decrease the central bank’s profit. For the majority of the economies under review, a monetary policy intervention that is likely to be costly is sterilization in response to high foreign capital inflows.

We do not consider seigniorage and monetary income synonyms: seigniorage is a part of monetary income. According to the above definition, the only costs that reduce seigniorage are the printing costs of banknotes, the minting costs of coins (if issued by the central bank) and the interest paid on required reserves. Therefore, seigniorage must be positive except in extreme cases when, for example, the counterpart of the monetary base is in foreign assets and the rate of appreciation of the home currency is higher than the yield on foreign assets.

Another question is how expensive it is to sustain a chosen monetary regime.<sup>1)</sup> Obviously, central banks utilize their profit and reserves first to cover their costs for sustaining the monetary regime, but if this does not suffice, the government must subsidize these central banks. If intervention proves to be profitable in the end, it yields an income which is not part of seigniorage.

There is also a practical reason why we did not include the costs or profit of interventions in our investigations. Central banks are often hesitant in disclosing the costs of their interventions, and even if some information is given, it might not contain all costs because (though not typically) the central bank and the government might apply a division of labor in executing interventions and bearing the costs.

There are, however, considerations which would justify the inclusion of interventions in the definition of seigniorage. As this study will show, exchange rate movements have a considerable effect on seigniorage in the acceding countries: seigniorage decreases as the currency appreciates. Interventions often aim to prevent the acceding countries’ currencies from excessive appreciation. This means that a lack of interventions would reduce seigniorage. Although the motive behind an intervention has nothing to do with seigniorage expectations,

<sup>1</sup> Schobert (2001) points out that the Estonian and Slovenian monetary regimes were much cheaper to sustain in the period under investigation than those of the other acceding countries.

it would be interesting to investigate the effect of interventions on seigniorage. Such an investigation, however, would go beyond the scope of this study.

It should be noted that central banks make profits that are neither part of seigniorage nor of monetary income. Such profits may derive from managing reserves that are not a counterpart of the monetary base; furthermore, central banks may provide services to banks, to the government or to the general public, which also yield profit. This paper does not deal with this type of profit. Hochreiter and Rovelli (2002) include the yield on those reserves which had been accumulated as retained seigniorage in seigniorage revenue. We do not follow this calculation in this paper.

## 2.2 Definition of the Monetary Base

According to common definition, the monetary base is the sum of cash outside the central bank and the reserves of commercial banks held at the central bank. We use this definition in this study, but the following remarks are deemed necessary to justify this definition to some extent.

Central banks in the acceding countries often issue *securities denominated in domestic currency to sterilize excess liquidity* (e.g. money market bills in Poland). These securities are usually purchased by commercial banks and/or by the general public.<sup>1)</sup> Some national definitions consider this instrument part of the monetary base. We do not share this view for two reasons. First, the central bank has to pay market interest on these instruments, i.e. no seigniorage revenue arises out of their issue. Second, excess liquidity may be sterilized by selling government papers from the central bank's portfolio or by agreeing with the Treasury that it issues government papers in excess of the government's financing needs for sterilization. If central bank securities were treated as part of the monetary base, the monetary base would fluctuate depending on which method is used for sterilization.

Apart from serving as the calculation base of seigniorage, the monetary base can play an important role in the analytical work of central banks. It is one of the most easily accessible monetary aggregates and can provide information on the state of the economy. In order to draw conclusions, however, seasonal changes, changes in the behavior of cash management and cash holding, and changes in the rates of required reserves have to be taken into account as well.

According to the concept applied by the ESCB, *coins* are usually<sup>2)</sup> issued by the national governments and are not part of the monetary base. With respect to coins, the ESCB follows the concept of monetary seigniorage: The face value of coins is credited to the government when the coins are purchased by the central bank, which puts them into circulation. The monopoly profit of coin issuing – the difference between the minting cost and face value – is at the government's free disposal like any other revenue. (According to Article 106 of the Treaty Establishing the European Community, the ECB has the right to approve the volume of coins that can be issued by particular governments.)

1 Money market bills issued by Narodowy Bank Polski, the Polish central bank, can be purchased by commercial banks and by the Banking Guarantee Fund.

2 With the exception of Austria, where the mint is a 100% subsidiary of the national central bank.

However, in the acceding countries under review (with the exception of Slovenia) coins are issued by the central banks and are part of the monetary base. This difference somewhat weakens the comparability between data on the acceding countries and euro area member countries, but the distortion is fairly negligible. According to data extracted from the annual reports of Magyar Nemzeti Bank and Narodowy Bank Polski and to data obtained from the central banks of other countries,<sup>1)</sup> coins make up 1% to 3% of the currency in circulation. The share is lowest in Estonia (1%) and Slovakia (1.5%), while in the other countries analyzed it comes to 3%.

### 3 The Monetary Base of the Acceding Countries

#### 3.1 Components of the Monetary Base

Table 1 compares the monetary base of the acceding countries and that of the euro area in the period from 1998 to 2002.

Table 1

<b>Monetary Base</b>					
	1998	1999	2000	2001	2002
	<i>Annual average, % of nominal GDP</i>				
Czech Republic	12.7	11.1	11.1	10.3	9.5
Estonia	11.4	12.1	12.7	11.0	10.3
Hungary	10.6	11.1	11.0	9.5	9.5
Poland	9.0	8.8	6.8	6.6	7.4
Slovakia	12.5	11.7	11.4	10.9	10.9
Slovenia	4.2	4.6	4.5	4.3	4.5
Acceding countries' weighted average	9.9	9.5	8.4	7.9	8.3
Euro area	7.3	7.2	7.2	6.8	6.3

Source: National central banks, ECB, Eurostat, own calculations.  
Note: Euro area 1998: year-end value, not year-average value. The AC's weighted average includes only the six countries above.

As table 1 shows, the monetary base differs widely in the selected countries. To understand this behavior, let us investigate separately the components of the monetary base of the countries. We find that the two components develop differently. While currency holdings depend on individual decisions and on the habits of the economic subjects (which are influenced by macroeconomic developments and by the state of development of the individual country's banking system), the magnitude of reserves rather depends on the central bank's mandatory reserve regulations and on the behavior of commercial banks' liabilities, which are the calculation base of reserves.

Let us have a look at the *currency holdings* first. As table 2 shows, currency holdings in relation to nominal GDP are rather stable in each acceding country over the observation period, but there are substantial differences among countries.<sup>2)</sup> Czech households (and commercial banks) keep more than three times as much currency in relation to GDP than Slovenian households (and banks). The weighted average of currency holdings in relation to GDP for the six acceding countries analyzed is higher than that of the euro area; the difference is, however, not striking. While currency holdings in the euro area are diminishing, no definite trend can be determined for the acceding countries. The decrease of the currency stock relative to nominal GDP in the euro area in 2001 and 2002

<sup>1</sup> Thanks to Barta Vit (Česká národní banka), Martti Ranveer (Eesti Pank), Robert Pazitny (Narodná banka Slovenska).

<sup>2</sup> Currency holdings increased at end-1999 because of the Y2K effect, but this rise is smoothed by the annual averages.

is attributable to the replacement of national denominations by euro banknotes. Euro area citizens may have changed their savings habits; they no longer have to keep denominations of other euro area countries when traveling to another country, and Deutsche mark banknotes, which had been used as “quasi-legal tender” outside the euro area before, were not replaced by euro banknotes but rather by the U.S. dollar or put to bank accounts.

Table 2

<b>Currency Holdings</b>					
	1998	1999	2000	2001	2002
	Annual average, % of nominal GDP				
Czech Republic	7.6	8.3	9.3	9.0	8.4
Estonia	7.3	7.5	7.7	7.4	7.3
Hungary	6.6	7.0	6.9	6.7	7.1
Poland	5.9	6.0	5.3	5.2	5.8
Slovakia	7.6	7.1	7.3	7.9	8.4
Slovenia	2.4	2.6	2.6	2.4	2.5
Acceding countries' weighted average	6.2	6.4	6.2	6.1	6.5
Euro area	5.8	5.5	5.5	5.0	4.5

Source: National central banks, ECB, Eurostat, own calculations.  
Note: Euro area 1998: year-end value, not year-average value. The AC's weighted average includes only the six countries above.

To understand the currency holding habits of the population of different countries, we examined the per capita currency holdings in the acceding countries and in the euro area. As we can see in table 3, per capita currency holdings in purchasing power parity euro increased in the acceding countries during the period in question. This may be connected to the initial increase of the population's purchasing power in the acceding countries given the recovery after the transformation crisis and because of the diminishing opportunity costs of cash holding as inflation, and hence nominal interest rates, went down in these countries. The differences between the currency holding habits in the individual countries, however, remained, while currency holdings decreased in the euro area.

Table 3

<b>Currency outside the Central Bank</b>					
	1998	1999	2000	2001	2002
	Per capita, EUR converted at purchasing power parity, annual average				
Czech Republic	930	1,045	1,226	1,256	1,232
Estonia	592	612	688	729	779
Hungary	646	725	762	796	898
Poland	459	496	464	488	562
Slovakia	781	740	790	908	1,037
Slovenia	330	374	395	395	435
Euro area	1,178	1,166	1,214	1,125	1,037

Source: Eurostat.  
Note 1: Euro area 1998: year-end value, not year-average value.  
Note 2: Available data calculate the purchasing power parity of the acceding countries in relation to the European Union average and not to the euro area. We regard the purchasing power of the EU-15 equal to that of the euro area.

*Required reserves of commercial banks* at the central bank, the second part of base money, serve several goals. They increase the security of the banking system because required reserves of a particular bank can be released if the bank is in difficulties, and thus any spillover effect of the crisis of one bank can be contained. Furthermore, reserve holdings raise the efficiency and reliability of interbank transfers because they have to be kept on commercial banks' current

accounts with the central bank and reserve requirements have to be met on a monthly or fortnightly average only. They may help to mop up excess liquidity, may increase the official reserves of the country if commercial banks take out foreign exchange loans in order to meet the reserve requirement and the foreign exchange is converted at the central bank, and they may offer seigniorage revenue if the reserves are not remunerated at market interest rates. The banking systems of the acceding countries are (or at least were until lately) more fragile than the euro area banking system, and required reserves were partly needed to accumulate bank reserves that justified higher reserve requirements than in the euro area. Higher required reserves, however, have a negative side effect. They decrease the cross-border competitiveness of the domestic banking system vis-à-vis banks abroad. This disadvantage is more pronounced the more capital controls are eased. As in the countries under review enterprises are allowed to borrow from abroad, and best debtors can thus be lured away from the domestic banking system, it is understandable that the countries concerned have been easing their reserve requirements. In fact, the official explanation for reducing the reserve requirement often contains the intention to increase the competitiveness of the domestic banking sector and the intention to move, gradually, to mandatory reserve rates compatible with those of the euro area. Table 4 clearly reflects the decreasing trend of bank reserves as a percentage of GDP.

Table 4

**Commercial Banks' Reserve Holdings at the Central Bank**

	1998	1999	2000	2001	2002
	Annual average, % of nominal GDP				
Czech Republic	5.1	2.7	1.8	1.3	1.1
Estonia	4.1	4.6	5.0	3.5	3.0
Hungary	4.0	4.1	4.2	2.8	2.4
Poland	3.2	2.8	1.5	1.4	1.7
Slovakia	4.9	4.6	4.2	3.1	2.5
Slovenia	2.0	2.2	2.1	2.1	2.2
Acceding countries' weighted average	3.7	3.1	2.2	1.8	1.8
Euro area	1.5	1.7	1.7	1.8	1.8

Source: National central banks, ECB, Eurostat, own calculations.

Note: Euro area 1998: year-end value, not year-average value. The AC's weighted average includes only the six countries above.

In the Czech Republic, the reserve requirement was reduced from 9.5% to 7.5% in August 1998, to 5% in January 1999 and to 2% in October of the same year. Estonia has the highest reserve requirements, as under its currency board arrangement, the central bank cannot practice its "lender of last resort" function. The higher reserve requirement (13% of the eligible commercial bank liabilities) helps to partly compensate for this increased fragility. Until July 2000, 3 percentage points of the reserve requirement were called "additional" requirement and were remunerated differently than the other part. Since January 2001, 25% and since July of that year 50% of the reserve requirement may be met with high-quality foreign assets, which is clearly visible in the table in the decreasing trend in holdings at the central bank. In Hungary, the reserve requirement was reduced in several steps from the initial 12% to 5% by August 2002. Liabilities with a maturity of over two years were exempted from the reserve requirement in 2000. In Poland, the fragmented reserve requirement (20% on demand deposits, 11% on time deposits and 5% on foreign exchange deposits) was replaced by a 5% flat rate in September 1999. Taking into account

that 10% of the reserve requirement could be met with vault cash, the effective reserve ratio was reduced from 10.6% to 4.5%.<sup>1)</sup> In Slovakia, the requirement was reduced from the initial 9% to 4% by 2002. Slovenia was the only country where reserve requirements were not reduced during most of the observed period. Instead, the reserve requirement was fragmented, ranging from 12% on sight deposits to 0% on deposits with a maturity of more than one year, which results in an average reserve ratio of 5.6%. With a view to convergence with ECB instruments, however, three ratios (0%, 2% and 7%) have been applied since August 2002, and it is no longer possible to meet the reserve requirement by purchasing 60-day tolar bills issued by Banka Slovenije.<sup>2)</sup>

### 3.2 Counterparts of the Monetary Base

Central banks' balance sheet totals may surpass considerably the size of the monetary base because of their capital and reserves and because of other functions central banks may perform aside from their primary functions of issuing money, preserving price stability and ensuring the stability of the country's financial system.

Table 5

<b>Central Bank Assets</b>			
	Foreign currency assets	Claims on government in local currency	Claims on domestic banks in local currency
	% of monetary base, 2000		
Czech Republic	278.12	0.00	8.81
Estonia	130.77	0.00	0.00
Hungary	361.39	42.89	5.71
Poland	240.94	33.42	13.01
Slovakia	351.05	8.14	10.61
Slovenia	175.27	0.00	33.53
Euro area	78.92	11.63 <sup>1)</sup>	54.24

Source: National central banks, ECB, own calculations.

<sup>1)</sup> General government debt denominated in euro.

The national central banks of the Eurosystem are required to earmark the assets generated in connection with the creation of the monetary base,<sup>3)</sup> but this is not the case for the central banks of the acceding countries. Without onsite information we cannot perform the task of earmarking the assets linked to the creation of the monetary base in the acceding countries. Table 5 displays those assets of the central banks of the acceding countries under review which may serve as the *counterparts of the monetary base*; this means fixed assets, intangibles and accruals are not taken into account because they are not considered possible channels of money creation. Up to the size of the monetary base, the assets included in table 5 can be considered actual counterparts of the monetary base. By comparison, the table also shows the corresponding data from the consolidated euro area balance sheet.

1 In order to comply with ECB rules, the reserve ratio was lowered to 4.5% for all types of deposits (i.e. demand deposits, time deposits and foreign currency deposits) in February 2002, but vault cash was no longer deductible. The reserve ratio was further lowered to 3.5% for all types of deposits as of the end of October 2003.

2 Source: Annual reports and information from the websites of the respective national central banks retrieved on November 10, 2003.

3 See Article 32.2 of the Statute of the European System of Central Banks and of the European Central Bank.

As table 5 indicates, *foreign assets* dominate the asset side of the balance sheet of central banks in the acceding countries. The ratio of foreign assets to the monetary base is substantially higher in the acceding countries than in the euro area, coming to above 100%, as the acceding countries' foreign assets exceed their monetary base. Three acceding countries' central banks have no claims on their governments, and the share of claims on domestic banks in local currency is substantially lower than in the euro area. All central banks (with the exception of Eesti Pank, which is a currency board regime) basically have the same monetary policy instruments in place as the ESCB, but repos are used for money creation to a much smaller extent than in the euro area.

## 4 The Size of Seigniorage Revenues in the Acceding Countries

### 4.1 Measurement of Seigniorage Revenues

In this study, we assume that in the *acceding countries* money creation is effected exclusively through the foreign exchange channel. This simplifying assumption is justified by the fact that money creation is performed through this channel to an overwhelming extent. Accordingly, the quantity of seigniorage is the yield, or interest income, on the central bank's foreign assets equivalent to the size of the monetary base, minus the interest paid on the commercial banks' required reserves.

We have information about the currency composition of the foreign reserves from the annual report of Česká národní banka and from the website of Národná banka Slovenska. The other central banks in the region do not reveal their reserve allocation policy. The reserve allocation policy of the Czech and Slovak central banks is very similar; therefore, we assume that the other central banks in the acceding countries also follow a similar policy. We take it that 75% of the reserves of the six central banks under consideration are held in euro-denominated and 25% in U.S. dollar-denominated government bonds.

Because of the long-term character of these investments, we use the secondary market yields on long-term government papers.

Central banks' balance sheets are compiled in domestic currency; therefore, the depreciation or appreciation of the domestic currency against the euro and the U.S. dollar has to be taken into account as well.

In this study, we calculated seigniorage in the following steps. First, we took the long-term U.S. and euro<sup>1)</sup> government bond yields for the five years under investigation.<sup>2)</sup> We then adjusted U.S. yields for the depreciation of the euro against the U.S. dollar and computed the three-quarter euro/one-quarter U.S. dollar government bond basket. Subsequently, we adjusted the yield of

1 For 1998 we employed German government bond yields.

2 For reasons of simplicity, the annual average yield-to-maturity ratio of long-term government bonds was taken as the basis for the calculation. However, in actual practice, the total performance of central banks' actual asset portfolios during the investigated time periods formed the basis of seigniorage income. With regard to the Eurosystem, the transitional institutional rules for measuring monetary income implied that the benchmark for monetary income pooling and reallocation from its start in 1999 was the main refinancing operation (MRO) rate on a daily basis; since 2003 the sum of the actual (nominal) interest income on monetary policy instruments and the interest income resulting from applying the MRO rate on the difference between the monetary base and the total refinancing volume (consisting mainly of foreign assets and euro government bonds) have been taken for monetary income pooling.

the basket for the change of value of the individual countries' currencies against the euro. For 1998, we used the ECU instead of the euro.

To measure *euro area* seigniorage, we had to form a different basket, since euro-denominated government bonds held by the Eurosystem account for less than three quarters of the monetary base. For this exercise, we assume that money creation as reflected in commercial banks' required reserve deposits with the euro area central banks is effected through the repo channel and that the counterpart of the currency holdings is a basket composed of a 30% repo, 60% U.S. dollar-denominated bond and 10% euro-denominated bond portfolio. We arrived at this portfolio by assuming, roughly, that those euro area assets in excess of the level of the counterparts of the monetary base consist exclusively of foreign assets.

Table 3 of the annex presents the data used for calculating the *interest rates*; table 6 displays the computed interest rates.

Table 6

<b>Interest Rates Used in the Calculation of Seigniorage</b>					
	1998	1999	2000	2001	2002
	%				
Czech Republic	5.4	9.2	5.9	1.2	-6.4
Estonia	5.7	5.2	9.7	5.8	3.5
Hungary	20.2	11.3	12.8	4.4	-2.1
Poland	10.6	15.4	4.0	-3.2	8.7
Slovakia	9.9	18.2	5.9	7.6	2.0
Slovenia	8.7	10.3	16.1	12.1	7.8
Euro area (currency)	5.6	7.6	15.1	6.8	0.9

Source: National central banks, Eurostat, own calculations.

Though we assumed that all acceding country central banks use the same portfolio, the interest rates turned out to be substantially different, which is traceable to the exchange rate movements in the individual countries. In 1998 and in 1999, all the countries under review experienced a nominal depreciation against the euro, with Hungary and the Slovak Republic recording the most pronounced depreciation in 1998 and 1999, respectively. Depreciation entails high interest rates. In 2000, however, the currencies of three countries appreciated, and only Hungary and Slovenia recorded a depreciation of their national currencies. The Hungarian forint joined the club of appreciating currencies in 2001, followed by the Slovak koruna in 2002. The appreciation of the Polish zloty in 2001 and that of the Hungarian forint and the Czech koruna in 2002 was so high that the applied interest rates were negative in the respective years. The euro area interest rate used for the currency part of the monetary base was extremely high in 2000 because of the sharp appreciation of the U.S. dollar against the euro and substantially lower in 2002 as the U.S. dollar depreciated in that year.

Table 7 shows the *seigniorage on the currency holdings* of the acceding countries and of the euro area as a percentage of GDP. Among the acceding countries, Hungary recorded the highest seigniorage on currency holdings (1998 and 2000), as the country's currency holdings are high and interest rates went up as the forint devalued. In 1999, revenue on currency holdings was highest in Slovakia due to the pronounced depreciation of the koruna. Seigniorage revenues on currency holdings in Poland in 2001 and in Hungary and the Czech

Republic in 2002 are negative because their currencies appreciated. Seigniorage revenue on currency holdings in Estonia grew almost twofold from 1999 to 2000. The main reason behind this increase is the higher yield on the above-described model portfolio given the appreciation of the U.S. dollar against the euro. This effect was not mitigated by the appreciation of the domestic currency in the case of Estonia. Seigniorage on the currency holdings of the acceding countries does not differ substantially from that in the euro area. For 2000, however, euro area seigniorage turns out to be almost as high as the highest acceding country value because of the appreciation of the U.S. dollar.

Table 7

**Seigniorage on Currency Holdings**

	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	0.4	0.8	0.5	0.1	-0.5
Estonia	0.4	0.4	0.7	0.4	0.3
Hungary	1.3	0.8	0.9	0.3	-0.2
Poland	0.6	0.9	0.2	-0.2	0.5
Slovakia	0.8	1.3	0.4	0.6	0.2
Slovenia	0.2	0.3	0.4	0.3	0.2
Euro area	0.3	0.4	0.8	0.3	0.0

Source: National central banks, ECB, Eurostat, own calculations.

When calculating the *seigniorage on bank reserves* held at the central bank, we have to take into account the interest central banks pay to commercial banks. Narodowy Bank Polski paid no interest on deposits during the observation period, and Česká národní banka began to remunerate deposits in July 2001 only with the two-week repo rate. In the other countries, central banks paid (and still pay) interest on reserves, but rates are lower than market interest rates. In the second half of 2000, Magyar Nemzeti Bank paid 0.5% more interest on required reserves which had to be accumulated because of foreign exchange deposits in commercial banks, but this preferential rate was abolished in 2001. The interest Eesti Pank paid on required reserves increased substantially over the period because interest payment was extended to the whole volume of required reserves in July 1999. Until then, only “additional” reserves had been remunerated. The interest rate applied corresponds to the deposit interest rate of the ECB (and that of the Deutsche Bundesbank in 1998). In the euro area, the interest rate for commercial banks’ required reserves corresponds to the repo rate. As we assumed that commercial banks’ reserves are created through the repo channel, no seigniorage arises on required reserves in the euro area.

The influence of excess reserves on seigniorage is neglected in this paper. Excess reserves are usually not remunerated, and interest is paid on required reserves only. This treatment prompts commercial banks to pursue a tight liquidity management: Excess reserves make up merely 1% to 4% of total reserves.

The average interest rates on commercial banks’ reserves with the central bank are presented in table 4 of the annex. The seigniorage on bank deposits as a percentage of GDP is displayed in table 8.

Table 8 demonstrates that seigniorage on bank deposits follows a mixed, but in the majority of cases decreasing trend. The sharpest reduction is visible in Poland, given the sharp decrease of the reserve ratio in fall 1999 and the appre-

Table 8

<b>Seigniorage on Commercial Bank Deposits with the Central Bank</b>					
	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	0.3	0.2	0.1	0.0	-0.1
Estonia	0.2	0.2	0.3	0.1	0.0
Hungary	0.4	0.1	0.3	0.0	-0.2
Poland	0.3	0.4	0.1	0.0	0.1
Slovakia	0.4	0.8	0.2	0.2	0.0
Slovenia	0.2	0.2	0.3	0.2	0.1
Euro area	0.0	0.0	0.0	0.0	0.0

Source: National central banks, ECB, Eurostat, own calculations.

ciation of the zloty in 2000. Seigniorage on bank deposits increased sharply in Hungary from 1999 to 2000. The reason was, on the one hand, that – in line with the decreasing domestic interest rate – Magyar Nemzeti Bank paid lower interest on commercial banks' mandatory reserve deposits and on the other hand, that the yield the model portfolio (three-quarter euro, one-quarter U.S. dollar bonds) offered was amplified by the depreciation of the forint. However, the appreciation of the forint in 2001 and 2002 mopped up this revenue, and seigniorage on bank deposits turned negative in 2002, as in the Czech Republic, which had already posted a loss in 2001. Poland, in turn, recorded negative seigniorage in 2001, which changed its sign in 2002.

Adding up the two components of seigniorage, we get the *total seigniorage revenue* of the countries under review, which is presented in table 9.

Table 9

<b>Total Seigniorage Revenue</b>					
	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	0.7	1.0	0.7	0.1	-0.6
Estonia	0.6	0.6	1.0	0.5	0.3
Hungary	1.7	0.9	1.2	0.3	-0.3
Poland	1.0	1.4	0.3	-0.2	0.6
Slovakia	1.2	2.1	0.6	0.8	0.2
Slovenia	0.4	0.5	0.7	0.5	0.3
Euro area	0.3	0.4	0.9	0.4	0.1

Source: National central banks, ECB, Eurostat, own calculations.

As table 9 shows, total seigniorage revenue is usually higher in the acceding countries than in the euro area. The year 2000, when this value was higher in the euro area, can be treated as exceptional because of the steep appreciation of the U.S. dollar versus the euro. Only Slovenia posted smaller values in 1998 and 1999, mainly because of its low currency stock. The main reason why seigniorage is lower in the euro area is the lack of seigniorage on bank reserves.

We carried out *sensitivity analyses* regarding the effect of exchange rate changes on the size of total seigniorage revenue. In the first analysis we disregarded the exchange rate movements between the euro and the U.S. dollar. The U.S. dollar was appreciating against the euro in the observation period until 2001. This appreciation manifested itself in higher yields on U.S. dollar assets held against the monetary base. Therefore, if no exchange rate movements had taken place, seigniorage would have been smaller. In 2002, however, the dollar depreciated and without this depreciation seigniorage would have been higher.

In the second analysis we disregarded the exchange rate movements of the domestic currencies of the acceding countries as well. Slovenia shows lower seigniorage revenues than the euro area in all years but 2002, as the devaluation of the tolar no longer increases the yield of the foreign exchange portfolio in this simulation. Hungary shows extremely small values in 1998 and 1999, because in these years the nominal interest rate on commercial banks' required reserves was higher than the yield on the counterpart of the monetary base and therefore, if devaluation is not taken into account, negative seigniorage (loss) is realized on commercial bank deposits. If exchange rates had been stable, negative seigniorage values would not have occurred and seigniorage revenues would have been more stable. In the euro area, for example, seigniorage revenues would have fluctuated between 0.19% and 0.29% of GDP if the exchange rate of the euro against the U.S. dollar had been stable against the fluctuation of 0.05% and 0.88% of GDP. All in all, in most cases more than half of the seigniorage revenue can be attributed to exchange rate changes. Tables 5 and 6 in the annex present the results of the sensitivity analyses.

It should be noted that the seigniorage revenues calculated in this exercise have little to do with the *actual profit* (or the share of the actual profit) the central banks transfer to the Treasury each year. As mentioned above, central banks usually manage (foreign) assets that are much higher than the monetary base, and income on assets above the level of the counterparts of the monetary base is usually not identified separately. (One exception is the euro area, where reserves are labeled.) Open market operations may also influence profits substantially. But even if we neglected or tried to filter out these effects, a difference between seigniorage and transferred profit would remain. The reason lies in the accounting practices and profit distribution rules of the respective central banks.

In Hungary, Poland and Slovenia, foreign exchange gains have to be transferred to the foreign exchange reserves – either directly to the asset side or onto a revaluation account on the liabilities side. Any such gains may only be used to cover foreign exchange losses. As a general rule, unrealized gains must not be recognized as income and have to be put on a revaluation account. There is no information about the maturity structure of bonds, and even if we had such information, we could not gauge the effect the active portfolio management of central banks' treasurers has on the proportion of realized and unrealized gains. Unrealized losses, however, appear on the profit and loss accounts if they surpass prior, unrealized gains. The application of accounting rules will most probably help smooth out central banks' profits over the years.

Even if profits are realized, there are restrictions to transferring profits to the Treasury. In Estonia, for example, 25% of the profit can be transferred to the Treasury, provided the reserves of the Eesti Pank reach 2% of GDP and 5% of M2. Magyar Nemzeti Bank's profit transfer to the Treasury is equal to the average profit of the second, third and fourth preceding year, provided the profit of the year under review and retained earnings suffice.

#### **4.2 Further Evolution of Seigniorage in the Acceding Countries**

All acceding countries under review are on the road to joining the EU and are pursuing the final goal of joining the Eurosystem. They are already economically and financially integrated with the EU; their banking systems are to a large

extent foreign-owned, mainly by banks from the euro area (Reininger et al., 2002). Because of this high-level integration, it is expected that these countries converge their reserve requirements to those of the Eurosystem even before actually joining it, although legally they are obliged to harmonize mandatory reserve rates fully only when they join the euro area. Maybe they will keep a higher reserve ratio in order to preserve ample official foreign exchange reserves, but the implicit taxation of the banking system will be further reduced and will finally disappear: The interest rates the central banks pay on reserves will converge to market rates. Therefore, as in the Eurosystem, seigniorage revenue on commercial bank reserves will disappear.

As mentioned before, the repo channel was hardly used for money creation in the acceding countries in the years under investigation because commercial banks in the region had ample liquidity even without using this option. This was for three reasons. First, in order to restrict domestic demand and to reduce inflation, domestic interest rates were kept at a relatively high level and therefore it was rewarding for commercial banks to borrow money from abroad instead of using repos to obtain funds from the central bank. Second, some transnational banks centralized their treasury activities in the country of their headquarters, using the repo facility of that country and disbursing the funds among the subsidiary banks. Aside from organizational considerations, this practice had another advantage, namely that intrabank loans may serve as a convenient vehicle of profit transfer between a parent bank and its subsidiaries. As inflation in the acceding countries is abating, interest rates are also being reduced and using repos will become less disadvantageous. The second reason, however, will sustain or even gain momentum, as the banking system is becoming even more integrated into the network of transnational banks through the privatization of remaining state-owned banks. Third, capital inflow (FDI and portfolio investment of nonbanks) drove up the resources of commercial banks even if banks did not make use of the repo facility. Anyway, as a consequence of these three factors – and in particular because of changes in the first factor – the use of repos is expected to go up, which will reduce seigniorage because repos incur lower yields for central banks than long-term bonds.

The currencies of most acceding countries appreciated in recent years. It is expected that appreciation will slow down in the coming years for the following reasons. First, as euro area membership becomes a realistic option, the acceding countries have to consider that joining ERM II with an excessively appreciated currency would negatively influence their competitiveness in the long run. Second, inflation in most countries has already been reduced to a level where the weapon of exchange rate appreciation is not needed for further disinflation. Therefore, it is expected that these countries will follow an exchange rate policy which impedes, or at least slows down, appreciation. This means that in the coming years, no significant further upward movements are expected in the nominal exchange rate of the acceding countries' domestic currencies that would have a large-scale impact on seigniorage revenue.

As far as currency-holding habits are concerned, we have seen above that currency holdings in relation to GDP are higher in the acceding countries than in the euro area, but per capita currency holdings in purchasing power parity euro are smaller. Increasing purchasing power, as experienced in the acceding

countries, points towards a rise in currency holdings, which can be offset by the increasing availability of banking services and the spreading of financial innovation. We expect that currency holding habits will be neutral to seigniorage revenue in relation to GDP in the coming years.

All in all, we expect that seigniorage revenue will decrease somewhat in the acceding countries in the coming years.

The question arises whether the acceding countries could or should stop this decrease to improve their fiscal stance, as suggested by the “optimal inflation rate” literature. Obviously, an expansive monetary policy would – ceteris paribus – result in higher inflation, higher nominal interest rates and a (higher) nominal depreciation of the currency, which would entail higher seigniorage revenue. On the other hand, as table 10 shows, government debt is higher than the monetary base in all the countries under review (with the exception of Estonia). More than the gain on seigniorage would be spent on higher debt service, all other things being equal, if an expansive monetary policy were pursued.

Table 10

**Government Debt less Monetary Base in the Acceding Countries**

	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	1.0	3.2	5.5	13.0	17.4
Estonia	– 5.3	– 5.6	– 7.7	– 6.3	– 4.6
Hungary	51.5	50.1	44.5	43.9	48.0
Poland	33.9	33.9	30.4	30.7	34.4
Slovakia	n.a.	32.1	35.5	37.2	33.4
Slovenia	n.a.	21.8	23.1	23.2	23.3

Source: National central banks, ECB, Eurostat, own calculations.

## 5 Seigniorage in the Acceding Countries after Joining the Euro Area

In this part we investigate how the prospective entry into the Eurosystem will affect the seigniorage revenues of the acceding countries. It should be noted that accession to the euro area will occur as the last step after EU accession and participation in ERM II and that it will require the fulfillment of the Maastricht convergence criteria.

In this analysis, we use the *rules of the protocol on the Statute of the ESCB and of the ECB*, under which the monetary income (seigniorage revenue) of the Eurosystem is to be distributed according to the respective national central bank’s share in the ECB’s paid-up capital, which in turn is determined as a weighted average of the respective country’s share in population (50% weight) and in GDP (50% weight).<sup>1</sup> Actually, we should take average GDP over the five

<sup>1</sup> While the pooled monetary income has always been distributed according to the capital key, from 1999 to 2007 smoothing mechanisms are applied in line with the transitional provisions of the Statute of the ESCB. From 1999 to 2001, the smoothing mechanism was based on the exclusion of the national banknotes in circulation from the monetary base, as euro cash had not been introduced yet (see ECB Decision of 3 November 1998 as amended by Decision of 14 December 2000 ECB/2000/19). Since the euro cash changeover on January 1, 2002, the smoothing mechanism has primarily aimed to equalize historical differences in the banknote circulation. “Historical differences” are identified by discrepancies between the actual national banknote circulation of a national central bank (NCB) before the euro cash changeover and the NCB’s “ideal” part in the total Eurosystem banknote circulation according to its share in the paid-up ECB capital (see ECB Decision ECB/2001/16, in particular Article 4). Since 2002, the smoothing effects have been declining year by year.

years preceding the penultimate year and the population of the penultimate year into account,<sup>1)</sup> but we simplify the compilation by taking year 2002 data only.

To facilitate the investigation, we make the following *assumptions*. We assume that the incumbent members of the euro area are the 12 current euro area members, i.e. our analysis does not include those current ESCB member countries that are not members of the euro area, i.e. Denmark, Sweden and the U.K. Moreover, we assume that all profits resulting from seigniorage will be transferred to the national central banks of the euro area.

In order to investigate just the effect of joining the euro area, this exercise assumes that, already before the adoption of the euro, money creation in the acceding countries is effected through the same channels and in the same proportions as in the euro area today. Next, we assume that interest rates will be the same in the acceding countries and in the Eurosystem even before the acceding countries join, i.e. the yield on claims on the government and on domestic banks in local currency will be the same in the acceding countries and in the euro area.<sup>2)</sup> Moreover, we assume that seigniorage arises on currency holdings only, as explained above. In a first step, we use the data on the year 2002 currency stock. Tymoczko (2001) uses the same method to appraise the effect of Eurosystem membership on Poland's seigniorage.

Table 11

**Key Ratios for Estimating the Effect of Euro Adoption  
on the Seigniorage Revenues of the Acceding Countries, 2002 data**

	Currency holdings share	Nominal GDP	Population	ECB capital share (key to seigniorage distribution)	ECB capital share in % of currency holdings share
	%				
Czech Republic	1.8	1.0	2.7	1.9	102.6
Estonia	0.1	0.1	0.4	0.2	155.8
Hungary	1.4	0.9	2.7	1.8	126.9
Poland	3.4	2.7	10.3	6.5	191.8
Slovakia	0.6	0.3	1.4	0.9	144.1
Slovenia	0.2	0.3	0.5	0.4	243.5
Euro area	92.4	94.7	81.9	88.3	95.5
Total	100.0	100.0	100.0	100.0	

Source: National central banks, ECB, Eurostat, own calculations.

According to the *results* presented in table 11, all acceding countries receive a smaller share of the combined seigniorage revenue of the acceding countries and the euro area if seigniorage is distributed according to the share of currency holdings, i.e. if the countries do not join the euro area. This is because the acceding countries account for a relatively high share in the population of the "enlarged" euro area. Though their share in GDP is much smaller, this is more than offset by their population. The largest winner of seigniorage distribution would be Slovenia; it would receive almost two and a half times more seigniorage if it joined the euro area because its share in the combined currency holdings is much smaller than its share in the combined GDP and combined population

1 See Article 29.1 of the Statute of the European System of Central Banks and of the European Central Bank.

2 In fact, interest rates will probably be somewhat higher, but they will converge as the countries approach the adoption of the euro.

of the “enlarged” euro area. Poland would almost double its seigniorage revenue because of its large population. By contrast, if the acceding countries joined the euro area, this would not be beneficial – from the viewpoint of seigniorage – for the existing members, as they would receive about 4.5% less than before.

We carried out the *same exercise with 1998–2001 data*. The results are similar, but the gain of the acceding countries – and the loss of the incumbent euro area member states, respectively – was higher in the earlier years. This is because the nominal rise of currency holdings is higher in the acceding countries than in the euro area, as nominal GDP is rising at a faster pace. Another reason is the nominal drop of currency holdings relative to nominal GDP in the euro area in 2001 to 2002 because of the euro cash changeover. Both factors implied that the share of the acceding countries in their combined total currency holdings with the euro area went up in the period from 1998 to 2002. This uptrend, in turn, reduced the difference between the acceding countries’ share in the currency holdings of the enlarged euro area and the acceding countries’ share in the ECB’s capital of the enlarged euro area, with the latter being taken as the key to distribute the total seigniorage revenue of the enlarged Eurosystem. Based on 1998 data, the loss of seigniorage for the incumbent euro area members would be 7.3%, based on 1999 data 6.9%, on 2000 data 6.4% and on 2001 data 5.7% (see annex table 7).

If this tendency continues until the acceding countries join the euro area, their gain (and consequently the loss to the incumbent members) will be smaller. Moreover, if the euro takes over the dominant role of the U.S. dollar as “quasi-legal tender” in various parts of the world, currency holdings may expand rapidly in the present euro area. This, in turn, would increase the loss of seigniorage to the current members when the acceding countries join the euro area.

If we *ease the assumption* that money creation will be effected through the same channels and in the same proportion as in the present euro area by the time the acceding countries join and assume that the foreign exchange channel remains more pronounced in the acceding countries up to their adoption of the euro, their gain will be less than indicated in the table and the loss of the present euro area will also be smaller. This results from the fact that the yield on (long-term) foreign assets will usually be higher than the (short-term) repo rate. By assessing the impact of joining the euro area on the monetary income of the central banks in the acceding countries we must take into account that interventions in the case of the euro are much less likely than in the case of smaller currencies. Although an intervention by the Eurosystem, which would reduce the monetary income of the euro area, cannot be excluded theoretically, it will most probably impose less of a burden on the acceding countries’ central banks than interventions in their individual national currencies. This may increase the monetary income of the new members without decreasing that of the current members.

Csajbók and Csermely (2002) use a different approach in assessing the effect of euro adoption on the seigniorage revenue of Hungary. Their conclusion is that Hungary would lose seigniorage revenue of a magnitude of 0.2% of GDP if it introduced the euro around 2007.<sup>1)</sup> Their calculations cannot be

<sup>1</sup> As of November 2003 Hungary’s official goal has been joining the euro area in 2008.

reproduced because neither the underlying assumptions nor the method of calculation are given, but according to their reasoning, if Hungary did not join the euro area, a large part of the counterpart of the Hungarian monetary base would be short-term forint-denominated assets with a yield 150 to 300 basis points higher than that of euro-denominated assets.

This reasoning is rather questionable. As explained above, we also estimate that repos will play an increasingly important role in money creation in the acceding countries in the coming years, but the precondition of this shift is a decrease in domestic interest rates. If the yield difference remains as high as envisaged by Csajbók and Csermely, such a shift will not materialize. Moreover, the authors calculate the loss of seigniorage as a “national cost” of joining the euro area. It would be more appropriate to take into account that falling interest rates reduce the interest burden of government debt, which will surpass any potential loss of seigniorage even if such a loss really occurs as a result of joining the euro area. In addition, Csajbók and Csermely assume that the total seigniorage revenue of the Eurosystem remains constant, regardless of whether one or more countries join the euro area. As table 11 shows, their assumption does not hold. The cake of euro area seigniorage is not constant, as every new member puts in the yield on its currency holdings.

## 6 Conclusions

In the acceding countries, seigniorage in relation to nominal GDP is usually higher than in the euro area. This ratio is expected to decrease somewhat until these countries adopt the euro. After that, the seigniorage of the acceding countries' central banks will go up due to the ECB's distribution rules. Consequently, the current members will be entitled to a somewhat smaller share of seigniorage than today. Moreover, as a result of euro adoption, the central bank profits of the acceding countries will no longer be dampened by possibly costly intervention or sterilization measures for the national currencies.

But looking at the acceding countries' decision of joining the euro area from a broader perspective, considerations of seigniorage distribution or central bank profits play a minor role, if any. Synergy effects as well as a further facilitation of trade, tourism and capital movements will provide gains to both new and current Member States that will be more significant than the gain or loss of a few percentage points of seigniorage revenue.

## References

- Banka Slovenije. 1999.** Annual Report 1998.  
**Banka Slovenije. 2000.** Annual Report 1999.  
**Banka Slovenije. 2001.** Annual Report 2000.  
**Banka Slovenije. 2003.** Website. <http://www.bsi.si/>. Retrieved in October 2003.  
**Česká národní banka. 1999.** Annual Report 1998.  
**Česká národní banka. 2000.** Annual Report 1999.  
**Česká národní banka. 2001.** Annual Report 2000.  
**Česká národní banka. 2003.** Website. <http://www.cnb.cz/>. Retrieved in October 2003.  
**Csajbók, A. and A. Csermely (eds.). 2002.** Adopting the euro in Hungary: expected costs, benefits and timing. Magyar Nemzeti Bank Occasional Papers 24. Budapest.

- Cincibuch, M. and D. Vávra. 2000.** Monetary income: What is the value of a central bank in a transition economy? Prague: Česká národní banka and CERGE-EI Charles University.
- Eesti Pank. 1999.** Annual Report 1998.
- Eesti Pank. 2000.** Annual Report 1999.
- Eesti Pank. 2001.** Annual Report 2000.
- Eesti Pank. 2003.** Website. <http://www.eestipank.info/frontpage/et/>. Retrieved in October 2003.
- European Central Bank/European System of Central Banks.** Protocol (No. 18.) on the Statute of the European System of Central Banks and of the European Central Bank. <http://www.ecb.int>. Retrieved in October 2003.
- Fischer, S. 1980.** Seigniorage and the Case for National Money. In: Journal for Political Economy 90. Chicago: The University of Chicago Press.
- Halpern, L. and J. Neményi. 2002.** Fiscal Foundation of Convergence to European Union in Pre-Accession Transition Countries. In: Discussion Paper of the Economic Research Centre of the Deutsche Bundesbank. Frankfurt: Deutsche Bundesbank.
- Hochreiter, E. and R. Rovelli. 2002.** The Generation and Distribution of Central Bank Seigniorage in the Czech Republic, Hungary and Poland. Banca Nazionale del Lavoro Quarterly Review. Rome. December.
- Holub, T. 2001.** Seigniorage, Central Bank's Profits, Capital and Credibility. Prague: Česká národní banka (manuscript).
- Kun, J. 1996.** Seigniorage and Burdens of Government Debt. In: National Bank of Hungary Workshop Studies. Budapest: Magyar Nemzeti Bank.
- Lange, C. 1995.** Seigniorage – Eine theoretische und empirische Analyse des staatlichen Geldschöpfungsgewinnes. Berlin: Duncker und Humblot.
- Magyar Nemzeti Bank. 1999.** Annual Report 1998.
- Magyar Nemzeti Bank. 2000.** Annual Report 1999.
- Magyar Nemzeti Bank. 2001.** Annual Report 2000.
- Magyar Nemzeti Bank. 2003.** Website. <http://www.mnb.hu/main.asp?id=1>. Retrieved in October 2003.
- Národná banka Slovenska. 1999.** Annual Report 1998.
- Národná banka Slovenska. 2000.** Annual Report 1999.
- Národná banka Slovenska. 2001.** Annual Report 2000.
- Národná banka Slovenska. 2003.** Website. <http://www.nbs.sk/>. Retrieved in October 2003.
- Narodowy Bank Polski. 1999.** Annual Report 1998.
- Narodowy Bank Polski. 2000.** Annual Report 1999.
- Narodowy Bank Polski. 2001.** Annual Report 2000.
- Narodowy Bank Polski. 2003.** Website. <http://www.nbp.pl/>. Retrieved in October 2003.
- Reininger, T., F. Schardax and M. Summer. 2002.** Financial System Transition in Central Europe: The First Decade. Vienna: Société Universitaire Européenne de Recherches Financières.
- Schobert, F. 2001.** Seigniorage: An argument for a national currency? CEPS Working Document 174. <http://www.ceps.be>. Retrieved in October 2003.
- Tymoczko, D. 2001.** Seigniorage Revenues upon EMU Accession – Costs or Benefits? Narodowy Bank Polski Conference: The Polish Way to the Euro. Warsaw.

SEIGNIORAGE IN SELECTED ACCEDING COUNTRIES:  
CURRENT SITUATION AND FUTURE PROSPECTS ON THE  
ROAD TOWARDS MONETARY INTEGRATION

**Annex**

Table 1

<b>Currency outside the Central Bank</b>					
	1998	1999	2000	2001	2002
	<i>EUR million, converted at purchasing power parity, annual average</i>				
Czech Republic	3,829	4,298	5,191	5,742	6,215
Estonia	342	364	428	465	502
Hungary	2,761	3,146	3,473	3,891	4,924
Poland	8,270	8,727	9,462	10,627	11,539
Slovakia	1,511	1,350	1,593	1,835	2,113
Slovenia	445	508	525	531	595
Acceding countries' total	17,158	18,393	20,671	23,091	25,889
Euro area	342,194	339,670	354,533	341,900	315,658

Source: National central banks, ECB, own calculations.

Note: Euro area 1998: year-end value, not year-average value.

Table 2

<b>Commercial Banks' Reserves Held at the Central Bank</b>					
	1998	1999	2000	2001	2002
	<i>Annual average, EUR million</i>				
Czech Republic	2,604	1,382	1,010	813	832
Estonia	190	225	280	222	210
Hungary	1,698	1,843	2,115	1,609	1,653
Poland	4,475	4,128	2,645	2,944	3,353
Slovakia	977	890	910	714	639
Slovenia	372	431	437	454	507
Acceding countries' total	10,315	8,899	7,398	6,756	7,193
Euro area	87,299	103,232	112,383	124,408	130,650

Source: National central banks, ECB, own calculations.

Table 3

<b>Data for the Calculation of Interest Rates on the Monetary Base</b>					
	1998	1999	2000	2001	2002
	<i>%</i>				
Long-term euro-denominated government bond yield	4.7	4.7	5.4	5.0	4.9
Long-term U.S. government bond yield	5.3	5.6	6.0	5.0	4.6
Depreciation of the euro against the U.S. dollar	1.4	4.6	15.4	3.1	-5.3
Yield on the ¾ EUR / ¼ USD portfolio in euro	5.2	6.1	9.7	5.8	3.5
Yield on the basket portfolio in euro (basket: 30% repo, 10% EUR, 60% USD)	5.6	7.6	15.1	6.8	0.9
	<i>Change of value of local currencies against the euro (value &gt; 1 = depreciation)</i>				
Czech Republic	1.00	1.03	0.97	0.96	0.90
Estonia	1.00	0.99	1.00	1.00	1.00
Hungary	1.14	1.05	1.03	0.99	0.95
Poland	1.05	1.09	0.95	0.91	1.05
Slovakia	1.04	1.11	0.97	1.02	0.99
Slovenia	1.03	1.04	1.06	1.06	1.04

Source: National central banks, Eurostat, own calculations.

SEIGNIORAGE IN SELECTED ACCEDING COUNTRIES:  
CURRENT SITUATION AND FUTURE PROSPECTS ON THE  
ROAD TOWARDS MONETARY INTEGRATION

Table 4

**Average Interest Rates on Bank Deposits**

	1998	1999	2000	2001	2002
	%				
Czech Republic	0.0	0.0	0.0	2.4	3.2
Estonia	0.5	1.6	3.5	3.3	2.2
Hungary	10.9	9.0	5.6	4.0	4.5
Poland	0.0	0.0	0.0	0.0	0.0
Slovakia	1.5	1.5	1.5	1.5	1.5
Slovenia	1.0	1.0	1.0	1.0	1.0
Euro area	3.3	2.7	4.0	4.3	3.2

Source: National central banks, ECB, own calculations.

Table 5

**Simulation: Total Seigniorage Revenue**

**without EUR/USD Exchange Rate Changes**

	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	0.6	0.9	0.2	0.0	-0.5
Estonia	0.6	0.4	0.5	0.4	0.4
Hungary	1.7	0.7	0.7	0.2	-0.2
Poland	0.9	1.2	0.0	-0.3	0.8
Slovakia	1.1	1.9	0.2	0.7	0.3
Slovenia	0.3	0.4	0.5	0.5	0.4
Euro area	0.3	0.3	0.3	0.2	0.2

Source: National central banks, ECB, Eurostat, own calculations.

Table 6

**Simulation: Total Seigniorage Revenue**

**without Exchange Rate Changes**

	1998	1999	2000	2001	2002
	% of nominal GDP				
Czech Republic	0.6	0.5	0.6	0.5	0.4
Estonia	0.5	0.5	0.5	0.4	0.4
Hungary	0.1	0.2	0.4	0.4	0.4
Poland	0.4	0.4	0.4	0.3	0.4
Slovakia	0.5	0.5	0.6	0.5	0.5
Slovenia	0.2	0.2	0.2	0.2	0.2
Euro area	0.3	0.3	0.3	0.2	0.2

Source: National central banks, ECB, Eurostat, own calculations.

Table 7

**Ratio of Seigniorage Based on ECB Capital Share**

**to Seigniorage Based on Currency Holdings Share**

	1998	1999	2000	2001	2002
	ratio				
Czech Republic	1.733	1.527	1.294	1.157	1.026
Estonia	2.526	2.351	1.978	1.786	1.558
Hungary	2.308	2.023	1.886	1.664	1.269
Poland	2.840	2.672	2.579	2.255	1.918
Slovakia	2.168	2.386	2.090	1.762	1.441
Slovenia	3.441	3.022	2.976	2.875	2.435
Euro area	0.927	0.931	0.936	0.943	0.955

Source: National central banks, ECB, Eurostat, own calculations.



O E N B A C T I V I T I E S

# The Economic Potential of a Larger Europe – “Keys to Success”

## The OeNB’s and JVI’s East-West Conference 2003

Compiled by  
Stephan Barisitz<sup>1</sup>)

This year’s East-West Conference, hosted by the OeNB and the Joint Vienna Institute (JVI), took place from November 2 to 4 and covered the topic “The Economic Potential of a Larger Europe – Keys to Success.”

### **Welcome Reception at the New Joint Vienna Institute (JVI) Facility**

On the eve of the conference, the new Joint Vienna Institute was officially opened. The glamorous gala event was attended by many prominent personalities, among others *Horst Köhler*, Managing Director of the International Monetary Fund, *Karl-Heinz Grasser*, Minister of Finance of the Republic of Austria, *Klaus Liebscher*, Governor of the OeNB, representing the JVI’s primary members, as well as by *Gertrude Tumpel-Gugerell*, Member of the Executive Board of the ECB and former Vice Governor of the OeNB. The new JVI building – funded by the Oesterreichische Nationalbank and the Austrian Ministry of Finance – meets the requirements of a modern training facility and will guarantee continuity in training. This year’s conference again bore testimony to the longstanding close and fruitful cooperation between the OeNB and the JVI.

### **Opening Remarks on November 3**

OeNB Governor *Klaus Liebscher* stressed that over recent years the conference focus had shifted from purely transition-related topics toward a more global perspective – to investigating the importance of human capital formation, financial stability, a suitable policy mix and structural reforms both for the success of integration and ongoing transition, and to addressing forward-looking initiatives such as the “Wider Europe” concept to foster cooperation with non-EU countries. More generally, the Governor pointed out that while EU enlargement had yet to be formalized, an “enlarged Europe” had already become a reality in many respects. In order to accede to EMU, the new members would have to fulfill the same conditions as earlier members did. Maintaining price stability remained a key factor for the credibility of both EMU and the euro, and meeting the provisions of the Stability and Growth Pact was crucial for the functioning of EMU.

IMF Managing Director *Horst Köhler* discussed the challenges for turning a larger Europe also into a stronger Europe. He emphasized the need for structural reforms to tackle labor market problems in Western Europe, and to correct fiscal imbalances, underdeveloped financial sectors, institutional and legal frameworks in the Central European and the Baltic countries – to ensure that this region can continue to be a center of investment and job creation in Europe. At the same time, it would be important for Europe to embrace the opportunities of globalization while maintaining its own identity, and to continue to foster the process of integration. Finally, *Horst Köhler* outlined the role of the IMF in a larger Europe, identifying an increasing focus on cross-border issues, such as international standards and codes.

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### **Key Issues for Capacity Building**

EBRD President *Jean Lemierre* stressed that the process of transition had not yet been concluded. Looking ahead, the first priority is to reform the banking sector to improve its capacity to sufficiently finance the real economy. Second, to be competitive, it is crucial to invest in infrastructure and education. However, to pave the way for these improvements and to attract investors, the judiciary systems need to be adjusted. Jean Lemierre also called for tightening relationships with neighboring countries beyond EU borders, and he strongly supported the concept of a “Wider Europe.” He briefly addressed challenges ahead, including the relationship between Russia and Europe, and announced that the EBRD Annual Meeting in 2005 would take place in Belgrade as a clear symbol of focus on the Balkans.

WTO Deputy Director-General *Kipkorir Aly Azad Rana* elaborated on the fruitful cooperation between the WTO and the JVI, and underlined that the World Trade Organization’s new approach to building strategic relations and capacity could best be achieved through training centers and regional centers of excellence. The WTO very much appreciated that, almost without exception, the Central and Eastern European countries had expressed their interest in full WTO membership. Effective integration into the European Union and the world economy as a whole will require further reductions in trade barriers, the elimination of inefficient policies, stable and sound macro-economic conditions as well as fiscal and monetary policies, and coherence in policymaking.

### **Panel to Celebrate the Opening of the New JVI Facility: Human Capital and Capacity Building, Experiences and Lessons for the Future**

The panel was chaired by *Mario Blejer*, Director of the Bank of England’s Centre for Central Banking Studies. As an introduction, *Valeriy Pyatnytskiy*, Ukrainian First Deputy Minister of Economy and European Integration, a graduate of the JVI’s Comprehensive Course, gave a first-hand account of his JVI experience. He also dealt with recent developments in his country: Ukraine’s key priority now is accession to the WTO, which he considers a powerful incentive for further economic reform. *Jozef Tošovský* shared with the audience his experience as both a recipient of technical assistance in his former position as Governor of Česká národní banka, and as a provider of technical cooperation in his current function as Chairman of the BIS Financial Stability Institute, whose principal aim is to upgrade knowledge in financial market regulation and supervision.

*Frannie Léautier*, Vice President of the World Bank Institute, dealt with the issues of how the World Bank has responded to the capacity-building challenge and of how to scale up measures for capacity enhancement in order to achieve sustained, measurable results. In his presentation, *Saleh Nsouli*, Deputy Director of the IMF Institute, took stock of the activities of the IMF and the JVI, focusing in particular on why institutions are important, how needs have evolved, what the IMF’s unique model of capacity building comprises and how the JVI has contributed to institution building. Last but not least, *Raymond Torres*, Head of the Employment Analysis and Policy Division at the OECD Directorate for Employment, Labor and Social Affairs, discussed the impor-

tance of human capital investment in today’s economies. In his assessment, adequate policies are needed not just to ensure initial education, but also to create an environment conducive to lifelong learning.

### **Session I: The Importance of R&D and FDI in the Catching-Up Process**

Session I was chaired by Professor *Michael Landesmann*, Director of Research of the WIIW. *Andreas Wörgötter*, Head of the Country Studies Division V, Economics Department, OECD, emphasized the transmission channels between research and development (R&D) and foreign direct investment (FDI) on the one hand and economic growth on the other. He outlined the effects of R&D in creating new technologies and productive skills and those of FDI in transferring technologies that have already been applied in other countries and in opening access to markets. But these positive effects also come at a cost: the risks associated with investments in R&D are relatively high, as returns on these investments are very uncertain and may not accrue until the distant future. FDI often requires the transfer of corporate governance abroad. *Andreas Wörgötter* concluded that governments should focus on the regulatory framework to allow the reallocation of resources at the lowest possible costs. In the discussion following his presentation, the relevance of the location of R&D for growth was debated, as was the ability of governments to pick successful technologies.

*Alena Zemplerova*, Senior Researcher at the CERGE-EI and Charles University, Prague, showed that in the case of the Czech Republic, FDI has proven to be welfare enhancing. Many indicators point to a higher productivity of foreign-owned enterprises compared to domestic firms. She stressed the long-run commitment of a strategic investor and the competitive environment of the economy as key factors for success; investment incentives by the government also play a role, but are often overrated. *Jarko Fidrmuc*, economist in the Foreign Research Division of the OeNB, spoke about the importance of FDI for intra-industry trade between the EU and the CEECs. The regional shift from former CEEC markets to EU countries was accompanied by an improvement in the commodity trade structure, thereby increasing the welfare gains of integration for consumers. FDI plays an important role in improving the trade structure of these countries. Slovenia and Hungary seem to be the most integrated acceding countries in this respect.

### **Keynote Lecture I**

In his lecture “The Accession Economies’ Rocky Road to the Euro,” Professor *Barry Eichengreen* (University of California, Berkeley) set out to analyze the major challenges acceding countries face during the run-up to euro adoption. He mentioned alternative exchange rate regimes, such as currency boards, unilateral euroization, free floating and fixed exchange rate regimes. He stressed that with a currency board pegged to the euro, monetary policy was virtually identical to what it would be after euro adoption. Free floating, he stressed, was hardly possible because floating would probably mean heavily managed floating, which limits monetary policy to a large extent. As to narrow band regimes, theory teaches us that they stabilize the exchange rate only in the presence of perfect credibility. But in practice, because of possible capital

flow reversals, such regimes are prone to crisis, as the collapse of the ERM in 1992–93 showed. With this as a background, Barry Eichengreen favored early euro adoption.

Therefore, whether or not acceding countries could adopt the euro should be judged on inflation and fiscal policy, without considering a narrow ERM II band such as that EU Economic Commissioner Solbes proposed early in 2003. In this context, the real challenge for some of the acceding countries is indeed fiscal adjustment. The Czech Republic, Hungary, Poland and Slovakia, dubbed the “big four,” have recorded large budget deficits in the past and are expected to do so in 2003. By contrast, the Baltic states and Slovenia have balanced fiscal policies. Barry Eichengreen stated that the “big four” were running large welfare systems, which are difficult to reform, and that fiscal control may be more complicated in bigger countries. Going beyond this, he emphasized that successful fiscal consolidation should come through expenditure reduction and not tax increases because even painful budgetary cuts could turn out to be expansionary by giving a fillip to long-term economic growth. Nevertheless, in practice, fiscal consolidation is expected to take considerable time and to be painful with reversals.

### **Panel Discussion with Representatives of the Central Banks of the Ten Acceding Countries: ERM II – The Next Steps**

Very high-ranking officials, among them two central bank governors and five vice governors, took part in this discussion, which was moderated by *Peter Mooslechner*, Director of the Economic Analysis and Research Section of the Oesterreichische Nationalbank. After Barry Eichengreen’s stimulating and critical keynote speech, partly skeptical positions toward ERM II surfaced also during the first round of the panel. The Deputy Governor of Eesti Pank, *Märten Ross*, stressed the advantages of ERM II, which he primarily pinpointed to greater credibility as compared to unilateral exchange rate pegs. The Deputy Governor of Magyar Nemzeti Bank, *György Szapáry*, regarded participation in ERM II as positive, too. He principally agreed with using the narrow bands as an orientation point in the assessment of exchange rate stability, but at the same time advocated some degree of flexibility in the interpretation. More critical tones came from *Adam Czyzewski*, Director of the Macroeconomic and Structural Analysis Department of Narodowy Bank Polski, and *Oldrich Dedek*, Vice Governor of Česká národní banka. Both highlighted the success they had achieved by their policies of direct inflation targeting during the past few years and expressed concern that participation in ERM II could constrain the maneuvering room for such policies. Therefore they intend to limit the duration of participation in the mechanism to the necessary minimum of two years. Correspondingly, entry into ERM II should take place only when it can be realistically expected that the other Maastricht criteria can be fulfilled within two years.

Asked about the necessity to adapt the current exchange rate regimes before or upon entry into ERM II, *Ramune Vilija Zabuliene*, Deputy Chairperson of the Board of Lietuvos bankas, did not see the need for significant action, apart from an agreement on the central rate. Lithuania intends to maintain the narrow fluctuation bands within ERM II as a unilateral obligation. *George Thoma*, Senior

Manager and Head of the Economic Research and Statistics Division of the Central Bank of Cyprus, stressed that Cyprus had been operating an exchange rate regime which has shadowed ERM II for several years without significant tension. Therefore, he also regarded an agreement on the central rate as the only necessity. The Governor of Banka Slovenije, Mitja Gaspari, underlined that the expected decline in Slovenian inflation next year would allow further interest rate adjustments. Thus, the current policy of step-by-step depreciation of the currency can be abolished before ERM II entry. Malta will also have to change its regime and replace the present currency basket with the euro as an anchor, as the Governor of the Central Bank of Malta, *Michael Bonello*, explained. None of the participants perceived any important risk in connection with adjustments in exchange rate regimes that may be necessary.

Given the limited role of interest rate policy within the framework of ERM II, all participants agreed upon the necessity of price stability-oriented exchange rate, fiscal and wage policies. Furthermore, they underlined the importance of structural reforms and of increased labor market efficiency to fight inflation. The participants emphasized that necessary reforms to eliminate economic imbalances would have to be pursued as soon as possible. This should guarantee that participation in ERM II is smooth and that it is not endangered by asymmetric shocks. The participants harbored quite different views on whether ERM II would work as a “discipline multiplier”: While the Hungarian representative saw ERM II as an instrument to foster discipline, his Czech colleague was rather skeptical and questioned the ability of such an external factor to replace the lack of fiscal discipline. Finally, the participants saw little evidence for potential risks of asymmetric shocks upon and after EU entry. EU accession has been planned for quite a long period and is very much anticipated by all economic agents. Nonetheless, the rather large necessary fiscal consolidation measures may lead to asymmetric shocks in some countries because of their short-term negative effects on GDP growth. Although the participants saw their currencies as shock absorbers, they did not object to giving up their currencies (in a medium-term perspective).

### **A Welcome to the New EU Members**

The dinner speech was given by *Gertrude Tumpel-Gugerell*, Member of the Executive Board of the ECB and former Vice Governor of the Oesterreichische Nationalbank. Referring to the last session before dinner, the panel on the ERM II strategies of the acceding countries, she spelled out three key points that will guide the approach of the ECB in the area of prospective monetary integration. First, the basic interest of the euro area is to ensure that monetary integration will be a smooth process in line with Treaty (the Treaty establishing the European Community) provisions. Second, there is no single path to the euro that would suit all acceding countries, and the ECB does not discourage any particular strategy, provided that it conforms with the institutional set-up in place. Third, new Member States will have to fulfill the convergence criteria in a sustainable manner to qualify for full participation in EMU, whereby the equal treatment principle will continue to govern the application of the criteria. Gertrude Tumpel-Gugerell stressed that monetary integration would be facilitated by a successful EU accession process that enhanced the growth differential

between the new member countries and the euro area. The cumulative long-term effects of enlargement should be moderately positive for current member countries and significantly positive for the new member countries, due to the full integration into the Internal Market, the decrease in the risk premia and the net transfers from the EU budget. However, she cautioned that the total size of these growth effects and even more so their dynamic profile are quite unclear.

#### **Opening Remarks on November 4**

The second day of the East-West Conference started with opening remarks by *Josef Christl*, Executive Director, Oesterreichische Nationalbank. In his speech, Josef Christl emphasized the strong economic ties that have been established between the euro area and the acceding countries. Austrian companies, in particular Austrian banks, have made use of the business opportunities which have opened up in the transition process. They have not only benefited from the emergence of new markets but have, in return, also contributed to the economic changes in Central and Eastern Europe. Josef Christl then addressed the issue of the Stability and Growth Pact and the importance of compliance with fiscal policy rules. Abolishing agreed-on rules could not only destabilize expectations of economic agents but also result in a severe loss of credibility. He went on to stress that the provisions of the Stability and Growth Pact and the Maastricht Treaty would be an important challenge for Central and Eastern European countries in the years to come.

#### **Session II: Corporate Governance, Financial Markets and the Optimal Role of the State**

Session II was chaired by *Thomas Wieser*, Director General, Austrian Ministry of Finance. The first speaker was *Boris Vujčić*, Deputy Governor of Hrvatska narodna banka. He talked about financial sector transformation in Croatia. Considering the Croatian example, he stressed the pivotal role of financial sector transformation in the transition process. Boris Vujčić analyzed the consolidation of the banking sector and foreign entry as well as the efficiency of financial intermediation and policies that help support it. The speaker pointed out the most important risks for the Croatian financial sector: the very high level of de facto euroization, low intermediation and the weak legal system.

In the next presentation, *Khaled Sherif*, Sector Manager for Finance and Private Sector Development for Europe and Central Asia of the World Bank, shared his views on the costs and fiscal impact of state-owned banks. He reviewed the experiences with state banks, described the problems that exist today, and highlighted the main findings: First, continued state ownership of the banking sector entails high economic costs; second, delaying banking sector reform and privatization only adds to the costs; and third, most remaining state-owned banks should be treated as resolution cases, i.e. if they carry large burdens of nonperforming assets, they should be liquidated.

This presentation was followed by a country study presentation by *Stephan Barisitz*, economist with the Foreign Research Division of the OeNB, on “Banking in Romania: Progress, Problems and Prospects.” Many features of the Romanian banking sector are comparable to those of the banking sector in Croatia: The sector is small with a low level of financial intermediation,

and foreign-owned banks play a large role. The Romanian financial sector also faces many challenges, such as the banks’ insufficient risk analysis and management capacities, weak corporate governance, continuing limited contract enforcement and corruption. The presentations were followed by a lively discussion about the optimal role of the state. The session chair argued that the optimal role of the state was not obvious but depended on the specific situation of a country. And there is certainly ample evidence of mistakes made that should not be repeated.

### **Session III: Stabilization Expectations – Macroeconomic and Structural Policies in an Enlarged Euro Area**

Session III was again chaired by OeNB Director *Peter Mooslechner*. *Fabrizio Coricelli*, Professor at the University of Siena, presented a paper entitled “Fiscal Discipline and the Adoption of the Euro for New Members of the European Union.” The paper points out several issues that question the efficiency of existing fiscal rules in the European Union in the light of the upcoming enlargement, such as the fact that existing rules have the property of reinforcing a procyclical stance during bad times and that they provide little incentive for surpluses during good times. One implication of the paper is that it is of great importance that fiscal discipline be strengthened in accession countries but also that new fiscal rules are needed for such countries, since they usually display much higher volatility of economic activity, making it much harder to comply with the 3% deficit ceiling.

*Luca Onorante*, economist at the ECB, presented the paper “Fiscal, Monetary and Wage Policies in a Monetary Union: Is there a Need for Fiscal Rules?” His game-theoretical approach investigates the interaction of monetary, fiscal and wage policies and their effects on prices in a monetary union hit by economic shocks. A model is developed which focuses on wage dynamics, fiscal and monetary activism and their consequences on inflation and which highlights some relevant problems central to the current policy debate. The paper concludes that the beginning of EMU is a structural break that needs to be modeled explicitly and that fiscal rules may help in the process of convergence but are more optimal after EMU entry than before.

*Gabriel Moser*, economist at the Foreign Research Division of the OeNB, presented the paper “International Risk-Sharing in Europe: Has Anything Changed?” The subject of the paper is a test of whether the process of European integration has increased the extent of risk-sharing among European countries, which is equivalent to asking how integrated European financial markets are. This is an important question, since as long as international financial markets provide insurance against regional shocks, asymmetric shocks might not be so problematic. The results of the paper imply that risk-sharing does not appear to have improved among European countries. Moreover, a few countries even feature indicators of declining risk-sharing over time.

### **Keynote Lecture II**

*Charles Wyplosz*, professor at the Graduate Institute of International Studies in Geneva and the CEPR in London, held a keynote lecture on “The Challenges of a Wider and Deeper Europe.” Charles Wyplosz addressed two broad sets

of issues. First, he asked whether we needed further deepening of the European Union. He concentrated on the provision of economic and noneconomic public goods, which can be either centralized (thus implying further deepening) or decentralized. Charles Wyplosz argued that the theory of fiscal federalism should be applied to compare the potential benefits of centralized and decentralized solutions. His impressive analysis showed that the process of centralization for a majority of economic public goods (such as trade liberalization and the common currency) is nearly complete. The remaining areas are characterized by questionable benefits and/or potentially high costs of centralization (e.g. research, financial market supervision, taxes and public spending, labor market institutions).

By contrast, the process of centralization of noneconomic public goods (e.g. internal and external security, foreign policy and justice) has just started. On the one hand, these areas are characterized by strong national preferences, implying high costs of centralization. On the other hand, the process of economic integration may justify a certain degree of coordination, but a reform of EU institutions may be necessary to ensure adequate political authority and accountability. Second, Charles Wyplosz asked whether the eastward enlargement of the EU could contradict further deepening in selected areas. He found only little evidence for this hypothesis and stressed the necessity to reform decision-making procedures in a wider EU.

### **Panel Discussion: Economic and Monetary Union – A Leading Indicator for Political Union?**

Charles Wyplosz’s very informative presentation set the stage for the final forward-looking panel discussion, which was chaired by OeNB Executive Director *Josef Christl*. Mr. Christl pointed out that there were a number of unresolved issues on how far European political and institutional integration is to advance, but was convinced that the single currency – an important token of identity – holds out the promise of fostering EU deepening in areas far beyond EMU. *Gerda Falkner*, Head of the Department of Political Science of the Institute of Advanced Studies, Vienna, demonstrated that in some fields, like in social policy, there can be slow but steady processes that at least partly move decision-making from the country level to the EU level. On the other hand, actual compliance with EU directives is often problematic. *Johan Verhaeven*, Head of Unit, Transition Issues Related to EMU, European Commission, pointed out that in certain policy areas (trade, agriculture, monetary policy, exchange rate), the EU already embodies a kind of political union. The EU comprises quasi-federal elements (Parliament, Commission, primacy of European law over national law) and intergovernmental components (Council, small size of the budget). The fact that EU integration embodies a mostly functional step-by-step process and that there is no clear *finalité politique* yet may constitute the basis for its success so far. What is the way forward? With more and more Member States, enhanced cooperation through variable geometry may reconcile problems.

*Petr Mooz*, Minister-Counsellor at the Embassy of the Czech Republic in Vienna, pointed out that EMU may only be one of the leading indicators for political union; other – potentially more important – ones in the area of foreign policy and security cooperation are not yet fully discernible, as witnessed

by recent disagreements between European governments over the Iraq war. *Fritz Breuss*, Professor at the Vienna University of Economics and Business Administration, was skeptical about some economic aspects of further integration. In his opinion, the Stability and Growth Pact has not “passed the test,” given the delaying of decisions on France. The economic integration of a bloc of poor countries with a bloc of rich countries could lead to setbacks on interest rate policy and the goal of a European business cycle.

### **Concluding Remarks**

In his closing remarks, *Josef Christl* pointed out that in his opinion, most acceding countries will likely share the euro with the current members of the euro area by the end of the decade. He was quite confident that everything would work out smoothly. He also once again underlined the importance of rules for fiscal policy. Mr. Christl concluded by saying that he was looking forward to welcoming the participants again at one of the future conferences of the OeNB.

## Presentation of the Olga Radzyner Award 2003

This award was established to commemorate Olga Radzyner, who headed the OeNB's Foreign Research Division until her tragic death in August 1999 and who was the driving force behind building up and expanding the OeNB's array of transition- and accession-related activities. The award is bestowed on young economists for excellent research focused on monetary and finance issues in economics.

In 2003, the Olga Radzyner Award was awarded for the fourth time. The OeNB's independent jury had the honor and obligation to decide between 26 submissions from candidates from 12 Central and Eastern European countries and the CIS. While most contributions stem from Austria's neighboring countries, several submissions even come from more distant countries like Georgia or Azerbaijan. The winners for 2003 were:

- Rafał Kierzenkowski from Poland
- Márton Nagy und Csaba Móri (awarded jointly) from Hungary
- Adriana Lojschová from the Slovak Republic

Rafał Kierzenkowski was awarded with this prize for his paper "The Multi-Regime Bank Lending Channel and the Effectiveness of the Polish Monetary Policy Transmission During Transition," which he prepared as a part of his Ph.D. thesis at Dauphin University in Paris. This contribution is a mature theoretical work which succeeds in formulating policy conclusions for transition economies. The model is calibrated for Poland, and bank lending and borrowing in the second half of the 1990s is discussed.

Márton Nagy und Csaba Móri received this award for their joint research paper prepared at Magyar Nemzeti Bank analyzing the "Relationship between Market Structure and Bank Performance: Empirical Evidence for Central and Eastern Europe." The contribution covers individual banks of eight CEECs between 1998 and 2001. It is shown that the relative market power, cost factors and the level of intermediations are important determinants of banks' performance.

Finally, Adriana Lojschová was awarded this prize for her research paper prepared at the Institute for Advanced Studies on "Estimating the Impact of the Balassa-Samuelson Effect in Transition Economies." The paper discusses in detail the theoretical derivation of the Balassa-Samuelson effect. The author discusses three deviations from standard assumptions, including an incomplete adjustment of wages, an incomplete adjustment of tradable prices and the effect of the real interest rate. Depending on model formulation, the Balassa-Samuelson effect contributes between one and three percentage points to annual inflation in selected transition countries.

# Lectures

## Organized by the Oesterreichische Nationalbank

In the second half of 2003, the OeNB hosted a lecture which served as a platform for presenting the Transition Report of the European Bank for Reconstruction and Development (EBRD). The presentation of the EBRD's Transition Report at the Oesterreichische Nationalbank has been a tradition for some years now. The report for 2003 was presented jointly by Alexander Auböck, Director of the EBRD's offices in the Czech and Slovak Republics, and Samuel Fankhauser, Senior Economist and Acting Director at the EBRD. The report is traditionally divided into two main parts. The first part, which draws on the EBRD's experience as an investor in 27 transition countries, analyzes each country's progress in its transition process and provides an outlook for the future. The second part discusses a special subject. The key topic of the current Transition Report deals with "integration and regional cooperation." Mr. Fankhauser provided a detailed analysis and comparison of the economic developments and institutional reforms in Central Eastern Europe and the Baltic states, Southeastern Europe, and the Commonwealth of Independent States. Furthermore, he discussed the relation between integration and regional cooperation in the areas trade, capital flows and labor market mobility. Mr. Auböck presented the EBRD and its role in the transition countries.

The presentations are routinely rounded off by statements by invited discussants and a general discussion which gives the participants – representatives of the academic community, government bodies and reporters, all of whom have a professional interest in the topics presented – ample opportunity to debate with the speakers. Constraints on the length of Focus on Transition do not allow a detailed account of the discussions in the brief overviews the reader will find below.

### Lecture by Samuel Fankhauser and Alexander Auböck

Thomas Gruber

#### Presentation of the EBRD's Transition Report 2003

The Oesterreichische Nationalbank traditionally hosts the annual presentation of the EBRD's Transition Report in Vienna; this year, Samuel Fankhauser, Senior Economist and Acting Director at the EBRD, and Alexander Auböck, Director of the EBRD's offices in the Czech and Slovak Republics, presented the report for 2003 on November 24 within the framework of the OeNB's lecture series. Doris Ritzberger-Grünwald, Head of the OeNB's Foreign Research Division, chaired the event.

The Transition Report is traditionally divided into two main parts. The first part provides a comprehensive analysis of each country's transition progress in its economic and institutional development, drawing on the EBRD's experience as an investor in 27 transition countries. Furthermore, the report discusses each country's transition development prospects. The second part puts the focus on a special subject, which changes every year and which gives each publication its unique character. The various special subjects reflect the most important issues of the times. This year's topic, "integration and regional cooperation," was chosen with a view to EU accession and deals with subjects like trade, foreign direct investment (FDI) flows and labor mobility.

## Part I: Transition and Economic Performance

The report finds that most of the observed countries, especially the accession countries as well as Southeastern Europe (SEE), have made huge progress with reform. For the Community of Independent States (CIS) the transition process has been quite uneven. Some countries performed fairly well (Russia), while others showed stagnation or even a decline in reform efforts (Uzbekistan and Moldova). The report shows that beside market reforms, which are crucial for the catching-up process, institutional reforms play a major role in the convergence process. Certainly more attention must be paid to this area in the future.

The macroeconomic development was generally quite favorable. Growth in the accession countries will come to 2.2% in 2003 and will accelerate to up to 4.2% in 2004. The SEE countries' GDP growth is expected to amount to about 3.9% in 2003 and to rise to 4.7% in 2004. The CIS will perform even better, with GDP growth running to 6.2% in 2003 and to an average of around 5% in 2004. Much of the growth in the CIS is attributable to favorable oil and other raw material price developments. Moreover, inflation seems to be under control now in most of the observed countries. This year inflation will run to some 2.9% in the acceding countries, to 6.7% in the SEE countries and to about 9.8% in the CIS. There are clear signs that the deflation process will continue over the next years in SEE and the CIS.

What are the main challenges ahead? For many acceding countries the consolidation of budget deficits will be most important. In the SEE countries more FDI is necessary in order to compensate for losses in "official money" (e.g. stemming from international financial assistance). Bulgaria and Romania will have to continue to make a strong reform effort with a view to EU accession in 2007. The EBRD expects the timetable for 2007 to be observed. The CIS economies will require more diversification, since they are heavily dependent on (the export of) natural resources such as oil and gas. Diversification is anticipated to reduce the risk of high economic volatility due to price developments of oil, gas and other natural resources.

## Part II: Integration and Regional Cooperation

The Transition Report elaborates on three special themes. First, the report discusses trade integration. While the integration of trade has made strides, it has not been completed yet. The reviewed countries exhibit a strong orientation towards the world market, especially towards the EU. Trade within various regions is increasing, although for some countries the opposite is true. Four countries even showed an overall decline in their trade performance measured in terms of trade growth. Despite the generally positive development in trade patterns, there is still much more trade potential than has actually been revealed. The differences between this potential and the actual performance result mainly from high shipping costs, the poor infrastructure, the unfavorable institutional setting and the trade policy imbalance.

The second theme is FDI. Large inflows of FDI during the last years helped the CEE countries to catch up faster. However, most of the FDI goes to the acceding countries (above all, the Czech Republic and Poland) and to the natural resource sector in nonaccession countries (i.e. Russia, Kazakhstan). The report

finds that FDI not only improves the performance of the business sector, but that it also tends to be in enterprises with a high return on investment.

The third theme is the labor markets in the observed countries. It is argued that their labor markets are not sufficiently integrated yet. There is still much scope for reforms. In addition, these countries face very high unemployment rates, which, moreover, differ considerably between the various regions (by up to 23 percentage points). These data are corroborated by the low labor market mobility in these countries. Only Russia and Hungary show figures similar to those of the EU. High migration flows from the acceding countries to the actual EU Member States after accession are not expected. According to Samuel Fankhauser, there will be greater mobility, but no “exodus.” A great part of the mobile labor force will be highly qualified. As this would result in a brain drain, incentive systems should be established to make returning attractive.

# The “East Jour Fixe” of the Oesterreichische Nationalbank – A Forum for Discussion

The East Jour Fixe of the Oesterreichische Nationalbank, a series of meetings initiated in 1991 as a forum in which economists, members of academia, government officials and other experts on Eastern Europe meet to discuss specific transition issues, looks back on a long tradition. The meetings are always opened with expert speeches on key topical issues related to transition economies. High-profile discussants are invited to comment on the contributions, and finally policymakers, analysts and researchers engage in an exchange of views during the general discussion, which is given ample room on the agenda.

During the period under review, two meetings continued the East Jour Fixe series. The 49<sup>th</sup> East Jour Fixe took place on June 24, 2003, and served as a forum for discussing a broad range of topics related to various aspects of convergence. The meeting was chaired by Peter Mooslechner, Director of the OeNB's Economic Analysis and Research Section. Professor Taner M. Yigit (Bilkent University, Ankara) started the discussion with a presentation on the relation between integration, productivity growth and convergence. This interesting talk was discussed by Professor Abdur Chowdhury (Marquette University, Milwaukee, Wisconsin and Suomen Pankki, BOFIT, Helsinki).

In the second part of the meeting, which was chaired by Doris Ritzberger-Grünwald, Head of the OeNB's Foreign Research Division, Professor Martin Wagner (University of Bern and Princeton University) presented his paper on “The CEEC-10's Real Convergence Prospects” (coauthored by Jaroslava Hloušková, Institute for Advanced Studies). Finally, Julia Wörz (The Vienna Institute for International Economic Studies) brought into the discussion issues related to “Trade Structure and Convergence.”

Moreover, the Oesterreichische Nationalbank organized the 50<sup>th</sup> East Jour Fixe on December 15, 2003. On this occasion, the special anniversary event looked at the past meetings to derive a deeper knowledge of present and future issues. Correspondingly, the 50<sup>th</sup> East Jour Fixe meeting consisted of a keynote lecture and three panels. Peter Mooslechner, Director of the OeNB's Economic Analysis and Research Section, introduced the meeting by giving a short outline of the history of the East Jour Fixe. Then, Professor Jakob de Haan (University of Groningen and CESifo Munich) presented a paper on transmission mechanisms and the financial structure in ten transition economies, which was followed by three panels related to past, present and future issues.

The first panel, chaired by Eduard Hochreiter, Head of the OeNB's Economic Studies Division, invited Professor Kazimierz Laski (The Vienna Institute for International Economic Studies), Marianne Kager (Bank Austria Creditanstalt), Angel Antonaya (IMF and Joint Vienna Institute) and Peter Backé (European Central Bank) to share with the participants their reminiscences of the history of the East Jour Fixe and to derive, on this basis, possible future trends. On the second panel, chaired again by Peter Mooslechner, Karl Pichelmann (European Commission), Marián Nemeč (Národná banka Slovenska), Jan Frait (Česká národná banka) and Professor László Halpern (Hungarian Academy of Sciences, Institute of Economics, CEU Budapest and CEPR London) analyzed the major factors behind the success of the countries joining the European Union in 2004.

Finally, the last panel, chaired by Doris Ritzberger-Grünwald, Head of the OeNB's Foreign Research Division, looked at policy options for countries

located along current or future boundaries of the EU. This panel included five contributions on selected countries by Pekka Sutela (Institute for Economies in Transition, Suomen Pankki), Michael Landesmann (The Vienna Institute for International Economic Studies), Boris Vujčić (Hrvatska narodna banka), Cristian Popa (Banca Națională a României) and Werner Varga (Institute for the Danube Region and Central Europe, IDM).

## Contributions

by **Taner M. Yigit, Martin Wagner and Julia Wörz**

### Convergence

On June 24, 2003, the 49<sup>th</sup> East Jour Fixe meeting was held in the Neuer Kassensaal of the Oesterreichische Nationalbank. The meeting entitled “Convergence” provided a forum for the discussion of several aspects of convergence in transition economies and emerging markets. The first two contributions focused on income convergence in Central and Eastern European countries, while the last presentation offered a broader view on trade restructuring during the catching-up process in emerging markets and transition economies.

In the first panel, chaired by the Director of the Economic Analysis and Research Section of the OeNB, Peter Mooslechner, Taner M. Yigit (professor at Bilkent University, Ankara) presented his joint research with Ali Kutan (professor at Southern Illinois University) on “Integration, Productivity Growth and Convergence.”

Taner M. Yigit started his presentation with the discussion of real convergence (convergence of output per capita) and the Copenhagen criteria. He stressed the importance of real convergence for a successful economic transition and integration of CEECs into the EU. Productivity growth is an important determinant of the speed of convergence. Similarly, economic integration is supposed to speed up the convergence process, although so far less attention has been paid to the question of how integration gains are transmitted to the real economy. In their paper Mr. Kutan and Mr. Yigit presented a possible explanation: integration provides better access to the international stock of human capital. As a result, membership in the EU is likely to lead to higher returns to scale, thus speeding up the convergence process. Mr. Yigit stressed that their contribution was the first work that looks specifically at the channel between integration, productivity growth and convergence both from the theoretical and from the empirical side.

After having introduced integration effects into an endogenous growth model, convergence was estimated for a panel of acceding countries between 1993 and 2002, testing homogeneity among the panel members. The results confirm heterogeneity among the acceding countries when compared with the EU, although more disposition for convergence can be found within the group. Furthermore, the speed of convergence seems to be relatively high compared to other regions. Generally, this creates relatively positive preconditions for further progress in the EU enlargement process.

The presentation by Mr. Yigit was discussed by Abdur Chowdhury (professor at Marquette University and economist at the Bank of Finland, BOFIT), who stressed the contributions of the paper and the linkage drawn between the theoretical and the empirical part, which is often missing in similar research works. Mr. Chowdhury also addressed several issues related to the model formulation and testing, data definition and the robustness of results. The open discussion also focused on these points.

In the second panel, which was chaired by Doris Ritzberger-Grünwald, Head of the Foreign Research Division of the Oesterreichische Nationalbank, Martin Wagner (University of Bern and Princeton University) presented his joint work with Jaroslava Hloušková (Institute for Advanced Studies, Vienna, and ECB) on "The CEEC10's Real Convergence Prospects." Finally, Julia Wörz (The Vienna Institute for International Economic Studies, WIIW) put the focus of discussion on the related issues of "Trade Structure and Convergence."

Martin Wagner started with a discussion of important structural changes during transition in the CEECs. Empirical research has to deal with the fact that the behavior of macroeconomic variables is caused by two groups of factors: First, the transitional recession dominated the picture especially at the beginning of the 1990s. Second, long-run economic growth is nevertheless determined by its standard factors as discussed in the context of growth theory (investment, productivity growth, population growth and the like). It is important that we distinguish between these two groups of factors if we are interested in long-run convergence. The influence on growth characteristics of the extent and timing of structural change are the essential factors.

Temporary transition factors help explain why there is divergence instead of convergence between transition countries during economic reforms. This reveals that there have been reform winners and losers up to now. Furthermore, the positive correlation of investment and growth is only marginal, although there is a broad consensus that this variable is generally one of the most important and strongest growth factors. Finally, public consumption is positively correlated with growth. These stylized facts contradict our expectations based on both the neoclassical growth theory and earlier empirical research on various countries. Martin Wagner concluded that we cannot use the available data to correctly estimate the role of growth factors in the CEECs. As an alternative approach, he suggested estimating selected growth equations for the countries of the EU and using them for subsequent simulations in the CEECs. He underlined that the CEECs accept the institutional framework of the EU as part of the accession process. This feature also gives more foundation to his procedure. The EU is also considered the main trading partner, the main FDI source and the geographic neighbor of the CEECs.

Martin Wagner addressed another caveat of empirical growth analysis. Unfortunately, there is no clear consensus on which variables are important for long-run growth, although we can identify several variables which are generally accepted (e.g. the initial level of GDP and investment). In particular, he presented 18 potential equations which can be equally applied to the question of convergence in the CEECs. The paper also discussed seven plausible policy assumptions of future development. This combination of various equations and policy assumptions provides us with a broad range of possible development

paths. The distribution of the predicted growth rates shows us that the scenarios are concentrated around two growth levels (peaks): In general, low-growth scenarios are close to 2.5%, while high-growth scenarios are arranged around 3.5% annual growth of real per capita GDP. The latter group also has more weight in the sample. Furthermore, the significance of these individual prospects are considered to be more reliable than the particular development paths. Finally, there is also an optimistic growth scenario, which is defined as the upper 10% quantile of the whole range of prospects. Another finding is that despite the broad range of the applied growth models and scenarios, all forecasts provide relatively moderate figures (below 4.5% in general). This implies in turn that full-convergence periods will be relatively long. For the majority of the CEECs, convergence will last several decades also in the optimistic scenario.

Martin Wagner’s presentation was discussed by Juraj Zeman (Národná banka Slovenska and Comenius University Bratislava). He mainly addressed the indirect approach used in the paper. He also noted several possible data problems in the presented growth simulations.

Finally, Julia Wörz concluded the meeting with a presentation on “Trade Structure and Convergence.” This topic extended the discussion of convergence issues by two important aspects: First, foreign trade restructuring provides important clues about underlying structural changes of domestic production. In general, developed economies are characterized by large shares of high-skill products, while less developed economies show a concentration of production and trade in low-skill industries. As a result, the catching-up process goes hand in hand with an improvement in trade structures.

Second, trade data are available for a wide range of products and countries. Thus the current pattern of development in CEE transition countries can be compared with selected world regions. Behind several developed countries (OECD north, OECD south, the U.S.A., Japan and the European Union), the emerging markets of East Asia and their successful policy of promoting export-led growth provide an interesting benchmark especially for current trends in the CEECs. This was an additional impetus for the discussion.

For the Central and Eastern European region as a whole, the results show a clear pattern of convergence in trade structures towards the major trading blocs (EU, U.S.A.). Compared with the experience of East Asian countries, the CEECs were able to achieve progress in convergence after a relatively short period of time. However, the results also show significant differences between the individual countries. On the one hand, the trade structure in the Czech Republic, Hungary, and more recently in Slovakia, shifted sharply toward high-skill sectors. Poland, Slovenia and Slovakia (before the end of the 1990s) made gradual progress towards this specialization pattern. The Baltic states gained a strong position in medium-skill sectors.

On the other hand, Bulgaria and Romania clearly outperformed the above-mentioned group of countries on trade specialization. These two countries specialized even more in low-skill industries, thus distinguishing themselves from the CEECs and the developed countries.

Julia Wörz concluded that the prospects for the CEECs (apart from laggards) are basically positive. Further progress of skill upgrading in export industries should translate into a more mature production structure in these

countries, with positive consequences for productivity growth and their economies as a whole. Furthermore, the example of Slovakia shows that economic liberalization and FDI-promoting policies are likely to help improve economic performance immediately.

Alari Purju (professor at Tallinn Technical University) discussed Julia Wörz's presentation. He first addressed the most important conclusions of the presentation, stressing some aspects of the sustainability of actual restructuring. Mr. Purju also examined what is called south-south trade and north-south trade within various model settings. He also illustrated his theory on the development in Estonia. The final general discussion again reviewed all aspects of real and structural convergence. Several statistical issues were raised in this respect. Other questions focused on econometric specifications of the presented papers.

### **Special Anniversary Event**

#### **on the Occasion of the 50<sup>th</sup> East Jour Fixe**

#### **Transition: Past, Present, Future**

On December 15, 2003, the 50<sup>th</sup> anniversary East Jour Fixe meeting took place in the Neuer Kassensaal of the Oesterreichische Nationalbank under the heading "Transition: Past, Present, Future." This special meeting celebrated the success of the East Jour Fixe series in the past 12 years by providing, inter alia, a review of the history of the East Jour Fixe. However, the meeting did not focus on the past alone, but also on current and future issues. Thus, the seminar kept the spirit of the entire series, which has adjusted continuously to current topics of economic policy and academic analysis in the accession countries.

Correspondingly, the meeting consisted of four sessions. Professor Jakob de Haan started the seminar with a keynote lecture, which was followed by three successive panels. The first panel looked back on the past and provided an ex post evaluation of reforms. The second panel discussed EU accession as the single most important issue covered by the East Jour Fixe meetings in recent years. Finally, the last panel opened the controversial issue of relationships between the enlarged EU and the countries located along the new EU boundaries.

The 50<sup>th</sup> anniversary meeting was opened by Peter Mooslechner, Director of the OeNB's Economic Analysis and Research Section. He highlighted the special anniversary character of the current meeting, pointing out that the majority of participants had already taken part in several East Jour Fixe seminars before. With regard to the keynote lecture, he stressed the importance of the transmission mechanism for the conduct of monetary policy in a currency union. For this reason, this topic had already been addressed several times in previous East Jour Fixes.

Professor Jakob de Haan (University of Groningen and CESifo Munich) continued with a presentation of his paper, entitled "Financial Structure and Monetary Policy Transmission in Transition Countries" (coauthored by Adam Elbourne and Vas M.C. Kiviet). Following the introduction by Peter Mooslechner, he underlined that there are at least three conditions that a common

monetary policy must meet. First, the members must agree on their goals, which is ensured in the case of EMU by the ECB's price stability objective. Second, the common monetary policy is easier to implement if the member countries' business cycles are aligned. Third, monetary policy transmission should operate in a similar fashion across the member countries. In their last point, the authors address the fact that earlier observers have warned that an enlargement of the euro area may hamper ECB policies.

In particular, the authors estimate the transmission mechanisms in ten CEECs between 1990 and 2003 (as far as data are available). They concentrate on the impulse response functions in vector autoregression (VAR) models, which consist of inflation, output growth, and deposit and lending rates as key policy variables (endogenous variables). Furthermore, the VARs include German output growth and the key policy rate, exchange rates and several dummy variables as exogenous variables. Finally, Professor de Haan focused especially on the relation between the transmission mechanism and financial structures in the CEECs.

In fact, the authors find substantial differences in monetary transmission among the CEECs, although these differences cannot be related to different structures of the financial sector in these countries. As a result, it seems likely that the eventual enlargement of EMU will only make the differences in the ECB's monetary policy transmission more visible, until significant adjustments follow in the years to come.

The keynote lecture was followed by the first panel entitled "Past: Over a Decade of Transition – 50 East Jour Fixes" chaired by Eduard Hochreiter, Head of the OeNB's Economic Studies Division, who actually created the seminar series and organized the first 21 meetings. The participants in the panel, Professor Kazimierz Laski (The Vienna Institute for International Economic Studies), Marianne Kager (Bank Austria Creditanstalt), Angel Antonaya (IMF and Joint Vienna Institute) and Peter Backé (European Central Bank), lauded the East Jour Fixe series as a very fruitful combination of economic theory, empirical analysis and political relevance. The underlying motivation for this seminar series remains as relevant today and for the foreseeable future as it was in the past, which bodes well for the further thriving of the East Jour Fixe.

Professor Kazimierz Laski (The Vienna Institute for International Economic Studies) started with a controversial *ex post* evaluation of the economic reforms in the transition economies. The output decline at the beginning of economic transition was significantly more pronounced than previously expected, which caused high unemployment and poverty also in the most developed transition economies which will join the EU in 2004. The other speakers opposed this pronounced view. Marianne Kager (Bank Austria Creditanstalt) stressed the achievements in the restructuring of the financial sector. Between 1997 and 2002, the region posted the highest growth rates of GDP per capita (in euro) of the entire world economy. Angel Antonaya (IMF and Joint Vienna Institute) pointed to the important role the IMF plays not only in macroeconomic stabilization but also in technical cooperation, education and in the adjustment of the previously central planning institutions to market economy. Finally, Peter Backé (European Central Bank) touched upon the prospective monetary integration of new Member States, focusing on ERM II participation. He recalled

that ERM II entry is not subject to a set of preestablished criteria, so that it can legally take place any time after EU accession. From an economic viewpoint he underlined that, to ensure a smooth participation in ERM II, it would be necessary that major policy adjustments, for example with regard to price liberalization and fiscal policy, are undertaken prior to participation in ERM II.

After this discussion, the second panel entitled “Present: The Accession to the European Union” under the chair of Peter Mooslechner focused on EU enlargement as the most important policy step in 2004. Karl Pichelmann (European Commission) started with brief selected remarks on the accession countries’ state of preparedness for EU membership. Then he turned his attention back to the Stability and Growth Pact (SGP). He underlined that the new Member States will face the challenge of fulfilling the SGP requirements immediately after EU accession. This should result in significant improvements of the fiscal stance in these countries.

Marián Nemeč (Národná banka Slovenska) addressed the factors of economic success in Slovakia, which joined the first wave of enlargement despite some initial difficulties. Then he concentrated on the preparation of the adoption of the euro as the eventual aim of Slovak monetary policy. Jan Frait (Česká národní banka) largely continued along the same line, devoting his presentation to the topic of the appropriate exchange rate level. In particular, he recalled that there had been significant exchange rate volatility and appreciation in recent years, pointing out that Česká národní banka now expects the exchange rate to gradually stabilize.

Finally, Professor László Halpern (Hungarian Academy of Sciences, Institute of Economics, CEU Budapest, and CEPR London) presented his recent research on pricing to markets and exchange rate pass-through. Among his findings was that microeconomic data (e.g. prices issued by individual firms) are important for understanding macroeconomic developments (e.g. inflation and the relationship between price and exchange rate developments).

The final panel entitled “Future: What Are the Next Steps” was chaired by Doris Ritzberger-Grünwald, Head of the OeNB’s Foreign Research Division. The panel looked for policy scenarios for the economic relations between the enlarged EU and the remaining European countries. Pekka Sutela (Institute for Economics in Transition, Suomen Pankki) started by illustrating the case of Turkey. According to his view, Turkey is likely to join the EU, although it is difficult to specify the time dimension of this process. However, this would also open the door for other countries to join the EU after the next waves of enlargement (e.g. Ukraine and Belarus). However, Russia as an earlier and future superpower is likely to look for specific relationships to the EU based on free trade and cooperation in selected areas.

Then the discussion returned to countries aiming to join the EU relatively soon. Michael Landesmann (The Vienna Institute for International Economic Studies) spoke about prospects for Southeastern Europe, emphasizing the structural problems in the region. Despite the common past, intraregional trade in the area is rather low, with the EU being the most important trade partner for the Balkan countries. As a result, the long-standing aim of EU accession is an important anchor for further reforms.

Along this line, Boris Vujčić (Hrvatska narodna banka) proved that, from an economic perspective, Croatia is fully comparable to the current EU entrants. A specific feature of the Croatian economy is the high degree of dollarization/euroization. Actually, the central bank acts as a quasi currency board, i.e. over 90% of money creation results from foreign exchange operations (interventions), the exchange rate is nearly fixed, but there are no official commitments to avoid speculative attacks. Therefore, after EU accession, Croatia aims to eventually adopt the euro. A similar view was given by Cristian Popa (Banca Națională a României), who in his presentation stressed the initial differences between Romania and the countries acceding to the EU in 2004. Despite initial difficulties, the Romanian economy has achieved significant progress in recent years. Inflation stabilized from a rate of nearly 60% to about 15% in October 2003, while GDP growth improved. Inflation targeting will be introduced in 2005. Romania intends to join the EU in 2007 and to adopt the euro shortly after EU entry.

In contrast to these contributions on improving countries, Werner Varga, (Institute for the Danube Region and Central Europe) reported on Bosnia and Herzegovina. His personal experience from the country showed overwhelming problems in all areas of economic activity. Furthermore, Croatia's possible EU accession may further destabilize economic development in the country, whose population has a significant share of ethnic Croats. Therefore, Werner Varga called for a special EU "association" agreement for Bosnia and Herzegovina.

The broad range of topics presented in the key lecture and all three panels gave impetus to an intensive discussion. While technical questions on the estimation of transmission mechanisms and data quality were asked after the keynote lecture, institutional issues dominated the discussion following the panels. Given the strict time constraints of the seminar, the discussion was continued informally at dinner.

# Technical Cooperation of the Oesterreichische Nationalbank with Countries in Transition

Romana Lehner

In 2003, the OeNB pursued its technical cooperation activities with transition countries in Central and Eastern Europe (CEE), the western Balkans and the CIS republics, both at a bilateral and at a multilateral level.

Within recent years, the recipient central banks, especially those in CEE, have made much progress. This new situation is reflected both in the changes in the type of assistance provided but also in an amended regional focus of the OeNB's training and assistance efforts.

Eight<sup>1)</sup> of the former recipient countries will become members of the European Union in May 2004 and although the need for assistance will remain, it can now be dealt with within the framework of the European System of Central Banks. Moreover, some of the traditional recipient countries have started to become providers of technical assistance, so that the old distinction between "donors" and "recipients" is becoming increasingly inaccurate. However, there is still a strong demand for assistance and training in Southeastern Europe (including Bulgaria and Romania) and the CIS countries, and much of the focus of the OeNB's assistance and training efforts has already shifted to these regions.

At the *multilateral* level, the OeNB is working together closely with the Joint Vienna Institute (JVI). The year 2003 brought about major changes for this international training institution: On May 1, 2003, a new arrangement came into effect, according to which the JVI has two primary members, namely the IMF and the Austrian authorities (the Austrian Ministry of Finance and the OeNB). As a consequence, the Austrian authorities have stepped up substantially their financial contributions to the operating cost of the JVI and moreover have provided the JVI with a new building that meets the requirements of a modern training facility. The gala opening of the new JVI at Mariahilferstrasse 97 in Vienna's sixth district took place on November 2, 2003, on the eve of the OeNB's East-West Conference, which was hosted jointly by the OeNB and the JVI.

In 2003 the OeNB increased its contribution to the JVI's academic program from four to five seminars designed for central bankers. Looking at the JVI's course schedule for 2004, the new facility will again be working at full capacity, and the OeNB will increase its contribution to the program further, to six seminars. These will cover the topics "Monetary Policy Issues in the Context of EMU" (February 16 to 20), "Challenges on the Road to the EU and EMU" (February 23 to 26), "Economic and Monetary Integration in Europe" (March 8 to 11), "Cash Circulation and Payment Systems in Austria" (April 26 to 30), "Modern Management of a Central Bank" (June 21 to 25) and "Transition in a Larger Europe" (December 13 to 15).

Moreover, the Austrian authorities will continue to jointly organize two one-week seminars on "Foreign Direct Investment Policies" and "Public Governance and Structural Reforms: Public and Private Partnership" in 2004.

Due to the decline in applications, the JVI's Applied Economic Policy (AEP) course with a duration of 14 weeks will be held only once in 2004. In the past two such courses were offered per year. The JVI Design Committee is currently exploring the reasons for this development and is looking at how the course might be restructured or adjusted to make it more attractive to potential par-

1 The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

ticipants and at ways and means of identifying and attracting qualified participants. The AEP includes a one-week “Austrian segment” financed jointly by the Austrian authorities. In the first part of this segment, experts from a variety of academic and organizational backgrounds spend three days presenting lectures devoted to specific features of Austria’s market economy. In the second part, the so-called “study tour,” participants spend three days visiting companies, state and local government authorities, banks, media centers and the like to gain an insight into the structures of Austria’s economy and administration. The program for each study tour is organized by the OeNB, typically in cooperation with the OeNB’s branch offices in various Austrian provincial capitals.

In addition to the seminars held at the JVI, the OeNB has continued its *bilateral* technical cooperation activities with central banks in transition countries (mostly in Southeastern Europe and the CIS countries) by organizing consultations, lectures and various study and information visits to the OeNB.

Last but not least, the OeNB – together with the European Central Bank and eight national central banks – is participating in an EU-funded Tacis project, which will provide technical assistance to the Central Bank of the Russian Federation in a coordinated Eurosystem approach. The program will involve the training of 400 staff members of the Russian central bank and is designed to strengthen banking supervision in Russia, with the wider aim of fostering the stability of the Russian financial system. The contract was signed in October, and the inception period of the project started at the beginning of November 2003.

S T A T I S T I C A L A N N E X

## Gross Domestic Product

	Bulgaria	Czech Republic <sup>1)</sup>	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
Annual change in %											
1992	-7.3	-0.5	-21.6	-3.1	x	x	+2.6	-8.8	-14.5	-6.5	-5.5
1993	-1.5	+0.1	- 8.2	-0.6	-14.9	-16.2	+3.8	+1.5	- 8.7	-3.7	+2.8
1994	+1.8	+2.2	- 2.0	+2.9	+ 0.6	- 9.8	+5.2	+3.9	-12.7	+5.2	+5.3
1995	+2.9	+5.9	+ 4.3	+1.5	- 0.8	+ 3.3	+7.0	+7.1	- 4.1	+6.5	+4.1
1996	-9.4	+4.3	+ 3.9	+1.3	+ 3.7	+ 4.7	+6.0	+3.9	- 3.6	+5.8	+3.5
1997	-5.6	-0.8	+ 9.8	+4.6	+ 8.4	+ 7.3	+6.8	-6.1	+ 1.4	+5.6	+4.6
1998	+4.0	-1.0	+ 4.6	+4.9	+ 4.8	+ 5.1	+4.8	-4.8	- 5.3	+4.0	+3.8
1999	+2.3	+0.5	- 0.6	+4.2	+ 2.8	- 3.9	+4.1	-1.2	+ 6.4	+1.3	+5.2
2000	+5.4	+3.3	+ 7.3	+5.2	+ 6.8	+ 3.8	+4.0	+2.1	+10.0	+2.2	+4.6
2001	+4.1	+3.1	+ 6.5	+3.8	+ 7.9	+ 5.9	+1.0	+5.7	+ 5.0	+3.3	+2.9
2002	+4.8	+2.0	+ 6.0	+3.3	+ 6.1	+ 5.9	+1.4	+4.9	+ 4.3	+4.4	+2.9
2001											
1 <sup>st</sup> quarter	+4.1	+3.6	+ 5.7	+4.4	+ 8.3	+ 3.5	+2.3	+4.8	+ 4.8	+3.0	+3.2
2 <sup>nd</sup> quarter	+4.1	+3.5	+ 5.5	+4.0	+ 9.3	+ 6.6	+0.9	+5.0	+ 5.3	+2.8	+2.8
3 <sup>rd</sup> quarter	+3.9	+3.3	+ 3.9	+3.7	+ 6.4	+ 5.3	+0.8	+6.8	+ 5.8	+3.5	+3.3
4 <sup>th</sup> quarter	+4.2	+2.7	+ 5.1	+3.3	+ 6.8	+ 7.9	+0.2	+4.5	+ 4.3	+3.9	+2.6
2002											
1 <sup>st</sup> quarter	+3.2	+2.8	+ 3.2	+2.9	+ 3.7	+ 3.9	+0.5	+3.1	+ 3.7	+3.9	+2.5
2 <sup>nd</sup> quarter	+5.3	+1.9	+ 7.0	+2.0	+ 4.9	+ 7.7	+0.8	+5.7	+ 4.1	+4.0	+3.3
3 <sup>rd</sup> quarter	+6.4	+1.7	+ 6.7	+3.5	+ 7.4	+ 7.8	+1.6	+4.7	+ 4.6	+4.4	+3.6
4 <sup>th</sup> quarter	+3.4	+1.5	+ 5.9	+3.7	+ 8.3	+ 7.0	+2.1	+6.1	+ 5.2	+5.4	+3.3
2003											
1 <sup>st</sup> quarter	+3.8	+2.4	+ 5.2	+2.7	+ 8.8	+ 9.4	+2.2	+4.4	+ 6.8	+4.1	+2.3
2 <sup>nd</sup> quarter	+4.4	+2.1	+ 3.5	+2.4	+ 6.2	+ 6.1	+3.8	..	+ 7.2	+3.8	+2.1

Source: Annual data: WIW (The Vienna Institute for International Economic Studies); Estonia, Latvia, Lithuania: IMF; Russia: national sources from 1999. Quarterly data: Eurostat, national sources.

<sup>1)</sup> Not including the GDP revision for the period from 2000 to 2002, announced by the Czech Statistical Office on October 27, 2003. Due to revisions quarterly data may not match annual data.

## Industrial Production

	Bulgaria	Czech Republic	Estonia <sup>1)</sup>	Hungary	Latvia	Lithuania <sup>2)</sup>	Poland	Romania	Russia	Slovak Republic	Slovenia
Annual change in %											
1993	- 9.8	- 5.3	x	+ 4.0	-38.1	-34.7	+ 6.4	+ 1.3	-14.1	- 3.8	-2.8
1994	+10.6	+ 2.1	- 2.1	+ 9.6	- 9.5	-29.8	+12.1	+ 3.3	-20.9	+ 4.8	+6.4
1995	+ 4.5	+ 8.7	+ 2.0	+ 4.6	- 6.3	+ 0.9	+ 9.7	+ 9.4	- 3.3	+ 8.3	+2.0
1996	+ 5.1	+ 2.0	+ 3.5	+ 3.4	+ 1.4	+ 3.5	+ 8.3	+ 6.3	- 4.0	+ 2.5	+1.0
1997	- 5.4	+ 4.5	+15.2	+11.1	+ 6.1	+ 8.0	+11.5	- 7.2	+ 1.9	+ 2.7	+1.0
1998	- 7.9	+ 1.6	+ 3.2	+12.5	+ 2.0	+ 9.3	+ 3.5	-13.8	- 5.2	+ 5.0	+3.7
1999	- 8.0	- 3.1	- 1.7	+10.4	- 8.8	- 9.6	+ 3.6	- 2.4	+11.0	- 2.7	-0.5
2000	+ 8.2	+ 5.4	+14.6	+18.1	+ 3.2	+ 8.8	+ 6.7	+ 7.1	+11.9	+ 8.6	+6.2
2001	+ 1.6	+ 6.5	+ 7.9	+ 3.6	+ 6.9	+16.5	+ 0.6	+ 8.4	+ 4.9	+ 6.9	+2.9
2002	+ 0.6	+ 4.8	+ 6.9	+ 2.7	+ 5.8	+ 7.7	+ 1.4	+ 3.1	+ 3.7	+ 6.5	+2.4
2002											
January	- 3.4	+ 2.6	+ 2.6	- 5.1	+ 2.8	- 2.4	- 1.4	+ 5.0	+ 2.2	+ 0.4	+3.9
February	- 5.8	+ 5.8	+ 2.5	+ 1.6	+ 0.1	- 5.9	+ 0.3	+ 5.0	+ 2.0	+ 5.0	+3.2
March	- 4.0	+ 4.1	- 0.8	+ 3.3	- 2.5	+10.8	- 3.2	- 0.1	+ 3.7	- 1.1	-1.5
April	+11.5	+ 8.2	+12.0	+ 4.8	+ 6.6	+11.0	+ 0.3	+ 5.6	+ 4.3	+10.5	+9.6
May	+ 4.5	+ 5.1	+ 7.2	- 4.6	+ 4.6	+ 4.6	- 4.2	+ 0.1	+ 2.8	+ 3.7	+0.1
June	+ 7.6	+ 1.3	+ 7.5	+ 4.4	+ 6.6	+ 4.0	+ 2.1	+ 6.6	+ 4.4	+ 3.8	-1.9
July	+12.0	+10.8	+ 5.0	+ 9.6	+ 8.1	+ 0.6	+ 5.7	+ 9.1	+ 7.8	+12.0	+4.6
August	+ 4.6	- 2.8	+ 8.8	- 2.7	+ 4.3	+ 3.3	- 1.2	+ 6.4	+ 3.4	+ 6.5	+0.1
September	+ 9.7	+ 9.2	+10.7	+10.2	+ 9.6	+ 7.0	+ 6.7	+ 9.1	+ 5.5	+10.0	+6.8
October	+ 5.6	+ 3.5	+ 9.8	- 1.7	+11.6	- 1.2	+ 3.3	+ 9.6	+ 3.9	+ 9.4	+1.5
November	+ 9.9	+ 4.4	+ 5.8	+ 3.9	+ 6.3	+ 0.5	+ 3.1	+ 7.0	+ 0.8	+ 9.2	+0.6
December	+ 4.0	+ 6.6	+ 4.1	+10.5	+11.9	+ 5.8	+ 5.1	+ 8.6	+ 3.2	+11.2	+2.8
2003											
January	+15.4	+ 6.4	+ 8.5	+ 4.5	+ 7.0	+22.1	+ 3.4	+ 1.6	+ 4.9	+13.7	-1.9
February	+15.4	+ 5.2	+13.0	+ 0.6	+10.0	+35.7	+ 4.2	- 1.7	+ 6.5	+ 7.9	+2.8
March	+23.4	+ 7.0	+13.1	+ 6.8	+ 9.0	+ 7.9	+ 5.5	+ 3.4	+ 6.7	+10.6	+1.4
April	+11.9	+ 5.6	+ 9.6	+ 2.5	+ 7.1	+ 5.5	+ 8.5	+ 1.6	+ 7.1	+ 2.2	-2.4
May	+ 9.6	+ 3.2	+ 7.1	+ 4.4	+ 4.9	+ 0.8	+11.7	+ 4.4	+ 8.5	+ 2.4	-0.8
June	+15.4	+ 6.2	+11.0	+ 4.4	+ 5.5	+ 6.8	+ 7.9	+ 6.7	+ 7.0	+ 9.5	+2.5
July	+13.0	+ 4.8	+ 9.4	+ 5.6	+10.7	+19.6	+10.3	+ 6.7	+ 7.1	+ 2.8	-0.8
August	+ 8.9	+ 8.0	+11.0	+ 6.6	+ 3.7	+21.8	+ 5.9	+ 2.5	+ 5.5	+ 1.2	-2.6
September	..	..	+ 9.5	..	..	+19.0	+11.0	..	+ 8.0	..	..

Source: Annual data: WIW; Estonia, Latvia, Lithuania: national sources. Monthly data: national sources.

<sup>1)</sup> Industrial sales up to 1999.

<sup>2)</sup> Industrial sales.

## Unemployment Rate

	Bulgaria	Czech Republic	Estonia	Hungary <sup>1)</sup>	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
End of period (%)											
1993	16.4	3.5	1.8	11.9	5.8	4.4	16.4	10.4	6.0	14.4	15.4
1994	12.8	3.2	1.5	10.7	6.5	3.8	16.0	10.9	7.7	14.6	14.2
1995	11.1	2.9	2.1	10.2	6.5	6.1	14.9	9.5	9.0	13.1	14.5
1996	12.5	3.5	2.6	9.9	7.2	7.1	13.2	6.6	9.9	12.8	14.4
1997	13.7	5.2	2.7	8.7	7.0	5.9	10.3	8.9	11.2	12.5	14.8
1998	12.2	7.5	2.7	7.8	9.2	6.4	10.4	10.4	13.3	15.6	14.6
1999	16.0	9.4	4.0	7.0	9.1	8.4	13.1	11.8	12.2	19.2	13.0
2000	17.9	8.8	5.9	6.4	7.8	11.5	15.1	10.5	9.9	17.9	12.0
2001	17.3	8.9	6.1	5.7	7.7	12.5	17.5	8.8	8.7	18.6	11.8
2002	16.3	9.8	5.9	5.8	7.9	11.3	18.1	8.1	7.5	17.5	11.3
2002											
January	18.0	9.4	6.6	5.6	7.9	13.1	18.1	12.7	8.6	19.7	12.0
February	17.9	9.3	6.5	5.7	8.2	12.9	18.2	13.5	8.4	19.6	11.8
March	17.5	9.1	6.4	5.8	8.2	12.6	18.2	13.4	8.2	19.1	11.7
April	17.8	8.8	6.4	5.7	8.1	11.8	17.9	11.4	8.0	18.1	11.6
May	17.6	8.6	6.0	5.6	8.0	11.1	17.3	10.5	7.7	17.7	11.4
June	17.2	8.7	5.5	5.6	7.9	10.7	17.4	9.9	7.5	17.6	11.3
July	17.6	9.2	5.5	5.9	8.0	10.7	17.5	9.2	7.4	17.6	11.5
August	17.6	9.4	5.4	5.9	7.9	10.7	17.5	8.7	7.2	17.2	11.6
September	17.4	9.4	5.5	5.9	7.8	10.5	17.6	8.4	7.6	16.6	11.7
October	17.4	9.3	5.5	5.9	7.7	10.4	17.5	8.2	8.1	16.4	11.7
November	16.9	9.3	5.6	5.9	7.7	10.7	17.8	8.1	8.5	16.8	11.5
December	16.3	9.8	5.4	5.9	7.6	10.9	18.1	8.1	8.8	17.5	11.3
2003											
January	17.5	10.2	5.7	6.0	7.7	12.1	18.7	8.3	9.1	17.7	11.6
February	16.5	10.2	5.7	6.3	7.9	12.1	18.8	8.5	9.3	17.1	11.5
March	15.7	10.0	6.7	6.4	7.9	12.1	18.7	8.3	8.9	16.5	11.3
April	14.9	9.6	7.7	6.2	7.9	12.1	18.4	7.8	8.5	15.4	11.1
May	14.3	9.4	8.7	6.0	7.9	12.1	17.9	7.4	8.2	14.8	10.9
June	13.7	9.5	9.7	5.8	7.9	12.1	17.8	7.1	8.0	14.6	10.8
July	13.2	9.9	10.7	5.7	7.9	12.1	17.8	6.9	7.8	14.5	11.1
August	13.0	10.0	11.7	5.7	7.9	12.1	17.6	6.6	7.6	14.3	11.3
September	12.8	10.1	12.7	5.7	7.9	12.1	17.5	..	7.7	13.9	..

Source: WIIW; Estonia, Latvia, Lithuania: national sources.

<sup>1)</sup> Period average.

## Consumer Price Index

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
Period average (annual change in %)											
1993	+ 72.8	+20.8	+89.8	+22.5	+108.8	+410.2	+35.3	+256.1	+873.5	+23.2	+32.3
1994	+ 96.0	+10.0	+47.7	+18.8	+ 35.9	+ 72.2	+32.2	+136.8	+307.0	+13.4	+19.8
1995	+ 62.1	+ 9.1	+28.8	+28.2	+ 25.0	+ 39.7	+27.8	+ 32.3	+197.5	+ 9.9	+12.6
1996	+ 121.6	+ 8.8	+23.1	+23.6	+ 17.6	+ 24.6	+19.9	+ 38.8	+ 47.8	+ 5.8	+ 9.7
1997	+1,058.4	+ 8.5	+10.6	+18.3	+ 8.4	+ 8.9	+14.9	+154.8	+ 14.8	+ 6.1	+ 9.1
1998	+ 18.7	+10.7	+ 8.2	+14.3	+ 4.7	+ 5.1	+11.8	+ 59.1	+ 27.6	+ 6.7	+ 8.6
1999	+ 2.6	+ 2.1	+ 3.3	+10.0	+ 2.4	+ 0.8	+ 7.3	+ 45.8	+ 85.7	+10.6	+ 6.6
2000	+ 10.3	+ 3.9	+ 4.0	+ 9.8	+ 2.7	+ 1.0	+10.1	+ 45.7	+ 20.8	+12.0	+10.9
2001	+ 7.4	+ 4.7	+ 5.7	+ 9.2	+ 2.5	+ 1.3	+ 5.5	+ 34.5	+ 21.6	+ 7.1	+ 9.4
2002	+ 5.8	+ 1.8	+ 3.6	+ 5.3	+ 2.0	+ 0.3	+ 1.9	+ 22.5	+ 16.0	+ 3.3	+ 7.5
2002											
January	+ 7.0	+ 3.7	+ 4.2	+ 6.6	+ 3.5	+ 3.2	+ 3.4	+ 28.6	+ 19.2	+ 6.2	+ 8.4
February	+ 8.4	+ 3.9	+ 4.4	+ 6.2	+ 3.3	+ 2.7	+ 3.5	+ 27.2	+ 17.9	+ 4.3	+ 8.1
March	+ 9.2	+ 3.7	+ 4.3	+ 5.9	+ 3.2	+ 1.7	+ 3.3	+ 25.1	+ 17.0	+ 3.6	+ 7.6
April	+ 9.2	+ 3.2	+ 4.6	+ 6.1	+ 2.9	+ 1.4	+ 3.0	+ 24.4	+ 16.3	+ 3.6	+ 8.4
May	+ 6.9	+ 2.5	+ 4.2	+ 5.6	+ 2.0	+ 0.6	+ 1.9	+ 24.5	+ 16.2	+ 3.2	+ 7.5
June	+ 5.2	+ 1.2	+ 3.8	+ 4.8	+ 1.0	- 0.4	+ 1.6	+ 24.0	+ 14.9	+ 2.6	+ 6.8
July	+ 5.5	+ 0.6	+ 3.1	+ 4.6	+ 1.1	+ 0.2	+ 1.3	+ 23.0	+ 15.1	+ 2.0	+ 7.2
August	+ 4.5	+ 0.6	+ 2.6	+ 4.5	+ 0.9	- 0.9	+ 1.2	+ 21.3	+ 15.2	+ 2.7	+ 7.3
September	+ 4.0	+ 0.8	+ 2.7	+ 4.6	+ 1.1	- 1.4	+ 1.3	+ 19.8	+ 15.0	+ 2.8	+ 7.2
October	+ 3.2	+ 0.6	+ 3.2	+ 4.9	+ 1.6	- 1.0	+ 1.1	+ 18.8	+ 15.0	+ 2.9	+ 7.2
November	+ 3.2	+ 0.5	+ 3.1	+ 4.8	+ 1.5	- 0.9	+ 0.9	+ 18.6	+ 15.2	+ 2.9	+ 6.7
December	+ 3.8	+ 0.6	+ 2.7	+ 4.8	+ 1.4	- 0.9	+ 0.8	+ 17.8	+ 15.1	+ 3.4	+ 7.2
2003											
January	+ 1.7	- 0.4	+ 2.6	+ 4.7	+ 1.4	- 1.8	+ 0.5	+ 16.6	+ 14.3	+ 7.3	+ 6.6
February	+ 0.2	- 0.4	+ 2.4	+ 4.5	+ 2.0	- 1.9	+ 0.5	+ 16.2	+ 14.8	+ 7.6	+ 6.2
March	- 0.2	- 0.4	+ 2.4	+ 4.7	+ 2.2	- 1.1	+ 0.6	+ 17.1	+ 14.8	+ 8.0	+ 6.3
April	+ 0.2	- 0.1	+ 1.2	+ 3.9	+ 2.5	- 1.0	+ 0.3	+ 16.0	+ 14.6	+ 7.7	+ 5.3
May	+ 1.7	+ 0.0	+ 0.6	+ 3.6	+ 2.5	- 0.9	+ 0.4	+ 14.4	+ 13.6	+ 7.6	+ 5.5
June	+ 1.2	+ 0.3	+ 0.3	+ 4.3	+ 3.7	- 0.4	+ 0.8	+ 14.0	+ 13.9	+ 8.4	+ 6.0
July	+ 2.0	- 0.1	+ 0.8	+ 4.7	+ 3.7	- 1.0	+ 0.8	+ 14.8	+ 13.9	+ 8.7	+ 6.0
August	+ 3.5	- 0.1	+ 1.3	+ 4.7	+ 3.4	- 1.2	+ 0.7	+ 14.2	+ 13.3	+ 9.2	+ 5.5
September	+ 3.6	+ 0.0	+ 2.3	+ 4.7	+ 3.4	- 1.2	+ 0.9	+ 15.9	+ 13.2	+ 9.5	+ 5.0

Source: WIIW; Estonia, Latvia, Lithuania: IMF.

## Trade Balance

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
USD million											
1993	- 885.4	- 525.3	- 144.8	-3,247.0	18.6	- 154.8	- 2,482.0	-1,128.0	15,590.0	- 932.0	- 154.2
1994	- 16.9	-1,381.2	- 356.9	-3,635.0	- 301.1	- 204.9	- 895.0	- 411.0	16,927.0	58.5	- 336.5
1995	- 351.7	-3,677.9	- 732.5	-2,442.0	- 514.0	- 698.0	- 1,912.0	-1,577.0	19,816.0	- 227.5	- 953.9
1996	- 237.9	-5,706.3	-1,190.8	-1,206.9	- 877.1	- 896.2	- 8,179.0	-2,470.0	21,592.0	-2,292.6	- 826.1
1997	- 45.5	-4,892.9	-1,687.2	-1,567.1	-1,051.3	-1,147.5	-11,320.0	-1,980.0	14,913.0	-2,057.9	- 774.8
1998	- 763.2	-2,603.3	-1,743.4	-1,904.9	-1,377.4	-1,518.4	-13,720.0	-2,625.0	16,429.0	-2,353.1	- 792.0
1999	-1,508.7	-1,902.6	- 820.6	-2,190.5	-1,223.2	-1,404.6	-14,379.0	-1,257.0	36,014.0	-1,092.4	-1,235.1
2000	-1,682.5	-3,131.0	- 766.3	-2,902.7	-1,322.2	-1,103.8	-13,168.0	-1,684.0	60,172.0	- 916.8	-1,138.9
2001	-2,147.9	-3,067.6	- 790.9	-3,127.9	-1,505.1	-1,108.0	-11,675.0	-2,969.0	48,121.0	-1,984.8	- 619.4
2002	-2,211.3	-2,178.7	-1,787.0	-3,236.5	-1,760.9	-1,252.4	-10,352.0	-3,987.9	46,635.0	-2,011.9	- 243.0
2002											
January	- 121.7	x	- 104.2	- 231.7	- 99.4	x	- 1,109.0	- 173.0	2,993.0	- 120.7	- 20.0
February	- 116.1	x	- 76.8	- 153.6	- 99.4	x	- 818.0	- 148.8	2,614.0	- 130.6	- 27.2
March	- 136.3	- 253.9	- 115.7	- 16.3	- 122.5	- 254.2	- 701.0	- 151.5	3,756.0	- 156.0	- 31.5
April	- 197.3	x	- 148.0	- 141.1	- 144.7	x	- 742.0	- 231.8	4,385.0	- 118.6	- 36.2
May	- 240.2	x	- 136.0	- 52.2	- 137.2	x	- 814.0	- 240.1	3,902.0	- 233.9	- 31.6
June	- 122.3	- 397.3	- 105.1	- 29.2	- 148.9	- 331.3	- 680.0	- 196.5	3,291.0	- 123.6	30.4
July	- 139.1	x	- 173.0	- 337.4	- 158.7	x	- 606.0	- 294.2	3,789.0	- 155.1	32.5
August	- 105.8	x	- 93.5	- 124.2	- 129.1	x	- 894.0	- 65.4	4,789.0	- 84.6	- 16.5
September	- 133.6	- 598.7	- 133.5	- 37.3	- 165.6	- 269.6	- 898.0	- 348.0	4,550.0	- 183.5	29.1
October	- 233.3	x	- 134.4	- 353.3	- 200.8	x	- 1,039.0	- 448.5	4,198.0	- 301.1	27.6
November	- 272.4	x	- 128.2	- 113.7	- 164.6	x	- 1,088.0	-1,245.8	3,679.0	- 237.7	- 57.6
December	- 393.2	- 989.5	- 178.7	- 528.4	- 198.1	- 481.8	- 963.0	- 444.3	4,689.0	- 321.2	- 150.2
2003											
January	- 121.4	x	- 149.3	- 108.3	- 129.0	x	- 1,199.0	- 247.0	4,926.0	- 22.8	9.0
February	- 175.2	x	- 183.4	- 346.5	- 143.2	x	- 629.0	- 229.8	4,740.0	- 83.4	- 96.7
March	- 180.4	- 147.4	- 221.9	- 164.8	- 180.7	- 89.8	- 545.0	- 342.7	5,676.0	- 72.8	- 75.6
April	- 336.7	x	- 166.6	- 477.0	- 174.7	x	- 931.0	565.8	3,948.0	- 173.9	- 21.1
May	- 359.5	x	- 149.1	- 408.8	- 176.1	x	- 801.0	622.1	4,360.0	78.7	- 115.1
June	- 228.5	- 482.4	- 175.3	- 325.8	- 207.6	- 496.0	- 572.0	557.2	4,945.0	29.4	- 14.6
July	- 285.2	x	- 227.9	- 518.0	- 197.6	x	- 942.0	488.3	4,614.0	- 93.4	- 11.4
August	- 223.0	x	- 142.3	- 386.9	- 217.2	x	- 836.0	334.2	5,352.0	..	70.8
September	..	..	- 244.0	- 192.7	..	..	- 602.0	576.9	..	..	..

Source: National sources.

## Current Account

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic <sup>1)</sup>	Slovenia
USD million											
1993	x	455.8	15.8	-2,958.7	428.0	- 85.7	- 2,868.0	-1,174.0	12,792.0	- 601.2	191.9
1994	x	- 786.8	- 121.6	-3,300.4	200.8	- 94.0	677.0	- 428.0	8,291.0	664.9	574.8
1995	x	-1,369.1	- 102.6	-1,915.1	- 17.9	- 614.4	5,310.0	-1,774.0	7,457.0	391.4	- 74.7
1996	x	-4,121.2	- 272.3	-1,339.5	- 280.0	- 722.7	- 1,371.0	-2,571.0	11,725.0	-2,098.1	55.5
1997	1,046.3	-3,563.5	- 442.5	- 847.8	- 346.2	- 981.5	- 4,309.0	-2,137.0	2,032.0	-1,803.9	50.5
1998	- 61.4	-1,254.9	- 383.0	-2,020.3	- 707.8	-1,298.1	- 6,841.0	-2,968.0	659.0	-2,124.0	-118.0
1999	- 651.7	-1,462.3	- 245.1	-1,974.9	- 635.9	-1,194.1	-11,553.0	-1,469.0	24,731.0	- 979.7	-698.4
2000	- 701.6	-2,717.7	- 292.1	-1,434.3	- 487.7	- 674.8	- 9,952.0	-1,363.0	47,294.0	- 713.0	-547.6
2001	- 842.2	-3,272.5	- 342.0	-1,247.8	-1,169.8	- 573.7	- 7,166.0	-2,223.0	34,620.0	-1,755.9	30.9
2002	- 678.7	-4,415.4	- 786.5	-2,770.8	- 651.7	- 662.8	- 6,700.0	-1,632.0	32,807.0	-1,938.9	375.0
2002											
January	- 130.5	x	- 66.4	- 230.1	- 7.4	x	- 870.0	- 82.0	x	- 84.1	54.2
February	- 51.9	x	- 50.3	- 154.6	- 14.6	x	- 824.0	- 96.0	x	- 84.4	22.4
March	- 55.2	- 780.8	- 75.3	- 36.2	- 34.1	- 129.2	- 652.0	- 106.0	6,761.0	- 144.5	- 26.3
April	- 137.4	x	- 78.3	- 301.6	- 53.8	x	- 634.0	- 257.0	x	- 131.3	- 5.5
May	- 101.5	x	- 53.9	- 114.0	- 52.0	x	- 568.0	- 122.0	x	- 311.7	2.5
June	92.8	- 937.9	- 27.2	- 249.3	- 65.4	- 210.4	- 430.0	- 244.0	8,052.0	- 101.6	70.1
July	116.2	x	- 74.9	- 251.7	- 33.7	x	- 109.0	- 141.0	x	- 110.2	43.8
August	160.6	x	- 30.1	20.7	- 32.0	x	- 276.0	113.0	x	- 24.7	42.9
September	50.8	-1,516.4	- 68.5	- 51.8	- 75.9	- 50.5	- 524.0	- 20.0	8,618.0	- 178.8	129.7
October	- 141.7	x	- 68.3	- 327.7	- 87.0	x	- 566.0	- 158.0	x	- 227.8	81.7
November	- 180.4	x	- 96.3	- 306.4	- 54.6	x	- 752.0	- 176.0	x	- 140.6	27.7
December	- 301.2	-1,248.7	- 117.4	- 648.5	- 96.4	- 343.8	- 495.0	- 282.0	9,376.0	- 289.2	-113.5
2003											
January	- 165.4	x	- 115.4	- 216.7	- 8.3	x	- 752.0	- 16.2	x	- 46.0	95.3
February	- 156.2	x	- 129.4	- 458.4	- 40.5	x	- 522.0	- 61.4	x	- 90.5	- 33.4
March	- 89.5	- 466.9	- 112.7	- 241.1	- 73.3	139.4	- 271.0	- 105.9	11,764.0	11.2	- 87.5
April	- 388.2	x	- 118.5	- 650.9	- 75.9	x	- 510.0	- 427.3	x	- 126.5	15.9
May	- 223.7	x	- 87.5	- 340.4	- 87.2	x	- 496.0	- 466.2	x	80.4	- 78.4
June	23.2	-1,600.7	- 97.7	- 740.2	- 99.8	- 350.9	- 105.0	- 325.4	8,617.0	- 17.7	27.5
July	32.5	x	- 99.9	- 464.3	- 84.1	x	- 272.0	- 159.2	x	5.8	26.9
August	152.6	x	- 48.5	- 448.1	- 78.9	x	- 120.0	- 10.0	x	..	- 8.2
September	..	..	..	- 400.4	..	..	54.0	..	..	..	..

Source: National central banks.

<sup>1)</sup> From 1997: IMF BOP Manual, 5<sup>th</sup> edition; monthly data: calculated on the basis of cumulative data.

## Total Reserves Minus Gold

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
End of period (USD million)											
1993	655.2	3,789.4	386.1	6,700.0	431.5	350.3	4,092.0	995.5	5,835.0	415.6	787.8
1994	1,001.8	6,144.5	443.4	6,735.5	545.2	525.5	5,841.8	2,086.2	3,980.4	1,691.2	1,499.0
1995	1,236.5	13,842.9	579.9	11,974.3	505.7	757.0	14,774.1	1,579.0	14,382.8	3,363.9	1,820.8
1996	483.6	12,351.8	636.8	9,720.2	654.1	772.2	17,844.0	2,102.8	11,276.4	3,418.9	2,297.4
1997	2,111.5	9,733.7	757.7	8,407.9	704.0	1,010.0	20,407.2	3,803.3	12,894.7	3,230.3	3,314.7
1998	2,684.7	12,542.1	810.6	9,318.7	728.2	1,409.1	27,325.2	2,867.4	7,801.4	2,868.8	3,638.5
1999	2,892.1	12,806.1	853.5	10,954.0	840.2	1,195.0	26,354.7	2,687.0	8,457.2	3,370.7	3,168.0
2000	3,154.9	13,019.2	920.6	11,189.6	850.9	1,311.6	26,562.0	3,922.2	24,264.3	4,022.3	3,196.0
2001	3,290.8	14,341.2	820.2	10,727.2	1,148.7	1,617.7	25,648.4	5,441.9	32,542.4	4,141.0	4,330.0
2002	4,407.1	23,555.6	1,000.4	10,348.5	1,241.4	2,356.2	28,649.7	7,211.3	44,053.6	8,808.7	6,980.2
2002											
January	2,972.1	14,497.6	800.6	10,104.2	1,139.3	1,638.5	25,400.4	5,316.3	32,316.7	4,371.7	4,272.7
February	2,977.4	14,517.4	788.7	9,657.9	1,121.2	1,758.1	25,454.1	5,349.7	32,768.3	4,316.9	4,511.2
March	2,923.7	14,625.2	858.6	9,588.7	1,129.9	1,683.3	26,053.9	5,425.7	33,179.2	4,399.5	4,521.1
April	3,125.5	16,069.6	839.1	10,035.7	1,130.9	1,745.1	26,196.0	5,437.7	35,024.5	4,496.8	4,780.9
May	3,314.1	20,238.8	859.2	9,765.6	1,133.2	2,104.2	26,435.7	6,352.0	38,495.9	4,537.0	4,941.9
June	3,706.5	21,296.6	914.3	10,149.1	1,145.1	2,289.5	27,099.4	6,256.8	39,848.0	4,420.8	5,384.9
July	3,698.1	21,394.7	892.2	10,048.0	1,129.5	2,043.7	28,285.7	6,520.1	39,563.5	7,200.0	5,314.3
August	3,816.3	21,634.3	979.8	10,122.5	1,203.4	2,080.5	28,332.4	6,709.9	40,596.2	7,192.4	5,378.5
September	3,960.1	22,342.1	924.1	10,069.0	1,229.0	2,094.8	28,183.9	6,828.2	41,887.3	7,544.2	5,865.2
October	4,088.4	22,373.1	935.4	9,732.5	1,148.5	2,176.2	28,186.9	7,069.0	43,034.3	7,701.1	5,969.0
November	4,204.1	22,604.5	923.0	9,693.2	1,114.8	2,146.4	28,449.7	7,048.8	44,469.7	8,422.3	6,733.2
December	4,407.1	23,555.6	1,000.4	10,348.5	1,241.4	2,356.2	28,649.7	7,211.3	44,053.6	8,808.7	6,980.2
2003											
January	4,270.6	24,314.9	1,004.2	15,312.8	1,189.8	2,504.6	29,267.4	7,241.1	45,533.6	9,379.2	7,191.3
February	4,317.6	24,444.2	1,004.7	13,974.8	1,236.0	2,551.6	30,694.7	7,320.1	49,325.9	9,923.1	7,320.0
March	4,435.2	24,598.3	1,082.4	13,583.1	1,105.8	2,825.1	29,975.3	7,288.7	51,790.0	9,379.3	7,090.9
April	4,890.1	24,614.1	1,053.6	12,827.5	1,198.0	2,580.7	29,920.2	7,247.9	56,110.8	9,323.7	7,291.4
May	5,243.5	25,893.3	1,201.5	12,833.4	1,316.3	2,719.7	32,302.2	7,329.3	61,144.4	10,006.9	7,825.8
June	5,323.6	25,317.2	1,112.6	12,356.0	1,282.6	2,711.4	30,926.9	7,344.4	60,690.7	10,098.7	7,867.9
July	5,136.9	25,031.8	1,158.4	12,181.0	1,277.9	2,679.9	30,849.1	8,190.3	60,709.9	10,441.0	7,823.8

Source: IMF.

## Central Government Surplus/Deficit

	Bulgaria	Czech Republic	Estonia <sup>1)</sup>	Hungary	Latvia	Lithuania	Poland <sup>2)</sup>	Romania	Russia	Slovak Republic	Slovenia <sup>3)</sup>
% of GDP											
1993	-11.0	+0.1	-0.4	- 5.6	-0.2	x	-2.8	-1.7	- 4.6	-6.2	+ 0.9
1994	- 6.5	+0.9	-0.6	- 8.1	-1.9	-1.9	-2.7	-4.2	-10.3	-4.7	+ 0.0
1995	- 6.6	+0.5	+0.3	- 5.5	-3.8	-1.8	-2.4	-4.1	- 3.2	-1.5	+ 0.0
1996	-10.8	-0.1	-1.6	- 1.9	-0.8	-2.5	-2.4	-4.9	- 4.4	-4.1	+ 0.3
1997	- 3.6	-0.9	+2.2	- 4.0	+1.2	-1.0	-1.2	-3.6	- 5.2	-5.2	- 1.2
1998	+ 1.3	-1.6	-1.8	- 5.5	+0.2	-1.3	-2.4	-2.8	- 5.7	-2.5	- 0.8
1999	+ 1.9	-1.6	-4.8	- 3.0	-3.0	-0.3	-2.0	-2.5	- 0.9	-1.8	- 0.6
2000	- 0.7	-2.3	-0.7	- 2.8	-2.8	-1.6	-2.2	-3.6	+ 1.9	-3.0	- 1.3
2001	- 2.2	-3.1	+0.4	- 2.8	-1.5	-1.2	-4.3	-3.1	+ 3.0	-4.5	- 1.3
2002	+ 0.0	-2.0	+1.1	- 8.7	-2.1	..	-5.1	-3.1	+ 1.0	-4.8	- 3.0
2001											
1 <sup>st</sup> quarter	- 1.9	+0.5	+0.2	- 1.1	-1.7	+0.3	-9.1	-4.4	+ 2.6	-2.5	- 5.0
2 <sup>nd</sup> quarter	+ 4.2	-5.8	+1.0	- 1.3	-0.8	-3.4	-2.1	-5.4	+ 3.9	-3.1	- 5.5
3 <sup>rd</sup> quarter	- 3.7	+1.3	+3.0	- 2.3	-0.9	-0.2	-1.6	-2.4	+ 1.8	-3.7	- 0.8
4 <sup>th</sup> quarter	- 1.4	-7.9	-2.7	- 5.9	-2.4	-1.5	-5.1	-1.4	+ 3.5	-8.5	+ 6.5
2002											
1 <sup>st</sup> quarter	- 0.6	-2.9	+1.4	- 5.0	-0.9	-0.9	-9.2	-4.3	+ 4.7	-6.2	-10.3
2 <sup>nd</sup> quarter	+ 4.9	+2.6	+2.3	- 3.4	+0.3	+1.3	-4.5	-5.5	+ 2.1	-3.5	- 2.9
3 <sup>rd</sup> quarter	+ 1.8	-3.6	+3.9	- 4.2	-1.1	-0.2	-2.2	-0.7	+ 2.4	-2.7	+ 0.9
4 <sup>th</sup> quarter	- 8.2	-0.9	-3.3	-21.0	-5.8	-4.8	-4.7	-3.1	- 2.7	-7.0	+ 0.7
2003											
1 <sup>st</sup> quarter	+ 1.5	-3.3	..	- 5.1	-0.5	-0.6	-8.4	-2.4	+ 3.1	-6.6	- 2.1
2 <sup>nd</sup> quarter	+ 6.5	-3.5	..	- 5.0	-2.5	-1.7	-4.5	-2.7	+ 3.4	-3.3	- 1.2

Source: Annual data: WIW; Latvia, Lithuania: national sources; Estonia: national sources from 1996; Russia: IMF; Tacis from 1996. Quarterly data: national sources.

<sup>1)</sup> Including social budget in 1993 and 1994.

<sup>2)</sup> Since 1998: privatization receipts treated as financing items.

<sup>3)</sup> General government balance; revised methodology since 1999.

## General Government Debt

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
	% of GDP										
1997	105.1	12.9	6.9	64.2	15.6	x	46.9	16.5	x	28.6	x
1998	79.6	13.7	6.0	61.9	16.8	10.6	41.6	18.0	x	28.6	23.9
1999	79.3	14.3	6.5	61.2	23.4	13.7	42.7	24.0	x	43.8	26.4
2000	73.6	16.6	5.1	55.5	24.3	13.9	37.2	23.9	x	46.9	27.6
2001	66.4	23.3	4.8	53.4	23.4	15.7	37.3	23.1	x	48.1	27.5
2002	53.0	27.1	5.8	56.3	22.7	15.2	41.8	22.7	x	42.6	28.3

Source: Eurostat.

## Gross External Debt

	Bulgaria <sup>1)</sup>	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania <sup>2)</sup>	Russia	Slovak Republic <sup>3)</sup>	Slovenia
	USD million										
1993	13,836.4	9,604.9	228.0	24,566.0	x	x	47,246.0	4,249.0	112,784.0	3,626.0	1,873.0
1994	11,338.4	12,209.7	381.0	28,526.0	x	529.0	42,174.0	5,563.0	121,600.0	4,310.0	2,258.0
1995	10,148.0	17,190.3	626.0	31,660.0	1,538.0	1,374.0	43,957.0	6,482.1	120,500.0	5,827.0	2,970.0
1996	9,601.6	21,180.5	1,534.0	27,956.0	2,091.0	2,401.0	47,541.0	8,344.9	125,000.0	7,810.0	3,981.0
1997	10,408.5	21,616.5	2,562.0	24,394.7	2,756.0	3,299.0	49,647.0	9,502.7	130,800.0	10,700.0	4,123.0
1998	10,891.9	24,348.4	2,924.0	27,280.4	3,098.0	3,795.0	59,135.0	9,898.6	189,200.0	11,900.0	4,915.0
1999	10,913.9	22,860.6	2,879.0	29,189.8	3,821.0	4,540.0	65,365.0	9,156.0	178,600.0	10,518.0	5,400.0
2000	11,201.8	21,608.3	3,011.0	30,253.7	4,701.0	4,884.0	69,465.0	10,649.4	161,400.0	10,804.2	6,217.0
2001	10,618.7	22,374.0	3,279.0	33,165.7	5,569.0	5,268.0	71,970.0	12,335.5	150,800.0	11,042.5	6,717.0
2002	11,160.3	26,280.8	4,704.0	40,418.7	6,974.0	6,199.0	83,274.0	15,704.2	152,100.0	13,188.2	8,799.0

Source: WIIW; Bulgaria, Estonia, Latvia, Lithuania: EBRD (European Bank for Reconstruction and Development).

<sup>1)</sup> Gross external debt in convertible currencies.

<sup>2)</sup> Medium- and long-term gross debt.

<sup>3)</sup> The official level of foreign debt in 1997 was USD 9.9 billion; however, this figure was distorted by an accounting operation.

## Exchange Rate

	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovak Republic	Slovenia
<i>Period average (ATS/EUR per 100 units of national currency)<sup>1)</sup></i>											
1993	42,145.65	39.90	87.97	12.65	1,722.52	267.77	642.13	1.53	1,162.41	37.80	10.27
1994	21,112.38	39.68	87.92	10.86	2,040.34	287.14	502.65	0.69	516.66	35.64	8.87
1995	15,002.23	37.99	87.94	8.02	1,910.82	252.04	415.73	0.50	219.13	33.93	8.51
1996	5,950.87	39.00	87.97	6.94	1,922.04	264.67	392.66	0.34	204.87	34.54	7.82
1997	725.62	38.50	87.92	6.53	2,100.91	305.11	372.16	0.17	209.07	36.30	7.64
1998	703.20	38.35	87.95	5.77	2,098.86	309.48	356.19	0.14	127.55	35.13	7.45
1999	51.11	2.72	6.39	0.40	160.39	23.47	23.65	0.0061	3.81	2.27	0.52
2000	51.12	2.81	6.40	0.38	178.96	27.14	24.93	0.0050	3.84	2.35	0.49
2001	51.15	2.94	6.36	0.39	177.97	27.94	27.25	0.0038	3.83	2.31	0.46
2002	51.16	3.25	6.40	0.41	171.88	28.90	26.04	0.0032	3.39	2.34	0.44
2002											
January	51.13	3.12	6.40	0.41	177.49	28.31	27.86	0.0035	3.72	2.36	0.45
February	51.13	3.15	6.39	0.41	178.76	28.94	27.45	0.0036	3.73	2.37	0.45
March	51.12	3.19	6.39	0.41	178.41	28.98	27.56	0.0035	3.68	2.38	0.45
April	51.10	3.29	6.39	0.41	177.24	28.92	27.81	0.0034	3.62	2.40	0.44
May	51.17	3.27	6.39	0.41	173.94	28.85	26.96	0.0033	3.49	2.33	0.44
June	51.13	3.30	6.38	0.41	169.97	28.84	26.01	0.0031	3.33	2.25	0.44
July	51.13	3.36	6.39	0.41	167.72	28.97	24.48	0.0031	3.20	2.25	0.44
August	51.12	3.25	6.39	0.41	169.04	28.97	24.47	0.0031	3.24	2.27	0.44
September	51.10	3.31	6.39	0.41	168.53	28.97	24.57	0.0031	3.22	2.33	0.44
October	51.14	3.26	6.40	0.41	167.97	28.97	24.73	0.0031	3.22	2.39	0.44
November	51.62	3.28	6.45	0.42	167.75	29.22	25.49	0.0030	3.17	2.43	0.44
December	51.04	3.20	6.40	0.42	164.18	28.91	25.11	0.0029	3.09	2.39	0.43
2003											
January	51.13	3.18	6.39	0.42	160.41	28.87	24.57	0.0028	2.96	2.40	0.43
February	51.13	3.16	6.39	0.41	159.23	28.99	24.03	0.0028	2.93	2.38	0.43
March	51.13	3.15	6.39	0.41	158.49	28.95	23.12	0.0028	2.94	2.39	0.43
April	51.10	3.16	6.40	0.41	157.88	29.00	23.28	0.0027	2.95	2.43	0.43
May	51.35	3.19	6.39	0.41	151.67	28.73	23.06	0.0027	2.80	2.43	0.43
June	51.13	3.18	6.41	0.38	151.77	29.01	22.59	0.0026	2.81	2.42	0.43
July	51.13	3.14	6.39	0.38	153.74	29.00	22.51	0.0027	2.90	2.39	0.43
August	51.13	3.10	6.40	0.39	155.71	29.03	22.92	0.0027	2.96	2.40	0.43
September	51.36	3.09	6.39	0.39	156.66	28.97	22.40	0.0026	2.96	2.41	0.43
October	51.35	3.13	6.39	0.39	154.25	28.96	21.76	0.0026	..	2.42	0.42

Source: IMF.

<sup>1)</sup> In Austrian schillings up to December 31, 1998; in euro as of January 1, 1999.

## Official Lending Rate<sup>1)</sup>

	Bulgaria <sup>2)</sup>	Czech Republic <sup>3)</sup>	Estonia	Hungary <sup>2)</sup>	Latvia <sup>3)</sup>	Lithuania <sup>2)</sup>	Poland <sup>4)</sup>	Romania <sup>4)</sup>	Russia <sup>4)</sup>	Slovak Republic <sup>4)</sup>	Slovenia <sup>5)</sup>
<i>End of period in %</i>											
1993	52.00	x	x	22.00	27.00	x	29.00	70.00	210.00	12.00	x
1994	72.00	x	x	25.00	25.00	x	28.00	58.00	180.00	12.00	x
1995	34.00	11.30	x	28.00	24.00	x	25.00	35.00	160.00	9.75	13.75
1996	180.00	12.40	x	23.00	9.50	x	22.00	35.00	48.00	8.80	6.07
1997	6.70	14.75	x	20.50	4.00	13.00	24.50	40.00	28.00	8.80	9.84
1998	5.10	9.50	x	17.00	4.00	13.00	18.25	35.00	60.00	8.80	6.26
1999	4.50	5.25	x	14.50	4.00	13.00	19.00	35.00	55.00	8.80	6.05
2000	4.60	5.25	x	11.00	3.50	9.60	21.50	35.00	25.00	8.80	9.86
2001	4.73	4.75	x	9.80	3.50	7.80	14.00	35.00	25.00	8.80	7.30
2002	3.35	2.75	x	8.50	3.00	7.99	7.50	20.40	21.00	6.50	7.30
2002											
January	4.87	4.50	x	9.00	3.50	6.90	12.00	35.00	25.00	7.75	7.30
February	4.62	4.25	x	8.50	3.50	7.30	12.00	34.60	25.00	7.75	8.11
March	4.50	4.25	x	8.50	3.50	6.70	12.00	34.20	25.00	7.75	8.56
April	3.98	3.75	x	8.50	3.50	4.90	11.00	34.10	23.00	8.25	7.55
May	3.98	3.75	x	9.00	3.50	5.40	10.50	32.20	23.00	8.25	8.56
June	3.76	3.75	x	9.00	3.50	7.40	10.00	30.60	23.00	8.25	7.55
July	3.72	3.00	x	9.50	3.50	5.70	10.00	28.30	23.00	8.25	7.30
August	3.84	3.00	x	9.50	3.50	7.30	9.00	27.20	21.00	8.25	7.30
September	3.80	3.00	x	9.50	3.00	6.50	8.50	25.60	21.00	8.25	7.55
October	3.76	3.00	x	9.50	3.00	7.09	7.75	23.80	21.00	8.00	7.30
November	3.76	2.75	x	9.00	3.00	5.76	7.50	22.20	21.00	6.50	7.55
December	3.35	2.75	x	8.50	3.00	7.99	7.50	20.40	21.00	6.50	7.30
2003											
January	2.52	2.50	x	6.50	3.00	7.67	7.25	19.60	21.00	7.50	7.30
February	2.54	2.50	x	6.50	3.00	8.60	6.75	19.20	18.00	6.50	8.11
March	2.58	2.50	x	6.50	3.00	5.71	6.50	18.40	18.00	6.50	6.05
April	2.98	2.50	x	6.50	3.00	5.13	6.25	17.40	18.00	6.50	6.26
May	2.99	3.50	x	6.50	3.00	5.13	6.00	17.90	18.00	6.50	7.26
June	2.54	4.50	x	9.50	3.00	5.13	5.75	18.20	16.00	6.50	8.26
July	2.54	5.50	x	9.50	3.00	5.13	5.75	18.20	16.00	6.50	9.26
August	2.58	6.50	x	9.50	3.00	5.13	5.75	18.20	16.00	6.50	10.26
September	2.62	7.50	x	9.50	3.00	5.13	5.75	19.10	16.00	6.25	11.26
October	2.63	8.50	x	9.50	3.00	5.13	5.75	19.30	16.00	6.25	12.26

Source: WIIW; Latvia, Lithuania: national sources.

<sup>1)</sup> Due to currency board arrangements, the Bank of Estonia and the Bank of Lithuania do not lend to the government or to enterprises. Therefore these two countries do not define or publish discount rates. On October 9, 1997, the Bank of Lithuania introduced an "official lending rate": a weighted average rate on domestic currency lending to residents.

<sup>2)</sup> Refinancing rate.

<sup>3)</sup> Repo rate.

<sup>4)</sup> Discount rate.

<sup>5)</sup> Base interest rate.

# Legend, Abbreviations

## Legend

- . . = not available  
x = not applicable  
\_ = new series

Discrepancies may arise from rounding.

## Abbreviations

AC	accession country
ADF test	Augmented Dickey-Fuller test
ARDL	autoregressive distributed lag approach
BEER	Behavioral Equilibrium Exchange Rate
B-S effect	Balassa-Samuelson effect
CAP	Common Agricultural Policy (EU)
CBA	currency board arrangement
CEE	Central and Eastern Europe
CEECs	Central and Eastern European countries
CERGE-EI	The Center for Economic Research and Graduate Education – Economic Institute, Prague
CIS	Community of Independent States
ČNB	Česká národní banka
CPI	consumer price index
DEER	Desired Equilibrium Exchange Rate
DF test	Dickey-Fuller test
DOLS	dynamic ordinary least squares
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank (EU)
EG technique	Engle and Granger technique
EMI	European Monetary Institute
EMU	Economic and Monetary Union
ERM II	exchange rate mechanism II
ESA	European System of Accounts
EU	European Union
EUR	euro
FDI	foreign direct investment
FEER	Fundamental Equilibrium Exchange Rate
FIML	Full information maximum likelihood
FMOLS	fully modified ordinary least squares
FSU	former Soviet Union
GDP	gross domestic product
HP	Hodrick-Prescott
IPS test	Im-Pesaran-Shin test
IMF	International Monetary Fund
JVI	Joint Vienna Institute
KPSS test	Kwiatkowski-Phillips-Schmidt-Shin test
LLC test	Levin, Lin and Chu test
LM test	Lagrange multiplier test

LOOP	law of one price
MGE	mean group estimator
MRO	main refinancing operation
NAIRU	nonaccelerating inflation rate of unemployment
NATREX	Natural Real Exchange Rate
NCB	national central bank
NIESR	National Institute for Economic and Social Research
NIGEM	National Institute's Global Econometric Model
OECD	Organisation for Economic Co-operation and Development
OeNB	Oesterreichische Nationalbank
OLS	ordinary least squares
PEER	Permanent Equilibrium Exchange Rate
PEP	Pre-Accession Economic Programme
PKPSS	Panel Kwiatowski-Phillips-Schmidt-Shin test
PMGE	pooled mean group estimator
PP test	Phillips-Perron test
PPI	producer price index
PPP	purchasing power parity
RECEP	Russian-European Centre for Economic Policy
REER	Real Effective Exchange Rate
RER	real exchange rate
RTS	Russian Trading System
SGP	Stability and Growth Pact
SUR	seemingly unrelated regression
TAR model	threshold autoregressive model
Treaty	Treaty establishing the European Community
UIP	uncovered interest parity
UNECE	United Nations Economic Commission for Europe
VECM	vector error correction model
WIFO	Österreichisches Institut für Wirtschaftsforschung – Austrian Institute of Economic Research
WIIW	Wiener Institut für internationale Wirtschaftsvergleiche – The Vienna Institute for International Economic Studies
WTO	World Trade Organization