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# Review of Economies in Transition

## Idäntalouksien katsauksia

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1995 • No. 2

19.4.1995

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Reprint in PDF format 2002

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ISSN 1235-7405  
Reprint in PDF format 2002

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The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland.

## Inflation in Estonia: the Effect of Transition<sup>1</sup>

This paper treats inflation in Estonia during a period of dramatic change. In the course of this period both the nature and features of inflation have changed considerably.

Starting in the mid-1980s, the development of the Estonian economy can be divided into two periods.

During the first period the command economy was transformed into a post-socialist economy. The latter period was marked by the abolition of centralization and direct control, which are typical of the command economy.

The difference between these periods is most clearly seen on the microeconomic level and is connected with the importance of market signals in determining the behaviour of economic agents. During the first period, i.e. from 1985 to 1992, nonmarket forces determined this behaviour. The market, or at least the initial conditions for a market were functioning, but market signals were not for the most part taken into account. In reality the command economy was reformed without a qualitative change in the economic system.

The second period, which began in 1992 in connection with the monetary reform, include the qualitative change from a command economy to a market economy. The reforms that have taken place during the second period are making market signals the main impetus for the economic agents' behaviour.

The nature of inflation has been different in the two periods. In the period of the post-socialist economy, inflation was a phenomenon that accompanied the liberalization of a command economy.

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<sup>1</sup> Based on the paper *Inflation in Estonia: the Cost of Development* for the conference on *Restructuring Financial Institutions in Emerging Market Economies* in Lohusalu, Estonia, October 17-18, 1994.

Discussions in the Unit for Eastern European Economies of the Bank of Finland were helpful in improving the paper. I am particularly grateful to Pekka Sutela and Kari Pekonen for valuable comments.

# 1 Inflation as a phenomenon accompanying the liberalization of a command economy

## 1.1 Price formation in a command economy

Due to the lack of markets, price setting in a planned economy is artificial. According to ideological explanations it was based on the law of value formulated by Marx.

One could, of course, doubt whether the Marxian scheme is the basis for correct pricing so that prices could effectively perform functions like allocation, distribution and measurement. It is well known that this approach virtually denies the role of demand in determining value. The idea of marginal utility is rejected because it is in conflict with the assumption that value is objectively determined by labour content, not by subjective valuation depending on the amount used. (Wilczynsky 1970 pp.128-129)

However, the Marxian postulates, in spite of the dominating status in centrally planned economies, do not exhaust the variety of theories and concepts for central planning. According to Bennett (1989, p.2) discussions by Wiser and Pareto may be regarded as the beginning of modern planning theory. Unfortunately developments in this field (see Bennett 1989) spanning nearly a century do not touch on the practical pricing procedures in the USSR, including Estonia. Perhaps the only real attempt at improving the pricing model was made when Marxian standard slogans were mixed with the input-output framework. To make the pricing model operational, the Marxian assumption by which every price consists of three basic components: material costs, wages and profits was translated into the input-output table. Unfortunately the practical outcome was failure. The price model based on the input-output table suffered from all the limitations associated with the assumptions behind that technique (see Brown 1977). In addition, the rationality of using the input-output framework was in their usefulness in solving optimization problems. Only in that case can dual solutions be treated as proxies for prices. Unfortunately the ultimate aim of practical planning was to achieve consistency rather than optimality (Bennett 1989, p.65).

Thus so the practical price formation remained arbitrary. It was based on the calculation of material costs in current prices, wage costs and amortization (depreciation) costs. To get the actual price, the value added in the form of mark-up was added. In the determination of mark-up intuition concerning the priority of products (branches of national economy) was decisive. Besides, price setting was determined by sociopolitical aims, of which price stability was crucial.

The elimination of price signals had a rather distortive effect on resource allocation. As under planned economy conditions, the allocation of resources and the major structural proportions, e.g. between consumption and accumulation, or between sectors etc. are determined directly and quantitatively.

Quantitative planning and centrally directed distribution of resources, from the aspect of efficiency, are not comparable with market regulation and do not give optimum results. As a result of price control and inefficient allocation of resources, a characteristic feature of the planned economy is the tendency to supply-sidedness

accompanied by an excess of aggregate demand<sup>2</sup> over supply at the official prices, and the consequent privileged and dominant position of producers and distributors over consumers.

## 1.2 Price liberalization

Normalization of the price system began in Estonia in 1988 with the Government decree on selling agricultural products and foodstuffs with so-called negotiated price. The first significant step towards price liberalization was taken with the adoption of the pricing law in December 1989. According to the law, state-established, coordinated and free prices were introduced. State-established prices were introduced for goods and services of state enterprises and joint stock companies.

State coordinated prices were applied to primary goods and services produced by monopolies. According to the law a monopoly was defined as a producer/supplier delivering half or more of the sales volume for a good or service in a county, town or local market.

Local administrations had the right to establish and co-ordinate prices of goods and services of municipal enterprises. In all other cases free prices were permitted.

In 1990 the Price Committee, the institution of the planned economy, was replaced by the Price Office. In the first half of the year price control of several consumer goods (fruit and vegetables, books, furniture) and production inputs (certain building materials) was abolished. The decontrol was accompanied administrative rise in wholesale and retail prices (postal services, footwear, furs, etc.) by 10-100 %.

In October 1990 prices of basic foodstuffs (bread, meat, milk etc.) were raised 80-200 % by administrative measures. Since, at the same time, minimum salaries and salaries of public sector as well as pensions were raised, subsidization of foodstuffs in the 1991 budget decreased by as much as 10 %.

In addition to retail prices the Government also began to deregulate wholesale prices.

By April 1991 the share of goods with fixed prices had decreased to 20 %, and the share of free price goods amounted to 40 %. The other 40 % had controlled prices.

By the end of 1991 approximately 10 % of consumer prices were still set by the state. By the end of 1992 price liberalization had practically ended.

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<sup>2</sup> The supply constraint and excess demand is also caused by (i) planning for high investment at the expense of current consumption to maintain high rates of economic growth; (ii) balancing with unduly low (or no) reserves; (iii) strictly controlled imports and priorities given to exports; (iv) irregularities in the supply of inputs (unfulfilled targets); (v) official reluctance to commit more resources to distribution (Wilczynsky, J. 1970 p.168).

### 1.3 Price liberalization and the rise in prices

As a rule, in the case of economies in transition, the result of price liberalization is at least galloping inflation and often hyperinflation. That was the case in Estonia as well.

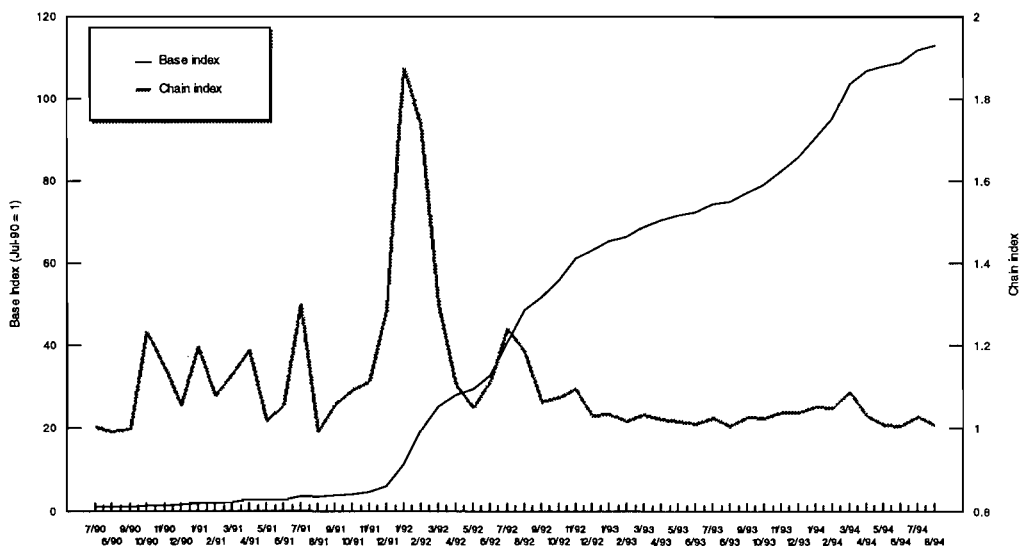
Due to their controlled and fixed levels and their structure, prices are distorted. A good example of this is the extremely low price of energy carriers and many other subsidized products, such as public utilities, rent etc.

Decontrol of prices brings a rise in the price level up to the market-clearing level (since demand in a planned economy exceeds supply). As a result, in the period of price liberalization (up to 1991) demand-pull inflation was dominant in Estonia.

As a matter of fact, the actual dynamics were more complicated than a simple rise in the price so as to balance demand and supply. The price dynamics were determined by the process of transition to a market economy in all its complexity. Thus, the price dynamics were caused by both supply factors (production decline in Estonia and decrease in final consumption imports) and demand factors (increase in money supply and change in the behaviour of consumers).

Since 1992, cost-push inflation has been dominant. This is because of the rise in prices of production inputs, due to both domestic monopolistic price formation and internationalization of the price level of the former Soviet Union. During this period the consumer price index (CPI) has been characterized by permanently accelerating growth which led to hyperinflation at the beginning of 1992. In January 1992 the CPI was up 629 %, in February 1015 % and in March 1169 %, on the corresponding months of the previous year (figure 1).

Figure 1. Consumer price index



Clearly the transition from command to market economy was a significant step forward. Unfortunately, the price liberalization necessary for this development meant high inflation. Thus, the effect of launching a market economy (ie the effect of development) was inflation.

## 2 Stabilization in a demand-driven economic environment

### 2.1 Change of the economic environment

By economic environment we mean below a system of economic regulation which with its stimuli, constraints etc. determines the behaviour of economic agents. Kornai (1979) distinguishes between resource-constrained and demand-constrained systems in talking about centrally planned and market economies. Close equivalents to resource-constrained and demand-constrained macroeconomic environments might be demand-driven and supply-driven economic environments. G.W.Kolodko (1989) has stressed that "a socialist economy, unlike the market economy of developed capitalism, is constrained by inadequate supply, not demand. This is the source of all bottlenecks."

Below, an economy is called demand-driven if the (potential) quantity supplied,  $S$ , exceeds the (potential) quantity demanded  $D$ :  $S > D$ . And an economy is supply-driven if  $D > S$ . In other words in a supply-driven economy supply determines aggregate output,  $Q$ , while in a demand-driven economy demand determines output.

Whether an economy is demand or supply-driven is not identical with whether it is in equilibrium or disequilibrium. Being demand-driven is a precondition for equilibrium. In a supply-driven economy prices and production volumes fluctuate at levels that are lower than the equilibrium levels. Nonetheless, according to Kornai (1992) the disequilibrium of markets need not signify the disequilibrium of the system (see also Lin 1992).

An economy can change from being supply-driven to being demand-driven in two ways: by means of a positive supply shock or/and a negative demand shock. As a rule, decisive factor in the change of the economic environment of a post-socialist country is a price shock accompanying the liberalization of the economy and the ensuing collapse of demand. The result of this in turn is a decrease in supply. According to Chu (1994), p.2) all European transition economies experienced a steep output decline during 1989-92. In 1991 alone, real GDP declined by some 8-16 percent.

One may, of course, assume a priori that the liberalization of pricing and ensuing price rise (shock) automatically creates a demand-driven economic environment. The experience of Eastern Europe does not yet confirm that belief. For example, recall the shortageflation in Poland in the 1980s (see Kolodko 1989 and Kolodko, MacMahon 1987).

To see whether the economic environment in Estonia has changed from supply to demand driven, we examined the period of price liberalization (1991 - summer 1992), which also includes the currency reform and the introduction of the Estonian kroon. From Sepp (1993) it followed that the economic environment changed during the above period. Until 1992 the Estonian economy was generally supply driven. Due to excess demand, supply (production, sales, etc.) determined the main characteristics of economic activity (volume, quality etc). The drop in demand was caused by the price shock at the beginning of 1992. However, there were several indications that the effect of the shock would be short term. The spring of 1992 was characterized by a cash shortage, that is, a restricted money supply. Yet after the



receipt of cash from Moscow the money supply increased rapidly. The expansionist policy produced monetary overhang, which compensated the previous price increases. The continuation of this development would have again led to massive excess demand for goods.

## 2.2 Monetary Reform and the New Economic Policy

In a demand driven economy there is a simple recipe for rising prices and inflation: restrictive economic policy which allows for neither excess money supply nor its transformation into demand pressure and rising in prices. Monetary reform paved the way for the introduction of such a policy.

Currency reform broke the inflationary cycle and brought about a balance between demand and supply. The restrictive monetary policy in combination with restrictions in incomes policy (stipulations on the growth of wages in the state sector) stopped the transfer of price rises into wages and the build-up of excess demand.

The effect of the currency reform can be divided into two parts;

1. the effect of the monetary reform as such
2. the effect of monetary policy (and in a broader sense economic policy) which started from the reform.

The effect of the reform manifests itself in the following:

- a) the currency reform and introduction of the kroon allowed Estonia to leave the rouble zone, i.e. to escape economic chaos (e.g. the hyperinflation in Russia);
- b) the introduction of the national currency made it possible to conduct Estonia-oriented monetary and economic policies;
- c) the reform liquidated monetary overhang;
- d) the reform changed the inflationary expectations of economic agents.

The currency reform also marked the beginning of the new economic policy.

Eesti Pank (Bank of Estonia) in its role as monetary authority can be considered a modification of the currency board<sup>3</sup>. With a currency board the money supply is entirely automatic and endogenous (domestic currency exchangeable at fixed exchange rates) into currencies that make up the reserves). A currency board means that the monetary system is changed from being one in which the central bank is a lender of first resort to one in which there is no lender of last resort whatever (Rostowsky, J. 1993, p.24)<sup>4</sup>.

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<sup>3</sup> See Bennett (1993), Lainela - Sutela (1994).

<sup>4</sup> As compared with the classical variant of the currency board the Bank of Estonia is more independent because of the possibility to regulate the money supply by changing one component of base money - the minimum reserve requirement.

Adam G.G. Bennett points out that in Estonia it was also decided to maintain the existing regime of reserve deposits. This was partly because there was no effective system of interbank clearing in place outside the central bank but also to ensure that banks held precautionary balances, over and

Stabilization in a demand driven economic environment has to eliminate two factors

- a) expectations of inflation
- b) monetary overhang.

Accomplishing of the latter task is (in the short run) relatively easy. Excess liquidity has to be liquidated. In the transition from one currency to another this is relatively easy.

In order to reach a permanent equilibrium, economic agents' inflation expectations have to be eliminated. Otherwise the effect of stabilization measures remains temporary. The change of expectations is possible as a result of a drastic change or shock. Thus, an effective way to achieve stabilization is by means of a shock.

The change of expectations must be grounded in a belief in the future of and the stability of the national currency. On the one hand this is connected with the achievement of credibility towards economic policy according to the following principle: whatever the situation, there will not be an excessive money growth of inflation. This task was accomplished through laws adopted before the monetary reform which prohibited monetarization of budget deficits and the granting of credit to commercial banks by Eesti Pank. The package of fiscal policy measures introduced and accompanied by the monetary reform ensured balance of budgetary system.

A decisive factor in influencing expectations, of course, was the introduction of the currency board arrangement under which the money supply is independent of subjective decisions.

Finally, in eliminating inflation, it is not any the less important which key anchor is chosen for the price system. According to M. Bruno (1993), pp.28-29) in a small open economy the relationship between the general price level and the exchange rate is considerably tighter than between money and prices, primarily because import prices play a large role in the input-output system. In this sense the regime introduced by the monetary reform in Estonia, i.e. the kroon being pegged to the German mark, was rational.

In the light of the above argument it seems that in carrying out a restrictive economic policy it is possible to force inflation to a normal level. This assumption seemed to be backed by the slowdown in the inflation rate. Conservative fiscal policy and a money supply based on the currency board arrangement reduced the rate of inflation. In 1993 inflation subsided, regardless of the rise in autumn and winter, considerably more slowly than predicted (in the course of the whole year 35 %). Monthly rate was the lowest in August - only 0,7 %<sup>5</sup>.

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above till money, against unexpected outflows. Such deposits, by virtue of their being liabilities of the Bank of Estonia and interchangeable into cash, would have to be backed in the same way as cash. The Estonian system is therefore a hybrid (Bennett, 1993;2).

<sup>5</sup> Sutela (1994, p.167) stressed that Estonia with other Baltic states had possibly the best post-communist stabilization outcome in - with exception of the war-torn countries - probably the worst circumstances.

### 3 Problem of Inflation

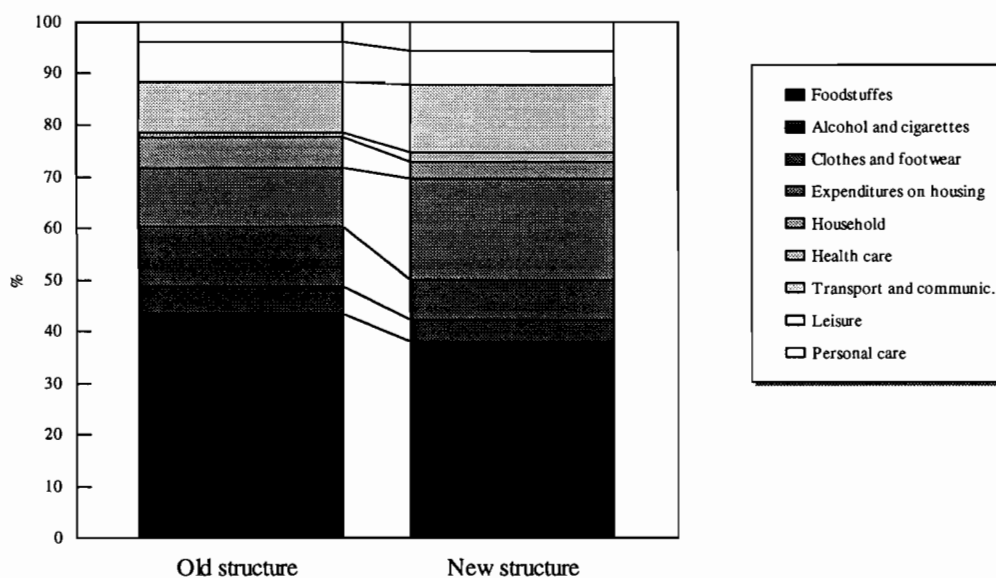
#### 3.1 Accelerating inflation

Unfortunately, at the end of 1993, despite of the continuation of restrictive monetary policy<sup>6</sup>, a new upward drift in the CPI began, continuing into the beginning of 1994. The rise in the CPI peaked in March at 8.9 %.

The rise in the official CPI was partly connected with the change in the CPI consumption basket. The new basket was introduced in January 1994.

The 1993 data from the family budget survey adjusted for predicted changes in 1994, such as the rise in rents and other subsidized services, were used as a basis for the new system of weights for the CPI. As a result the share of food in the new consumer basket decreased by 6 % and clothes and footwear by 4 %. On the other hand, the share of housing expenses increased by 9 %, and of transport and communication by 3 % (see Figure 2). In general the share of goods with higher price rises increased. Thus, the calculated CPI overstated the rise in consumer prices.

Figure 2. Old and new structures of the CPI consumer basket



<sup>6</sup> The money supply in Estonia is relatively small. In 1992 the ratio of M2 to GDP was 30.4 % in Estonia. In 1991 the same ratio in industrialized countries was between 51 % and 65 %, in developing countries 29 % to 46 %.

There is another problem connected with the consumer basket. In our rapidly changing world (which is the problem of all post-socialist economies), the fixed weighting system tends to distort the picture. A fixed structure or fixed system of weights does not enable one to take into consideration changes (some times drastic) in behaviour. The best example is housing expenses. Taking into account the rise of the rent etc., housing expenses should have increased substantially. However, nothing like that has occurred. According to the family budget survey, housing expenses have remained fairly constant. The increase in rent has caused an increase in debt. In other words, for an average family the cost of housing has not increased at the same pace as the respective tariffs have risen and as the respective index shows. More or less the same applies to public transport.

### 3.2 Inflation and ownership

Although the introduction of the new consumer basket plays a part in the growth of the CPI, it cannot by any means explain the continuation of inflation.

Above, the inflation and the reasons for it were examined mostly from the macroeconomic point of view. In reality the situation is more complicated because certain microeconomic factors are also important in inflation. In a post-socialist economy the behaviour of suppliers tends to become irrational. It finds expression, first of all, in price formation. In Estonia price setters exceeded the optimal levels of mark-up and prices in the simple-minded hope that a higher price would not affect the quantity demanded and so would result in higher profits (as under the inelastic demand which dominated in the supply-driven economy). It turned out, however, that it is not the case. Therefore, new tactics for price formation were developed – to compensate the decrease in the output ensuing from the anticipated decline in demand with a price rise.

Thus, turnover became the main argument for price setting and for the rise in prices in Estonia. Unfortunately this was not in accord with the normal logic, according to which an increase in turnover is a signal for raising prices (and vice versa). In our case the decrease in turnover did not signal pressure to lower prices but quite contrary. A decline in turnover became an important reason to raise prices.

On establishing a permanent state of stability, it is inevitable to rationalize the behaviour of economic agents. This is possible in the case of systematic reforms, particularly as a result of privatization. Only after privatization and the establishment and spread of entrepreneurship can it be expected that preconditions created by the change in the economic environment will be realized. The extension of entrepreneurship should also involve the state sector and particularly that part of the sector which after the privatization remains under state control, as the demonopolization (deconcentration) and commercialization of enterprise governance are inevitable.

Unfortunately the change in the form of ownership, which in itself is a sufficiently complicated task, is not enough to ensure the "right" kind of market regulation. The market economy is based not only on private ownership but to the same extent on adequate civil law. The essence of a market economy is the right and possibility of an individual to utilize/invest one's wealth with the aim of gaining

profit. The system works only if there exists a real danger of a loss of wealth if when one invests unwisely. Without the risk of losing, there is no incentive to make good economic decisions.

The use of (private) wealth is optimum only if there is legislation that stipulates the above-mentioned risk, i.e. the loss of wealth as a result of wrong decisions. Unfortunately the socialist legacy was not adequate to spawn such legislation. A characteristic example of this is the banking sector. Banks, by investing their resources (by granting loans), had to consider the danger of loss because the legislation did not guarantee the repayment the loan or the collateral. It was not always obligatory for the borrowers to take any dangers into consideration. The inadequacy of the legislation often enabled borrowers to evade the claims of the banks and to actually be responsible for making poor decisions in the use of other peoples' wealth.

In addition to a long-term structural reform there is another way by which it might be possible way to control inflation. A restrictive economic policy assuming irrational behaviour of on the part economic agents, will prevent inflation. At the same time, in introducing restrictive policy there lurks a danger that it will turn into an indirect engine of inflation.

Restrictive policy generally entails the risk of leading into economic recession. The irrational behaviour of suppliers has a negative effect on economic growth. It reduces demand, which through market transactions creates a new stimulus for a price rise. Therefore, it follows that a demand-driven economic environment along is not sufficient for starting economic growth in Estonia. Moreover, in spite of the existence of a demand-driven economy, the traditional demand-side remedy for recovering from recession and idle capacities - expansive economic policy - is neither effective nor sufficient under the circumstances prevailing in Estonia<sup>7</sup>.

The cycle of price rise and economic recession is not yet decisive in causing inflation. According to the economic growth index<sup>8</sup> of the Macroeconomic Research Department of Eesti Pank, GDP growth was 3 % in 1993, for 1994 the growth has been forecasted to be 4-5 %.

Thus, one can eliminate this possibility and assert that inflation is not directly connected with the irrational behaviour of economic agents.

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<sup>7</sup> An expansive monetary policy generates a positive demand shock and demand-pull inflation. Considering the price inelasticity of supply in Estonia, the suppliers will respond to the increase in demand with a price increase. The results of this action - diminishing demand and a decline in the rate of capacity use - have been described above.

Still, even if a short-term effect of the increase in demand is an increase in supply, this would not be sufficient from the perspective of long-term economic growth. In the present situation demand can be a factor in the use of production potential. The short-run improvement in capacity utilization, which could be caused by the increase of demand, does not lead to an increase in production potential. Without the latter, however, long-run economic growth is not possible (expansive economic policy in developing countries and the phases of economic chaos accompanying it are vividly described in Dornbusch and Edwards 1989).

<sup>8</sup> The growth index gives an approximation of the GDP growth rate. For a description of indicator, see Sepp 1994.

### 3.3 Inflation under the currency board arrangement

We have reached the conclusion that tight money leading to economic recession is not an inflationary factor.

The money supply is not excessive compared to demand because in case of a currency board supply is determined by demand. Thus, in the long-run money supply equals demand and there is no basis for demand-pull inflation<sup>9</sup>.

In connection with the supply and demand for money, there are, in addition to the long-run equilibrium, also possible short-run disequilibria. In reality, the long-run equilibrium is realized through the short-run disequilibria, where the supply is either greater or less than demand. This means that in the short-run the money supply may either promote or restrain inflation. We are interested 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 a permanent long-run inflation.

If supply exceeds demand, the result will be excess money supply and an acceleration of inflation. A natural sequel to this is a decline in the attractiveness of the kroon and an increase in the demand for foreign currency. Therefore, the money supply should decline to the equilibrium level. But as a result of overshooting, supply will drop below demand. The money supply is connected with changes in the level of foreign currency reserves. If the kroon supply exceeds the increase in foreign currency reserves, then only part of the reserve increase is converted into kroons. The other part flows out of the country. The main channel for this is an increase in commercial banks' foreign asset holdings. All in all, an automatic adjustment of the money supply takes place which does not allow the excess money supply to become a long-run inflationary factor<sup>10</sup>.

In the short run an excess money supply may be caused by large capital inflows.

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<sup>9</sup> But even in case of a demand-driven money supply there exists a certain inflationary risk. Factors of money demand in a country with high inflation are income/economic growth and (expectations of) inflation. In Estonia, and typically in developing countries (Shone 1989 p.139), the main demand for money is for transaction purposes. This is partly because of the almost nonexistent wealth effect in money demand but also due to a low interest rate. Since the real interest rate is negative, the opportunity cost of holding money is irrelevant.

The danger lies in the fact that due to inflation expectations, money demand increases and a vicious circle develops. Excessive money supply generates expectations of inflation which in turn is a factor in money demand etc. Fortunately, such a chain reaction has not yet occurred in Estonia.

The occurrence of the such a chain reaction is unlikely. Under the currency board arrangement the maximum money supply is limited the reserves of convertible foreign currency et al. This means that the vicious circle will be stopped when the increase in the demand for money exceeds the change of reserves. In this case the supply of money will be less than the demand. A shortage of money in turn has an anti-inflationary effect.

<sup>10</sup> The contrary situation, where the potential supply determined by the increase of the reserves is smaller than the demand, is also possible. In this case, in addition to the increase in reserves, a certain amount of the reserve stock is converted into the kroons. Thus, in this case, we also recognize self-regulation. The latter variant points to a certain danger in the currency board arrangement in the long-run. A problem arises if, due to insufficient convertible currency revenue, the money supply cannot satisfy the demand. For example, if the increase in reserves is zero, then the supply of base money is not increasing. Thus, with economic growth, the need for money must be satisfied by growth in the broader money aggregates. The latter, in turn, is dependent upon the level of development and efficiency of the banking sector.

In this sense a typical situation occurred at the beginning of 1994. At that time it was feared that the economy would drift into an inflationary cycle due to a growing money supply caused by the inflow of foreign currency. This fear gave rise to heated policy discussions. Those in favour of self-regulation were of the opinion that overheating due to a short-term excess money supply is an occasional and, one could say, self-regulating process. In this respect there would be no need for radical anti-inflationary measures.

The main argument of those supporting active anti-inflationary policy is the supposition that a rising CPI is first and foremost connected with an increasing money supply. The latter is caused by the functioning of the currency board, where money supply is automatic and depends on the increase of foreign exchange reserves. The key factor in the increase in foreign exchange reserves is the inflow of foreign capital (loans, investments, etc.). Combining the beginning and end of the above argument, it can be concluded that inflation is caused by an uncontrolled (by the economic authorities of Estonia) capital inflow. Thus, the excess currency issued as the result of the increase in capital inflow should be sterilized in order to restrain inflation.

However, the cause of inflation, as well as of other phenomena of overheating, can be less straightforward than this. According to Shadler (1993 and 1994) there is no danger of overheating if the inflow of foreign capital is caused by the country's increasing attractiveness to foreign investment, due primarily to economic policy changes, e.g. to the introduction of sound stabilization measures. In other words, the inflow is caused by internal factors and the increase in the money supply is absorbed by the domestic economy without any negative effects.

To some extent, this is the situation in Estonia where the increase of direct foreign investment has been remarkable. In addition to the above, external financing in Estonia has been done through other channels (foreign grants, official credits). In the latter case the determining factor in the inflow has been external in nature (decision made outside of Estonia). In that sense the conditions were similar to the situation at the end of 1980 and at the beginning of 1990 when decreases in interest rates in industrial countries caused capital to be channelled into the developing countries, which had higher interest rates. Experience shows (see Shadler (1993 and 1994) that the overheating effect occurs in countries where the inflow of foreign currency has been determined mainly by external factors. In this case the inflow can create a situation where the money supply exceeds the demand, i.e. exceeds the domestic absorption ability.

However, this is not always the case. When the capital inflow exceeds the domestic absorption ability, the inflow is accompanied by an equally intensive outflow of money from the country. This is the case when the money supply is endogenous and is driven by demand, as it is under the currency board arrangement. There is only one crucial precondition for the adjustment to be effective. Current and capital account transactions must have been liberalized. As both types of transaction are unrestricted in Estonia, the excessive foreign money outflow is not restricted. This is the reason for the short duration of adjustment, which in turn determines the efficiency of the process.

Regarding the problems described above concerning the money supply and inflation at the beginning of 1994, the economic policy measures were not taken in Estonia. Nevertheless inflation declined. This turned to be the best proof of the inflation-restraining automatic regulation. Thus, an excess money supply may temporarily cause inflation, but it is not a permanent and long-term factor in

inflation.

### 3.4 Inflation as a effect of economic development

If the money supply does not cause inflation, then what is the cause? One cause of the price rise is the fact that the kroon was introduced at an undervalued exchange rate in terms of purchasing power parity. The kroon exchange rates against the rouble and the German mark were equivalent to the respective market rates of the pre-reform period. According to Charemza, the free market demand for foreign currencies in transitional economies is composed of:

- 1) transactional demand, as foreign currencies provide access to goods not available domestically or for domestic currency;
- 2) speculative demand, in periods of substantial inflationary expectations;
- 3) substitutive demand, due to the persistent goods shortages, excess supply of domestic currency and to the fact that saving in domestic currencies was generally not attractive.

Because of its marginal nature, the free market exchange rate normally settled well above the rate based on the purchasing power parity. (Charemza 1992, p.3)

Thus, the reason for inflation is the appreciation of the kroon's real exchange rate toward the nominal rate.

The above-mentioned process is characteristic of economic development. I.B Kravis and his colleagues calculated the exchange rate deviation index (ERDI), which provides a gauge of the extent to which the exchange rate fails to measure purchasing power. According to Kravis the lower a country's real GDP per capita, the higher its ERDI tends to be (Kravis 1986, p.10). Kravis's conclusion can be restated in the following way: the higher the level of development of a country, the closer the ERDI is to unity and the closer the nominal exchange rate is to the real exchange rate.

Since the Estonian economy is developing, as is indicated by Eesti Pank's economic growth index, the real exchange rate has to appreciate toward the nominal rate.

There is another aspect to this. International experience proves (according to the results of the UN International Comparison Project) that the price level in a particular country corresponds to its level of development. In this way the price level tends to be lower in the developing countries than in the developed industrial countries. At the same time all goods are cheaper in the low-income countries, but the nontradables are cheaper by a larger margin (Kravis 1982, p.196). This is the case because services (an important part of nontradeables) in low-income countries are labour-intensive. Since the price equalizing tendencies of international trade operate weakly on nontradeables, they will be cheap in low-income countries and will help produce a low price level. (Kravis 1986, p.13)

If the price level in a country is connected with its level of development, then as a country develops its price level rises<sup>11</sup>. Since the Estonian economy is developing,

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<sup>11</sup> This process is described within the theoretical framework of economic convergence. See for instance Sala-i-Martin (1994), Ben-David (1994), Heliwell (1990), DeLong (1988).



we should expect a rise in prices.

Another issue is the speed of adjustment of the price level. According to the model presented in Kravis (1986, p.18) a 10 % increase in the index of relative GDP level<sup>12</sup> is associated with a 6–8.7 % increase<sup>13</sup> in the relative price level<sup>14</sup>. According to Hansson (1990, p.156) a 10 % rise in relative per capita income is associated with a 4 % appreciation of the real exchange rate.

A change in the relative price level is not exactly consumer price inflation. Yet such a change indicates something about the scale of the extra inflation that is accompanying the long-term economic development<sup>15</sup>. Even if we consider that under the same conditions the consumer price inflation is somewhat higher than the increase in the relative price level, the real exchange rate appreciation accompanying growth is not a sufficient explanation for the double-digit inflation seen in Estonia in 1993–1994, particularly if we take account that according to an optimistic estimation GDP growth in 1993 was 3 % and in 1994 it will be on the order of 5 %.

Yet the unexplained portion of inflation is associated with economic development. But the relation between the two is not as straightforward as that between the relative price and GDP levels. The development-produced double-digit inflation is connected with reorientation of the economy from East to West. Exports and imports are typical of the reorientation. The requirements for Estonian production (quality, design, efficiency etc.) in the international market are considerably higher than they used to be in the republics of the FSU. In spite of this Estonian exporters are expanding their presence in Western markets. This means they have managed to improve the quality and to meet the higher standards. Thus the Estonian economy has developed qualitatively in a sense of improving its export capability.

Economic development of this type is accompanied by an appreciation of the real exchange rate. The reason for this is the controlled and regulated price setting that prevailed in the republics of the FSU. Due the controlled nature of price formation, the price level for Estonia's key trade partners was low (as is typical of the command economy). Therefore the reorientation covered not only trade etc. but the price level as well. It meant an increase of prices to the international level and corresponding rise in foreign currency revenues.

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<sup>12</sup> The index of the relative price level reflects a country's nominal exchange-rate-converted GDP per capita relative to the U.S. GDP per capita.

<sup>13</sup> In case of growth from 30 % to 60 % of the relative GDP level and of openness of the economy from 15 % to 100 %. See the model and results in table 1.

<sup>14</sup> The relative price level is calculated as the index of nominal exchange-rate-converted GDP per capita to PPP-converted GDP per capita.

<sup>15</sup> The last statement does not conflict with the generally accepted understanding of the negative relationship between of high inflation and growth (for a comprehensive analysis, see Fischer 1993). Inflation accompanying the long-term economic development is too low to be treated as *high inflation* in the context of growth.

## 4 Inflation mechanism

In the long run inflation in Estonia is connected with the rise of the real exchange rate to the nominal rate which finds expression in the rise in prices accompanying economic development.

In order to examine the inflation mechanism it is useful to differentiate between tradables and nontradables. The principles of price formation are different in each case.

Tradables are outputs of the open (to international competition) sector. The open sector produces either

- a) for export (competing in international markets) or
- b) for the domestic market (competing with imports).

Producers in the open sector are price takers. Thus price formation for tradables is demand driven.

Nontradables are the outputs of the sheltered sector. Unlike the tradables, sheltered sector output does not face international competition (e.g. housing services). Therefore, the sheltered sector does not have price the restrictions that arise from external competition. The price formation is supply-driven and is based on the mark-up idea.

The rise in the price level takes place first among the tradables. The prices of exported goods are moving to international levels. This process depends on the increase in awareness and on the competitiveness of Estonian products. It is realized also by improvements in the quality, design and efficiency of Estonian goods.

Thus, the better known are Estonian exports and the better their quality, the higher the price of tradables and the higher the inflation.

Participation in the international markets creates, on one hand, wider revenue prospects for Estonian producers. At the same time it improves the possibility of raising foreign financing. Foreign investors are mainly interested in export production. Foreign financing means, directly or indirectly investment, the level of which is 100 USD per capita (in 1993).

Foreign investments contribute to increasing productivity for the Estonian economy. In the past productivity growth has also been connected with resource-consuming modes of production (useless energy losses, reckless marketing strategy, ineffective management and the aging of present equipment, both technologically and physically) as compared to the relatively high potential of Estonian labour.

The above-mentioned factors favoured moving to a higher level of prices and wages. The adjustment of Estonian exports to a new price level has two inflational implications. The first is connected with imports and the second with the tradables-nontradables relationship.

The price of imports is moving towards the international level (in accordance with the purchasing power dynamics in the Estonian market). The price of imports in turn determines the prices of domestic counterpart goods sold in the Estonian market. Domestic suppliers increase the price of domestic import-counterpart goods according to the increase of purchasing power in the domestic market. The latter depends on the rise in prices and wages in the export-producing sector.

The rise in prices in the tradables sector leads to a change in prices of

nontradables. The conceptual framework of this transmission mechanism is the model of Balassa (1964) and Samuelson (1964): faster productivity growth in tradables than in nontradables leads, via wage equalization, to a decline in the relative price of tradables (Gregorio 1994, p.2).

The increase in tradables production is accompanied by a rise in wages and salaries. Higher wages in the open sector spill over, via the labour market, into the sheltered sector, even if the productivity of nontradables remains unchanged.

Since the prices of nontradables are formed by marking up, they depend on the cost of labour.

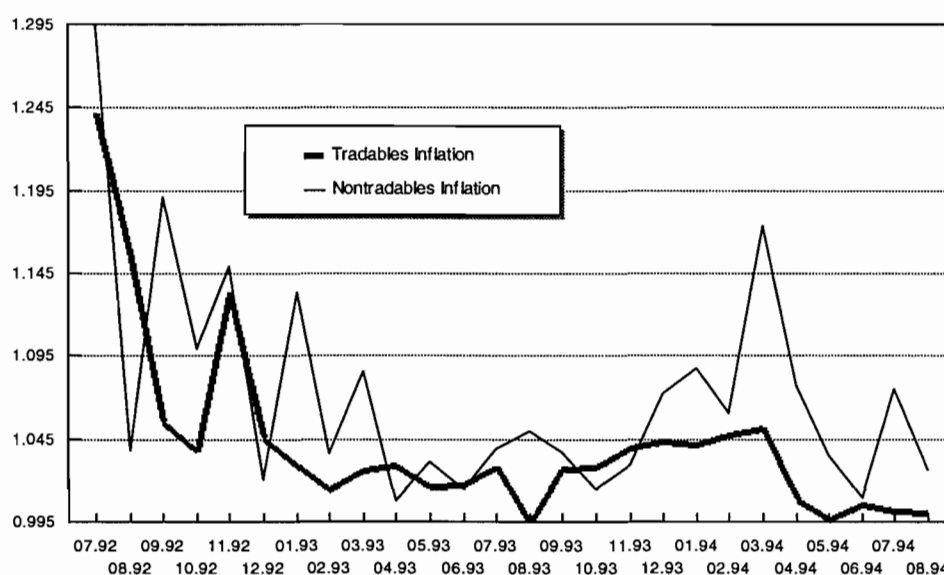
## 5 Model of inflation<sup>16</sup>

The model consists of 3 sub-models: for tradables, for nontradables and for a deviational money supply. According to the model the CPI is calculated as the weighted average of price indices of tradables and nontradables. The shares of the sectors in the consumer basket of the CPI are used as the weights.

### 5.1 Tradables

The rise in the prices of tradables has taken place at a relatively constant pace over time (Figure 3). This is characterized by the linear trend that we used as an indicator of internationalization of the price level.

Figure 3. Tradables and nontradables inflation



The time component is only a descriptive variable and does not characterize the essential factors of price internationalization. The speed of internationalization, i.e. inflation in time units cannot be explained by time trend. We leave unanswered the question of to what extent the internationalization of the price level is "natural" and to what extent "unnatural" (this is the question of the optimum intensity of the process).

In order to follow the actual factors, the trend component was replaced by the index of the money (M2) supply. Money supply is a proxy for economic growth. As stressed above, under the currency board arrangement the money supply is endogenous and is determined by demand. As demand is determined by the factors

<sup>16</sup> This section was written in collaboration with A. Kerge.

governed by the market, increases in the money supply are connected with the growth of the Estonian economy and other processes that reflect development.

The function holds for the long run. Unfortunately, considerable variation has occurred in the permanent rate of increase in tradables prices since April 1994 due to the short-run fluctuations. Nonetheless, the inflation model was re-calculated so as to reflect the factors that are presently influencing inflation.

The final version of the model consists of the following variables:

First, the price rise for the tradables  $CPI_t$  depends on the real exchange rate of the kroon. The price change for imports in kroons,  $P_t$  is calculated as the weighted average of the indices of Estonia's most important trade partners. Each index is the respective country's CPI divided by the change in its nominal exchange rate.

For Western countries, changes in  $P_t$  are caused mainly by fluctuations in exchange rates; for Eastern countries (primarily Russia and the other states of the FSU), by the total effect of exchange rate dynamics and inflation. Depreciation of the ruble is slower than the rate of inflation and thus an increase in real prices occurs due to the internationalization of the price level.

The rise in import prices pushes up the prices of production inputs, and this leads to rise in final goods prices. The rise in the prices of imported goods for final consumption directly increases the CPI.

Secondly, the dynamics of the kroon real exchange rate are also connected with the volume of exports,  $X$ . Depreciation of the kroon increases exports and decreases domestic supply. *Ceteris paribus*, supply decreases relative to demand and the pressure of demand-driven inflation increases, assuming a lack of domestically produced substitutes (and vice versa). Decrease in exports, e.g. due to trade restrictions, leads to an increase in domestic supply, which will have a restraining effect on the price rise.

The model also includes an index of excess money supply. As stressed above, in the currency board arrangement there exists a long-term equilibrium between money supply and demand. But equality of supply and demand on average does not mean that at each moment supply and demand are equal.

This phenomenon reflects the short-term disequilibrium of the money supply. Accordingly, in each subperiod (month) the disequilibrium is either inflationary (excess supply) or price restraining (undersupply).

The money supply used in the model is M2. Excess money supply  $M_e$  is the ratio of the actual money supply,  $M_s$ , to money demand,  $M_d$  ( $M_e = M_s/M_d$ ).

Because of the lack of sufficiently long time series, traditional methods of supply and demand research (simultaneous equations) have to be replaced with less precise techniques. Therefore the money demand is assumed to be equal to theoretical value of money supply. The logic behind this assumption is straightforward. The demand function can be estimated with money supply data. The interpretation of errors in the function is crucial. As money supply must equal demand, deviations in the empirical value from the theoretical value must reflect the excess of supply over demand.

The money demand function is estimated on the basis of the index of households' disposable income and expected inflation as the geometric mean of the two previous months' CPI.

$$M_d = 1,8107 + 0,1577 R_{tind} - 0,9017 CPI_{tu} \\ (10,15) \quad (3,65) \quad (-5,47)$$

$R^2 = 0,700$ ; F-krit = 22,2 (confidence level 99.999 %), where

$R_{tind}$  is index of households' disposable income and  $CPI_{tu}$  is expected inflation.

For example, in January and February of this year the excess money supply was 5.9 and 4.7, respectively. This was largely responsible for the rise in prices of tradables in February and March (the lag in the effect of the excess money supply is one month).

Economic policy and its implementation through taxes has a considerable effect on the price rise for tradables. The effect of taxes is estimated by tax revenues (VAT, excise tax and corporate income tax).

Tradables inflation is also connected with a seasonal aspect. Determining the seasonal coefficients is based on smoothing of the initial data using moving averages.

To sum up, the model for change in tradables prices,  $CPI_a$ , is

$CPI_a = CPI'_a * S$ , where  $CPI'_a$  is the change in prices for the open sector, seasonally adjusted and  $S$  is the seasonal coefficient.

$$CPI'_a = 0.6425 + 0.2197 P_f + 0.0123 X + 0.0626 M_e + 0.0842 F \\ (7.6) \quad (3.4) \quad (1.0) \quad (1.0) \quad (3.3)$$

$R^2 = 0.674$ ; F-krit = 7.24 (99.8 %), where

$P_f$  is the real exchange rate (lagged one period),

$X$  is the exports variable (lagged one period),

$M_e$  is excess money supply (lagged one period),

$F$  is fiscal policy.

## 5.2 Nontradables

The price rise in production inputs for nontradables is due, in addition to the price rise for open sector output, to the change in the prices of imported goods,  $P_f$ .

The excess money supply,  $M_e$ , has special features in the sheltered sector. The reason lies in the fact that some prices for nontradables are controlled (e.g. housing services and public transport).

The actions of the Government have considerable importance in (de)controlling prices in the sheltered sector. For example, the rise in rents and electricity prices is divided into stages. In order to reflect these actions, it is necessary to include dummies in the model.

To sum up, the model for nontradables price change  $CPI_{var}$ , is the following:

$$CPI_{var} = -0.6852 + 0.4485 M_e + 0.7173 CPI_a + 0.5926 P_f - 0.0675 D$$

(-2.1)      (2.0)            (3.9)            (3.0)      (-3.8)

F-krit = 13.78 (with the confidence level of 99.999 %), where

$M_e$  is excess money supply (lagged two periods);  
 $CPI_a$  is price rise of tradables (lagged two periods);  
 $P_f$  is change of foreign prices (lagged one period);  
 $D$  is a dummy.

## 6 Summary

1. Due to the lack of markets, price setting in a planned economy is artificial and directive. Directive price formation means a controlled and fixed price level as well as a controlled price structure, which results in price distortion.

Decontrol of prices leads to a rise in the price level to the market-clearing level (since demand exceeds supply in a planned economy).

As a rule, in the case of economies in transition, the result of price liberalization is at least galloping inflation, and often hyperinflation. That was the case in Estonia as well.

Thus, the effect of the introduction of the market economy (i.e. the effect of development) was inflation.

2. Until 1992 the Estonian economy was largely supply-driven. Due to the excess demand, the supply (production, sale, etc.) determined the main characteristics of economic activity (volume, quality etc). The fall in demand was caused by price shock at the beginning of 1992.
3. In a demand-driven economy there is a simple recipe for a rise in prices and inflation: restrictive economic policy which allows neither for an excess money supply nor its transformation into demand pressure and rising prices. Monetary reform became the first step in the implementation of this policy.

Currency reform broke the inflationary cycle, achieving a balance between demand and supply. The restrictive monetary policy together with incomes policy (limits placed on the growth of wages in the state sector) prevented the transfer of the price rise into wages and the development of excess demand.

4. At the end of 1993, despite the continuation of restrictive monetary policy, the CPI began another upward trend which lasted into the beginning of 1994.
5. Money supply is not to blame for the surge in prices. With the currency board arrangement, supply is determined by demand.

However, even in case of a demand-driven money supply there exists a certain inflationary danger. The factors behind money demand in a country with high inflation are income/economic growth and inflation expectations.

The danger lies in the fact that due to inflation expectations, money demand increases and a vicious circle develops. Excessive money supply generates expectations of inflation, which in turn are a factor in money demand etc. Fortunately, there has not yet arisen such a chain reaction in Estonia. Even in the long run this type of chain reaction is unlikely because the maximum stock of money supply is limited by the convertible foreign currency reserves et al.

6. In correlation of money supply with money demand, despite the occurrence of a long-run equilibrium, there may be a sequence of short-run disequilibria.



If supply exceeds demand, the result will be excess money supply and acceleration of inflation. A natural sequel to this is a decline in the attractiveness of the kroon and an increase in the demand for foreign currency. Therefore, the money supply should decline to the equilibrium level, but in reality, as a result of overshooting, supply will drop below demand.

All in all, an automatic adjustment of money supply takes place which does not allow the excess money supply to become a long-run engine of inflation.

7. One cause of the price rise is the fact that the kroon was issued at an undervalued exchange rate in terms of purchasing power parity. The reason for the inflation is that the kroon's real exchange rate is moving toward the nominal rate. The above-mentioned process is characteristic to economic development.
8. The rise in the price level takes place first among the tradables. The rise in tradables prices leads to a change in nontradables prices. The conceptual framework of the transmission process is the model of Balassa and Samuelson.
9. The concept of tradables and nontradables inflation is realized in the model of inflation in Eesti Pank. The model consists of 3 sub-models: for tradables, for nontradables and for the excess money supply.

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