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URMAS SEPP - MARTTI RANDVEER:

The Sustainability of the Estonian Currency Board Arrangement

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CONTENTS

INTRODUCTION

The aim of the analysis was to determine the performance of CBA in Estonia. First of all, we were interested in transmission channels working in the Estonian economy. The second aim of the analysis was more ambitious - to establish whether and in which way the post-shock adjustment works for studying the sustainability of CBA in Estonia.

The effect of shocks was studied with the help of model simulations. The shocking included endogenous as well as exogenous variables. The size of a shock was equalled to one standard deviation/or one (etc) percentage point. The temporary shock lasted from one quarter to one year depending on the nature of the variable under consideration. The permanent shock persisted up to the end of the simulation period. The impact of the shock was established as deviation from the baseline, which has been produced as an average of dynamic stochastic ex-post simulation.

The model used for simulations was the "reduced"[1] (and commonly the Keynesian) type macromodel, which has been estimated statistically. As it is well known, this class of models has a drawback as shown in the Lucas' critique. In spite of that we had to make the best of it since presently there are no analyses of Estonian economy that could be used in construction and calibration of the dynamic general equilibrium model.

Due to the fact that shocking took place in 1998, the outcome and conclusion from shocking are strongly backward oriented. To gain the results which were valid without doubts also for the future, the relevance of forward looking expectations[2] should be increased in the model (or DGEM should be used).

As the diagnostic simulations have shown the Estonian economy under the CBA adjusts relatively rapidly back to the long-run trajectory after shocks. The model includes nominal rigidities (staggered price contracts, partly backward looking price formation, ECM etc) in the short run which allow monetary shocks to have real effects. So the model can be characterized as having a Keynesian short-run with the neoclassical long-run.

The background for the study is the research done in the field of currency board shock sensitivity: Kwan-Lui (1999), Frenkel-Nickel-Schmidt (1999), Baltic (2000), Dobrinsky (2000), Avramov (1999) which provide the study with both stylised facts and analysis methodology.

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1 According to the claims of supporters of reduced type models, the macroequations are derived from theoretical microfoundations. Though, as a rule, microfoundations are presented not in general equilibrium, but in partial structure.

2 In the current version of the model the forward looking behavior is explicitly modeled in the price formation which is based on Calvo's staggered contracts approach.

1. CURRENCY BOARD ARRANGEMENT IN ESTONIA

The currency reform started in June 20, 1992 in Estonia and was backed up by basic legislation which determined the nature of the reform (The Currency Act, Foreign Currency Act, Act of the Republic of Estonia on the Security of the Estonian Kroon (adopted in the Supreme Council of the Republic of Estonia in May 20, 1992). With the reform the currency board (CBA) system was introduced.

CBA is a monetary regime based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate combined with restrictions on the issuing authority - the CBA - to ensure the fulfillment of its legal obligation (IMF (1996)).

CBA is restricted by a legal barrier to change the exchange rate. That the exchange rate can be changed only with great difficulties adds to the CBA's credibility. The backing rule eliminates (or strictly limits) the scope for issuing unbacked monetary liabilities ensuring that the CBA does not run out of foreign reserves to maintain the parity (IMF (1996)).

The main characteristic of the CBA system is that the board stands ready to exchange domestic currency for the foreign reserve currency at a specified and fixed rate (Walters - Hanke (1992)). In case of a CBA the money supply is endogenous consisting in exchanging domestic currency at a fixed exchange rate to the currency that forms the reserve.

The CBA bears a certain resemblance (though in a completely modified context) with gold standard principles. It could be considered as a 'surrogate' for the automatism and the rules of the gold standard. In some sense it is a return to the goals' hierarchy of the gold standard and to the corresponding adjustment mechanisms. Both systems aim to subordinate money supply to simple, effective and transparent rules. They affect macroeconomic policy by imposing the strongest discipline - that of capital movements and the markets. (Avramov (1999))

The principal features of the Estonian CBA are 100% backing of base money, fixed exchange rate regime and complete convertibility of kroon.

Under the terms of the Act on the Security of the Estonian Kroon, the currency issue is fully backed by the gold and convertible foreign exchange reserves of the Bank of Estonia. The Bank may change the amount of Estonian kroons in circulation only in accordance with changes in its gold and foreign exchange reserves (Clauses 1 and 4 of the above Act).

CBAs are principally required to hold realizable financial assets in the reserve currency at least equal to the value of domestic currency outstanding (Walters - Hanke (1992)). Actually the claims against the CBA and backed by reserves can be broader or narrower. For instance, Argentina has adopted a quasi-CBA arrangement in which only newly issued domestic currency, but not the whole outstanding stock, is 100 percent backed by foreign reserves with all currency convertible at a fixed exchange rate. (Osband-Villaneuva (1992))

According to rules of the Estonian CBA, the deposits of commercial banks (required and excess reserves) with Eesti Pank are backed in the same way as cash. This solution was

conditioned by practical considerations. In Estonia there was no effective system of interbank clearing outside the central bank. Therefore the banks had to keep their accounts in Eesti Pank. In the moment of kroon‘s issue it was crucial to create and support confidence in newly issued currency as well as in the monetary system as a whole. For this purpose, the obligations of the central bank to the commercial banks were decided to be backed.

A broader than usual CBA backing became possible due to the sufficient reserves. Gold reserves became available to the Estonian central bank following the agreement to repatriate gold deposited by Estonia with the Bank of England before the occupation of the country in 1940 (Saavalainen (1995)). So at the moment of the currency reform in June 1992, 90% of obligations of the CB was backed with reserves. The rest of the initial reserves was formed subsequent restitution by Swedish government and the Bank for International Settlements. By mid-July, the CB had already excess reserves compared to the obligations.

Since 20th June 1992, the exchange rate regime has been a fixed rate against the Deutsche mark of 8 EEK = 1 DEM. From the beginning of 1999, the Estonian kroon is also fixed to euro (15,6466 EEK = 1EUR)

According to the legislation, the Bank of Estonia has no power to devalue the Estonian kroon. Any change in the exchange rate of the kroon leading to a devaluation against the Deutsche mark must first be approved by the Parliament.

Considering the convertibility, there are no restrictions on current account transactions of balance of payments. With effect from 15th August 1994, Estonia has accepted the obligations of Article VIII of the IMF Articles of Agreement, under which members undertake to refrain from imposing restrictions on the making of payments and transfers for current international transactions or from engaging in discriminatory currency arrangements or multiple-currency practices without IMF approval.

The only valid restriction for capital account transactions is connected with the purchase of land by non-residents (the permission of the Government or local authority is needed). There are no further restrictions on capital account transactions.

Although the Bank of Estonia cannot conduct a discretionary monetary policy, it has implemented several measures aimed at improving the monetary policy operational framework to enhance the sustainability of the financial system.

2. FEATURES OF CBA

2.1. Credibility

CBA provides credidibility while even the possibility of discretionary policy may raise inflationary expectations.[3] CBA is an extreme/special form of fixed/pegged exchange rate systems whereby irreversibility of commitment is guaranteed by a legally fixed parity between the national currency and the reserve currency. Thus the currency board is capable of enhancing confidence, reducing the risk of attack against the national currency and imposing the stricter discipline rules of fixed exchange rate regimes. (Avramov (1999))

By eliminating or strictly limiting the monetary authorities' ability to monetize fiscal deficits, or lend to banks, CBA can rapidly strengthen credibility. In principle, CBAs would be expected to be more effective than conventional fixed pegs when the monetary authorities' reputation has been weakened by a history of lax fiscal policy, accommodative monetary policy, and failed stabilization attempts or when the authorities lack an established track record (as in Estonia and Lithuania). By providing clear signals about the policy intentions of the authorities, and ensuring monetary independence from the government, CBAs facilitate an adjustment of expectations and promote wage and price discipline, thereby lessening potential inflation biases. (IMF (1996))

Under fixed exchange rates and perfect capital mobility, a country can not pursue an independent monetary policy. In the case of CBA there are legal restrictions on the use of policy tools. (IMF (1996)) Under the currency board, the central bank would lose its discretion to act, and inflation and real interest rates would drop toward the levels of those in the country issuing the anchor currency. The more credible policy environment would provide a better framework for stability and growth. (Gulde (1999))

2.2. Adjustment Process

In accordance with the CBA principle, liquidity management of the banking system is the responsibility of the commercial banks themselves, i.e. of the market. Due to the lack of instruments (or their inefficiency), the CBA is characterized by the nondiscretionary monetary policy and nonintervention. Endogenous money supply is directly linked to automatic **"**sterilization" of the excess liquidity. Sterilization of excess liquidity is engineered through the increase of foreign assets of the commercial banks. In other words, banks tend to increase their foreign assets if there is no demand (acceptable by banks) for their domestic assets. The opposite process is also possible, meaning that banks increase their domestic assets by

[3] CBA is but one of the elements of the stabilization program. Although it will, if properly designed, contribute to eliminating macroeconomic imbalances, its long-term survival depends equally on the implementations of appropriate supporting measures (Gulde (1999))

decreasing their foreign assets. [4] The above-mentioned sterilisation brings money supply into accordance with demand and eliminates excessive money supply in the long run.

The adjustment mechanism works through interest rate arbitrage. Under the specie flow process, an outflow of capital, as a result of doubts about the exchange rate, would lead to a contraction of the money supply. The interest rates then go up, and a counter-flow of funds is induced. The series of event would take place automatically and speedily, so that the exchange rate can be "fixed" without government intervention.[5] (Tsang (1998))

According to Tsang such logic seems a bit shaky. Under normal circumstances, interest rate hikes may contribute towards the stabilization of a currency. But if the exchange rate is itself fluctuating and looks insecure, higher interest rates will *not* necessarily induce a counterflow of capital. In this sense, the specie flow process is not a reliable mechanism in fixing an exchange rate. Therefore, there is the need for the second mechanism of the CBA: currency arbitrage (alternatively known as exchange rate arbitrage) that directly binds the exchange rate. Given the board's 100% foreign reserves for cash in circulation, cash arbitrage can be carried out. In case the market exchange rate weakens from the official rate, people can convert their bank deposits into cash, go to the currency board to exchange the cash into foreign currency at the stronger official rate, and then sell the foreign currency in the market. This arbitrage activity will yield a riskless profit, and the selling pressure on the foreign currency will bring the market exchange rate back to the official level. (Tsang (1998))

3. THE RATIONALE FOR THE CHOICE OF THE CBA

Estonia's choice of the CBA reflected the search for high credibility and transparency of monetary policy as well as a firm ground for economic reforms.

3.1. Institutional Underdevelopment

An important reason for choosing CBA in 1992 was due to limited central banking expertise. Although the Bank of Estonia was re-established in 1989, it did not have any control over monetary policy until the monetary reform in 1992. Due to the lack of any expertise in implementing independent monetary policy CBA was partially chosen for its simplicity. In

[4] The referred process is the main mitigating remedy for one of the CB potential key problems - the restrictive effect. This criticism assumed that the only way to increase the currency supply under the CB arrangement was by means of a current account surplus (Fischer (1982)). Yet bank credit was capable of expansion. As deposits expanded, the public's currency-deposit ratio fell, as did also bank's excess reserves and their reserve-deposit ratio. The money supply could grow even in the absence of current account surpluses. Moreover, international capital inflows were also available to increase the currency supply. A secular rise in output did not necessarily betoken a falling price level.

[5] Gulde, Kähkonen and Keller (2000) stress that this is essentially the same mechanism that also operates under other fixed exchange rate arrangements, but the lesser room for discretionary monetary policy and the correspondingly stronger exchange rate guarantee implied by the CBA suggest that the necessary interest rate changes and the associated costs for the economy could be comparatively lower.

line with this argument, IMF has also concluded that due to the simplicity CBA is particularly attractive for post-chaos countries and/or for small countries that have recently attained independence and that wish to have their own currency for motives of seignorage as well as national identity.

In addition to the lack of central banking expertise at the time of the monetary reform the implementation of an effective discretionary monetary policy under different exchange rate arrangements was severely constrained by the lack of statistical data. This problem was accentuated by the fact that also during the first years after the monetary reform the quality of the available statistical data was low. Therefore the lack (and later the low quality) of statistical data hindered the creation of a model for the Estonian economy. Without a model describing the monetary transmission, the use of a discretionary monetary policy and the targeting of economic policy could not have been feasible.

It is clear that the creation and evaluation of models requires observations and time. Even if we believe that Estonian (and foreign) economists had in mind "the right" model (which considering the past is a very strong assumption[6]), one need to have waited until 1996 to be able to estimate the model. It was only then that the minimum length of time series was available for estimation. But even if the model had been compiled at that time, the reliability of that model would have been low. This stems from the fact that the confidence interval of the econometric model that is estimated on that short time series is so wide that the model-based policy recommendations cannot be reliable. The use of the model in 1997-98 would have also been hampered by the impact of the Asian and Russian crisis which caused significant structural changes in the economy. Therefore the model should have been re-estimated to take into account these structural changes. Accordingly, an adequate model could have been constructed only in 1999 or 2000 (as was the case).

To summarise, Keller (2000) has argued that an effective anticyclical monetary policy is difficult enough to pursue in developed, large and therefore relatively closed economies. In transition countries, with rapid structural transformations, the knowledge of our profession regarding the exact transmission channels and relevant time lags is clearly less deep. Therefore the balance of risk appears to favour small transition economies with fixed exchange rates to maintain their exchange rate policy.

3.2. Part of Stabilization Package

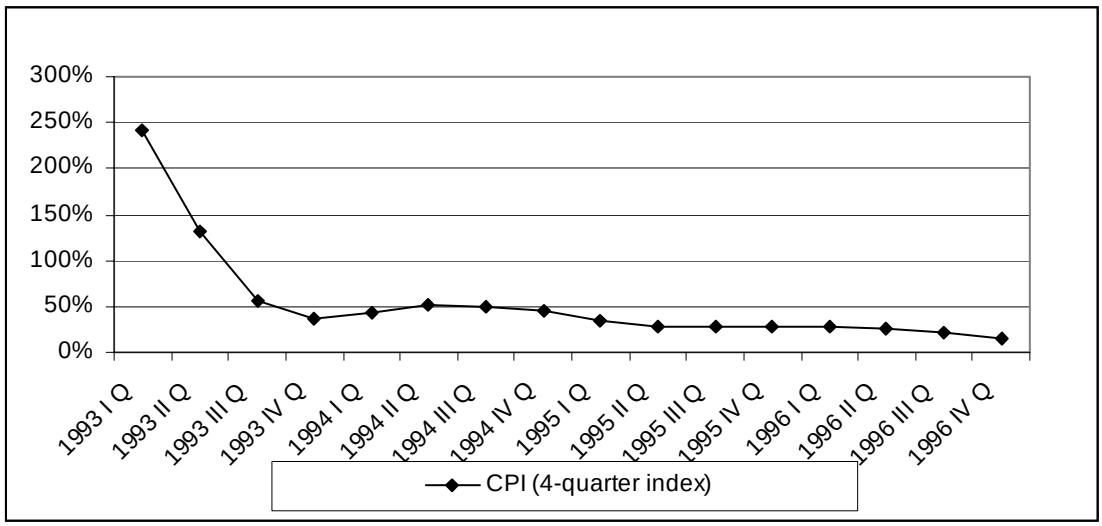
The implementation of the CBA was a crucial part of the stabilisation package. An important reason for choosing CBA arrangement was the need to gain credibility. In addition to that, the implementation of the CBA was to provide a solid nominal anchor for both stabilisation and

[6] The main problem in determination of the model is shaping of the long-term component. On the basis of a time series consisting of a couple of years it is impossible to do adequately. In that respect, the underlying inflation could be characteristic of that – each additional year changed radically the vision of underlying inflation (see Sepp-Vesilind-Kaasik (2000)).

restructuring. CBA arrangement seemed to be a feasible solution for achieving a stable monetary environment and a basis for stable economic relations in a short period of time.

One of the major goals of the economic stabilisation in 1992 was the need to lower inflation. As an important feature of the CBA is its noninflationary nature, the implementation of the CBA was considered as a way of bringing down the inflation.[7] As a result of the monetary reform, money supply became endogenously determined and inflation triggering excess money supply disappeared. Inflation rate started to fall: in the first quarter of 1992 the monthly CPI was close to 30 %; in December 1992 monthly CPI had decelerated to 3.3%. At the beginning of 1993 most of the open sector prices had reached the new equilibrium level. The disinflation process was quite smooth and the fluctuations of the monthly indices reflect mainly administrative steps, including tax measures (Figure 1).[8]

Figure 1
The dynamics of CPI in 1993-96



The introduction of the CBA helped to increase fiscal commitment. In order to avoid jeopardizing the target of lower inflation and keeping the external balance "on track," special fiscal targets were set for every year.[9] In the period from mid-1993 to the end of 1994, for

[7] The noninflationary nature of the CBA stems from the fact that under this arrangement the money supply is restricted. Devaluation is eliminated as a possible source of increasing the nominal money stock. Furthermore, money supply is strictly constrained by eliminating one of its sources. Under the classical two-tier banking system, the central bank issues money against both foreign and domestic assets. In this case it performs issuing functions by increasing its monetary liabilities against lending to government (budget financing) or commercial banks (refinancing or lender of last resort). Manipulation of domestic sources of reserve money underlies monetary policy and, in a sense, is the *raison d'etre* for central bank existence. However, if manipulation is exercised beyond certain sound limits and under governmental pressure it starts to generate inflation. (Avramov (1999))

[8] for a comprehensive discussion of the inflation in Estonia in the first half of the 90s see Sepp-Viilmann (1995)

[9] Ghosh, Gulde and Wolf (1998) have argued that the fixed exchange rates lead to better fiscal results. This is largely determined by the fact that the fiscal policy under these currency regimes is subordinated to

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example, the Government targeted a financial deficit about 1-2% of GDP. These ceilings helped to keep the public debt on a low level: since 1997 the government debt has not exceeded the 7% level of GDP.

The economic policy choices made during the monetary reform attained strong confidence in Estonian economy, and creditworthiness of the private sector (incl. the banking sector) improved considerably during the first couple of years after the monetary reform. Bearing this in mind, financial deficit as a fiscal target was replaced by fiscal (overall) deficit, which *de facto* marks a return to tighter fiscal policies. By setting low ceilings to fiscal deficits, the government aimed at dampening domestic demand and keeping the domestic economy from overshooting.

4. COMPARATIVE ANALYSIS: CBA VS ALTERNATIVE POLICY RULES IN ESTONIA [10]

The purpose of the comparative analysis is to determine the performance[11] of CBA in comparison with the situation where another monetary system would have been used in Estonia. CBA has been compared with the monetary policy rule targeting inflation or/and output gap and using the interest rate as the instrument.

The historical deterministic simulations show that under the simplified assumption of perfect information of the monetary authority[12] the rules that target only one variable – either output gap or inflation - outperformed formally the CBA. Whereas it appears that targeting output gap causes the interest rate volatility to increase drastically. This is due to the fact that output gap makes up approximately ¾ of the loss function (i.e. total variation of gap, inflation and interest rate). The rest of the total variation is divided more or less equally between inflation and interest rate.

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maintaining the fixed exchange rate. There is a essential difference between the intermediate regimes of a fixed exchange rate and the currency board (which is a further manifestation of the advantage of the stringent commitment of a currency board). While the first retains the possibility for monetary authorities to hold domestic assets, with currency boards this possibility is eliminated. Therefore the possibility that overly expansionary fiscal policy will cause a currency crisis under CBA is strongly reduced.

[10] The model that was used for the comparative analysis is described in the Appendix 2.

[11] The performance of monetary rule was expressed in the conventional way - by quadratic loss function including output gap, the deviaton of inflation from its long-run value and the difference of interest rate.

[12] In our experiments, the monetary authority is assumed to know the true structure of the economy. The monetary authority understands the formation of private agents' expectations, and is able to use this knowledge to its advantage. The possession of perfect information entails two things – firstly, the central bank is competent to make 100 per cent adequate decisions. Secondly, the perfect information assumption allows to realise its decision precisely in accordance with the expectation and intentions. The reality is certainly more complex than the above simplification. Svensson and Woodford state that central bank operates under considerable uncertainty due to the circularity problem. Many important indicator variables for central banks are forward-looking variables, variables that depend on private-sector expectations of the future developments in the economy and future policy. However, these expectations in turn depend on an estimate of the current state of the economy, and that estimate in turn depends, to some extent, on observations of the current forward-looking variables. (Svensson and Woodford (2000))

Figure 2 and **3** specify a trade-off between gap and interest rate variation. It appears that if we use interest rate for smoothening the gap, then the interest rate variation becomes similar to gap (actual) hypervariation. The reason for that is straightforward. The CBA simulations showed that due the openness of the Estonian economy, the output gap depends mostly on foreign demand and the role of domestic demand is marginal. Therefor the smoothing of gap (i.e. domestic demand) through interest rate requires irrational growth of interest rate variability.

Figure 2
Simulated dynamics of interest rate in case of CBA and gap targeting (when the gap has weight equal to 1,3 or 5 in the monetary rule)

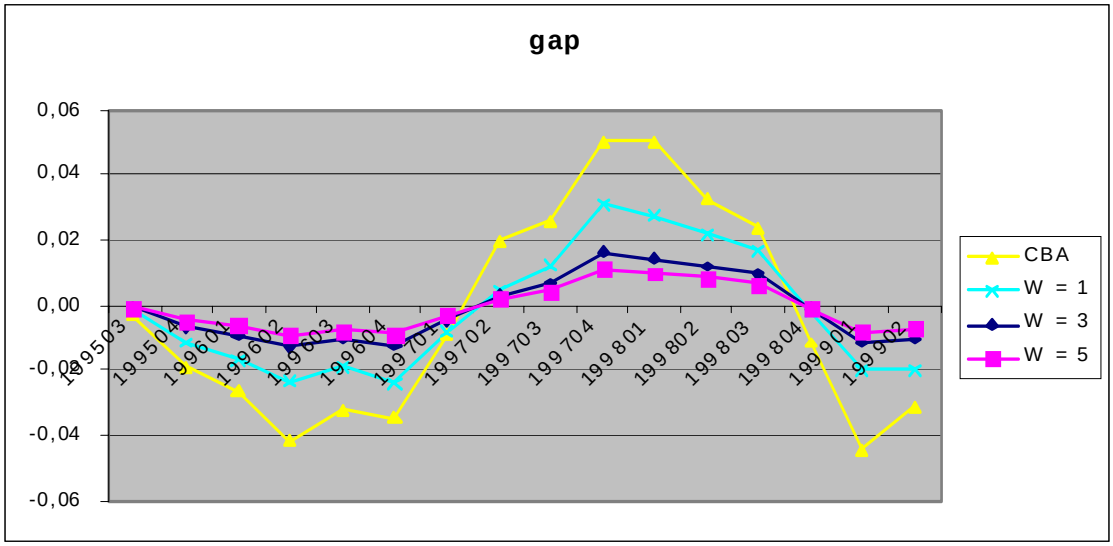
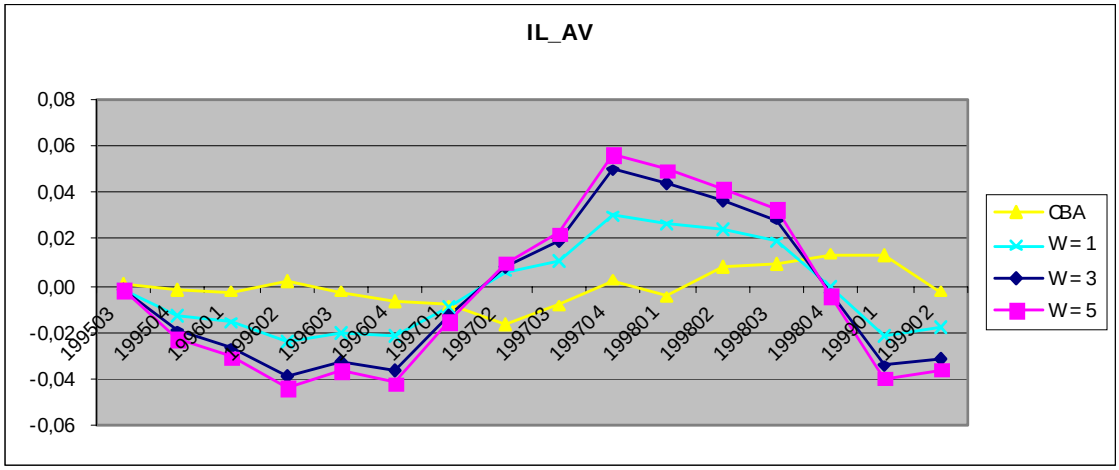


Figure 3
Simulated dynamics of gap in case of CBA and gap targeting (when the gap has weight equal to 1,3 or 5 in the monetary rule)



The historical simulation showed that only the inflation targeting could have been hypothetically competetive with CBA – provided that the central bank does not make mistakes, etc.

Anyway there is a way to soften the unrealistic assumption of perfect information and use stochastic simulations instead. For the latter, the relations described in model are realised stochastically, i.e. in the simulations the decisions of the central bank do not correspond 100 per cent to perfect information, but contain also mistakes. On the other hand, stochastic simulation provides a possibility that the decisions of the CBA will realise in a different way than compared with the intention of central bankers. To conclude, stochastic simulation provides a relatively realistic framework for comparative analysis of monetary rules.

Stochastic simulation proves CBA to be the most suitable for Estonian economy. The advantage of CBA comes from the lowest variation of the interest rate. In the case of other monetary rules, interest rate must vary considerably in order to be able to smooth targeted variable. At the same time, however, the growth of interest rate variation does not counterbalance the decrease in targeted variability.

Although the result – the advantage of CBA – could be guessed intuitively, the reasoning is not in accordance with the views expressed in economic literature. Characteristic to the fixed rate, and accordingly also to CBA, is wider variation of interest rate as compared to other exchange rate regimes (i.e. monetary rules). Interest rate variation results from the fact that in fixed regime there is no adjustment mechanism that derives from exchage rate changes. Adjustment occurs through interest rate changes. In the case of floating rate, however, it is the exchange rate that accounts for the adaptation and therefor interest rate variation is marginal.

5. CHANNELS OF TRANSMISSION

According to Leitemo and Roisland (1999), it is practical to model monetary transmission with a two sector model. In the two-sector model, there are basically two explicit channels for the transmission of shocks – interest rate and exchange rate channels. It seems plausible that the tradables sector output is more sensitive to changes in the real exchange rate, whereas the non-tradable sector output is more affected by the real interest rate through domestic demand.

Below, we will look at both channels, assuming different impacts of interest and exchange rates to the sectors. Alas, it is done by one-sector model, because till now we lack two-sector model of Estonian economy. As for the interest rate, we use nominal rate, because so far there is no empirically confirmed evidence that the real rate has an impact. Leaving aside speculative attacks, one might say that it is not a big mistake: in the absence of exchange rate risk, the nominal interest rate is a good proxy for investment yield/prices.

And one more clarification: although CBA is a fixed rate regime and by the definition the dynamics of nominal exchange rate is excluded, we study the effect of the nominal rate. It is due to the fact that in some episodes the NEER of kroon depends crucially on appreciation/depreciation of the currencies unpegged to DEM or to EURO.

One may say that the credit channel has a role to play in Estonian economy, though in modelling we were unable to establish that. That both in the loan channel and the balance sheet channel. The terms that characterise the latter - adverse selection and moral hazard - were at least in 1997-8 during the turmoil of the Asian and the Russian crises the keywords in describing the behaviour of Estonian economic agents.

5.1. Interest Rate Channel[13]

The model includes both the short and the long term rates. The long term interest rate depends on short rate and inflation expectations. The system could be reduced to look at only one interest rate, but the distinction between short and long rate is useful in order to analyze shocks caused by speculative attacks (see section 5).

The direct effect of the nominal interest rate is characterized by considerable restrictive impact. Regarding GDP it is a well documented puzzling negative correlation between real output and the short term nominal interest rate (Fuhrer-Moore (1995)). In the case of Estonia, a one percentage-point rise in short term rate (Fig 4) impacts domestic demand: SHORT LENDING RATE↑→ OUTPUT GAP↓. At the same time this transmission includes a kind of adjustment mechanism – as the money supply in the model is determined solely by transaction motive, and money supply has negative effect on the interest rate, then OUTPUT GAP↓→ M2↓→ LENDING RATE↑.

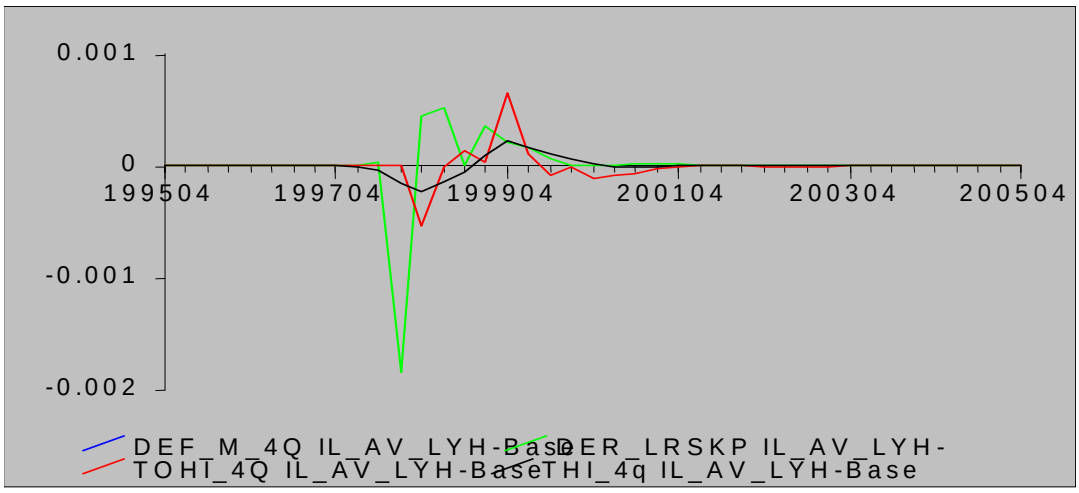
In addition to the effect on domestic demand, one can see from the Fig 4 that there exists also a marginal supply side effect, which is indicated by the decline of export. As capital (and therefore investments) is explanatory variables of export in the long-run, and investments are negatively related to interest rate, then LENDING RATE ↑→ CREDIT ↓ → INVESTMENTS↓→ REAL CAPITAL ↓ → EXPORT ↓

EXPORT converges with the pre-shock trajectory as the impact of the error correction process becomes prevailing in late stages of adjustment and GDP↑→ CREDIT↑ → INVESTMENTS↑→ REAL CAPITAL↑ → EXPORT↑. [14]

[13] The interest rate channel of our model does not actually include the interest rate arbitrage. The reason comes from the fact, that we failed to model international financial flows.

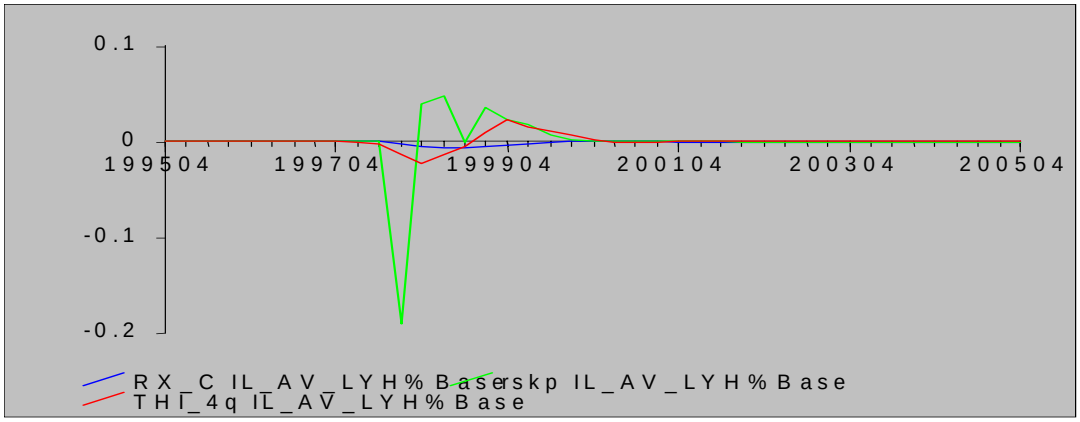
[14] This scheme contrasts the transmission logic of Leitemo and Roisland's two-sector model. Using their argumentation, one could assume that the effect of interest rate is expressed in decline of output in the domestic nontradables sector, which assumingly lowers inflation rate. Declining inflation and depreciation of domestic currency raises competitiveness and export.

Figure 4
Interest rate shock in %% from the baseline



Due to the output gap, the rise in interest rate has a small impact on inflation as well (Fig 4,5.).

Figure 5
Interest rate shock absolute deviation from the baseline



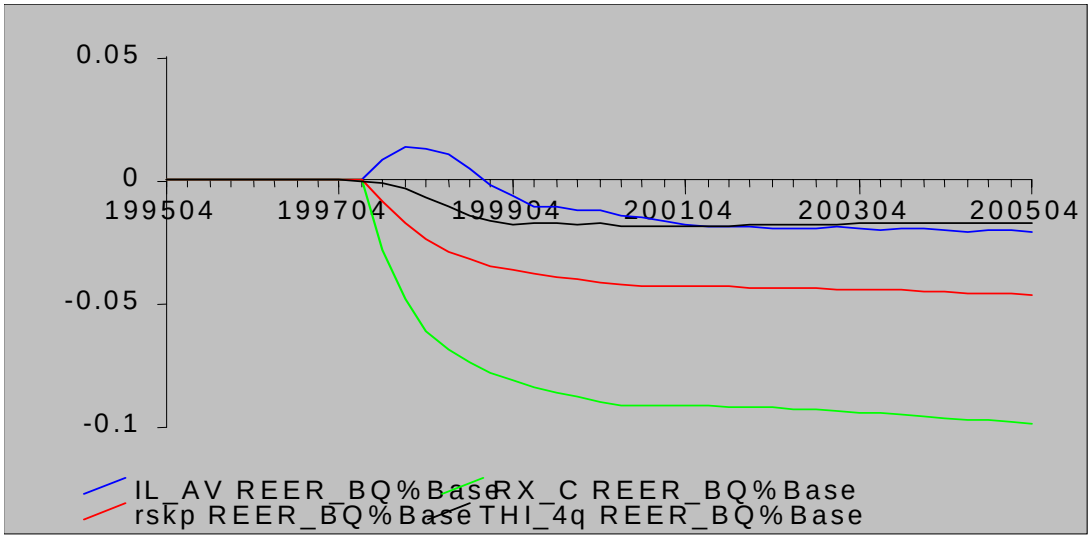
5.2. Exchange Rate Channel

The importance of exchange rate channel comes from the openness of Estonian economy. This channel transmits impacts of nominal as well as of real exchange rates. According to the restrictions of the fixed exchange rate regime, it is understandable that the real rate channel is particularly effective.

5.2.1. Real Exchange Rate (REER)

As mentioned above, the real exchange rate operates as a factor of export in the long run. The dynamics of real rate in (transition) economy with fixed exchange rate is primarily determined by domestic inflation, which depends on the convergence of price level and of relative prices. The appreciation of real rate means, *ceteris paribus,* declining (price) competitiviness and slower growth of export. In our simulations the permanent shock in the real effective exchange rate (1%point appreciation) has constant effect on real variables. Appreciation leads to lower long-term level of growth because of decreased competitiveness (Fig 6.).

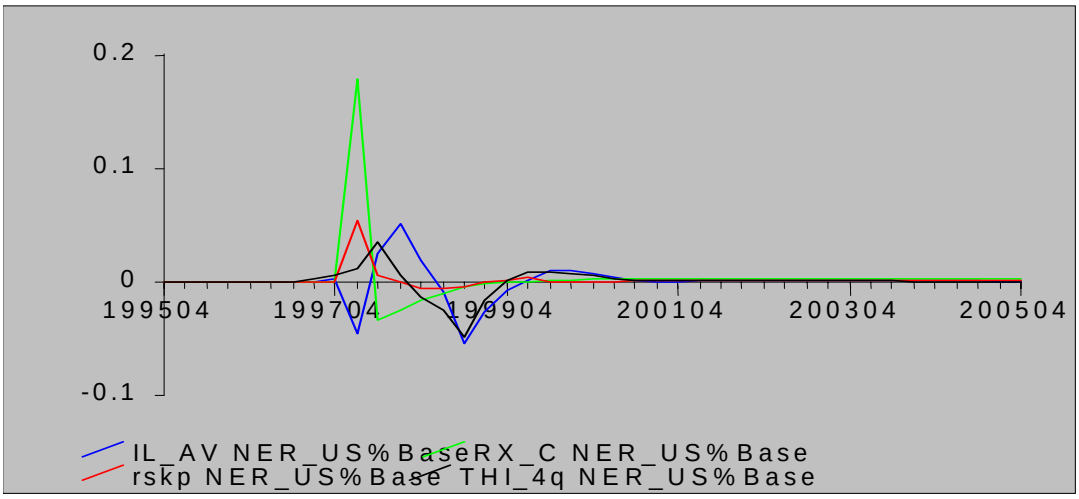
Figure 6
Shock of REER in %% from the baseline



5.2.2. Nominal Exchange Rate (USD)

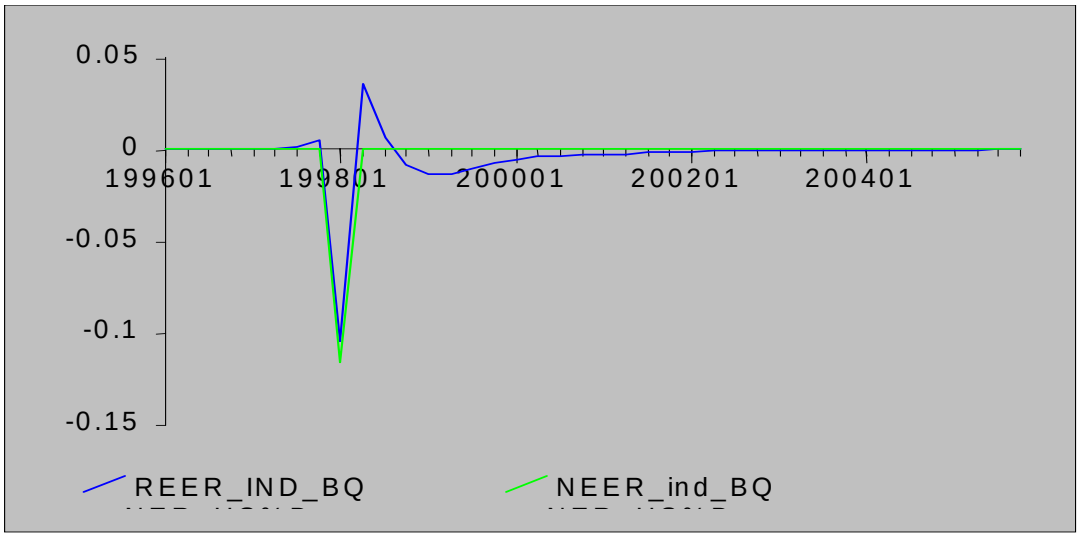
USD and SEK are on the trade bases principal floating currencies with respect to the Estonian kroon. Looking at the Fig 7, one may follow the adjustment after the nominal appreciation of USD by 1%. It can be concluded that the effect of the appreciation of dollar on real indicators is rather significant, and in total, positive. This is due to favorable reaction of real exchange rate.

Figure 7
USD shock in %% from the baseline



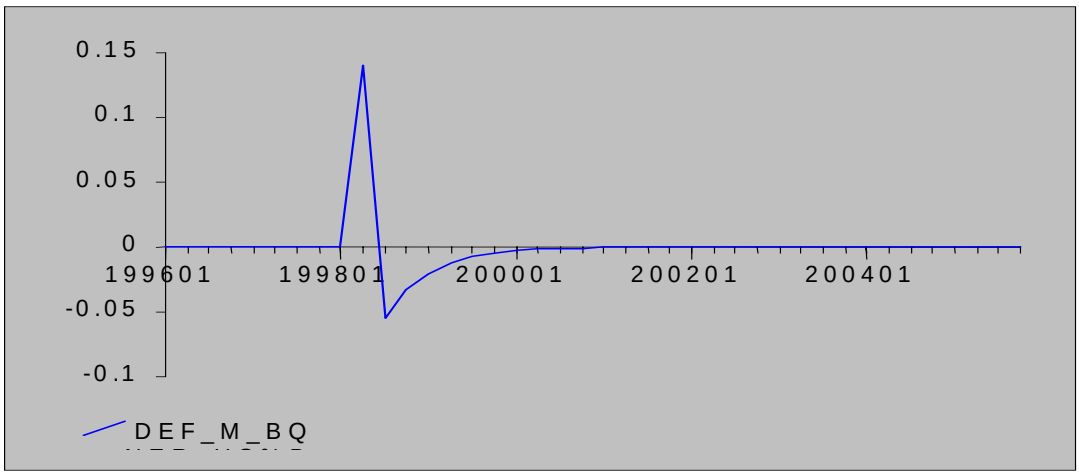
The nominal depreciation of kroon affects the economy through several variables. The increasing competitiveness raises export and GDP.

Figure 8
USD shock as absolute deviation from the baseline



On the other hand, the appreciation of USD causes domestic inflation by the increase of import prices (Fig 8). Inflation is supported also by increase of exports which creates some extra demand pressure. However, it is evident, that the overall effect of USD appreciation is positive. The real depreciation of kroon due to nominal depreciation of it is bigger than the real appreciation caused by inflation (Fig 9).

Figure 9
USD shock as absolute deviation from the baseline



5.3. Significance of Transmission Channels

Looking at the variation of key variables, it is clear that the interest rate channel is to some extent more influential.[15] Nominal rise in interest rate by 1% (Fig 10) causes immediate decrease of GDP by -0,2%. The impact of 1% appreciation of NEER remains slightly less (0,16% decrease of GDP, see Appendix 2). Post-shock adjustment - at least considering the GDP dynamics - is clearly more volatile in the case of interest rate shock. It is understandable – as the exchange rate is fixed, the interest rate is the prime variable carrying the burden of short-run adjustment.

Although the outcome is logical within the framework of the fixed exchange regime paradigm, it contrasts slightly intuition based on the realities of the Estonian economy. Taking into account the openness, one could have expected the prevalence of the impact exchange rate. Interest rate channel reacts primarily through the demand of nontradable sector, what has only a minor contribution to GDP. Therefore the impact of interest rate to the aggregate indicators (incl GDP) should be minor as well. On the other hand, the exchange rate is an influential argument of the tradables sector output. As the tradables sector is prevailing in Estonia, then, of course, one would conclude that the impact of exchange rate is crucial also for the development of the whole economy.

[15] Higher importance of interest rate channel cannot be explained by the differences of the relative sizes of the shocks. If one takes into account the real variation of these variables, then the shocks of both indicators are of the same proportion. 1 %point makes approximately a quarter in standard deviation of the interest rate (equal to 4.7%). 1%change of NEER constitutes the same proportion in its standard deviation (4,6%).

6. SUSTAINABILITY OF CBA

In addition to the legal and institutional factors that are the prerequisites and increase the sustainability of a CBA, a range of economic factors have to be in place for a well-functioning CBA. In other words the sustainability of the currency board also depends on the ability of the real economy to function reasonably well under such exchange rate regime.

One of the features of a CBA is the absence of an independent monetary policy. Therefore an economy operating under CBA principles needs greater flexibility of the markets in order to cope with missing adjustment instruments of monetary-policy and of the floating exchange rate. In fact under currency board economic adjustment has to come through price and wage adjustments. Therefore the sufficient flexibility of the labor and good markets are especially important.[16]

Under a currency board the role of fiscal policy is also of great importance, as it is the main policy tool, which can be used for economic stabilization.[17]

A sound banking system is an essential condition for the stability of the CBA. This necessity arises from several reasons. First (in most cases) monetary authority under CBA cannot act as a lender of last resort; secondly as there is no automatic refinancing window at the central bank, the principal role in ensuring a stable liquidity system, has to be fulfilled, first and foremost by financial intermediaries themselves.[18]

[16] The gain from the CBA derives from the flexibility of the economy. The flexibility, in turn, stems from the liberalization and openness. Yet it is a one-sided conclusion since it only reflects the short-term effect. In fact, CBA relevantly relates to the long-term aspect as well. The flexibility, liberal organization and openness of the Estonian economy are partially also the results of the introduction of the CBA (and the reforms initiated thereby). The structure of our economy is endogenous to monetary rule: CBA is most suitable because Estonia has developed a favourable environment for CBA through structural and institutional reforms.

[17] Avramov (1999) points out that an indirect threat for the system could come from political pressures for a withdrawal from the CBA through a change in the fixed exchange rate. The depression of the real sector and the restrictive financial conditions will decrease public support for maintaining the CBA.

[18] Viable banking system is also important due to the intertwining of monetary and credit systems which creates a connection between exchange-rate crises and bank crises. Stockam stresses that banking-system crises can create speculative attacks on a pegged exchange rate. Crises in currency markets and credit markets can feed on each other. This interrelationship - the fact that we have the same set of institutions for the allocation of credit in an economy as we have for promoting transactions services - means that monetary arrangements such as an exchange-rate system can affect the real economy through these credit channels. Importance of these credit channels remains controversial. Nevertheless, there is evidence to worry about those issues and to believe that they may be worse in countries with less-developed financial systems, business firms may depend even more heavily on the banking system (rather than direct acquisition of funds in capital markets) than in more developed countries. (Stockman, p.1495-9)

6.1. Simulation of External Shocks

One way to analyse the sustainability of Estonian CBA is to look at the outcomes of the shock- simulations. So we studied the following external shocks, most relevant under the CBA (not to consider the speculative attacks):

- nominal exchange rate shock (using the macromodel of the Estonian economy, it is possible to simulate the impact change of exchange rate of USD (see section 3.2.2), Swedish krona (Appendix 1), Russian ruble and also NEER (appendix 2));
- shock of foreign interest rate (EURIBOR_3M, appendix 3);
- export shock (using the model it is possible to distinguish the impact of different factors of external demand - as of GDP of EU15, the Finnish GDP, the CPI of EU15, the Russian CPI, etc in our exercise the foreign demand shock is studied in the simple aggregate form (Appendix 5));
- shock in import prices (Appendix 4).

The main conceptual conclusion to be drawn is that temporary shocks do not cause the divergence of the Estonian economy from the long-run path. Or in other words, the adjustment of exogenous shocks leads to convergence with the long-run path. According to intuition, export shock proved to be the most effective exogenous shock.

In order to verify that convergence is not caused by the mutual compensation of shocks, the least favourable combination of the simultaneous shocks was studied. The most restrictive selection of the shocks includes the increase of the interest rate, decrease of demand resulting negative GDP gap, fall in money supply etc. Nevertheless, the conclusion made earlier holds true here as well – shocks adjustment leads onto the long-run path.

We studied also the permanent shocks. The conclusions were in accordance with intuition: adjustment after demand side shocks leads back to the previous growth trajectory relatively quickly. The main exception is adjustment of EXPORT shock. Due to the role of external demand for the Estonian economy, the post-shock convergence is rather slow. As the external demand is the critical factor of output gap, the positive export shock produces increasing inflation, which in turn results in appreciation of real exchange rate and in temporary decline of competitiveness.

The second exception of convergence is the EURIBOR shock which has an essential impact on domestic interest rate. Interest rate has a direct effect on supply side through investments and on fixed capital (as capital formation is touched). The convergence is very slow: at the end of the period under the consideration (2005:04), the GDP deviation was still 0,0022% and EXPORT deviation 0,0044% from its baseline simulation.

Anyway, the main conclusion of our simple exercises is that shocks adjust to the long-run path and in this aspect the Estonian currency board seems sustainable.

6.2. Actual Performance of CBA

Second way to analyse the sustainability of Estonian CBA is to look how the economy has actually coped with shocks. As the Asian and Russian crisis both had a clear impact on the Estonian economy, we will analyse how the Estonian economy reacted to the adverse conditions brought by these external shocks.

The two external shocks that hit Estonia in 1997-98 were of different magnitude and influenced Estonian economy through different channels. The common feature of the crisis was the fact that these shocks spread via contagion effects – both crisis started with a speculative attack and were accompanied by difficulties in obtaining foreign financing.

The influence of the Asian crisis to Estonian economy was less severe. It started with a speculative attack and a decrease in foreign capital inflows, which resulted in the significant fall of the prices of financial assets and a temporary rise in money market rates.

The impact of the Russian crisis to the real sector was stronger. As a result, Estonia recorded four consecutive quarters of economic decline starting from the 4th quarter of 1998. The decline was steepest in the first half of 1999 when the output contracted by 3 % as compared to the first half of 1998. Although in the second half of the year another growth phase started, the overall GDP growth remained negative for the year 1999 (-1,1 %). The decline in economic growth was mainly due to a sharp contraction in exports. For the 1999 as a whole merchandise exports declined by 5 % - during the first half of the year the decline in exports amounted to 10 %. Obviously the exports to CIS was the hardest hit – during that period exports to Russia decreased by 40 %.

The influence of the Russian crisis was also felt in the financial sector. Immediately after the Russian crisis broke out there was a strong speculative attack on Estonian Kroon, significant increase in money market rates, subsequently both the growth in the money supply and loans stopped. The speculative attack was triggered by the contagion effect of the Russian crisis. The strength of these effects were supported by the fact that Estonia had relatively strong trade relations with Russia. In addition to that Estonia was in a vulnerable position because of its high current account deficit which at the outbreak of the crisis was seen as a threat to the existing exchange rate arrangement.

In conclusion, the Russian crisis (to a lesser extent also Asian crisis) could be considered a good test of the sustainability of the CBA (particularly from the perspective of the viability of financial sector).

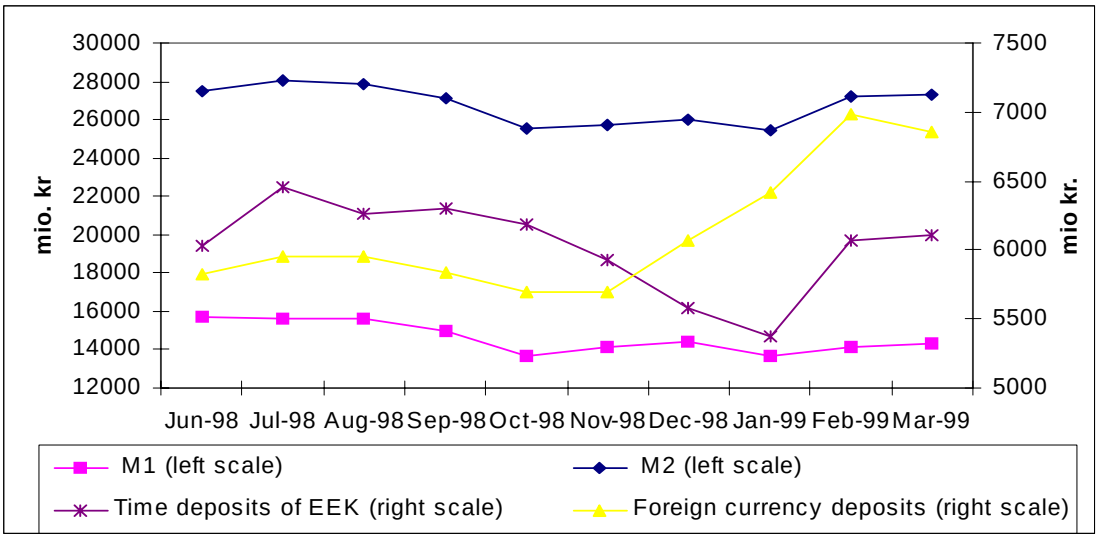
The two years starting from the second half of 1997 demonstrated the ability of Estonia's financial system to cope with rapid changes in the environment. The financial sector proved its performance efficiency in the face of severe external shocks. It could be said that Estonian financial sector emerged stronger from this turmoil – the capitalisation and liquidity of the banks increased and the involvement of Nordic banking groups also increased the credibility of domestic banks. Therefore one can conclude that the sustainability of the Estonian financial sector has increased during the last years which supports the argument that it is strongly supporting the sustainability of the CBA itself.

7. THE CASE STUDY OF THE SPECULATIVE ATTACK: THE RUSSIAN CRISIS

7.1. Money Supply

The Russian crisis also had a strong effect on the money supply. For the first time since the beginning of 1993, the money supply (both M2 and M1) contracted in absolute terms in the second half of 1998. Broader money supply decreased from 28 billion EEK in the end of July 1998 to 25,5 billion EEK in the end of January 1999. The decline in broader money supply reflected a decrease in cash in circulation and demand and time deposits of Estonian kroon (see Figure 10). During the period from July 1998 to January 1999 cash in circulation decreased by 12 %, demand deposits of EEK by 13 % and time deposits of EEK by 17 %. The only exception was the foreign currency deposits which increased by 10 %.

Figure 10
The dynamics of the components of money supply from June 1998 to March 1999



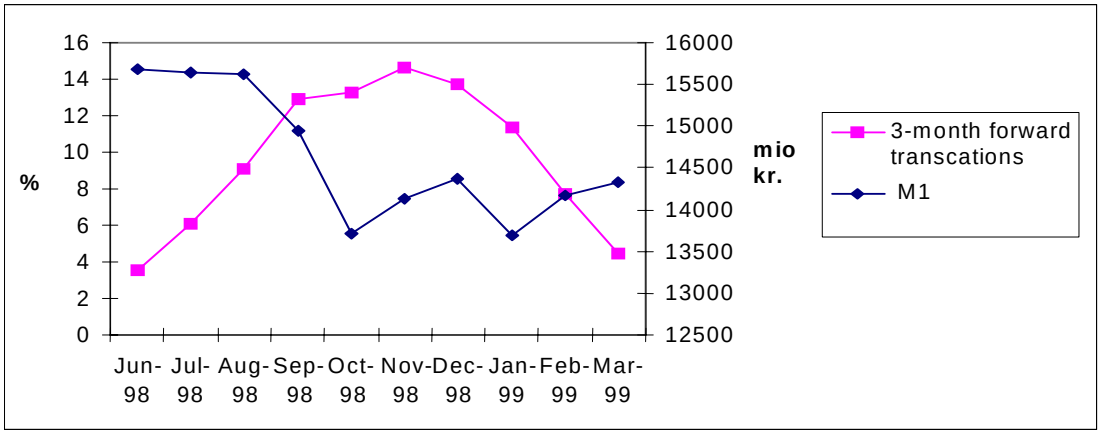
The decline in money supply was due to several reasons. First of all the Asian and Russian economic crisis decreased the credibility of emerging economies which in turn triggered a decline of foreign capital inflows to those countries (including Estonia). These developments were also exacerbated by a slowdown in Estonian economy. As a result of these developments the foreign capital inflows decreased from 11 billion EEK in 1997 to 7 billion EEK in 1998. Secondly the Russian crisis also caused a strong slowdown in the growth rate of consumers incomes and corporate profits. It is reasonable to assume that private individuals used temporarily part of their deposits for consumption smoothing and enterprises used their cash balances to cushion the growing problems with external financing.

Also the Russian crisis roughly coincided with a bankruptcy of a medium-sized bank (Maapank) which decreased the credibility of Estonian banking sector. At that time it was widely assumed that the Russian crisis will increase strongly the amount of bad loans. Therefore the decreased credibility of the banking sector and subsequent problems with 2

small banks (ERA Pank, EVEA Pank) in the autumn brought about a withdrawal of deposits from Estonian banks (especially from the smaller banks).

In addition to the above-mentioned factors, the Russian crisis also increased the probability of a devaluation. This is evidenced by the fact that during the second half of 1998 Estonian private individuals and firms decreased their cash portfolios of Estonian kroons and their demand and time deposits in EEK. Against the background of decreasing banking sector credibility and economic hardships Estonian private individuals increased their foreign currency holdings in Estonian commercial banks. This could be seen as an evidence of fears of devaluation among Estonian economic agents. Simple correlation analysis shows that during July 1998 and March 1999 the interest rates of forward transactions and components of money supply exhibited a strong negative correlation. The correlation between interest rates of forward transactions and M1, M2, demand deposits of EEK and time deposits of EEK were –0.54, -0.76, -0.51 and –0.35, respectively (see also Figure 11).

Figure 11
Interest rates of forward transactions and M1 from June 1998 to March 1999

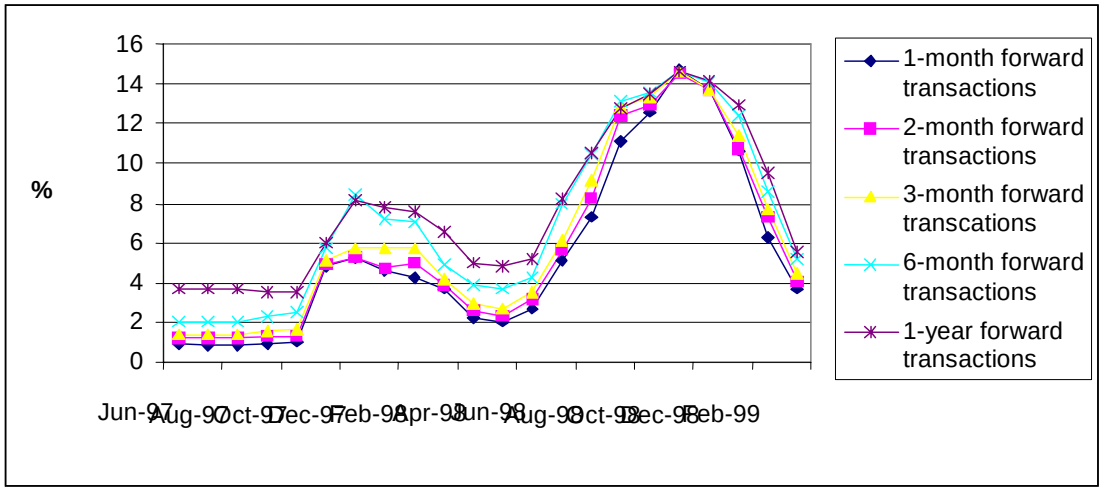


7.2. Forward Market

Similarly to the Asian crisis, the first influences of the Russian crisis were felt in the financial sector (mainly in the forward market). During the second half-year the foreign currency forward market experienced a substantial rise in price quotations, which was related to the crisis in Russia. Before the Russian crisis the interest rate of DEM-EEK forward transactions ranged from 2 % (1-month forward transactions) to 5 % (1-year forward transactions) (see Figure 12). With the start of the Russian crisis the price quotations surged and peaked in December when the interest rates of these transactions amounted to nearly 15 %. The reasons for this currency speculation was mainly based on the belief that Estonian economy is not able to withstand the adverse influence of the Russian economic crisis and in order to maintain its external competitiveness vis-à-vis Russian enterprises has to devalue its currency. Anecdotal evidence suggests that the currency speculation was launched by foreign financial intermediaries, both the Estonian commercial banks and to a lesser extent Estonian corporate sector firms were betting on the stability of the exchange rate of EEK.

Unlike October 1997, the rise in quotations was not followed by a notable increase in trading volumes. In the third quarter the volume of DEM-EEK forward transactions undertaken by the banks amounted to 7.8 billion kroons which was less than the record-breaking 9.5 billion kroons in November 1997. The difference between the behaviour of the commercial banks in the forward market in the second half of 1997 and second half of 1998 can be seen in the different dynamics of the price quotations (see Figure 12). While in the second half of 1997 the interest rates of forward transactions amounted to 8%, the corresponding figure in 1998 was twice as high. At the same time the difference between the money market interest rates in the second half of 1997 as compared to the second half of 1998 was quite small. This, in turn, indicates that Estonian commercial banks were at that time less inclined to take risks. On one hand, position taking was restrained by the availability of bank funds and the fact that due to the involvement of foreign capital in the banking sector the commercial banks took a cautious position which was evidenced by the reduced limits related to forward transactions. On the other hand, a huge bid-offer spread in foreign currencies and high interest levels made speculations expensive.

Figure 12
Interest rates of forward transactions (1-month to 1-year) in June 1997 to March 1999.



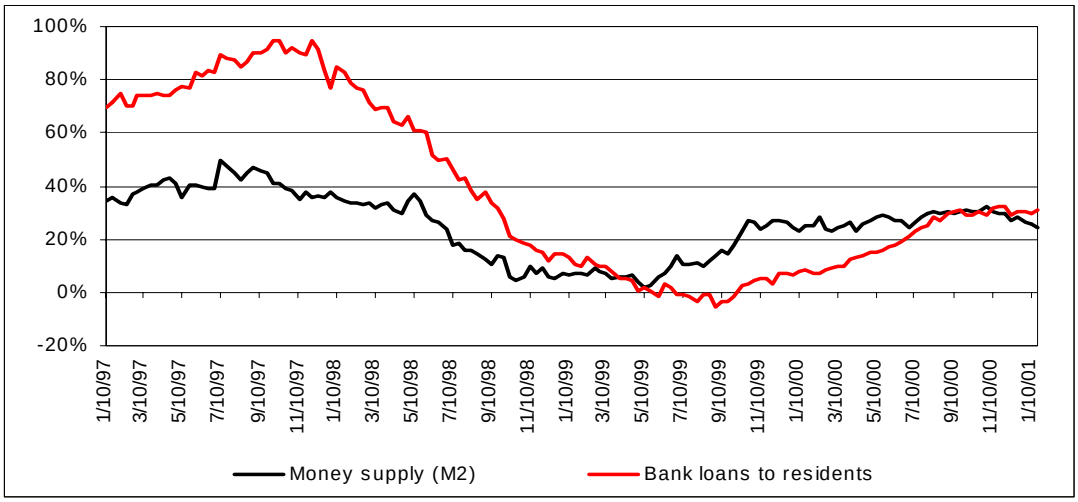
Because of the consolidation process in the banking sector and involvement of foreign capital, short positions of foreign banks in the Estonian kroons started to decrease on the forward market from November and with them also price quotations of Estonian kroon forwards. By December 1998, the situation in the forward market stabilised and returned to normal level.

7.3. Interest Rates

In addition to the impact of the Russian crisis on forward market, the developments in Russia also influenced money and credit markets. Due to the increased instability related to the Russian crisis, the money market interest surged again in August and this increase stopped

only in November. The money market interests rates peaked in November and December, but then started to decrease – between December 1998 and April 1999 the money market interest rates decreased from ~18 % to 6-7 %. This strong decline was associated with the disappearance of the foreign speculative pressure and the involvement of strategic investors which increased the capitalisation and liquidity of the banking sector.

Figure 13
The growth of money supply and credit in 1997-2000



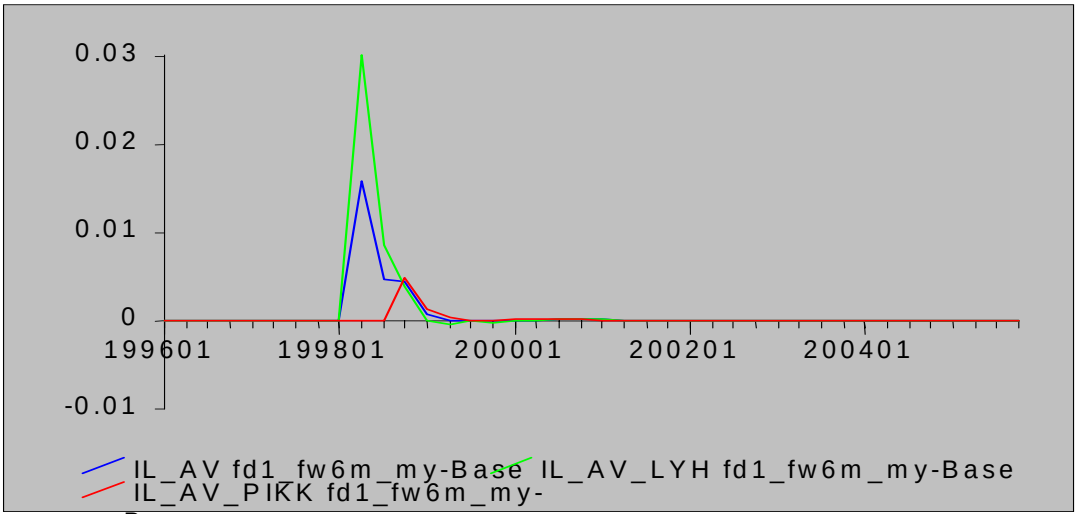
In the credit markets the influence of the Russian crisis already reinforced the already prevailing trend – the decline in credit growth (Figure 13). In the 4th quarter of 1998, the credit to residents started to decline (this trend continued up to the 3rd quarter of 1999). The decline in commercial banks loan portfolio in 1999 stemmed mainly from the Russian crisis. On one hand, the Russian crisis decreased the investment demand of the corporate sector and there-by reduced the demand for loans; on the other hand, it caused the commercial banks to adopt a more conservative lending policy.

Model simulations indicate that an increase in forward points, which is caused by currency speculation, has a strong impact on Estonian short-term interest rates, its impact on long-term interest rates is modest.

The Russian crisis had also an effect on long-term interest rates (the average long-term interest rates increased from 12 % in the 3rd quarter of 1998 to 14 % in the 4th quarter of 1998).

Figure 14 shows the effect of an increase in forward points that is equal to an increase in forward points in the 3rd quarter of 1998 – during that period the interest rates of forward transactions increased ca 6 %. As a result of this, shock short-term interest rates increase approximately by 3 percentage points. At the same time the influence of a temporary increase in forward points is short-lived.

Figure 14
Effects of a speculative attack (increase in forward points) on interest rates



7.4. Consequences of Crises

In addition to the effect of currency speculation on interest rates, it also has an impact on the price level and real variables (GDP, exports). Model simulations (see Figure 15 and 16) reveal that an increase in forward points has a relatively strong impact on Estonian GDP growth. Figure 15 shows that a temporary increase in forward points (equal to the increase in forward points in the 3rd quarter of 1998) causes a ca 0,6 % decline of GDP growth from baseline. On the other hand, the negative impact of this exogenous shock is temporary (1-quarter) and GDP growth converges to its long-run path. The impact of an increase in forward points has a small impact on exports and price level.

Figure 15
Effects of a speculative attack (increase in forward points) on exports, GDP and CPI

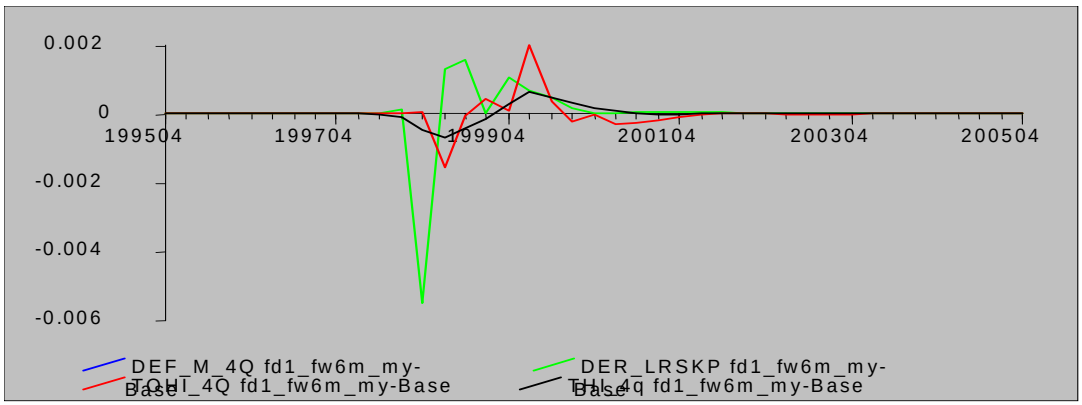
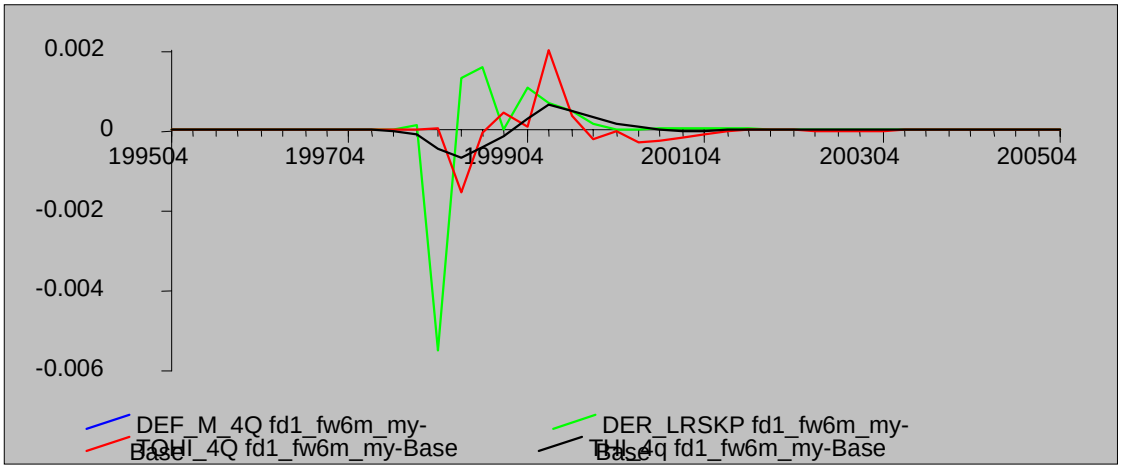


Figure 16

Effects of a speculative attack (increase in forward points) on import prices, GDP gap, CPI and PPI



In addition to the influence of Asian and Russian crisis on monetary aggregates and credit and money markets, they also quickened the pace of consolidation in the financial system. As under CBA, the burden of adjustment remains with banks, two years of turbulence resulted in the second wave of consolidation of the banking system. The number of banks fell from 12 in 1997 to 6 in 1999. This dramatic fall did not involve either remarkable loss for depositors or serious deterioration in asset quality. There were 3 mergers resulting in highly oligopolistic banking market – two leading banking groups possess more than 80% of total assets of the banking system. Third merger was more of a rescue operation, resulting in central bank ownership of the third largest bank (which was later sold to foreign strategic investor). It is clear, that turbulence in international markets forced consolidation of the banking sector; also in end 1998, Scandinavian banks entered as strategic owners of the two largest banking groups. Due to involvement of strategic investors and rapid consolidation, the banking sector became highly capitalised and liquid.

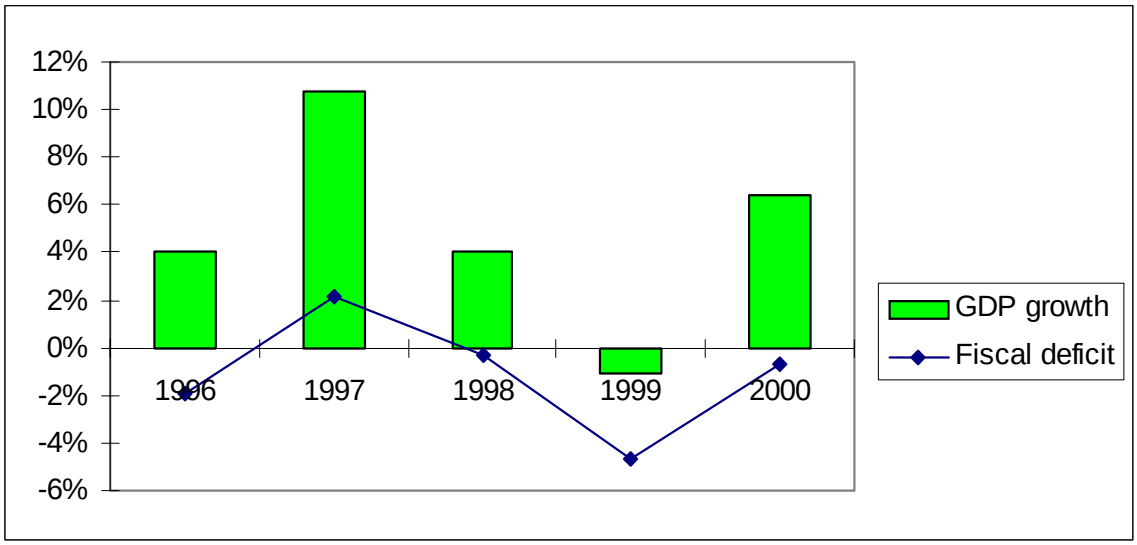
8. FISCAL POLICY STANCE (1997-2000)

Fiscal discipline is an essential prerequisite for the sustainability of the CBA. As was argued in the second chapter of this material, the CBA eliminates or strictly limits the monetary authorities ability to monetise fiscal deficits. But there is still a possibility that the government could run irresponsible fiscal policy. This in turn might undermine the stability of the economy and create political pressures for abandoning the CBA, there by increasing the risk of a currency crisis. Therefore the fiscal policy should be aimed at achieving a sustainable economic growth. This is underlined by the fact that under a CBA the central bank cannot implement an effective discretionary monetary policy – the primary policy tool for macroeconomic stabilization is fiscal policy.

Since 1995 the deteriorating current account deficit became the main concern of the fiscal policy and the government started to target fiscal deficits (**Figure 17**). By setting low ceilings

to fiscal deficits the government aimed at dampening domestic demand and keeping domestic economy form "overshooting". The role of fiscal policy became crucial in 1997- mid 1998. By spring 1997 current account deficits exceeded 14% of GDP and the domestic credit growth was over 70 % (y-o-y). Under these circumstances the government made a decision to raise the public savings as much as possible. This brought along a drastic change: in the first quarter of 1997 the general government budget was practically balanced, reaching a surplus of 5% of GDP in the third quarter and more than 2% of GDP in the fourth quarter. The overall annual surplus of over 2% of GDP was generated in the second half of the year. During the period of surplus-generating fiscal policy the Stabilisation Reserve Fund was established. Investing the funds of the Stabilisation Reserve Fund abroad served the aim of reducing domestic demand and sustaining foreign investor confidence in economic policy.

Figure 17
The dynamics of economic growth and fiscal deficits in 1996-2000



The tight fiscal policy continued in the first half of 1998, helping not only to stop deterioration but also decrease current account deficit. With large capital inflows, restrictive fiscal policy helped to maintain foreign investor confidence, avoided the overheating of economy, as well as the balance of payment crisis and reduced volatility of capital flows.

Economic decline in the 2nd half of 1998 and 1st half of 1999 had a negative impact on fiscal revenues: the general government accounts swung from a surplus of 2.2% of GDP at the end of June 1998 to a deficit of 0.2 % of GDP for 1998. The 1999 draft budget was elaborated before the full extent of the slowdown and was based on too optimistic growth expectations. In addition, the draft was worked out and passed at the Parliament in a pre-election period. As a result, deficit increased even further in 1999, reaching over 6% of GDP in the first half. The deficit was financed from the reserve built up during the years of fiscal surpluses.

After the elections, the new government prepared a supplementary budget, which cut expenditures by about 1.2% of GDP and was adopted by the Parliament in June 1999. As a result the public sector deficit decreased somewhat in the second half of 1999, for the year as

a whole the deficit was equal to 4,7 % of GDP. In 2000 the authorities aimed to curb the deficit and succeeded to lower it to 0,7 % of GDP.

Therefore it could be said that during the last 4 years fiscal policy has been used for stabilisation purposes – in 1997 and 1998 fiscal policy measures were implemented to avoid overheating of the economy, in 1999 it cushioned the decline in economic activity. Taking into account that fiscal policy is the main policy tool for macroeconomic stabilisation, the fiscal policy this far has supported the sustainability of the CBA. At the same time authorities have managed to keep public sector deficits manageable and have swiftly reacted to avoid large fiscal deficits.

9. THE FLEXIBILITY OF THE REAL SECTOR OF THE ESTONIAN ECONOMY

Given the strict rule based monetary framework, the real sector flexibility (especially labour market flexibility) is an important prerequisite for smooth adjustment to both external and internal shocks. As Estonia has set few restrictions and regulations to the labour market, this has created possibilities to develop a flexible wage and employment system.

Vesilind and Rell (2000) used the period 1996 – 1999 1st half to estimate the flexibility of the wage-setting in the economy. They found that the wages were quite flexible in the tradables sector of the economy – the changes in the productivity had a strong impact on the wages (Figure 18). In the sheltered sector of the economy the relationship between productivity and wages was less evident. In the public sector, however, the changes in the economic activity had a negligible effect on the wages of the public sector employees (Figure 19).

Figure 18
The real wage and productivity growth in tradeables sector in 1996-99

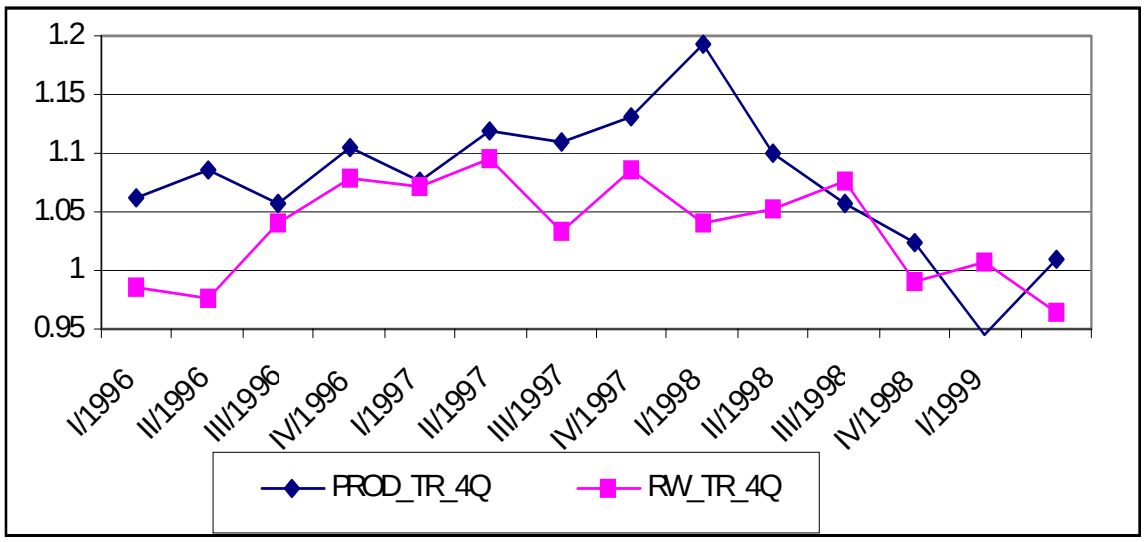
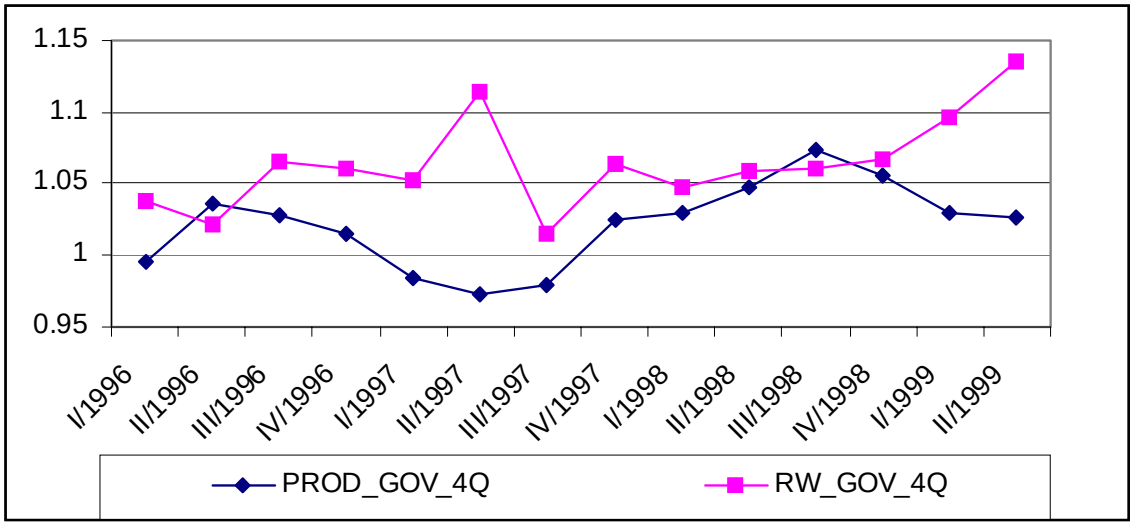


Figure 19
The real wage and productivity growth in public sector 1996-99



In addition to analysing directly the flexibility of the labour and goods markets, the flexibility of the Estonian economy can be assessed indirectly by looking at the deviations of the actual real effective exchange rate (REER) from the equilibrium level. By this way one can gain insight about the flexibility of the economy by looking whether the actual REER has deviated from the equilibrium level and how quickly has the actual REER returned to its equilibrium path. It could be said that the smaller the deviations are and the quicker the return of the actual REER to its equilibrium level is, the higher the flexibility of the economy.

From 1992 the real effective exchange rate of Estonian kroon has continued an appreciating trend. In particular in 1997 it showed a 5 % appreciation, a 17 % appreciation in 1998 (mainly due to the Russian crisis) and a 4 % depreciation in both 1999 and 2000 (due to low CPI growth and the weakening of the euro) (**Figure 20**). As the Estonian Kroon was clearly undervalued in the first years after the monetary reform part of the appreciation is therefore just a normal path towards equilibrium, driven by the existing price differential with western partners. Calculations done in BoE (Filipozzi (2000)) suggests that in addition to the appreciation of the real effective exchange rate also its equilibrium level appreciated (**Figure 21**).[19] But the appreciation of the equilibrium REER has been slower than that of actual REER. For example in 1993 the misalignment (the difference between actual and equilibrium REER) decreased from ca 25 % in 1993 to 7-8 % right before the Russian crisis.

[19] In this estimation the equilibrium REER depended on the following variables: productivity differential between tradeables and nontradeables sectors, investment share, resource balance and nominal effective exchange rate.

Figure 20
The dynamics of REER in 1995-2000

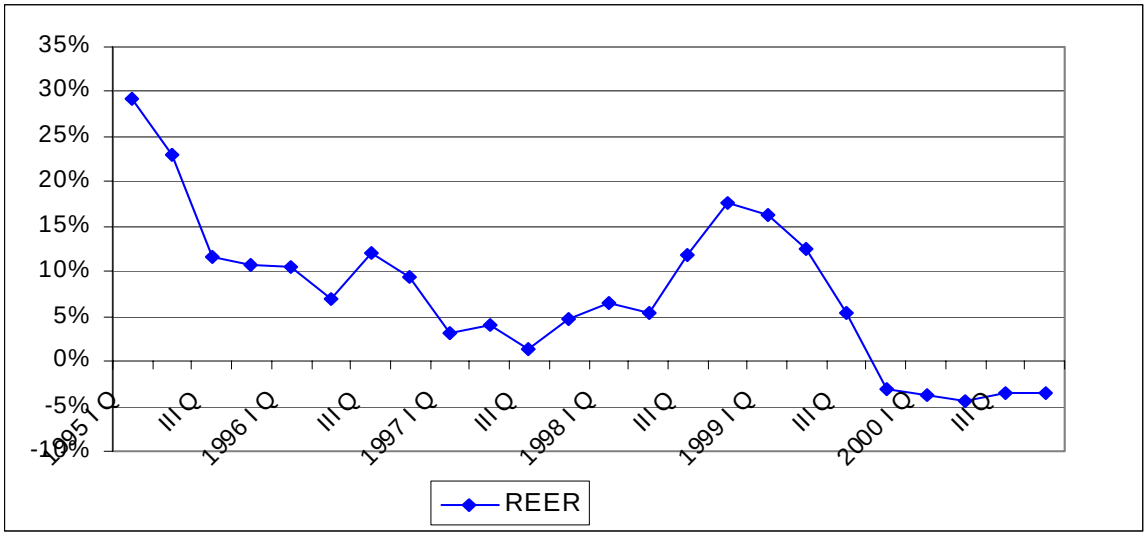
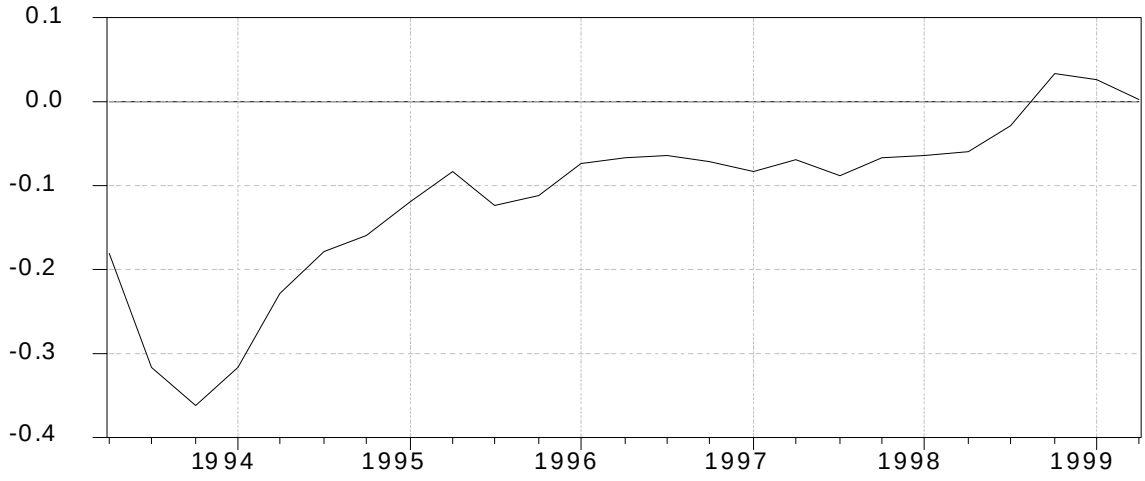


Figure 21
The difference between REER and equilibrium REER



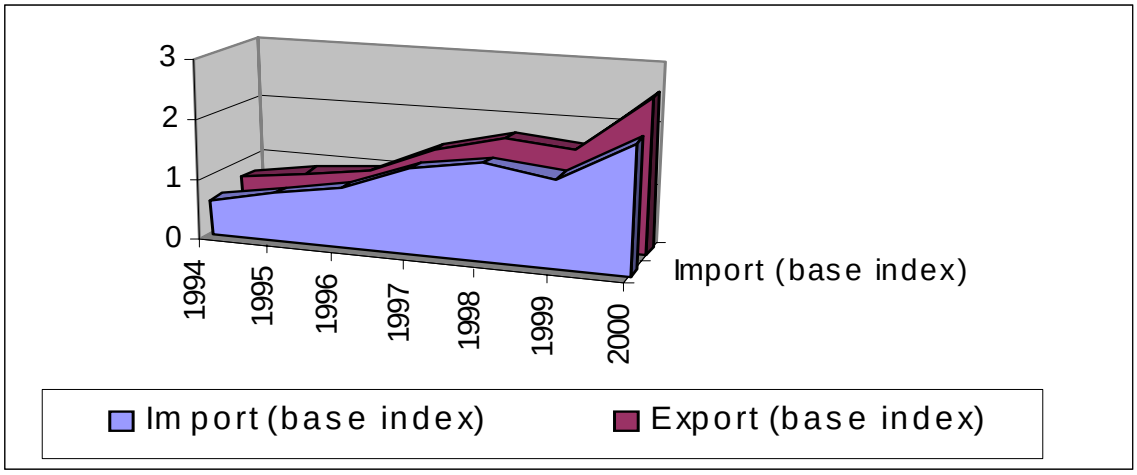
The Russian crisis brought about a sudden jump in REER – therefore the actual REER exceeded the equilibrium REER by appr. 5 %. But today the actual REER has fallen slightly below the equilibrium one.

From this we can conclude that in the period 1997-2000 the REER of EEK was not overvalued. This conclusion can be affected by different hypotheses on the equilibrium or sustainable value of fundamentals that influence the equilibrium REER but the main message of our estimation remains unchanged. The appreciation of real exchange rate goes together with an appreciation of its equilibrium value, and this did not damage seriously the external competitiveness of Estonian economy and cause a significant widening of current account

deficit. The fact that during the last 4 years the equilibrium real exchange rate and actual exchange rate have not differed significantly for a longer period indirectly demonstrates the flexibility of the economy which in turn increases the sustainability of the CBA.

The argument that the actual REER has not exceeded the equilibrium exchange rate level or put differently the actual REER has not been overvalued, is also evidenced by the trends in Estonian foreign trade. In 1998-2000 the annual growth in exports has every year exceeded the growth rate in imports – during that period the average annual growth rate of exports was 23 %, the corresponding figure for imports was 15 % (**Figure 22**). Therefore it could be argued that these foreign trade developments indicate that the continual real appreciation of the REER has not negatively affected Estonian competitiveness.

Figure 22
The export and import growth in 1994-2000



As it was said, the Russian crisis (in the 3rd quarter of 1998) caused the actual REER to appreciate significantly and exceed the equilibrium level. According to the calculations by Filipozzi (2000), the actual REER returned to its equilibrium level already in the second quarter of 1999. In addition to the flexibility in the labour market, this was supported by the rapid reorientation of Estonian trade from CIS markets to Western – Europe. In 1997 the share of Estonian goods exports to Russia amounted to 14 %, two years later (in 1999) it had decreased to only 5 %. During the same period the share of exports to EU increased from 58 % in 1997 to 70 % in 1999. In addition to the increase of the share of Estonian exports to Western Europe, its growth was also strong (27 % in 1998 and 6 % in 1999). Together with the rapid reorientation of Estonian trade, there were also significant changes in the structure of the manufacturing and commodity structure of the exports. As a result of the Russian crisis the importance of the food–processing industry declined considerably; at the same against the background of overall decline there was fast growth in manufacture of machinery and equipment. These trends brought along also changes in the structure of foreign trade – the share of foodstuffs in exports decreased from 16 % in the 1st half of 1998 to 6 % in the 1st half of 2000; the share of machinery and equipment increased during this period from 19 % to

33%. This rapid reorientation of trade and changes in the structure of the economy therefore points to the flexibility of the economy.

10. COMPATIBILITY OF THE ESTONIAN CBA WITH EMU AND ERM 2

The process of acquiring the full participation in EMU can be divided into three distinct stages:

- Estonia's economic and monetary policy preparations to accede to the European Union (from an applicant country to full EU membership)
- Estonia as a European Union Member State: period from the accession to the European Union to joining the euro area;
- Estonia joins the euro area: Estonia will participate in the formulation and implementation of the EU monetary policy (ie the central bank will implement ECB monetary policy guidelines and manage the circulation of the cash and account money in euros)

Estonia's official position is the maintenance of Estonia's currency board and fixed exchange rate peg until the full participation in EMU, inter alia, during Estonia's participation in the exchange rate mechanism (ERM 2, the standard fluctuation band 0 %).

The main reasons for maintaining CBA arrangement can be divided into two groups. First, Estonian economy has prerequisites for a successful CBA: quite flexible labour and goods markets, resilient financial sector and sustainable fiscal policy. Secondly, the Bank of Estonia wishes to avoid possible economic costs (increased uncertainty that might lower investments, reduced policy transparency and discipline and high exchange rate fluctuations) associated with a move from a CBA to a more flexible exchange rate arrangement.

Currently also the official position of the ECB and (un)official position of the IMF are similar to that of the Bank of Estonia – both the ECB and IMF have acknowledged that there are no fundamental reasons against maintaining CBA until the full participation in EMU.

According to the official position of the ECB (2000) euro-based currency board arrangements cannot be regarded as an acceptable substitute for participation in ERM II, but may in some circumstances constitute an appropriate unilateral commitment undertaking enhancing the commitment to exchange rate stability deriving from participation in ERM II. It should be emphasised that their unilateral character implies that they would not impose additional obligations on the ECB, besides those deriving from the ERM II resolution.

ECB has noted that there do not seem to be fundamental reasons that would suggest that CBAs might be counterproductive in the run up to accession, provided some preconditions are met. Notably among these are: sufficient international reserves to back up the CBA, a strong commitment to fiscal discipline, a sound financial system with proper regulation and supervision, and goods and labour markets with flexible prices and wages. While the nominal exchange rate is fixed, other prices adjust to keep the real exchange rate at an appropriate

level. CBAs have also reinforced candidate countries prudent attitude towards fiscal policy by forbidding the central bank to monetise fiscal deficits.

ECB has argued that CBAs are a proper policy choice for countries where a fixed exchange rate system is deemed appropriate, such as small, open economies with flexible input and output markets. The choice of anchor is most important, as the anchor currency must not only enjoy the confidence of markets, but also be the currency of an entity which the CBA economy has close economic and trade relations.

At the same time ECB has acknowledged that during the transition and catching-up period, there are factors tending to produce an appreciation of the real exchange rate. Among these are price liberalisation, the Balassa-Samuelson effect, and implementation of community acquis having an impact on prices and price convergence to the EU. Under currency boards, there is no trade-off between prices and exchange rates, hence a nominal appreciation could not counter these factors, and there will be some resulting inflation, higher than EU-average. The ECB has concluded that this real appreciation should not necessaritly have a negative impact on competitiveness because there are still economy-wide productivity gains to be achieved in transition economies, and there is a large scope for improvement in non-price competitiveness.

In addition to ECB IMF (see Keller (2000), Gulde, Kähkonen, Keller (2000)) has also endorsed the view that CBA is compatible with EMU an ERM 2 mechanism. Still one has to keep in mind this is not an official position of the IMF.

Keller(2000) has found that ECB decision that a euro-pegged CBA will be permitted under ERM2 on a case-by-case basis provided that agreement is reached on the central rate vis-à-vis the euro is a most welcome decision as there does not appear to exist a solid economic argument against maintaining a well functioning CBA under ERM2. However, Balassa-Samuelson effects, or other reasons for equilibrium real exchange rate appreciation, may make it difficult for a country with a CBA to meet inflation convergence criteria as now defined. Rough calculations suggest that the Balassa-Samuelson effect is perhaps equivalent to slightly more than the 1½ percentage point inflation margin allowed under the Maastricht criteria. However, this would probably be less of a problem for countries using the wide band of ERM2 as they could in principle allow their nominal exchange rates to appreciate. In the past (and most recently in the case of Greece) the EU has also deemed revaluations of central rates within the ERM to be consistent with the convergence process. And as also recently demonstrated, strategic tax cuts can help meet the Maastricht inflation target. There remains also the question whether it would not be appropriate to redefine the Maastricht criteria, so as to take account, inter alia, of the trend of real appreciation in the CEEC transition countries. It is clear that their circumstances differ from those countries that became the original euro-area members.

The above-mentioned authors have argued that the success of the Estonian currency board arrangement in weathering severe crises—prompted by banking failures (1992–1993), the emerging markets crisis (1997), and the Russia crisis (1998)—has reinforced the authorities' commitment to maintain the existing arrangement through EU accession and ERM2. This should not be problematic for Estonia. First, the CBA enjoys considerable credibility, which

should reduce convergence play. While in the most recent crises (1997 and 1998), short-term domestic interest rates rose rapidly from about 5–6 percent to over 15 percent, they unwound relatively quickly and are currently at historically low and close to euro area levels. Second, under the discipline of the CBA, the authorities have transformed their economy: in particular, the banking system has been consolidated, supervision strengthened and labor markets are quite flexible. Third, a very low level of public sector debt provides room for fiscal policy flexibility.

Keller (2000) has also concluded that the economic justification for allowing a CBA in ERM2 appears strong. With unfettered capital flows, the appropriateness of the exchange rate parity can be inferred indirectly by the size of interest differentials and the durability of export and GDP growth. And provided that prices and wages are sufficiently flexible, real exchange rate flexibility can still be achieved under a CBA. Moreover, moving from a CBA to a more flexible exchange regime is unlikely to provide a clear indication about the long-term equilibrium exchange rate—if we look, for example, at the exchange rates between the euro and the U.S. dollar—and could entail significant economic costs. During an intermediate period with a more flexible exchange rate regime, the exchange rate could be expected to fluctuate significantly as market participants speculate about the rate for euro-zone entry. In addition, abandoning a well-functioning and credible currency board could lead to reduced policy transparency and discipline, lower investment as a result of greater uncertainty, and the potential for households to shy away from local currency savings. Very importantly, there may be no obvious candidate for an alternative monetary policy framework since, following an extended period with a CBA, it might be difficult to identify a stable quantitative framework linking policy instruments to inflation, while the range of available central bank instruments might also be inadequate.

11. LEGAL AND INSTITUTIONAL ASPECTS OF JOINING EMU

According to the official position of Estonia, we are prepared to adopt and implement the acquis with respect to economic and monetary union in full on accession to the European Union. Estonia does not request any transitional period to the acquis in this chapter.

At the present moment Estonian legislation is not fully in compliance with the EU acquis of the EMU; however, the basics are in place: capital movements are largely liberalized; the central bank is independent from the Government; and Estonian fiscal policy aims at budget balance. The remaining harmonization of the respective legislation will be achieved by 2003, i.e. by the time we expect to join the EU (two key acts in this field are the Basic Budget Act and the Central Bank Act). This enables Estonia to participate in the EU as a non-euro area country. BoES accept the position of the EU that the EU and the euro area cannot be joined simultaneously, while Estonia will be granted the status of a member state with derogation upon accession to the EMU.

Estonia remains committed to align its policies with the EMU acquis and guarantees their effective implementation in accordance with the final objective of adopting the euro.

In addition to the harmonisation of the Estonian legislation there are also some institutional aspects that deserve attention in light of the accession and joining EMU. Namely there is a need for the reform of the monetary policy operational framework.

The ongoing reform of monetary operational framework is targeted to improvement of standing facilities which form the core of any CBA. In the medium term the joining of Euro area is expected in line with EU enlargement. This gives rise to a specific question – how should a CBA be merged into single currency area in operational terms? Which different scenarios can be under consideration? By and large, there seem to be at least two alternative ways to treat this issue:

- quick operational convergence with limited use of open market operations (as a CBA itself limits the scope for OMOs);
- stepwise operational convergence which means improvement of standing facilities and creation of conditions for full-scale operational framework with delayed implementation until joining the EMU.

As it is internationally recognized by today, a CBA can be regarded a suitable exchange rate arrangement for nominal and real convergence towards single currency area – i.e. Euro area – in case of Estonia. Therefore the second option (i.e stepwise operational convergence) has been chosen for the reform of the operational framework.

The ongoing reform of Estonian monetary policy operational framework has the following goals:

The first goal is the reorganisation of the required reserves' system. This means lowering the rate of required reserves with the central bank (in national currency) with simultaneous rise of required reserves in high-rated liquid foreign assets (in anchor currency). This reminds to some extent the liquidity requirement operational in Argentina. Here it is important to note that the ratio of the required reserve with the central banks was 13 % in 2000, that is significantly higher than in the eurozone (2 %).

The second major goal is the start of operational convergence towards EMU. One of the central issues here is the introduction of high-rated liquid foreign assets (in anchor currency) which will serve as a collateral for intra-day liquidity facility which is necessary for starting the RTGS. This can also mean the possibility for creating marginal lending facility, collateralized by foreign assets. In the longer run, extending the maturity of intra-day repo facility can be the way to converge to ECB type facilities (2 week repo, etc.). If the foreign assets in question are high-rated (no less AA for example) and euro denominated, this can be the way for operational convergence towards the Eurozone standards in the medium term without undermining the credibility of the CBA in the short-term.

The final goal is the maintenance of the credibility of the CBA in terms of financial independence. In terms of central bank expenditures this reform will not change much. As required reserves are remunerated in Estonia, the financial outcome of the reform depends on difference of earnings rate on central bank's foreign assets (currency board cover) and

required reserves remuneration rate. This feature also limits the possibilities of the central bank to offer market rate remuneration on required reserves, as the central bank must cover its risks as well.

12. ECONOMIC PROBLEMS RELATED TO EMU: THE CONFLICT BETWEEN ACHIEVING FULL NOMINAL AND REAL CONVERGENCE

It is widely accepted that the income and price level of a given country are positively related. As it was also briefly mentioned ECB (2000) has acknowledged this tendency and has argued that real appreciation (which under fixed exchange rate regimes reveals via inflation differential, say between Estonia and EU) should not necessarily have a negative impact on competitiveness.

Although there is consensus in theoretical literature of the positive correlation between income and price level, it is quite difficult to quantify this. According to a recent IMF (2000) study that looked at the relationship between income and price level convergence in Central European (CE) countries, a 1 percentage point growth differential between EU and CE will lead to 0.4 % price level increase in these accession countries. Kravis (1986) and Hansson and Helliwell (1990) have found that a 1 % increase in income level will cause a 0.6-0.9 and 0.4 % increase in price level, respectively.

A European Comparison Program (1996) has produced analogous results. It shows that there is relatively strong correlation between price and income convergence in countries with income levels below 60-70 % of the Austrian level, i.e in the group of countries Estonia belongs to. On the other hand, countries with income levels above 80 % of Austrian income do not have considerable positive correlation. Based on that one can conclude that the relationship between price and income convergence is stronger when the income level of a country is relatively low.

Simple calculations done in the Bank of Estonia show that a 1 % increase in income level of transition countries will lead to a 0.5-0.7 % increase in the price level of these countries. Assuming that the long-run (10-20 years) economic growth rate of Estonia is 5 % and that of the EU is 2 %, the inflation differential between Estonia and EU would be approximately 2 percentage points. Naturally the inflation rate of a transition economy is strongly influenced by other factors specific to transition economies (price liberalisation, the influence of adopting community acquis on prices) as well as usual supply- and demand-side factors. For example the recession Estonia endured in 1999 caused the price differential between Estonia and EU to narrow to less than 1 percentage points. On the other hand, the strong rebound in 2000 and 2001 with the impact of the weakening of the euro will probably result in a widening of this inflation differential (to about 3 percentage points in 2001).

The relationship between price and income convergence indicates that in the next 10-20 years the inflation differential between Estonia and EU will remain probably higher than stipulated in the Maastricht Treaty. Therefore it could be said that achieving full nominal (if it is interpreted as a strict fulfilment of Maastricht criteria) convergence might under specific

circumstances hinder the pace of real convergence. Hopefully it will be acknowledged that the inflation differential between an accession country with a fixed exchange rate regime and EU might not show the worsening competitiveness of the accession country. But the situation is just opposite – the higher inflation in accession country might be a response to increasing competitiveness in the latter.

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APPENDIX 1.

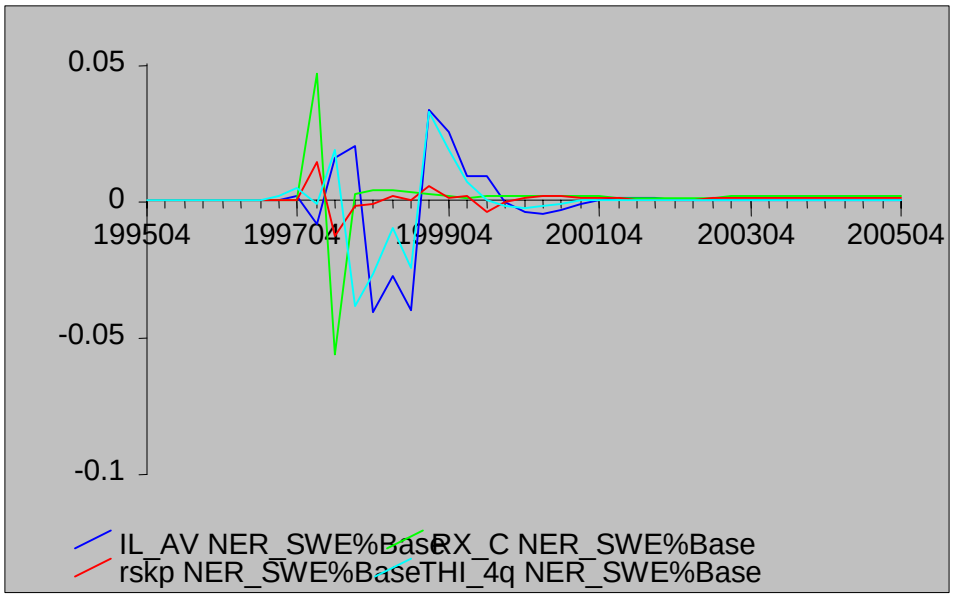
Measures taken by Eesti Pank (EP) aimed to improve the monetary policy operational framework in changing internal and external environment

Measure	Date	Underlying causes	Impact on markets
Standing facility of buying/selling foreign currency to commercial banks ("forex window")			
Abolishing the spread in EEK/DEM (since 1.01.99. EEK/EUR and other EMU currencies) transactions between EP and domestic credit institutions	1.07. 96	• Promote the effective functioning of the forex market and facilitating short-term interest arbitrage	• Bigger banks have established an effective infrastructure for such "broader liquidity management" as well as strengthened their foreign liquidity buffers • Transactions between EP and commercial banks have simplified • Role of the domestic inter-bank forex market has gradually weakened • Lowered interest rate margin between the Estonian kroon and the euro due to missing capital controls • For liquidity management purposes the "forex window" could not be viewed as an alternative to required reserves in very short term (T+0)
Reserve requirement			
Introducing the monthly averaging principle in meeting the reserve requirement	1.07.96	• Provide for banks more flexible buffer for the short-term liquidity management in order to limit liquidity risks and stabilise the inter-bank money market interest rates	• The use of daily minimum requirement by banks decreased substantially • Assessment of the impact of introducing the averaging on the interest rate stability is complicated because of significant structural changes in the banking sector over the past 3 years. However, the interest rate level has been stable in normal times
Lowering of the cash deductibility in meeting the reserve requirement	1.07.96 (40%) 1.07.97 (30%) 19.06.98 (20%)	• Decrease actual cash demand • Increase liquidity buffers • Decrease of security risks of cash holdings	• In 1996-1997 banks have taken into account cash deductibility ratio in their cash holdings • In 1998 the impact of the decrease of cash component was insignificant
Adding net liabilities of credit institutions vis-à-vis foreign banks to the reserve requirement calculation base	1.07.97	• Diminish structural deviations caused by the massive foreign capital inflow • Eliminate "unjustified advantages" of credit supply based on foreign capital inflow • Limit credit expansion • Increase liquidity buffers	• Strong signal to banks about the risks of foreign liabilities based credit expansion • Banks' circumventing the requirement in various ways (over reporting cycle, over channelling capital inflow via other parts of banking group) • The size of foreign reserves of banks grew; at the same time the quality of foreign assets remained ambiguous
Increase in the penalty interest rate for non-compliance with the reserve requirement to 20%	1.11.97	• Ensure the meeting of the reserve requirement in a situation where the market interest rates tend to grow higher than penalty interest rate set by EP	• Created the "ceiling" for the money market interest rates • The penalty interest rate has been too high and rigid at normal times
Raising the daily minimum reserve requirement to 4% of the reserve base	1.11.97	• Force the banks to keep intra-day kroon liquidity reserves due to instability stemming from Asian crisis • Provide EP with some flexibility in the case of potential liquidity crisis	• Because of the relatively high (monthly averaged) reserve requirement the daily requirement did not play any important role, particularly for bigger banks
Extending the reserve requirement base: including financial guarantees into reserve base	1.08.98	• Avoid circumventing of "net liabilities against foreign banks" clause in reserve requirements over channelling the capital inflow via other parts of financial groups • For strengthening the liquidity buffers of the monetary system	• The volume of effective reserve requirement increased significantly • Rapid adjustment of banks: the amount of banks' guarantees to financial institutions and non-resident credit institutions diminished

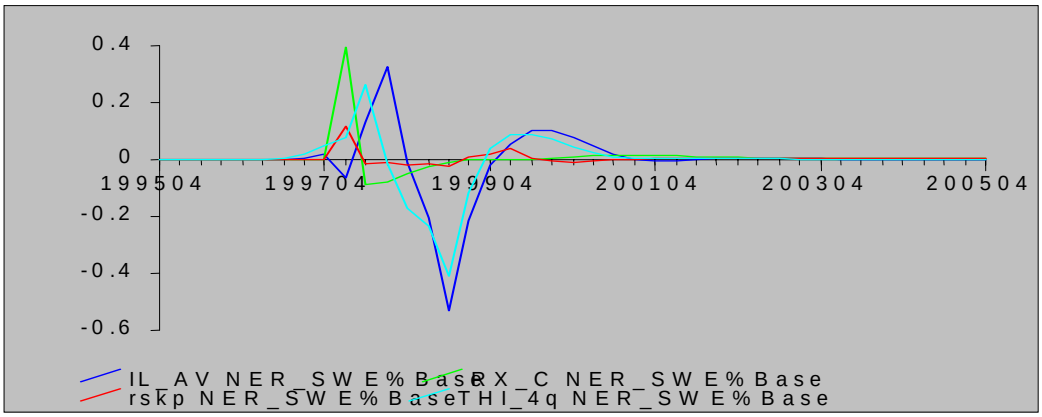
Remuneration of required reserves	1.07.99	• Decrease distortions on financial market by reducing negative impact of the uncompensated reserve requirement • Decrease advantages of other financial market players (not subject to reserve requirement) over credit institutions • Avoid reducing liquidity buffers, while reforming operational framework in a more market-oriented direction	• Decrease in the structural deviations • Signalling effect: continuation of restrictive monetary policy in the conditions of expansive fiscal policy • Partial compensation for the restrictive monetary policy
additional liquidity requirement (ALR)			
Establishing liquidity requirement	1.11.97	• Prevent banks from expanding their loan portfolios at the expense of liquidity buffers in the deteriorating financial environment • Enhance financial stability • Restrict credit expansion	• Considerable growth of banks' deposits held with EP • Most banks did not face any trouble meeting the requirement after the introducing it • Strong positive signal in the middle of Asian financial crisis
Maintaining the liquidity requirement	1998	• Maintain adequate liquidity buffers and secure financial stability (precautionary measures in order to avoid the contagious effects of the Russian financial crisis)	
	1999	• Continue restrictive monetary policy in the conditions of the expansive fiscal policy • Maintain adequate liquidity buffers for potential Y2K problems	
Penalty for non-compliance with additional liquidity requirement	1.11.97	• Ensure the meeting of ALR	• Overwhelmingly correct meeting of ALR • Case by case penalty rule may cause moral hazard • Liquidity buffer at EP is in practice not operational (due to harsh penalty measures), thereby hindering smooth liquidity management
standing deposit facility			
Establishing standing deposit facility	1.07.96	Increase banks' incentives to maintain liquidity in domestic currency	• Assessment of the impact on reserve demand ambiguous • The instrument has supported smooth functioning of the liquidity management
certificates of deposits of Eesti Pank			
Central bank CD auctions	19.03.93	• Increase the efficiency of inter-bank money market • Smooth seasonal fluctuations in the cash demand cycles • The creation of an instrument based on domestic eligible security was meant to encourage domestic inter-bank market (via providing potential collateral)	• Does not function at turbulent times (if market rates are significantly higher than the yield offered by the central bank) • Is a divergence form orthodox currency board as it changes money supply; hence the volumes have been kept very small and yield capped; hence its role diminished in line with deepening of financial intermediation

APPENDIX 2.

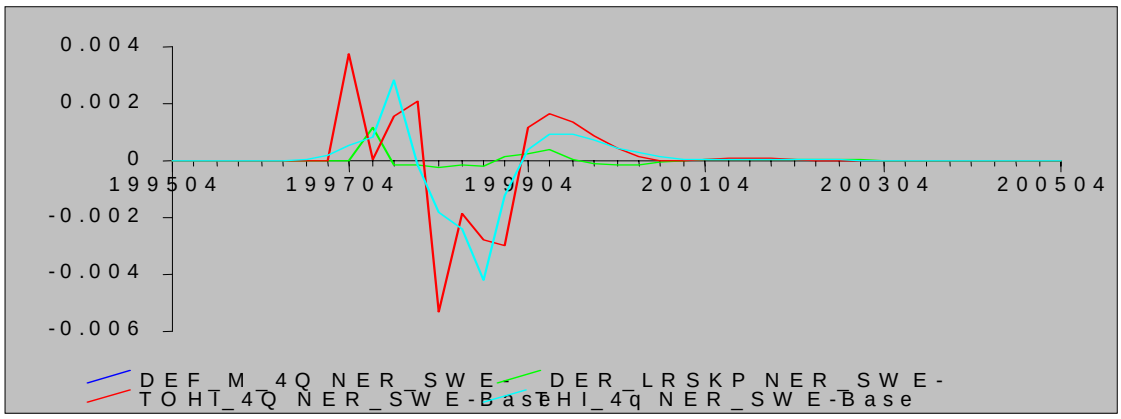
Nominal appreciation of Swedish Krona



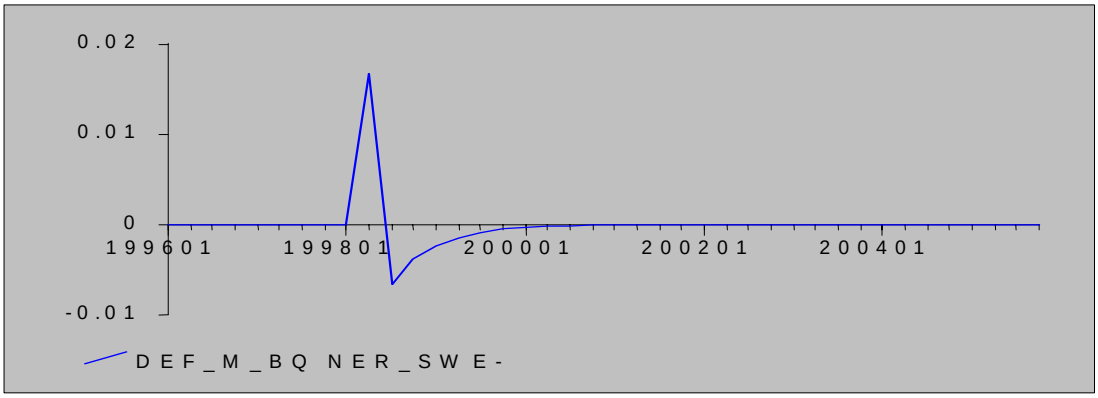
in %% from the baseline : RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI



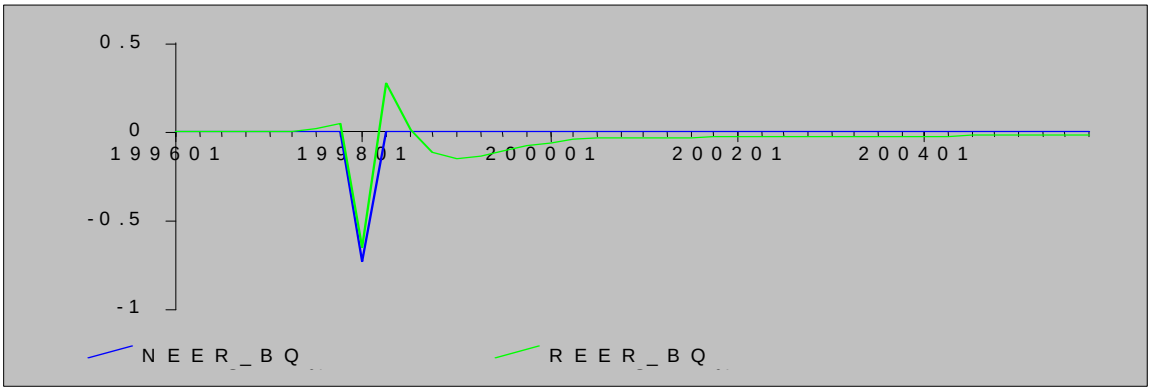
in %% from the baseline : RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI



as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI



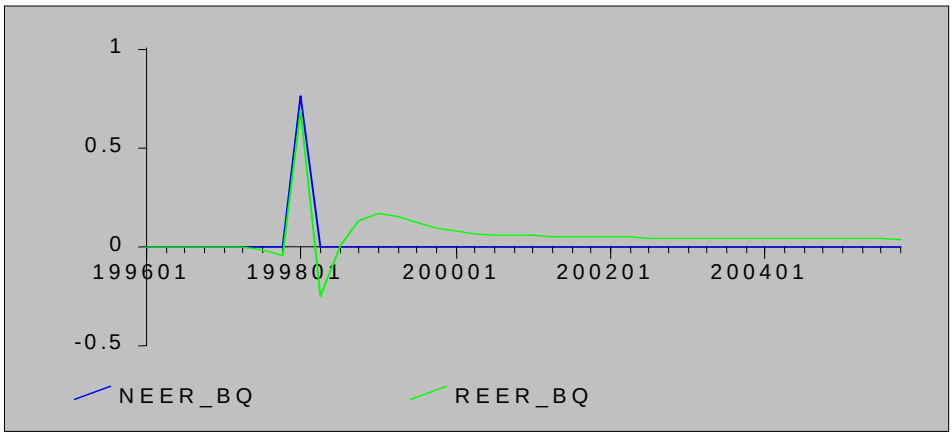
as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator



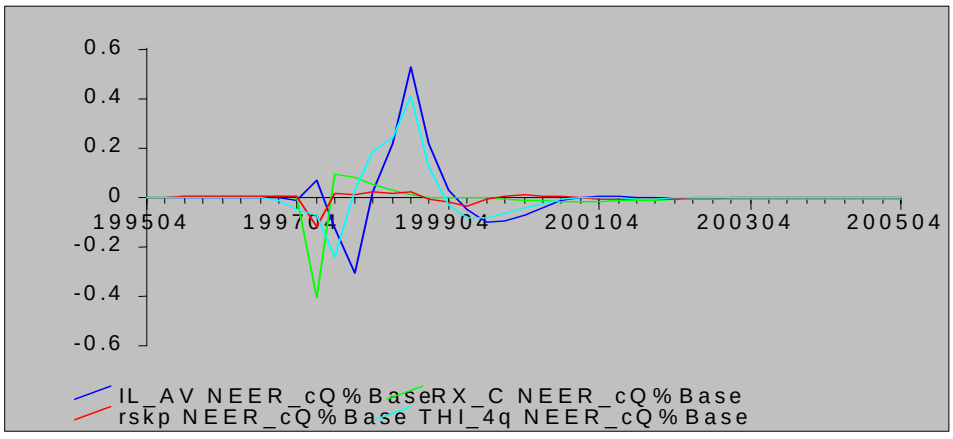
as absolute deviation from the baseline: REER_BQ is base index of real effective exchange rate of Estonian kroon, NEER _BQ is base index of nominal effective exchange rate of Estonian kroon.

APPENDIX 3.

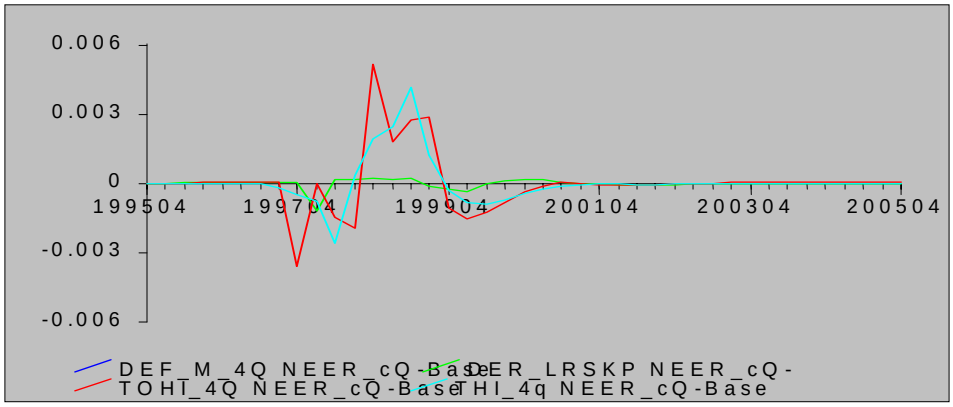
Appreciation of NEER



as absolute deviation from the baseline: REER_BQ is base index of real effective exchange rate of Estonian kroon, NEER _BQ is base index of nominal effective exchange rate of Estonian kroon.



in %% from the baseline : RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI

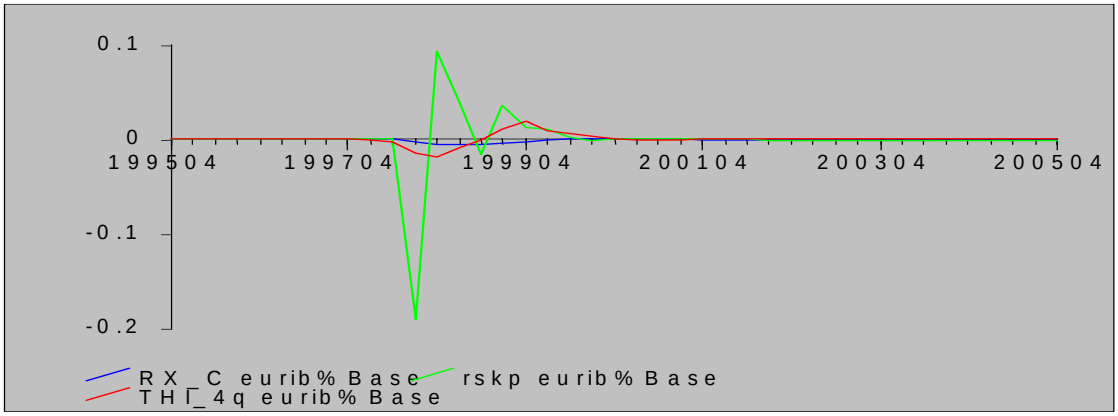


as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI

APPENDIX 4.

1% point increase of EURIBOR

Temporary



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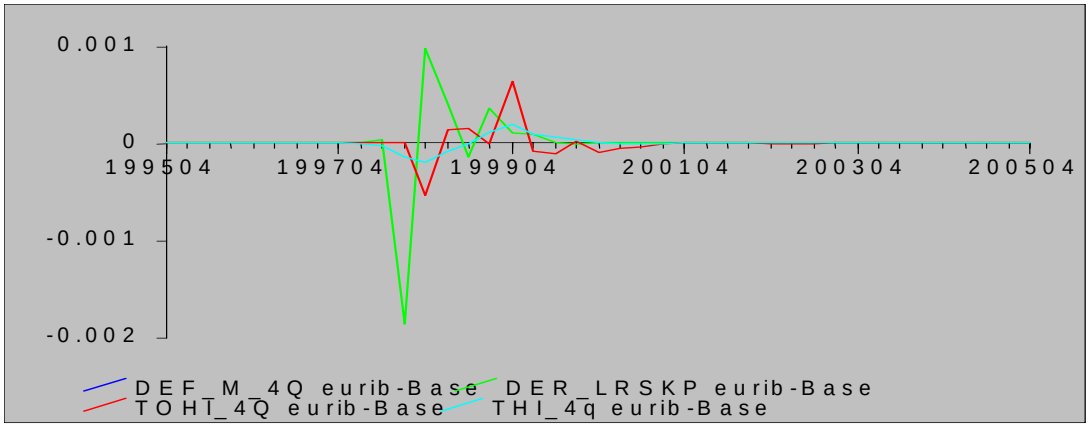
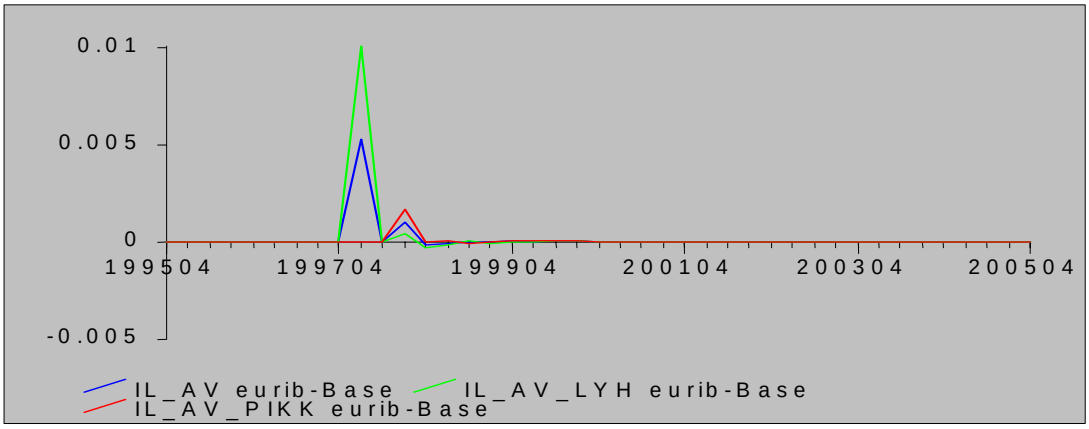
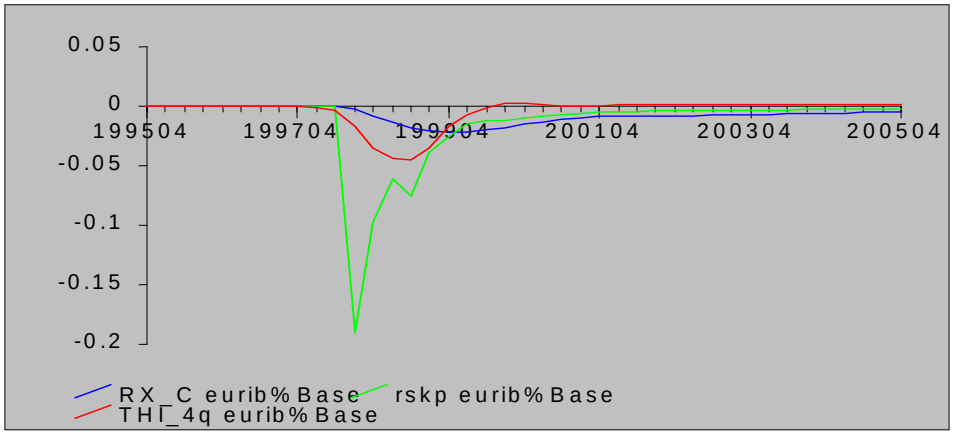


as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI

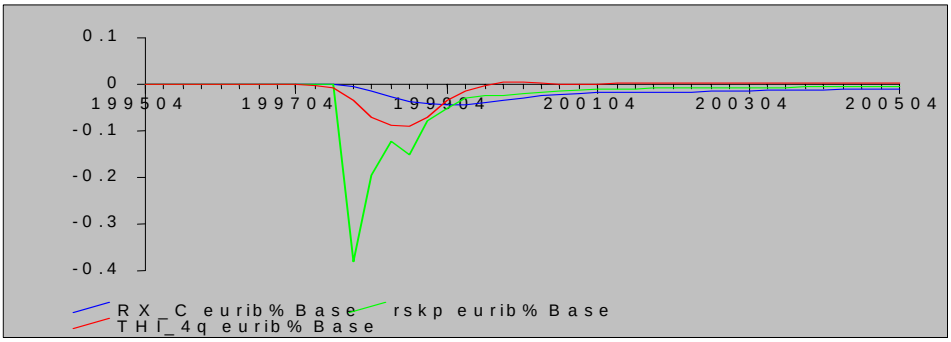


Permanent (+1%)

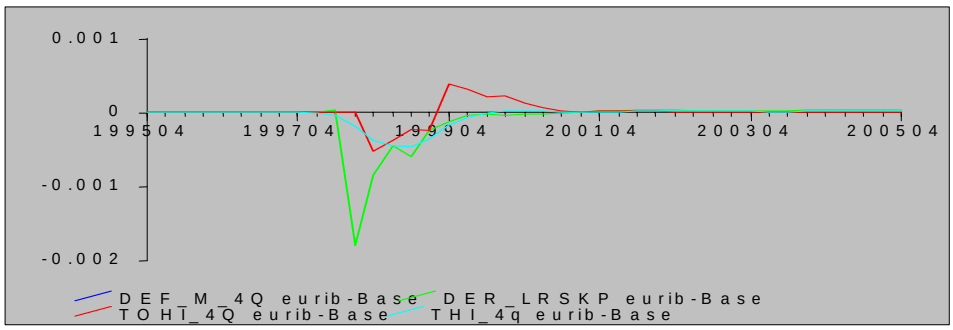


in %% from the baseline: RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI

Permanent (+2%)

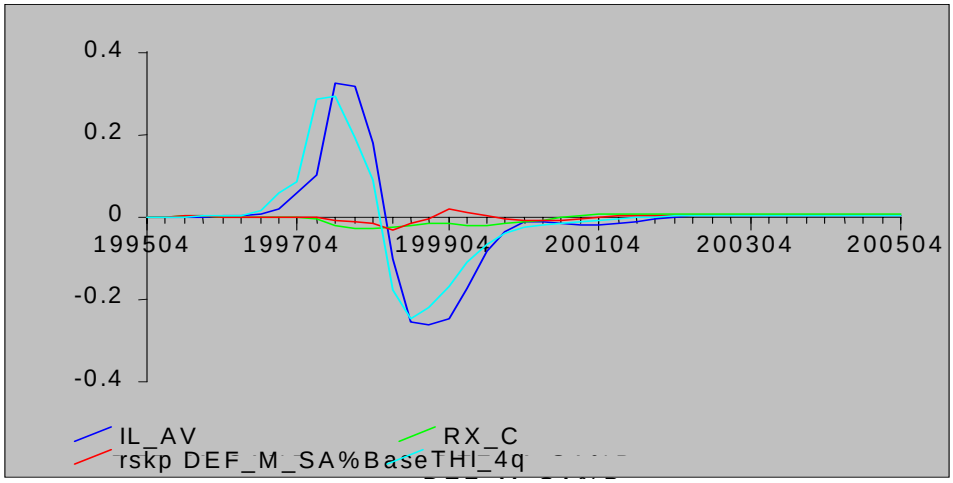


in %% from the baseline: RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI

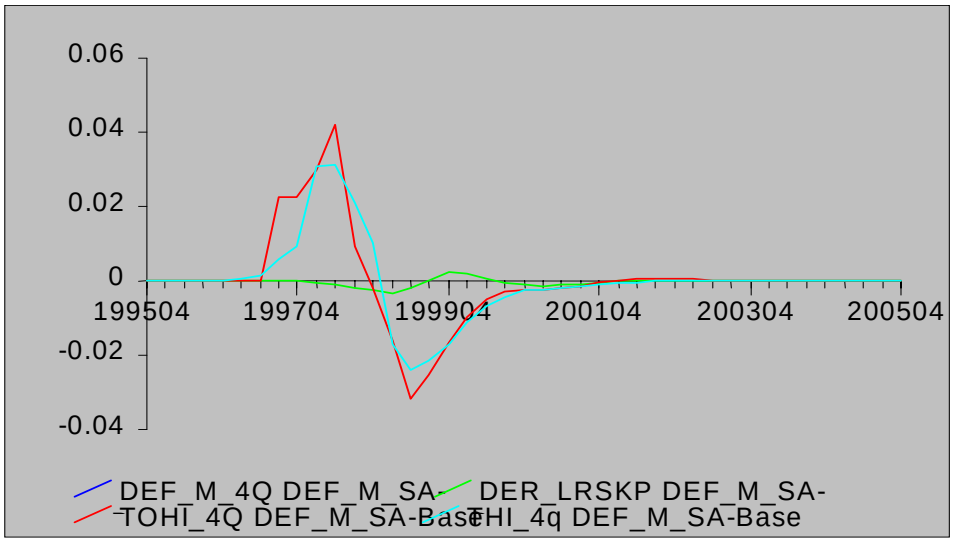


APPENDIX 5.

1%point increase of import prices



in %% from the baseline: RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI

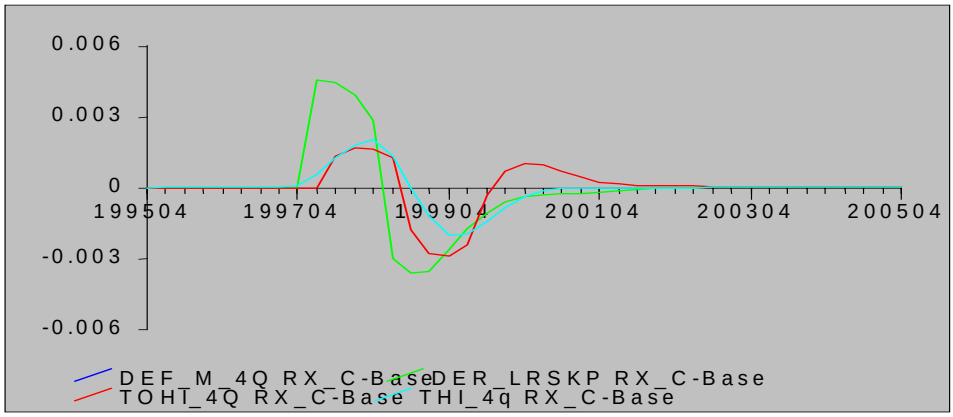


as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI

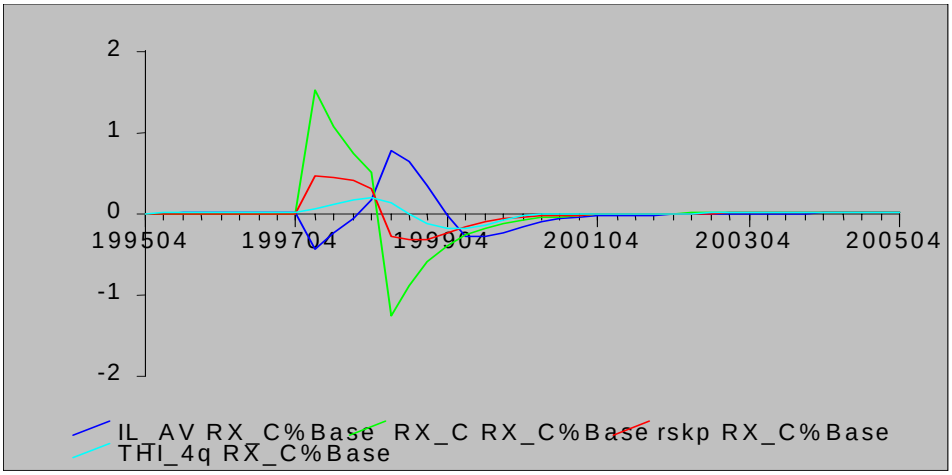
APPENDIX 6.

Increase of exports (+1,5%)

Temporary

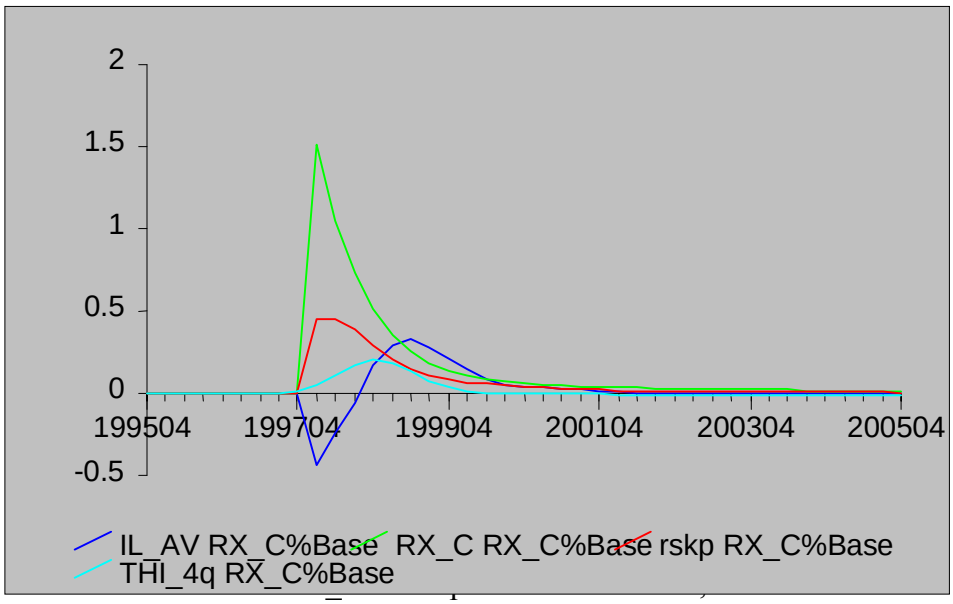


as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI

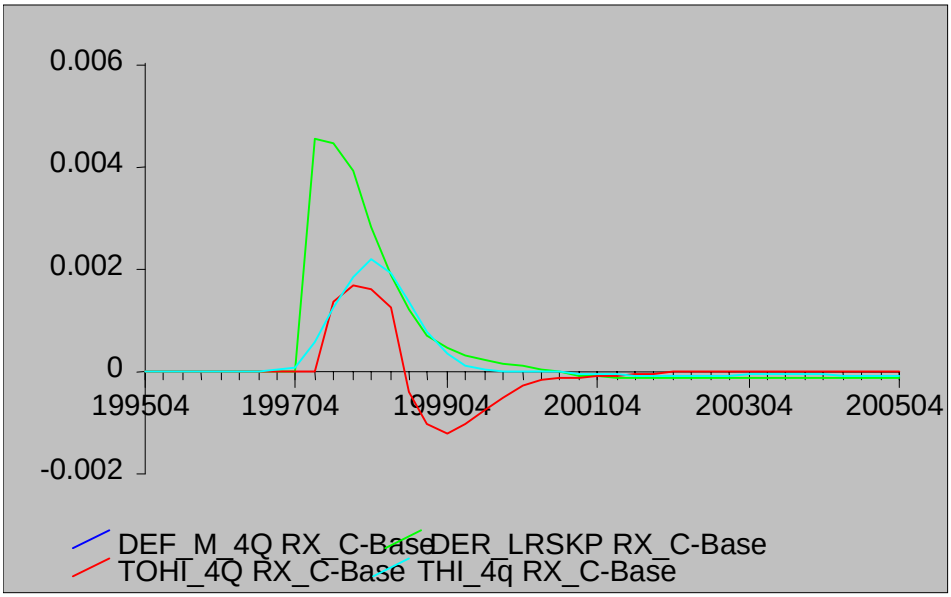


in %% from the baseline: RX_C is export in real terms, SKP is GDP in real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI

Permanent



in %% real terms, IL_AV_LYH is short lending rate, THI_4Q is annualized CPI



as absolute deviation from the baseline: DEF_M_4Q is annualized import deflator, DER_LRSKP is output gap, TOHI_4Q is annualized PPI, THI_4Q is annualized CPI