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A Note on Inflation under the Estonian Currency Board

In an earlier article (Sepp 1995), Estonian inflation history was discussed in a broad historical and institutional framework. This note concentrates on the more narrow topic of inflation under the currency board arrangement. The fact that Estonian inflation has continued in low-to-middle two-digit annual figures even after the currency board was adopted has given rise to speculation which – as this note shows – reflect a deficient understanding of the mechanisms involved.

Formally one can blame the administrative measures for the price rises in 1994. During 1994 the ceiling of tariffs for housing services was increased substantially. For example, rent restrictions were increased by a factor of 3.3. As a result the contribution of housing services in consumer price inflation amounted to 39 % in 1994. The other effective contributor to inflation was the administrative increase in the ceiling for public transport tariffs (16 % of price rise)[1].

However, the increase in tariff ceilings does not explain the essence of the inflation process in Estonia. Or, to phrase it another way, how was it possible that the rise in prices allowed by the relaxing of administrative restrictions actually resulted in inflation. One could argue that under a restrictive money supply, as is the case under the CB arrangement, the administrative changes do not have the power to affect actual processes.

The general reasons for inflation are discussed below in the context of the CB, and the possibilities for an adjustment of the double-digit inflation are also discussed. This begins with a look at the money supply.

[1] See Eesti (1995).

1 Money supply

In the case of the CB, the money supply is endogenous (Saavalainen 1994). It follows that the money supply is not excessive compared to demand. Due to the long-run equilibrium of money supply with the demand there is no basis for demand-pull inflation.

In connection with the supply and demand for money, there are possible short-run disequilibria in addition to the long-run equilibrium. In reality, the long-run equilibrium is realized through the short-run disequilibria, where the supply is either greater or less than the demand. This means that in the short-run the money supply may either promote or restrain inflation. We are interested here in whether a short-run excess supply may develop into a long-term engine of inflation or, in other words, whether a short-run money disequilibrium may be the reason for permanent long-run inflation.

The supply of money proceeds as a result of decisions made in the process of portfolio formation and allocation of resources.

The money supply starts from the solution of the currency substitution problem[2] (see Giovannini 1991, Calvo–Vegh 1992, Rodriguez 1992). If the fixed exchange rate is confident and steady, the extent of currency substitution will also be steady (Calvo 1991). It is assumed that the kroon's risk has not achieved the critical level where foreign currencies would be preferred in Estonia. In this case the kroon's supply is determined by the money demand. This is the reason for the long term balance between the supply and demand for money.

The narrow money supply (M1[3]) is determined by the preference of M1 in financial assets. Preference for M1 can be formulated as the ratio of M1 to the stock of foreign currency denominated liabilities[4]. If the money demand increases, then (all else being equal) part of the foreign currency liabilities will be exchanged for the domestic currency denominated assets (including M1). If the money demand decreases, the opposite happens and some of the domestic currency assets are exchanged for the foreign currency denominated assets.

Due to the dependence of the money supply on changes in foreign currency stocks under the CB arrangement, changes in money supply could be seen as being directly determined by the inflow of foreign capital and currency. If so, stopping the foreign currency inflow would also mean the end of money issue. Even worse, a net outflow of capital and currency would mean that the money supply must unconditionally fall (independently of the demand for money)[5].

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[2] Currency substitution means the replacement of domestic currency in its traditional roles by foreign currency.

[3] M1 is here taken to refer to currency outside the banks and current accounts, while quasi-money includes other deposits in domestic banks.

[4] The liabilities can be owned by legal persons, state bodies or individuals. The money supply process involves all of them, in spite of the fact that in Estonia direct access to the CB is the privilege of the commercial banks.

[5] The opposite case of massive capital inflow, a real cause of overheating in many developing countries, is dealt with in section 4.

The experience of the CB actually proves the absence of the above-mentioned problem. The reason lies in the fact that decisions on whether or not to exchange foreign currency denominated liabilities for domestic currency and, if so, how much to exchange cover not only the flows of the current period but the whole stock of liabilities[6]. In terms of the money supply it is not the current capital flows that are crucial but the elements of portfolio formation.

It is quite possible for the money supply to increase in the case of a net outflow of capital. Honohan (1994, p. 19) notes, in describing the Irish CB, that the fact that the total banking system always had external reserves far in excess of the note issue provided the necessary additional elasticity. Net capital outflows were absorbed without any shrinkage in the currency.

It seems clear that a decrease in foreign currency liabilities and revenues[7] could transmit a signal for decreasing the kroon's preference and lowering the demand for kroons[8].

Determinants of the M1 money supply include the currency risk[9], the country risk, transaction and precautionary demand for money as well as the opportunity cost of holding M1.

The transaction demand for money is determined by the price level and GDP. The effect of prices depends on the price elasticity of demand. When the demand for goods is inelastic with respect to prices (as for nontradables[10]), the increase in money demand is close to the price rise. In the case of price elasticity, the relation of money demand to the price level is less straightforward.

In Estonia the main domestic alternatives for M1 are still time and demand deposits. Therefore the actual opportunity cost of M1 is the interest rate of demand and time deposits. Actually the supply of deposits is inelastic with respect to interest rates (see Sepp 1995). Interest rates as opportunity costs are not therefore very influential.

The role of other financial assets is modest due to the initial state of the Estonian capital market[11]. So they are omitted in the treatment of portfolio formation as well as in the following treatment of adjustment process under the

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[6] Even the location of the liabilities is not important when capital and current account transactions are liberalized. The only possible problem can arise from the transaction costs.

[7] For example, due to the increase in net imports.

[8] For example, due to considerations of risk diversification in portfolio formation.

[9] Currency risk is the factor affecting the solution of the currency substitution problem. In line with the remark at the beginning of this section the currency substitution problem is regarded as irrelevant in Estonia.

[10] Demand for nontradables is price inelastic due to its composition. Demand for nontradables includes demand for housing services and primary goods.

[11] A Securities Market Act was adopted in 1993. In 1994 the new issue of bonds and stocks increased considerably, amounting to 684.5 million kroons. Yet the total volume of bonds and stocks (950 million kroons) remains insignificant (Eesti 1994). The market for stocks and bonds is in an embryonic state (Economic Transition 1994, p.23) also due to the lack of a secondary market. The only regularly traded securities are certificate deposits with 28 days maturity of Eesti Pank.

A certain accelerator of capital market growth is the selling of stocks of state-owned firms for privatization vouchers. This process started in the end of 1994.

CB arrangement.

Characteristic of the composition of M1 has been a permanent preference for cash (65–70 % of M1) during the post-(monetary)reform period.

Preference for cash depends on the wealth effect and the effect of changes in expected returns. In Estonia the latter is crucial, and particularly the fragile confidence in the banking sector and the considerable role of the underground economy.

The supply of quasi-money starts with a choice between depositing and the alternative financial investments. The next crucial question is whether to keep deposits abroad or in domestic banks. The choice is affected by the country risk and confidence towards the domestic banking sector.

The next problem is currency preference. The supply of quasi-money depends on the decision of the currency substitution problem for deposits and other elements of quasi-money. Exchange and currency risks are influential in solving this problem.

After all involved had made the above decisions the ratio of quasi-money supply to GDP was equal to 2–3 % in 1993[12] (data for 1994 are still incomplete). The low level of a quasi-money is crucial for the adjustment process under the Estonian CB. This shows that a quasi-money supply is not yet a viable alternative to M1.

[12] See details in Sepp (1995a).

2 Effect of deviations in money supply

It is assumed that the clearing of money supply and demand deviations take place within the domestic economy. In other words, fluctuations in the money supply do not affect money and capital inflows or outflows to or from the domestic economy.

Looking at the inflation in Estonia one has to consider the fact that the interest rate is not directly affected by the inflation rate (see Sepp 1995a). This means that inflation has little, if any, influence on the interest rate of deposits or the supply of deposits[13]. So the removal of fluctuations in the money supply from money demand takes place through changes in the prices and quantities of goods as well as through changes in M1 supply.

The question considered below is whether the short-run disequilibrium in money supply has the effect of accelerating/stopping inflation under the CB arrangement and conditions prevailing in Estonia.

The excess or shortage in the money supply is determined by the deviations in expectations of suppliers in the goods market and those involved in money demand. The suppliers set the price and volume of output according to the expectations of the money supply. Money supply takes place in accordance with the money demand, i.e. in accordance with expectations about the behaviour of suppliers in a price and quantity setting.

Let's assume that the excess money supply is caused by internal miscalculations:

a) suppliers of goods underestimate the money supply and set prices and quantities below the market clearing point, or
b) demanders of money overestimate the need for money.

The inflationary effect of excessive money supply depends on
a) price elasticity (of the goods supply);
b) the response of the money supply to excess money balances.

Where there is a rapid reaction on the part of the money supply via exchange of excess kroon balances for foreign currency, the inflationary effect is absent. If only the suppliers react, then the inflationary effect depends on the price elasticity of supply. In the worst case (consider price setting of nontradables), the excessive money supply will be completely covered by the price rise.

The most probable result of the excessive money supply is the reaction of both parties and the generation of a certain price rise.

On the other hand, a shortage of money supply does not lead to a fall in prices[14]. Suppliers react by changing quantities. The response of the money supply is to increase money balances to an equilibrium level. As the result of overshooting, there will be an excessive supply of money, leading in turn to a shortage of goods and demand pressure on prices.

[13] Typical of high inflation countries, inflation but not the interest rate serves as an opportunity cost of holding money and thus affects money demand and supply.

[14] Taking account of the actual resistence to downard movements in prices in Estonia.

Regarding the overall effect of deviations in the money supply the asymmetry of the process should be taken into account. Excess money supply favours inflation, while a shortage in the money supply does not have a deflationary effect. The consequence of deviations is inflationary pressure. The greater the influence of monopolies and the lower the price elasticity of supply, the harder the pressure.

In summary, it must be concluded that short-term deviations of the money supply from money demand do not lead in the short-run to quick adjustments of inflationary pressure. Inflationary pressure can be regulated by the long-term adjustment process.

3 Long-term adjustment

A typical cause of permanently high inflation in (fast) developing economies under a fixed exchange rate regime is (Balassa 1964, Samuelson 1964) the set of process[15] brought about by differentials in productivity growth and wage parity of tradables and nontradables[16].

A cause of inflation can also be inflationary pressure of deviations in the money supply (see previous section).

In addition, in the case of a CB and a highly liberal economic regime where the state intervention (including price control) is minimized, the Estonian economy suffers from permanent price pressure from monopolies[17].

The adjustment of price pressures under the CB arrangement crucially depends on transactions with the external sector.

Inflation leads to the appreciation of the kroon's real exchange rate as well as growth of exchange risks. The appreciation of the exchange rate reduces capital inflows and net export revenues. According to the Marshall–Lerner–Hirschmann condition, the trade balance improves following a real depreciation if the components of the trade balance possess sufficiently large exchange rate elasticities (Arora–Kumar 1994).

The real exchange rate of the kroon is appreciating. This has resulted from the domestic price rise under the fixed exchange rate. Appreciation of the real exchange rate favours imports as the relative price of imported goods is falling compared with domestic goods. Meanwhile the appreciation reduces exports due to decreases in profits and operating surplus.

The consequence of appreciation is a drop in net foreign currency revenues[18].

An appreciation in the real exchange rate favours deflationary processes not only by the increase of imports but also by the reduction of net trade revenues.

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[15] See Rebelo (1992).

[16] For details of the process in Estonia, see Sepp (1995).

[17] It is conditioned by the joint effect of the following factors:

1. Price setting of nontradables is monopolistic.
2. The elasticity of demand for nontradables in respect of the price is low (often it is actually inelastic).
3. The money supply is determined by the demand.

As the result of interaction one could envision permanent inflation in the following way (without considering the external sector, which will be included later):

Using monopolistic power the sheltered sector is permanently increasing prices for nontradables. As nontradables usually do not have substitutes and as nontradables include goods with high priority in consumption preferences, the money demand increases in accordance with the price rise (constant velocity of money is presumed).

As the money supply is determined by the demand, it will increase according to monopolistic price setting of nontradables. The process continues.

[18] The last conclusion holds when the prices of exports and imports remain stable. Otherwise, if in the case of stable import prices part of the domestic price rise is transformed into export prices, the terms of trade would improve and net export incomes would increase.

The growth of imports supports and develops competition on the domestic market, which is necessary to restrict monopolistic price setting.

Appreciation of the real exchange rate affects foreign direct investments as well. As appreciation with a fixed exchange rate and stable terms of trade reduces profitability, the incentives for foreigners to invest in Estonia fall. Foreign investors are interested in the export sector as the Estonian domestic market is small.

Therefore the probable result of appreciation is a decline in the net inflow of capital. However, in connection with the decrease of investments, the appreciation also has the effect of diminishing outflows. When direct investments fall, the import of means of production also falls[19]. It produces the increase of net export.

The reduction has further influenced the money supply through the choice of portfolio and allocation of financial assets. The reduction of capital and foreign currency inflow is a signal that limits the money supply (that is, conversation of foreign currency to kroons).

The restricting effect of the real exchange rate is compensated by the terms of trade effect in export revenues. As a result the effect of appreciation depends on the extent of transmission of domestic price rises into export prices.

Inflation also increases the exchange rate risk. In portfolio formation it is a factor that diminishes the demand/supply of kroons.

To summarize, it can be concluded that under the CB arrangement and the conditions peculiar to Estonia, the long-run adjustment processes reduce the rate of inflation by automatic regulation.

The adjustment process is accelerated by:

a) appreciation of the kroon's real exchange rate;
b) decrease of capital and net export revenue inflows;
c) increase of exchange risk;
d) decrease of the share of kroon balances (in cash as well as deposits) in the allocation of resources and in portfolios;
e) increase of imports, which increases the price elasticity of demand and restricts the extent of supply-side price setting;
f) currency substitution process.

The adjustment is decelerated by:

a) growth of the transaction demand for money[20] caused by the price rise;
b) rise in export prices;
c) independence of interest rate for deposits on inflation.

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[19] Foreign direct investments to Estonia are accompanied by a massive import of machinery and equipment. These form the largest import category. In 1994 their share reached almost one quarter of the total import value (in December, 24.2 %).

[20] As far as there is no currency substitution.

4 Capital inflow and inflation

According to a simplification rather popular in Estonia, endogenity under the CB arrangement means a direct link between the money supply with the total stock of foreign exchange (including resources of banking sector, corporate sector, etc.)[21]. This creates the view that the increase in reserves (and particularly the surge of capital inflow typical in Estonia) automatically and inevitably leads to an increase in the money supply. It follows that the problem of surges of capital inflow[22] must be even more acute under the CB than under other monetary rules. In Estonia capital inflow seems to be the main reason for the excess supply of money and increasing pressure on prices.

As we know from section 1, the relation between capital inflow and the money supply is not as straightforward as stated above. First of all, in the case of a CB endogenity means the determination of the money supply by the demand for money. Decisive for demand is the choice of portfolio and allocation of assets. The capital inflow and growth of foreign currency denominated liabilities could (but must not) be a factor increasing the demand for domestic currency. So the link between the money supply and foreign reserves is mediated by the demand for money.

Summarizing the 'supply' and 'demand' side of the CB, the money supply can be determined by two processes:
a) by factors affecting flows of foreign currency and capital;
b) by factors affecting the exchange of foreign currency to kroons.

Accordingly, reactions to the sequence of capital inflows could be divided in to two. Firstly, externally-made decisions concerning the inflow. Secondly, internal decisions about the exchange of foreign currency for kroons. The adjustment process therefore involves external and internal components.

Beginning with the simplification that a surge in capital inflow is a single shock causing the excess money supply, the adjustment described in sections 2 and 3 would be set in motion. Decisive in that adjustment would be the effect of appreciation on the real exchange rate of the kroon, which decreases the inflow of capital and foreign exchange. The latter, in turn, results in a decrease of the kroon's preference and a decline in the money supply.

Turning to the second option, where the capital inflow is permanent, under high inflation[23], this inflow shows that the kroon's appreciation has no effect and the adjustment process based on appreciation does not work.

In Estonia the main forms of capital inflow are foreign direct investments and

[21] Perhaps one reason for this misunderstanding is the principle of a CB according to which the issue of currency takes place with the increase of foreign reserves of the CB.

[22] See Schadler (1994,1994a), Schadler–Carkowitz–Bennett–Kahn (1993).

[23] It is presumed that inflow is not caused by 'pushing' factors such as a drop in the interest rate in international markets, etc. See Coping (1995).

official credits (Eesti Pank 1995)[24].

In principle, the creditworthiness of the country must be in accordance with its performance in applying stabilization and structural programme. Even if it is really so, the provision of official credits (mainly by international institutions on concessional terms) is independent of changes to the double-digit inflation. Therefore the supply of official credits is inelastic with regard to the changes in the rate inflation and can not serve as an adjustment factor.

In Estonia the main channel for foreign capital is the inflow of foreign direct investments. If foreign investments are a function of the dynamics of the real exchange rate (as was presumed above), then the adjustment of excess money supply and a slowing down of inflation are possible (according to the scheme in section 3). However, the low real exchange rate is still one of the incentives for foreign investors. The proximity of Estonia to the large Russian market and its gateway role in accessing Russia, along with other reasons which have little to do with the current state of the Estonian economy (including inflation), are factors which help to attract investment[25].

As with the official credits, the elasticity of supply of foreign direct investments is inflation inelastic. Therefore the foreign investment process can not perform as an efficient counterpart of the adjustment.

Those who perform deflationary adjustments are the agents whose decisions determine the supply of money. As was stated above, the main component of money demand is the demand for transaction needs. In Estonia the price setting of nontradables is monopolistic with price inelasticity in the demand for nontradables. Under such conditions the money supply/demand is elastic in terms of the (actual or expected) price rise. This is the reason for adjustment inefficiencies in the case of permanent capital inflows under the CB arrangement.

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[24] The rapid rise of exports also has a certain contribution to the increase of foreign currency revenues. Unfortunately in the case of massive direct investments accompanied by the import of production means (reducing net exports and worsening the trade deficit) it is complicated to determine the real role of exports in inflows of foreign exchange.

[25] See Hyvärinen–Borsos (1994).

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