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**On the road to EMU:
Which Exchange Rate System Performs Best for Estonia?¹²**

¹ For valuable research assistance we would like to thank Rico Wondrejz (Deutsche Bundesbank).

² The views in this paper are those of the authors and do not necessarily represent the views of the Deutsche Bundesbank.

1. Introduction

After the central and eastern European countries (CEEC) as well as Cyprus and Malta joined the European Union in 2004, their way to the euro has become a topic of major importance. The final shape of the new members' exchange rate regimes and monetary policy is not an open question: By adopting the euro they irrevocably fix their exchange rates and join the single European monetary policy conducted by the Eurosystem, which consists of the ECB and the national central banks of the participating countries.

And what should the path to the euro look like and how long should it take? The answer to these questions appears far from self-evident. Joining EMU means the last and probably most important step of European integration. On the one hand, the introduction of the euro offers the well-known advantages of monetary integration, i.e. the participation in a stable currency, the absence of dramatic currency fluctuation which might endanger trade, and the reduction of transaction costs.³

On the other hand, if the necessary conditions for a currency union are not fulfilled, the danger of macroeconomic imbalances arises. In general, the loss of an independent monetary policy and exchange rate flexibility can be a severe challenge for national stabilization policy. These conditions have been identified by the optimum currency area literature.⁴

2. How do the exchange arrangements of CEECs look like?

Some of the CEEC, Estonia among them, would like to introduce the euro "as quickly as possible". At the earliest, they will be able to do so after two years of participation in the Exchange Rate Mechanism (ERM) II. Of course, this is subject to the fulfilment of the Maastricht convergence criteria. At present, except for the Czech republic, no country meets all criteria simultaneously. Especially, the majority of national inflation rates exceeds the reference value.

We must not forget that it would be the new member states themselves which would bear the risks of introducing the euro prematurely. Their economic structures have to be sufficiently developed in order to withstand the pressure of competition in a single currency area. As has been said many times: the new EU member states must first achieve sufficient progress in real convergence. Turning now to the road to the euro. What do the exchange rate arrangements of CEECs, Cyprus and Malta look like? Chart 1 shows the whole spectrum from fixed to flexible exchange rates. As a rule, the smaller countries like the Baltic states have chosen hard pegs by establishing currency board arrangements (CBA), whereas Poland has opted for totally flexible exchange during the last years. Other countries lie somewhat in between these border solutions. For example, the Czech Republic, Slovakia and Slovenia combine a free float with the possibility of central bank interventions to keep their exchange within the desired range. All countries with exchange rate pegs take the euro as anchor currency. Six of them have joined ERM II so far.

This record all in all coincides with the recommendations of the theory of optimum currency areas. It states that *ceteris paribus* a peg is more desirable for small national economies with a high degree of openness and intensive economic relations with

³ Cabos/Eckhoff (2006).

⁴ Mundell (1961), Mongelli (2002) for an overview.

the country whose currency serves as an anchor. Conversely, bigger countries with a lower extent of trade integration will usually tend to prefer more flexible solutions. Doing so, they keep their monetary policies as a national tool to handle asymmetric shocks.

Figure 1: Exchange Rate Arrangements of New EU Member States

country	arrangement
Bulgaria	Currency-Board-Arrangement with Euro ($\pm 0\%$)
Cyprus	ERM II ($\pm 15\%$)
Czech Republic	Managed Float
Estonia	ERM II, Currency-Board-Arrangement with Euro ($\pm 0\%$)
Hungary	Peg to Euro ($\pm 15\%$)
Latvia	ERM II, Peg to Euro ($\pm 1\%$)
Lithuania	ERM II, Currency-Board-Arrangement with Euro ($\pm 0\%$)
Malta	ERM II, Peg to Euro ($\pm 0\%$)
Poland	Free Float
Romania	Managed Float
Slovakia	ERM II ($\pm 15\%$)
Source: ECB.	

3. The Estonian Currency Board

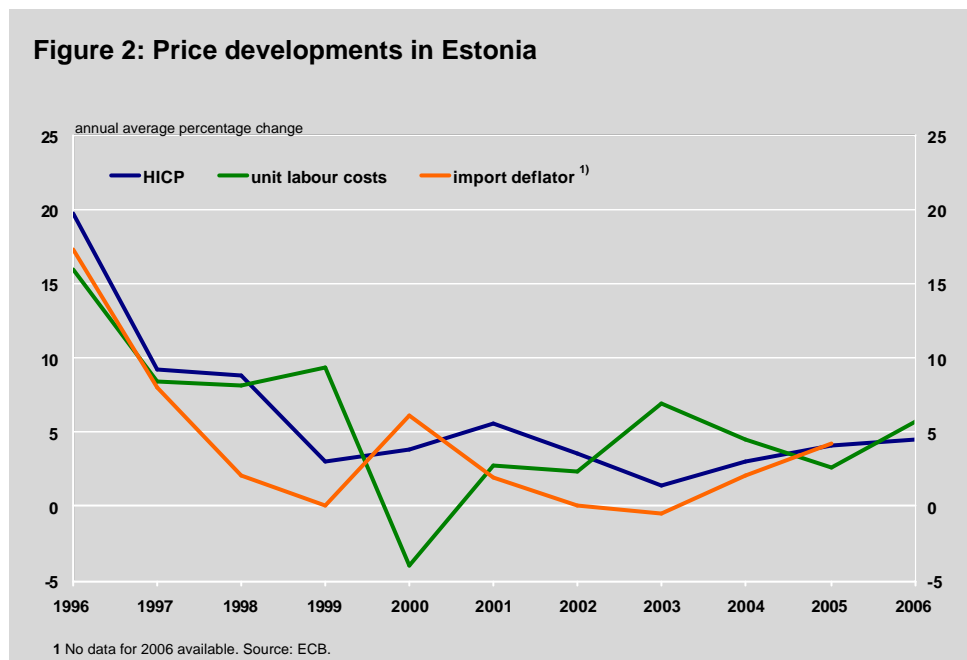
Taking a closer look at Estonia now: Estonia established a currency board as early as 1992. In the beginning, the Eesti kroon was pegged to the Deutsche mark. In 1999, after the start of EMU, the euro was taken as anchor. On 28 June 2004, the Estonian kroon joined ERM II.

Briefly, the institutional arrangements of the Estonian currency board are as follows: The backing of national currency comprises 100 % of the monetary base. So the issue of Estonian kroons is totally secured by gold and convertible foreign exchange reserves, mainly in euros. 10 % of reserves serve as liquidity buffer. Assets are mainly invested in liquid bond markets and require minimum credit ratings assigned by international rating agencies. In 2005 the investment portfolio mainly consisted of low-risk government bonds of euro area countries and the US.⁵ An important step was taken in March 1994 when full capital account convertibility was achieved in accordance with Article VIII of the International Monetary Fund.

Regarding inflation, the Estonian experience has all in all been quite impressive. The currency board system with its peg to the euro has served as a stability anchor. Monetary policy was orientated towards the achievement of price stability. Starting up with a value of 19.8 % in 1996 HICP inflation came down to 1.4 % in 2003, its lowest value so far. The process of disinflation reflected some important factors.⁶

⁵ Eesti Pank (2006).

⁶ ECB (2006), 71.



Not least, the exchange rate peg helped to bring down the increase of import prices. Additionally, disinflation was fostered by a sound fiscal policy and by a tendency of low rises of unit labour costs in most years. Estonia's transition to a market economy and liberalisation of the product and financial markets gave additional support.

The rise of inflation beginning in 2003 was due to several developments: an increase in administered as well as in energy prices and some one-off factors related to EU accession. Apart from that the strong stance of economic activity caused upward pressure on inflation. It led to capacity constraints and kind of labour market tightness. In 2006 HICP inflation moved around 4 %, with an upward trend.

Judging the success of the Estonian currency board and its appropriateness on the way to the euro: of course, the development of inflation does not draw the whole picture. Currency boards can pose severe problems which we will identify and discuss for Estonia in the next chapters of our paper. First, some useful ideas may be taken from the ECB:

Incompatibilities with ERM II are the cases of free floating (or managed floats without a mutually agreed central rate), crawling pegs, and pegs against anchors other than the euro. With regard to currency boards, the ECB does not consider them to be a substitute for participation in ERM II, implying that countries operating a currency board will be required to participate in ERM II for at least two years before the convergence assessment that is made before a country can finally adopt the euro. However, countries that operate a euro-based currency board deemed to be sustainable might not be required to go through a double regime shift, i.e. floating the currency within ERM II only to re-peg it to the euro at a later stage. Such countries may therefore participate in ERM II with a currency board as a unilateral commitment, enhancing the discipline within ERM II. However, the ECB has stressed that such an arrangement will be assessed on a

*case-by-case basis and that a common accord on the central parity against the euro will have to be reached.*⁷

Obviously, the ECB feels a bit uneasy with currency boards. We can draw the conclusion that there might be a conflict between a euro-based currency board and sustainability of later EMU membership. As the ECB states, the value of the central parity is of crucial importance. How can such a conflict arise? In other words: do the problems related to currency boards outweigh the advantages of monetary and exchange rate stability? And for Estonia, are there any realistic alternatives to maintaining the currency board?

4. Problems of the existing currency board arrangement

To sum up the main arguments for introducing the currency board arrangement in Estonia in 1992 were twofold. First there was the need for a country as small, as open and as much in need of foreign investment as Estonia to have stable exchange rate relations with its main trading partners. The second group of arguments was related to more technical considerations of monetary feasibility. At the beginning of the nineties the Estonian Central Bank would have been in a difficult position to conduct an independent monetary policy because a sound domestic banking sector was yet to be established and the availability of statistical data was sparse.⁸

From a theoretical viewpoint the main reasons for having currency boards are related more closely to the first set of arguments.⁹ By linking domestic money supply directly to the external performance of the economy the risk of over expansionary monetary policy is reduced. The normal adjustment process is the traditional price-specie mechanism: If prices grow excessively, competitiveness will decrease thereby dampening money supply. So by the mechanism of tight monetary conditions – an endogenous money supply that is fully linked to the availability of foreign reserves – price stability is guaranteed.

As far as interest rates are concerned, full capital mobility ensures that uncovered interest parity must hold: The domestic interest rate is equal to the interest rate of the anchor currency plus the expected rate of depreciation of the domestic currency. If the fixed exchange rate arrangement is credible under the currency board this implies that domestic interest rates will converge to those of the anchor currency. For countries with a history of high inflation rates the introduction of currency boards contributes to substantial decreases in domestic interest rates. The general risk that this might create excess credit expansion – i.e. money supply – is alleviated by foreign reserve restrictions faced by the banking sector.

Somehow these fundamental mechanisms have not been working fully in Estonia: While domestic inflation decreased sharply during the first three years of the currency board and kept decreasing at a somewhat lower pace for another six years until 2004, it has been picking up ever since. The difficulties this poses to economic performance are obvious- inflation rates of more than 4 % as compared to an average of 2 % in the euro area are tantamount to a real appreciation of the Estonian kroon against the euro of 2 % per year. If this process continues it might seriously dampen the process of catching up.

⁷ ECB (2003).

⁸ Berensmann (2001).

⁹ Roubini (1998), Rohde/Janssen (2001).

An easy remedy for this problem could be a devaluation of the Estonian kroon. In technical terms this would be equivalent to abandoning the currency board before introducing the euro. Before entering into the discussion of how this could be accomplished – and what the corresponding risks would be – we want to take a closer look at the reasons that lie behind the problems currently faced by the Estonian economy.

Let us start with international trade relations. Under a currency board domestic monetary growth is contingent on an inflow of foreign reserves into the country. Neglecting other parts of the capital account this constitutes an export of capital from Estonia that has to be matched by a surplus in the current account.

Matters in Estonia are more complicated though. Ever since its independence Estonia has exhibited a deficit in its current account, implying that there have been net inflows of capital into the Estonian economy. The main reason for this are massive inflows of foreign direct investment and Estonia shares this situation with almost all other transition economies – China being the noteworthy exception. These continuing deficits in the current account have been of little concern. FDI inflows are less prone to reversal than portfolio investment, so the foreign position of Estonia was considered rather more stable than that of the U.S. for instance.

Things look a little different when currency board requirements are taken into account. The related outflow of capital partially balances the capital account. This implies that the current account deficit would increase once this capital outflow ceases. To gauge the magnitude of the underlying movements: Credits in Estonia have expanded by about 30 % p.a. during the last years. This has been matched by an increase in official reserves of approximately 22 % p.a. during the last five years.

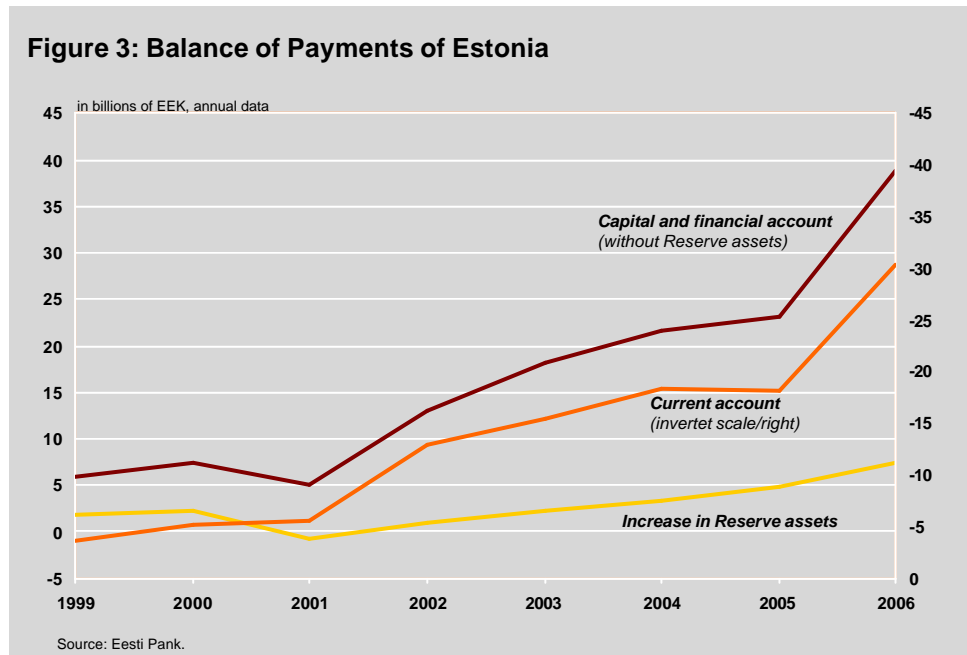
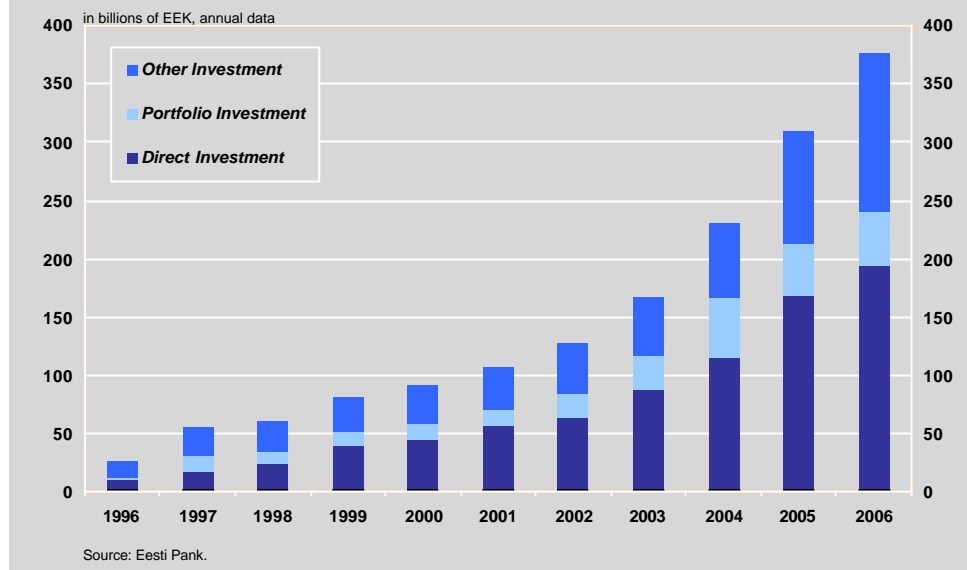
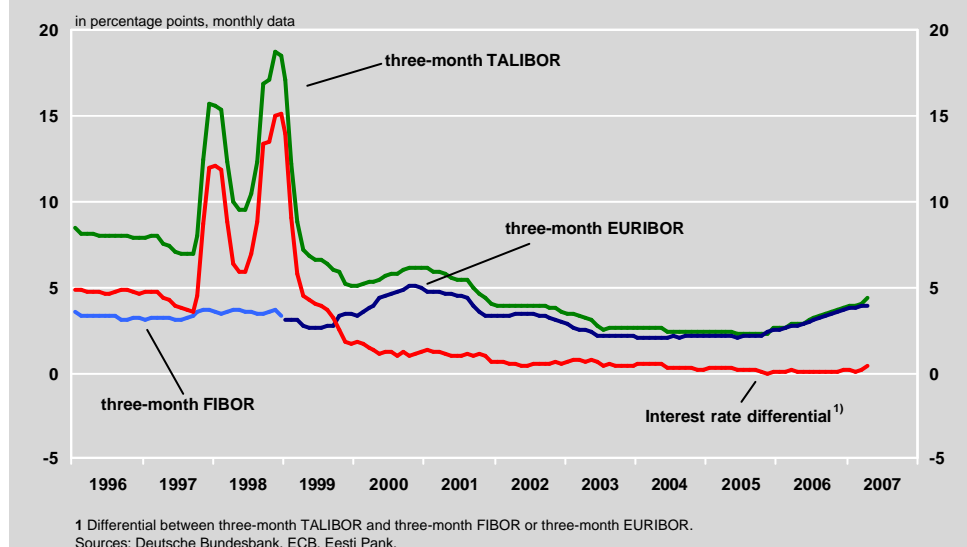


Figure 4: Capital inflows to Estonia

What are the processes behind these capital movements? Or to put the question more directly: Who is buying foreign assets when at the same time there is a massive inflow of capital to Estonia? The driving force has been witnessed by other countries before. Reliability of the currency board has increased the acceptance of euro denominated credit transactions in Estonia. Especially since 1994 many Scandinavian banks have taken up business in Estonia, the amount of euro denominated borrowing has risen sharply. So a notable component of capital inflow is lending by foreign commercial banks. In fact, the long term capital market in Estonia is mostly denominated in euros.¹⁰

Figure 5: Short-term interest rates in Estonia and the Euro-area

¹⁰ ECB (2006), p. 84.

In our view the most plausible explanation why Estonians are willing to take the risk of borrowing in a foreign currency is their reliance on the sustainability of the kroon's fixed parity against the euro. The assessment that markets consider the risk of devaluation of the kroon as low is mirrored in the low short term spread. As for the lending banks the advantages of doing business in euros need no further explanation.

But why are foreign banks willing to expand credit to Estonians on such a scale? What are the securities Estonians can offer to back the credits? We would like to argue that the main reason behind this may be the asset price channel of currency integration in Europe we have described before.¹¹ The driving force is the sharp decrease in interest rates that has a strong impact on asset prices. With a history of low personal incomes, the prospect of high growth rates and foreign demand for domestic assets low interest rates will trigger an increase in domestic borrowing. We argue that a substantial part of this borrowing is used to finance consumption expenditures: People feel rich because of higher wealth, low interest rates and the prospect of increasing incomes make borrowing attractive.

We have witnessed the same process in low income countries like Greece and Spain when the euro was introduced. The result is an increase in domestic inflation rates that dampens the convergence process. The same has taken place in Lithuania, a country that has followed the same monetary policy strategy as Estonia. In both countries domestic borrowing has risen sharply since EMU accession, both countries have faced sharp rises in domestic asset prices – and CPI inflation. The only difference as compared to those countries that have already introduced the euro is that borrowing is in euros – and that there remains the risk of exchange rate changes – hence the denomination of credits in euros.¹²

To gauge the magnitude of asset price changes we propose some simple arithmetic. We use the approach of present discounted values and the assumption that a change in interest rates does not affect the levels of rents. Under these assumptions a change in the level of interest rates by $d(i)$ at the initial level of i implies a price increase of

$$\frac{1 + (i - d(i)) \cdot i}{(i - d(i)) \cdot (1 + i)}.$$

So we need an idea as to the size of the interest rate cut that has been brought about by the EU accession. A way to do that is to estimate a Taylor rate for Estonia. This concept has been used to estimate monetary policy rules in the industrial countries for many years.¹³ Taylor proposed that the optimal interest rate in an economy is given by the long run real interest rate plus a weighted average of inflation divergence from the target rate an output divergence from normal capacity utilisation (output gap).¹⁴

A common way to set the appropriate level of the real interest rate is to use a long run average of real economic growth.¹⁵ For the period since the introduction of the currency board in Estonia average real growth has amounted to 6.7 %. As target inflation we use the upper limit of 2% that the ECB targets for the euro area. Capacity utilisation is calculated as the difference between real growth rates and exponential smoothing of real

¹¹ Cabos/Eckhoff (2006).

¹² Berensmann (2001).

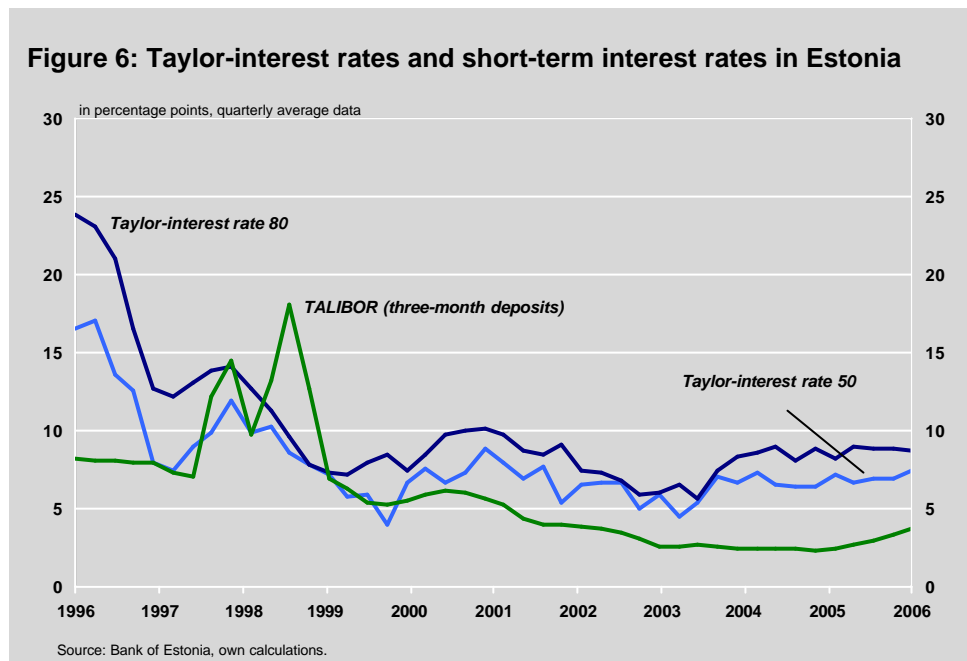
¹³ Clarida/Gertler (1998) and (2000).

¹⁴ Taylor (1993).

¹⁵ Clausen/Meyer (2003).

GDP. Taylor originally proposed to use a weight of 50% for both capacity utilisation and the inflation differential. Studies of the ECB strategy show, that the weight given to inflation tends to be higher than that given to the output gap.¹⁶

Figure 6 shows the prevailing interest rate plotted against to Taylor rule rates, one constructed with equal weights of 50 % given to inflation and output, one with inflation weighted with 80 % and output at twenty. Only taking the effect of EU accession into consideration, i.e. the time span since the third quarter of 2004, the difference amounts to about 4 percentage points at minimum, and is higher the higher the weight given to inflation. A rough estimate of the Taylor rate level could be 7% as compared to the prevailing level of 3%.



So if we take the Taylor rate as 7% and the prevailing rate is 3% the corresponding change in the level of house prices is equal to

$$\frac{(1 + (0.07 - 0.04) \cdot 0.07)}{(0.07 - 0.04) \cdot (1 + 0.07)} = 2.25.$$

From the beginning of 2004 until end 2006 house prices in Estonia (prices per square meter of existing flats in Tallinn) have risen by a factor of 2.27 – which is almost exactly the implied change. From this we cannot draw the conclusion that no further asset price increases are under way because the economic upswing entails a rising rents which fuel further increases in the equilibrium price level – a process that could signal an overheating of the market.

Using Engle and Grangers two-step cointegration¹⁷ approach to explain inflation in Estonia we find that housing prices and CPI inflation are cointegrated. The long run coefficient of house prices in explaining CPI inflation is 0.18, implying that a one-percent increase in house prices raises the price level by 0.18 percent. The speed of adjustment as

¹⁶ Clarida/Gertler (1996), Gerdemeier/Roffia (2003).

¹⁷ Engle/Granger (1987)

given in the dynamic equation is 0.08 implying that the time span for full adjustment is approximately 3 years. These estimates suggest that most of the increase in inflation can really be attributed to wealth effects.

From this we would like to suggest that the process that has taken place in Estonia during the last 3 to 4 years is really very similar to what would have taken place had the euro already been introduced. The prevailing interest rate is basically the same as in the euro area. By the end of 2006 the major part of housing price adjustment to the new situation has taken place. The resulting effects on credit, consumption and HICP inflation are clearly visible. They harm competitiveness of the Estonian industry and thereby slows down the further adjustment process.

The only way to stop this would be a devaluation of the Estonian kroon – an option that we will discuss in the next chapter.

5. What are the alternatives?

Regarding the problems a currency board can pose the question of feasible alternatives arises. Obviously, for a small open economy like Estonia turning to flexible exchange rates cannot be a realistic option. Such a step would expose the country to incalculable risks. In general, apart from their supporters' view, flexible exchange rates often cause high fluctuations which cannot be brought in line with the so-called "economic fundamentals".

This is because the main or even dominating part of world-wide foreign exchange turnover is not due to international trade but rests on the yield considerations of international investors, not least institutional investors who have gained importance during the last years. Even little changes in their expected returns on investment may result in heavy shifts of foreign exchange turnovers. In this case flexible exchange rate do no longer work as the appropriate tool to handle differences in national inflation und productivity growth rates as described in text books. So flexible exchange rates often hardly give any contribution to eliminating trade imbalances. Contrarily, today the negative effects on production, trade and inflation seem to dominate, coming from currency turmoil and biased exchange rates. Although not being a new phenomenon, the problems with flexible exchange rates increased in the wake of the continuing liberalisation of international capital markets during the nineties.

The trouble with flexible exchange rates led to a great number of exchange rate agreements. As a rule, regional arrangements seem much more promising. Within a region, we can usually watch close trade relations and a tendency towards a synchronization of national business cycles. Both factors loosen the pressure on exchange rate adjustments.

On the regional level flexible solutions may take account of the specific needs of the participants. Here one can take advantage of the experience gained with the old European Monetary System, which ultimately culminated in ERM II. ERM II, with its institutional regulations, offers great flexibility in the shaping of exchange-rate arrangements.¹⁸ The maximum margin of fluctuation, for instance, amounts to $\pm 15\%$. So, ERM II allows pegging to the euro without any risk of high intervention requirements. One consideration argues against a narrow band: "Equilibrium exchange rates" geared to the so-called

¹⁸ The institutional arrangements of EMS II are explained in ECB (2003) and Deutsche Bundesbank (1998).

"fundamentals" can be defined only with a certain margin of uncertainty. So one needs a fluctuation margin around the central parity, as otherwise a risk of permanently setting a wrong course will arise.

Moreover, a sizeable fluctuation margin provides far less incentive to speculate on a parity change. The fluctuation margin can, however, be narrowed to facilitate a gradual transition to a more fixed link with the introduction of the euro in the end. At the same time, it is possible to implement parity changes if economic conditions require it.¹⁹ So far, Cyprus, Denmark, Estonia, Latvia, Lithuania, Malta, and Slovakia have joined ERM II. Figure 7 depicts the corresponding fluctuation margins. Slovenia left ERM II at the beginning of 2007 to introduce the euro the same time.

Figure 7: Intervention rates of the currencies in ERM II

currency	Intervention rate 1 EUR =		
	upper rate:	central rate:	lower rate:
Danish krone (DKK)	7.62824 DKK	7.46038 DKK	7.29252 DKK
Estonian kroon (EEK)	17.9936 EEK	15.6466 EEK	13.2996 EEK
Latvian lats (LVL)	0.808225 LVL	0.702804 LVL	0.597383 LVL
Lithuanian litas (LTL)	3.97072 LTL	3.45280 LTL	2.93488 LTL
Maltese lira (MTL)	0.493695 MTL	0.429300 MTL	0.364905 MTL
Slovak koruna (SKK)	40.7588 SKK	35.4424 SKK	30.1260 SKK
Cyprus pound (CYP)	0.673065 CYP	0.585274 CYP	0.497483 CYP

Source: Deutsche Bundesbank.

As for the Estonian kroon, the central rate has been set at EEK/EUR 15.6466. The ECB monitors the standard fluctuation band of $\pm 15\%$ for the kroon. Nevertheless, as said before, it was accepted that Estonia and other countries entered ERM II with their existing currency board as unilateral commitment. Thus no additional obligations arise to the ECB²⁰ Obviously, giving up the currency board and becoming a "normal" member of ERM II would offer some flexibility. Using the fluctuation margin would gain some room for manoeuvre in the event of any conflict between the two targets of price stability on the one hand and exchange rate stability on the other.

Additionally, the institutional arrangements of ERM II include the opportunity of a so-called crawling peg: given the mutual agreement of the various parties involved, the Estonian kroon might be devalued from time to time to take account of inflation differentials with respect to the euro area.²¹ Such a policy would serve to stabilise the real exchange rate and avoid a loss of price competitiveness. On the other hand, long lasting inflation differentials can pose severe problems: an inflation rate in Estonia which is, let us say, 2 percentage points higher than the EMU rate, means a more than 10 % real

¹⁹ Krupp/Eckhoff (1999), p. 40.

²⁰ ECB (2004), p. 40.

²¹ Experiences with currency boards are discussed by Cumby (1989), Egert (2001) and Jochem (1998).

appreciation of the kroon after five years, if the nominal exchange rate remains fixed. This is because the effects of every single year add up over time. Of course, the total effect would be higher if a longer time horizon was considered.

So the danger of a persistently growing current account deficit arises which is not the counterpart of warranted and necessary capital inflows but just a reflection of real exchange rate movements

Nobody knows the exact figure of future inflation rates. But even our simple example shows the possibility of severe problems without making unrealistic assumptions. In the latest convergence report the ECB (2006) states that available inflation forecasts of important international institutions move well within a span of 3.5 % to 4.2 % for 2007 and between 3.9 % and 4.6 % for 2008, respectively. Taking the centre of these intervals, the expected inflation rate of Estonia will be around 2 percentage points higher or even a bit more than the inflation target of the ECB.

Participation in ERM II also allows to combine the two tools just described. This means that the members could devalue an exchange rate band with the maximum range of ± 15 %. Later on, after economic development and inflation rates have come more in line with the euro area, the band may be narrowed and the depreciation rate may become smaller. By this, a smooth transition to the introduction of the euro can be reached. At first glance such an approach seems much promising. But does it meet the needs of Estonia?

6. What should be done?

To sum up: regarding the current account deficit, some depreciation of the Estonian kroon seems desirable. Ideally, it could restore external equilibrium. On top of that, more exchange rate flexibility offers degrees of freedom to monetary policy as an instrument of national stabilisation. But these advantages are frequently counteracted by the reactions of financial markets. First of all, re-gaining some degree of flexibility, exchange-rate movements often turn out to be much stronger than necessary to re-establish an external equilibrium: international investors may lose confidence in any kind of exchange rate arrangement after abandoning the currency board. In such a situation restoring confidence might be difficult. The risk of unforeseeable capital movements arises which can start a downward spiral: a depreciation caused by capital outflows raises international investors' fears of their returns in Estonia. So, they withdraw even more capital, which leads to a further depreciation. As a result, the lower limit of the 15 %-band of ERM II comes under pressure. This process is actually exacerbated if the depreciation of the currency is reflected in rising inflation rates which means that the remedy does not cure the problem but even makes things worse. Of course, to break the market trend, the possibility of central bank interventions remains an option. But interventions might be very costly without restoring the confidence of market participants.

Regarding the very high share of the use of the euro, a significant depreciation of the kroon vis-à-vis the euro can peril the financial sector and real economic activity in Estonia. This is because a lower value of the national currency increases the real debt burden and thereby the risk of bankruptcies. The loss of credibility and the higher inflation rate drive up interest rates, not least by an increasing risk premium.

The arguments introduced so far apply even more when considering the following: Giving up the CBA implies a double change of exchange rate regimes on Estonia's road to the euro. By this, two phases of insecurity and instability could be created. And: not

denying the shortcomings just discussed, people got used to the CBA as an all in all stable framework to rest their economic activities and future plans on. Probably this is most visible in the heavy indebtedness of Estonians in euro. Devaluation of the currency would inflate these debts and probably cause many bankruptcies. That means, thinking of abandoning a currency board in existence differs a lot from the question of introducing it or not.

Moreover, we doubt that an depreciation of the Estonian kroon would improve the current account balance significantly: We estimated Estonian import and export functions.²² We chose Engle and Granger's two step error correction framework in order to be able to distinguish short run and long run movements. Imports are explained by Estonian GDP and the real effective exchange rate. Exports are explained by domestic and OECD GDP and the real effective exchange rate. While the export function exhibits a negative elasticity with respect to the real effective exchange rate, imports have a considerable J-curve effect. This means, that on a short run basis, a devaluation of the kroon would worsen the trade balance.

Another point has been mentioned before. In a currency board any creation of money in circulation necessitates an accommodation of foreign reserves which can be realized only by an inflow of capital. At the moment this can be interpreted as equilibrating the capital account balance. So, abandoning the currency board might give an additional pressure on deteriorating the current account as in that case no more foreign assets need to be collected by the central bank.

Finally, we have to consider the economic situation in Estonia as a whole. As has been argued in chapter 4 some of the recent rise in interest rates can be interpreted as a reaction to decreasing interest rates. If the currency board was abolished in order to let the kroon devalue this would inevitably increase interest rates in Estonia and trigger a correction in wealth. But later on euro introduction would bring back the same effects. So from the perspective of asset price stability temporary exchange rate flexibility might cause substantial swings in domestic economic activity.

As discussed intensively by the ECB (2006), there are other clear signs of an overheating. Adjustment of excise duties to EU levels gives an additional impetus to inflation. Inflation forecasts mentioned above bear additional risks due to income policy and the development of energy prices. Although being singular effects in nature, in a surrounding of a strong growth and signs of labour market tightness, the danger of second round effects increases. A depreciation even worsens the situation as it drives up import prices and strengthens international price competitiveness: the outcome will be both, an even higher inflation and a further stimulus to national production, via the improvement of the current account.

So, not exchange rate policy but a contractive fiscal policy lies at the heart of a solution. It dampens inflation and economic activity the same time and helps to cut the current account deficit. This counts all the more if we turn our view from the business cycle over to long-run economic development. During the process of real convergence Estonia is likely to face systematically higher inflation rates than the EMU countries. Taking counteraction by fiscal may harm growth and convergence to some extent but we do not see any realistic alternative.

²² The results are given in the technical appendix.

Technical Annex

1. Estimation output for Estonian exports

(All variables are in logs. EFFEX is the effective exchange rate, export data are taken from national accounting statistics UEXP is the cointegration term from long-term relationship. SAI1... are seasonal dummies)

Long-run relationship

Dependent Variable: LEXVGR

Method: Least Squares

Date: 05/28/07 Time: 13:26

Sample(adjusted): 1995:1 2006:3

Included observations: 47 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.832889	0.917653	7.446052	0.0000
SAIS1	-0.109879	0.023968	-4.584445	0.0000
SAI2	-0.011278	0.023959	-0.470698	0.6404
SAI3	-0.033982	0.023964	-1.418026	0.1637
LEFFEX	-0.478038	0.198214	-2.411725	0.0204
LGDPOECD	4.632744	0.257481	17.99260	0.0000
R-squared	0.978883	Mean dependent var		4.532009
Adjusted R-squared	0.976308	S.D. dependent var		0.372747
S.E. of regression	0.057374	Akaike info criterion		-2.759691
Sum squared resid	0.134965	Schwarz criterion		-2.523502
Log likelihood	70.85274	F-statistic		380.1101
Durbin-Watson stat	0.563820	Prob(F-statistic)		0.000000

Short-run dynamics

Dependent Variable: D(LEXVGR)

Method: Least Squares

Date: 05/28/07 Time: 13:27

Sample(adjusted): 1994:3 2006:3

Included observations: 49 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.030518	0.017310	1.763017	0.0852
SAIS1	-0.142889	0.016215	-8.812263	0.0000
SAI2	0.082093	0.016868	4.866838	0.0000
SAI3	-0.053988	0.016020	-3.370095	0.0016
UEXP(-1)	-0.279898	0.108592	-2.577532	0.0136
D(LGDPOECD(-1))	4.710515	1.813404	2.597609	0.0129
D(LEFFEX(-1))	-0.568522	0.216830	-2.621977	0.0121
R-squared	0.834060	Mean dependent var		0.024781
Adjusted R-squared	0.810354	S.D. dependent var		0.091025
S.E. of regression	0.039640	Akaike info criterion		-3.486400
Sum squared resid	0.065995	Schwarz criterion		-3.216140
Log likelihood	92.41680	F-statistic		35.18380
Durbin-Watson stat	2.000191	Prob(F-statistic)		0.000000

2. Estimation output for Estonian Imports

(All variables are in logs. EFFEX is the effective exchange rate, import data are taken from national accounting statistics UIMP is the cointegration term from long-term relationship. GDP stands for Estonian GDP)

Long-run relationship

Dependent Variable: LIMVGR

Method: Least Squares

Date: 05/28/07 Time: 12:55

Sample(adjusted): 1995:1 2006:3

Included observations: 47 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.732593	0.499628	-7.470745	0.0000
SAIS1	-0.039522	0.028002	-1.411403	0.1657
SAI2	-0.054879	0.027088	-2.025979	0.0493
SAI3	-0.036778	0.027201	-1.352056	0.1838
LEFFEX	0.484011	0.176355	2.744525	0.0090
LGDP	1.311285	0.084441	15.52905	0.0000
R-squared	0.973959	Mean dependent var		4.571205
Adjusted R-squared	0.970783	S.D. dependent var		0.379634
S.E. of regression	0.064890	Akaike info criterion		-2.513492
Sum squared resid	0.172641	Schwarz criterion		-2.277303
Log likelihood	65.06706	F-statistic		306.6898
Durbin-Watson stat	0.547039	Prob(F-statistic)		0.000000

Short-run dynamics

Dependent Variable: D(LIMVGR)

Method: Least Squares

Date: 05/28/07 Time: 12:51

Sample(adjusted): 1994:3 2006:3

Included observations: 49 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.046605	0.021685	2.149190	0.0374
SAIS1	-0.074426	0.038546	-1.930850	0.0603
SAI2	-0.034651	0.019647	-1.763665	0.0851
SAI3	-0.025117	0.029337	-0.856156	0.3968
D(LBIP)	1.215888	0.262676	4.628856	0.0000
UIMP(-1)	-0.259043	0.095065	-2.724907	0.0093
D(LEFFEX(-1))	-0.523110	0.226891	-2.305556	0.0261
R-squared	0.887361	Mean dependent var		0.026792
Adjusted R-squared	0.871270	S.D. dependent var		0.113445
S.E. of regression	0.040703	Akaike info criterion		-3.433462
Sum squared resid	0.069583	Schwarz criterion		-3.163202
Log likelihood	91.11981	F-statistic		55.14538
Durbin-Watson stat	1.910751	Prob(F-statistic)		0.000000

3. Estonian inflation dynamics

(All variables are in logs. HOUSE is the price index for existing flats (m²), uhouse is the cointegration term)

Long-run relationship

Dependent Variable: LCPIEST

Method: Least Squares

Date: 05/28/07 Time: 13:41

Sample(adjusted): 1997:1 2006:4

Included observations: 40 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.866124	0.108584	26.39557	0.0000
SAIS1	0.003969	0.019317	0.205459	0.8384
SAI2	0.005548	0.019236	0.288395	0.7747
SAI3	0.008740	0.019219	0.454755	0.6521
LOGHOUSE	0.180136	0.011912	15.12224	0.0000
R-squared	0.868549	Mean dependent var		4.482389
Adjusted R-squared	0.853526	S.D. dependent var		0.112117
S.E. of regression	0.042909	Akaike info criterion		-3.342989
Sum squared resid	0.064442	Schwarz criterion		-3.131879
Log likelihood	71.85977	F-statistic		57.81490
Durbin-Watson stat	0.329446	Prob(F-statistic)		0.000000

Short-run dynamics

Dependent Variable: D(LCPIEST)

Method: Least Squares

Date: 05/28/07 Time: 16:24

Sample(adjusted): 1997:2 2007:1

Included observations: 40 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004793	0.002172	2.206309	0.0347
UHOUSE(-1)	-0.079153	0.026827	-2.950530	0.0059
SAIS1	0.007999	0.002740	2.918809	0.0064
SAI2	0.006281	0.003034	2.069931	0.0466
SAI3	-0.001502	0.002957	-0.507742	0.6151
D(LCPIEST(-1))	0.180788	0.144917	1.247529	0.2213
KAP(-2)	0.001251	0.000650	1.923857	0.0633
KAP(-3)	0.001166	0.000679	1.717812	0.0955
R-squared	0.601845	Mean dependent var		0.011095
Adjusted R-squared	0.514749	S.D. dependent var		0.008762
S.E. of regression	0.006104	Akaike info criterion		-7.182919
Sum squared resid	0.001192	Schwarz criterion		-6.845143
Log likelihood	151.6584	F-statistic		6.910108
Durbin-Watson stat	2.032559	Prob(F-statistic)		0.000049

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