

Monetary Transmission Mechanism in Estonia – Some Theoretical Considerations and Stylized Aspects

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The monetary system in Estonia is based on the currency board arrangement with German Mark. The strong commitments and rule-based features of currency board imply that there is no active monetary policy in Estonia – all necessarily monetary adjustments are left to the market forces. Under fixed exchange rate and free capital mobility Estonian monetary conditions are therefore closely linked with monetary policy in Europe – in addition to the changes in Estonian risk-premium, interest rate developments in Europe can directly influence Estonian interest rates. Those monetary signals transmit widely into Estonian financial sector and ultimately into Estonian real sector through various channels. The interest rate and credit channel have gained special attention in this paper.

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The views expressed are those of the author and do not necessarily represent the official views of Eesti Pank.

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Introduction to the Series “Monetary Transmission Mechanism in Estonia”¹

The traditional view on monetary policy transmission mechanism is that monetary policy decisions affect liquidity and yields in financial markets, and these ultimately influence consumption and investment decisions. Understanding those mechanisms is essential for understanding the impact of monetary authority decisions and actions on the economy. However, even today there is no consensus about how monetary policy exactly transmits to monetary policy ultimate targets. The theoretical mechanisms of monetary transmission are still under ongoing debate. Moreover, the empirical estimations are usually difficult to implement even in advanced economies, not to mention transition economies.

This series is concerned with surveying some intuitive aspects that affect the monetary transmission process in Estonian currency board arrangement (CBA) and with empirical estimation of the monetary transmission mechanism in Estonia. Note that we prefer the phrase *monetary transmission* rather than *monetary policy transmission* in the context of CBA. The reason is straightforward – the scope for active monetary policy is rather limited in the context of CBA. The lack of active monetary policy does not necessarily mean that some important links or channels are missing in the economy using currency board system. However, the strength of particular links or channels can differ across monetary systems.

The current paper is concerned with surveying some theoretical and intuitive aspects that affect monetary transmission process in Estonian currency board arrangement. The first Chapter of the paper gives a brief overview of the set-up of currency board in Estonia and of aspects of CBA that probably affect monetary transmission process. The second Chapter discusses some structural issues and the experience of monetary transmission process in Estonia. In the second paper of the series empirical model of monetary transmission process is specified and estimated. Special emphasis is put on foreign debt capital supply and formation of domestic lending rates.

After current publication of the first two papers, the series stays open for further contribution and discussion. Especially considering the growing interest in MTM in the accession countries and ongoing process of Estonian accession to EU and EMU.

¹ The series consists currently of two papers: the paper discussing the empirical model of monetary transmission mechanism in Estonia (Pikkani 2001); and the current paper on theoretical set-up and implications of monetary transmission mechanism in the framework of currency board.

Introduction

The traditional view on monetary policy transmission mechanism is that monetary policy affects liquidity and yields in financial markets, and these ultimately influence consumption and investment decisions. Understanding those mechanisms is essential for understanding the impact of monetary authority decisions and actions on the economy.

This paper is concerned with surveying some theoretical and intuitive aspects that affect the monetary transmission process in Estonian currency board arrangement (CBA). The aim of this paper – first in the Series "Monetary Transmission Mechanism in Estonia" – is to discuss about this process in Estonia in a rather intuitive way. A more empirical discussion can be found in the second paper of the same series, where the empirical model of monetary transmission in Estonia is estimated (Pikkani 2001). Note also that the phrase *monetary transmission* is preferred rather than the phrase *monetary policy transmission* in the context of both the papers. The reason is straightforward – the scope for active monetary policy is limited in the context of currency board. The lack of active monetary policy in currency board does not necessarily mean that some important links or channels are missing in the currency board economy. However, the strength of particular links or channels can differ across monetary systems.

Although there is huge amount of literature on monetary transmission mechanism² (MTM) and on currency boards³, the literature on MTM in currency boards is very limited. Most of the empirical work on currency boards has examined their behaviour in *comparative* perspective, thus comparing the performance of CBA with other monetary regimes. For example Ghosh, Gulde, and Wolf (1998) report that currency boards tend to have lower average inflation and as good growth performance as other peg rate regimes. Kwan and Lui (1996) perform a simulation analysis of a currency board versus flexible exchange rate regime, finding that the currency board reduces both output growth volatility and inflation. Batiz & Sy (2000) study currency board's credibility. Baliño, Enoch, Ize, Santriprabhob and, Stella (1997) conclude in a broad analysis of the experience of currency boards that currency boards are attractive to countries seeking to reduce inflation, or wishing to achieve the benefits of belonging to a broader currency area. Hristov & Nenovsky (1998, 1999) have studied CBA in Bulgaria. Some attempts of modelling currency board's transmission mechanism can be found in Catão & Rodrigues (2000), who studied credit channel in Argentina.

The first Chapter gives a brief overview of the set-up of the currency board in Estonia and aspects of CBA that probably affect the monetary transmission process. The second Chapter discusses some structural issues and experience of monetary transmission process in Estonia. The last Section summarizes the main findings of the paper.

² See for example Mishkin (1996) for survey of MTM channels, Kamin et. al (1998) for survey of MTM in developing countries, Checchetti (1999) for survey of impact of legal and financial structure on MTM, Bernanke & Blinder (1988), Kashyap & Stein (1993) and Bernanke & Gertler (1995) for discussion of credit channel.

³ For more detailed studies on currency boards see for example Hancke & Schuler (1994), Williamson (1995), Baliño & Enoch (1997), Yam (1999), Santiprabhob (1997).

1. MTM under CBA – Estonian CBA and Theoretical Considerations

The monetary policy goal in Estonia is to maintain the stability of the national currency⁴. This obligation is delegated to the independent central bank – Eesti Pank (the Bank of Estonia). The stability of the currency can be seen as price stability, thus the ultimate goal of Estonian monetary policy is to maintain price stability. In achieving this goal, Estonia implemented currency board arrangement (CBA) simultaneously with the introduction of the national currency in 1992.

1.1. What is CBA in Estonia?

Monetary system in Estonia is based on fixed exchange rate with the German mark (implicitly thus also with the euro) under the currency board arrangement. The currency board arrangement is very similar to the rules of gold standard. The most common features of the currency board arrangement are the fixed exchange rate; the convertibility rule, which restricts the base-money supply to the currency board's foreign reserves, and strong legal commitments of the system, usually written explicitly into a law. The convertibility rule, that requires full backing of base money with foreign reserves, and strong legal commitments should increase the credibility of monetary arrangements, which is an important feature of CBA.

Fixed rate. Eesti Pank has taken unlimited commitment to convert domestic currency into anchor currency and vice versa at the fixed exchange rate. Since the monetary reform in 1992 the exchange rate vis-à-vis German mark is 1DEM=8EEK (1EUR=15,64664EEK). This exchange rate is explicitly written into the law. In a small open economy the exchange rate stability and the price stability are directly connected – fixed exchange rate provides nominal anchor⁵ for the domestic prices and domestic interest rates. Fixed exchange rate initiates adjustments of the internal price and cost structure and yields into long-run price level convergence with the anchor currency⁶. Under unpredictable and changing monetary transmission mechanism and relatively high openness of the economy the existence of such nominal anchor is relevant. It can be claimed that exchange rate is the single most important asset price for a small open economy (Eichengreen 1999) thus, the exchange rate based monetary policy is a natural choice in achieving price stability in the context of Estonia. In addition, in the context of a small open economy with fully liberalized capital movements, the active monetary policy would be a complex issue anyway.

Convertibility rule. The convertibility rule means that the issued base money is fully covered with the Eesti Pank's foreign reserves (see Figure 1) and that the unlimited exchange of base money to anchor currency and vice versa at the fixed exchange rate is

⁴ § 111 in the Constitution of the Republic of Estonia states: “[---] The Bank of Estonia shall regulate currency circulation and shall *uphold the stability of the national currency.*”

⁵ For more detailed overview of the concept of nominal anchor see for ex. Calvo & Végh (1992) and Flood & Mussa (1994).

⁶ Liberalized capital and current account is needed to fulfil the convergence condition. In Estonia current account was made fully convertible with monetary reform in 1992 and capital account was made fully convertible in 1994. (The restrictions on capital account convertibility before 1994 had no relevant meaning, however).

granted. The full cover of base money with foreign reserves will insure that the central bank is able to grant the fixed exchange rate. Moreover, base money issuance is directly tied to the corresponding change in foreign reserves at the fixed exchange rate. This makes the base money supply mechanism automatic, as domestic base-money supply follows automatically the base money demand through foreign exchange. Therefore, the convertibility rule is sometimes referred to also as a monetary rule (for example Yam 1999). The convertibility rule provides an effective constraint on monetary policy and restricts the use of foreign reserves. Foreign reserves (except excess reserves) cannot be used to borrow to domestic financial sector or to finance government fiscal needs.

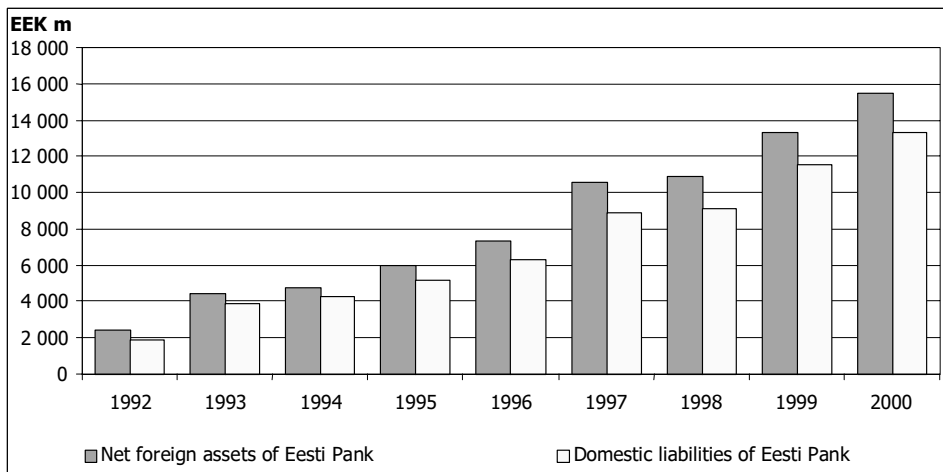


Figure 1. Currency Board Cover - Net foreign assets and domestic liabilities of Eesti Pank

Strong commitments and rule-based set-up. Convertibility rule together with policy independent set-up of monetary arrangements and strong legal commitments to the arrangement⁷ should increase the credibility of the fix and separate the CBA from the ordinary fixed exchange rate systems⁸. Full backing of base money should insure that central bank is able to fulfil its commitments. As currency board is a rule-based technical arrangement (fixed exchange rate with automatic money supply mechanism) it is not associated with political pressures, to which usual central bank can be more adhered. In addition, the inflationary financing of government cannot take place. Moreover, given the simple rules of CBA it can be easier to anticipate the behaviour of central bank, because there is no discretionary component in monetary policy. Those factors should decrease uncertainty in monetary policy. It can be an additional factor, which can amplify the effect of exchange rate based stabilization, especially at the early phase of monetary reforms. Sound commitments and rule-based mechanism should increase market participants' confidence and provide long-term stability, but only if market participants' believe in the consistency of CBA-based monetary arrangements. Therefore, good track record and sufficient amount of excess reserves are relevant to insure the confidence. It should also be pointed out, that the increase in monetary credibility is restricted to the credibility of anchor currency. A currency board transmits the relative credibility of the reserve country's central bank to the currency board country (Hancke, Schuler 1994, 2000).

⁷ The fixed exchange rate of Estonian Kroon and the requirement of full backing of money issuance are realized under the Law of the Republic of Estonia on the Security of the Estonian Kroon.

⁸ See Batiz & Sy (2000) about the issues of Currency Board's Credibility. They develop credibility model of Currency board to analyse currency board's macroeconomic behaviour.

1.2. Monetary Policy Framework in Estonia

These rule-based features of currency board imply important characteristic of Estonian CBA – the lack of active monetary policy⁹. The price stability objective is tied to the anchoring role of the exchange rate, and all the necessary adjustments are left to the market. **There is no central bank policy rate¹⁰ or other operational monetary policy targets in Estonia.** This strategy is based on the belief that in a small open economy with fixed exchange rate, active monetary policy would be a complex issue anyway.

The lack of active monetary policy is reflected also at the set-up of monetary policy framework in Estonia. The most important device of Estonian CBA is unlimited forex exchange between the Estonian kroon and the German mark (since 1999 between euro-area currencies) with the fixed exchange rate. This can be viewed as a foreign exchange window where buying and selling foreign currencies against reserve currencies are initiated by commercial banks (Lepik 1999). This “forex window”, enhances short-term capital flows and makes the exchange rate mechanism of the currency board actually work. This forex window is also the mechanism for the base money issuance – change in the base money supply is caused only by the corresponding operation in forex window. Since 1996 there are no exchange rate spreads in forex window operations with all euro-area currencies and therefore this facility has become an important instrument for the liquidity management of commercial banks through their foreign reserves.

Another important monetary policy instrument in Estonia is reserve requirement that should create sufficient liquidity buffers for commercial banks and substitute the lack of the Lender-of-Last-Resort facility and the lack of other monetary policy facilities. Therefore, the ratio of required reserves in Estonia has been relatively high, compared to other central and transition countries. The reserve requirement can be viewed also as an instrument that implicitly can affect the broader monetary conditions through change in money multiplier or through change in cost of resources for banking sector. This possible effect is however questionable in the context of open economy without any restrictions on capital movements. In sum, those monetary instruments are not devices for active monetary policy, but are aimed to support efficient functioning of markets and to create sufficient liquidity buffers for financial sector.

1.3. MTM in CBA

Most studies, related to monetary policy transmission, treat some monetary policy exercises at the beginning of the transmission chain. In relevant literature there are usually two different approaches used to treat those exercises. The first approach uses direct change in base money supply. Money market interest rates are adjusting according to the new relationship between changed base money supply and demand. The second approach uses change in official interest rate as monetary policy action, which leads to the change in

⁹ The ability to do monetary policy is restricted with central bank's excess reserves.

¹⁰ Sometimes the interest rate paid on required and excess reserves in central bank or penalty interests for not fulfilling the reserve requirement are referred as a “policy rate” of Eesti Pank. Before 1999 the reserve interest rate was linked to Deutsche Bundesbank discount rate and since 1999 it is linked to the ECB deposit rate. The penalty rate was 15% from unfulfilled portion of reserves before 1997, and has been 20% since then.

base money demand. This approach is based on the assumption that money supply is endogenous. The main question that separates those two approaches is whether it is possible to change the quantity of money without changing its price or not.

However, in case of CBA, there are no active monetary policy exercises. The monetary transmission mechanism in CBA is based on the anchoring role of fixed exchange rate. There is no independent interest rate target or other targets for central bank and the interest rates adjust according to arbitrage conditions on the markets. Also the price adjustments are left to the market. Moreover, under CBA, the money supply is endogenous; thus, money supply adjusts automatically when money demand changes. To sum up, there is neither policy-induced change in money supply nor policy-induced change in interest rates. They both adjust according to economic development, external financing conditions and arbitrage conditions. As a result, monetary policy signals are exogenous to the system, and sometimes hardly distinguishable from other external shocks.

This suggests that in principle both money supply and money market interest rates can reflect the present stance of domestic monetary conditions. There are however several reasons why interest rates can be better indicators of monetary stance than monetary aggregate. First, considering the substantial development of financial sector during transition, the money demand function has most probably not been stable. In recent years a number of prominent economists have argued that short-term interest rates are better indicators of monetary policy than monetary aggregates because of the problem of variability in velocity induced by financial innovation. Second, interest rate is more universal than the single monetary aggregate as an indicator. For example, interest rate indicators are more comparable with the foreign ones than monetary aggregate indicators. Third, the domestic risk premium (spread between domestic and foreign interest rates) can be a valuable indicator, as this should clearly reflect domestic monetary conditions. We cannot get such an indicator from monetary aggregates.

The most prominent textbook explanation of monetary transmission mechanism in currency board system is working through automatic money-supply mechanism: Due to automatic money-supply mechanism, current account deficit or capital outflow is directly transmitted to domestic liquidity tightening, which leads to the increase in domestic money market interest rates. The changes in domestic interest rates will transmit into economic activity through usual transmission channels and those changes will reduce the current account deficit. Under fixed exchange rate, the change in domestic interest rates will also lead to capital inflow¹¹ and vice versa because of interest rate arbitrage. Those changes will balance the balance of payments and the domestic interest rate level will converge to the world (anchor currency) interest rate level.

We should keep in mind some issues when we are discussing this textbook mechanism, sometimes referred to as an “automatic stabilizer of CBA”. First, the traditional balancing mechanism (mechanism where *current account* deficit yields to the liquidity tightening and from there to the deteriorating *current account* deficit)¹² does not necessarily mean prompt

¹¹ The current and capital account convertibility; and substitutability of domestic and foreign assets are relevant in determining the relative strength of those flows.

¹² The explanations of automatic money supply process of historic CBAs (the gold rule) have a tendency to tie the changes in money supply to changes in current account balance only. This misleading assumption has also been one cause that led for criticism of CBAs in 1940-50ies (Schuler 1992).

macroeconomic adjustments in the sense of lowering the current account deficit rapidly to consistent levels. There can be several reasons for that. One factor that can deteriorate the direct link between money supply and current account balance is that capital mobility is usually higher than that of trade flows, especially if there are no restrictions on capital account. Thus most of the current account signals can be balanced by corresponding flows in *capital account* (Baliño & Enoch 1997). Another factor can be foreign direct investments, which is part of the capital account balance (Hanke & Schuler 1994, 2000). The CBA's role as a macroeconomic stabilizer can be therefore viewed rather as a long-run relationship between monetary and macroeconomic conditions. Thus it can be more convenient to rephrase that in the shorter-run capital flows rather than trade flows will keep interest rates in the level, where money supply and money demand are balanced. And this interest rate level can have longer-term impacts on real activity thus also on trade flows and on money demand.

Hanke and Schuler (1994, 2000) state also that the main point of the CBA automatic money supply mechanism is that market forces determine and limit expansion of the money supply. As long as it is [expected to be] more profitable to invest funds in the currency board country than elsewhere, commercial banks in the currency board system tend to increase their loans. They can do so because foreign investment tends to occur, bringing additional foreign reserves to the currency board system. Eventually commercial banks expand their loans in the currency board system to such an extent that making further loans there is less profitable than investing the funds abroad. At that point, commercial banks hold the supply of loans constant in the currency board system, and money supply ceases to increase. (Hanke & Schuler 1994, 2000). Because the exchange rate is fixed, arbitrage opportunities occur through the changes in money supply, interest rates, and current-account balance; and market forces cause the money supply to adjust to the current-account balance (*Ibid.*).

Second, under a fixed exchange rate system, domestic interest rates are tied to the interest rates of the anchor currency. The foreign (anchor currency) interest rates are influenced by foreign (anchor currency) monetary policy and conditions. However, even when the central bank is fully committed to the exchange rate, domestic interest rates are not completely pre-determined by foreign interest rates because of domestic risk-premium. The latter reflects country-specific risks (default risk and currency risk) and regional and global factors. Country specific default risks are related to the expectations about domestic economic performance, reflected by macroeconomic indicators (so-called fundamentals), political risks, term structure and maturity mismatch.

The currency risk component of domestic risk premium can be lower under currency board arrangement, as the arrangement is by the definition "the ultimate fix". This proposition is however valid only when the market participants' believe in the arrangement. The currency board arrangement alone cannot lower the default risk, as the latter relies more on sound fiscal policies and on overall macroeconomic performance. Thus the currency board arrangement cannot prevent changes in domestic risk premium, but if it is credible enough then it can lower the currency risk component in it. If the confidence in macroeconomic policies is low, then the domestic risk premium can still be high and volatile. Moreover, when markets are not fully perfect, domestic liquidity conditions and term structure can also affect domestic risk premium.

In addition, regional and global risks, for example the crisis in emerging markets or other global factors, can implement undesirable effects of contagion in domestic risk premium. Contagion initiated sharp changes in interest rates are usually not justified by the domestic fundamentals. Therefore, currency board needs more flexibility in the real sector to cope with interest rate movements. Under the currency board, the market achieves adjustments in economy rather automatically. As there are no central bank interest rate targets under CBA, the changes in domestic interest rates are purely market-determined. Therefore, changes in foreign interest rates or domestic risk premium are not insulated from economy by central bank, and can have relevant effect on domestic economic developments via the interest rate and credit channels. In addition, foreign interest rates or regional risks are not necessarily synchronized with the evolution of domestic economy¹³.

In addition to the direct effects, expectations and credibility of economic policy can have a dominant and increasing role to play in the assertion of the transmission mechanism (Monetary Policy... 2000). The reason is, that market participants' saving and investment decisions are relying on their expectations. It is sometimes proposed that CBA and endogenous money supply can have some connections to those expectations. In the case of CBA, the component, which is derived from the discretionary monetary policy of the conventional central bank is not included in the expectations of agents. Thus we can say that the discretion of monetary authority and its (presumable) inflationary effect does not matter under CBA. As a result, Sepp, Kaasik & Vesilind (2000) argue that CBA can enjoy a higher degree of confidence and probably more modest expectations of inflation. Also Hanke and Schuler (1994, 2000) state that a currency board cannot create inflation itself. Some other authors note that the gold standard, which is similar to CBA, can be viewed as an anchor for price level expectations (Bordo & Jonung 2000). In addition, most of the CBA literature claims that increased monetary confidence is an important feature of CBA. However, we should still be careful, when we are discussing currency board implications on expectations. Currency board may stabilize expectations through a more confident monetary environment, but this link depends also on the belief of the consistency of the arrangement, on the legislative and structural developments and on fiscal policy issues.

¹³ It should be pointed out, that Estonian economy is closely connected to the developments in the European Union — about 70-80% of Estonian foreign trade is related to the EU countries. As export-import flows are close to 200% of Estonian GDP, economic trends in Estonia cannot differ very substantially from the ones in EU. Thus European interest rate policy cannot substantially contradict with the developments of Estonian economy.

2. MTM in Estonia – Some Stylized Aspects

Two broad aspects are important in evaluating how fast monetary conditions can affect the real economy in Estonia. The first is the transmission from monetary conditions to financial variables that most directly affect the non-financial sector – loan and deposit rates and asset prices. This linkage is determined by the structure of the financial system. The second is the link between financial conditions and the spending decisions of households and firms. The relationship between financial sector and real sector is relevant in this regard.

It should also be noted that the currency board framework is only one component of the overall Estonian economic policy framework. Fiscal discipline, liberalized external account and encouragement of private sector development has all been important components of macroeconomic policy. The currency board framework has created stable monetary environment for the real sector and provided nominal anchor for further restructuring, but it cannot work without support from other policies. In addition, during the last decade Estonia has experienced substantial institutional and structural changes¹⁴. Hence, the transmission channels can be obscure and the empirical analysis of this mechanism can be difficult. This Chapter gives an intuitive overview of some structural factors that can affect MTM in Estonia.

2.1. From Monetary Conditions to Financial Prices: Structural Issues and Experience

Due to the currency board system and liberalized capital account, balance of payments flows will assure that money supply equals to money demand at the prevailing interest rate level. At the same time the prevailing interest rate level is determined by the interest arbitrage opportunities with anchor currency through uncovered interest rate parity. Thus the domestic interest rate level is determined according to the prevailing foreign interest rates and domestic risk-premium. Consequently, the ECB's monetary policy, conditions in foreign money markets, factors that affect the domestic risk-premium, etc are all relevant factors that can influence monetary conditions in Estonia. As a result, the monetary policy signals are exogenous to the system and sometimes difficult to distinguish from other foreign shocks.

The transmission of those monetary signals within the financial sector depends on the depth of financial intermediation and on the structure of financial sector. Also, the relative strength of foreign components in monetary signals depends on the openness of the economy and on financial markets integration with foreign markets.

The depth of the financial intermediation in Estonia has increased year-by-year, but it is

¹⁴ For example, the analysis of financial flows in financial interactions' input-output model suggests that the structural effects in financial flows in 1997 were more than four and half and in 1998 three times higher compared to extensive effects; and in 1999 they made up two thirds of extensive effects. This result is of course not indisputable, but it can at least give intuitive impression about the proportions.

still considerably low compared to advanced economies. The ratio of broad money to GDP is about 40%; banking sector assets to GDP are about 65% and securities market (which consists mostly of stock market) capitalization is about 45% of GDP (see Figure 2). The structure of the financial sector in Estonia is bank-oriented and banks have continued to be basic financial intermediaries for the real sector in Estonia, whereas the role of securities market has remained lower. Thus, banks can assert a relevant role in the monetary transmission process. It should also be noted that the structure of banking sector is highly concentrated – the three biggest commercial banks in Estonia make up almost 90 per cent of the banking sector (see Figure 3)¹⁵. This high concentration ratio can probably have some implications on the transmission mechanism¹⁶ and make it more difficult to carry out empirical estimations and distinguish between different channels.

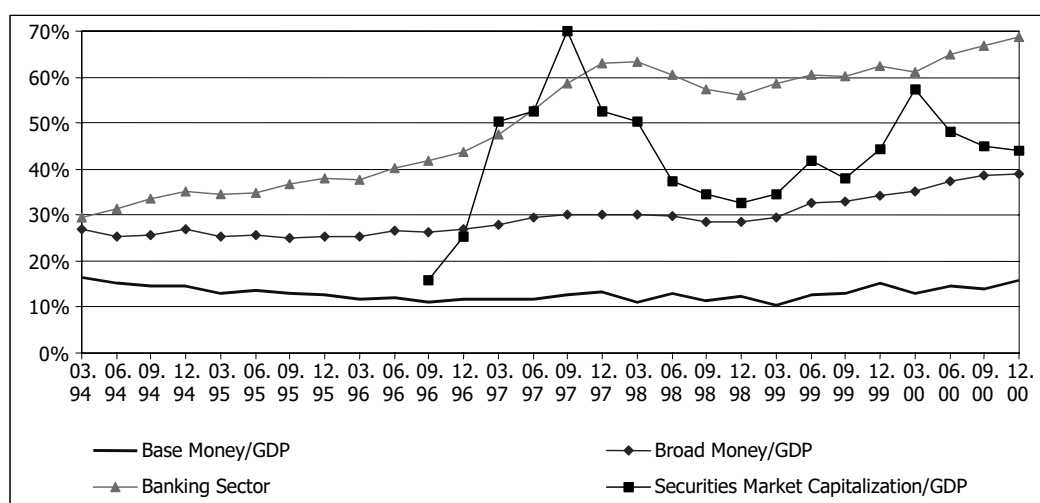


Figure 2. Financial intermediation in Estonia

Due to the small size of Estonia and partly due to the concentrated structure of the Estonian financial sector, domestic financial markets are rather small. It should also be noted, that there are no government securities in Estonia that have been the usual driving force of non-bank financial markets in other emerging countries. This makes it difficult to measure the domestic risk premium. Furthermore, the absence of appropriate financial assets has meant higher importance of deposits as a form for financial savings¹⁷. The small size of domestic financial markets and the lack of government securities translate into the lack of traditional yield curve and well-established term structure¹⁸. Due to that, direct transmission from domestic money market rates to other domestic financial prices is more difficult to capture,

¹⁵ Moreover, the depth of the competition is not evenly distributed, if we consider different liabilities and assets in banking sector. For example, the competition for enterprise-loans is less concentrated than the competition for household-loans or deposits (Herfindahl index was used to compare the competition concentration in banking sector).

¹⁶ It is believed, that concentrated market structure can make the response of loan and deposit rates in money market rates sluggish and asymmetric (Kamin, *et. al.* 1998). Also, the existence of smaller banks can support the existence of credit channel (Kashyap & Stein. What... 1997).

¹⁷ In 1998, 93 per cent of the households had a bank deposit account, but at the same time only eight per cent of the households owed stocks or securities.

¹⁸ The relevant maturities in Estonian money market are shorter-term maturities (less than three months). There is practically no trading at higher maturities than three months, thus those interest rate quotations may not be very representative.

as the information chain can be different from the traditional chain. However, it is believed, that this possible change in the information chain does not alter the transmission process and channels themselves.

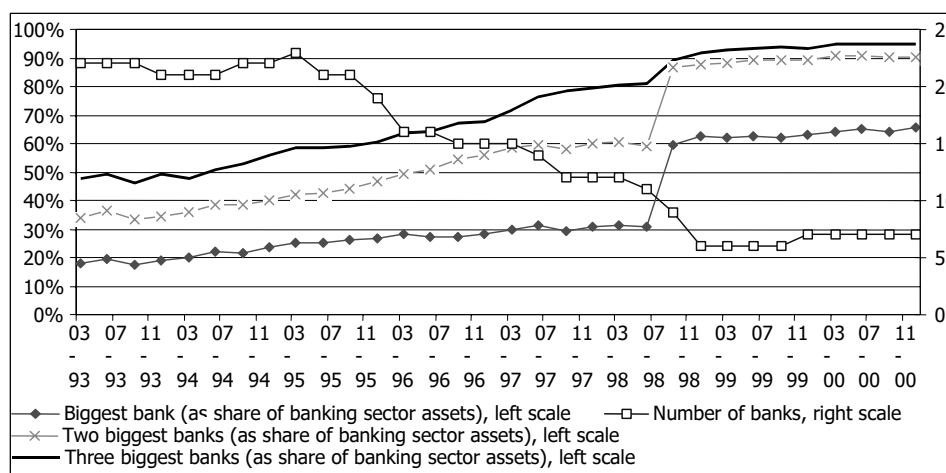


Figure 3. Composition of banking sector assets.

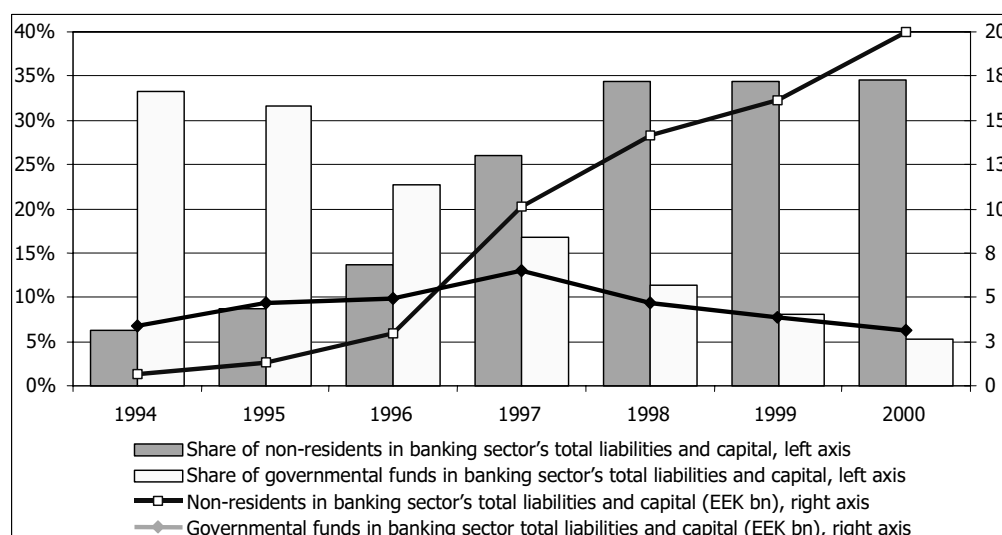


Figure 4. Share of non-residents and governmental funds in banking sector's total liabilities and capital.

Another relevant aspect in regard to Estonian financial sector is its connection to the foreign financial sector. The Estonian banking market is mainly foreign-owned. It is believed, that this fact can have some effects on monetary transmission. On the one hand, it makes it easier for the financial sector to attract funds from abroad, when domestic liquidity conditions are severe or when domestic depositing decreases. Thus it can help to keep the domestic interest rates closer to foreign ones when there is an upward pressure on the domestic risk premium. On the other hand it is believed that foreign owners can improve the corporate governance in the banking sector, for example to implement more strict risk assessment rules for bank lending than are in the domestically owned banks. This can increase the adequacy of lending-rate responses to domestic real sector developments and increase the possibility of credit rationing effects also. In addition to banking, foreign presence is existent also in Estonian financial markets.

Those factors are reflected also in the development of Estonian financial sector since the monetary reform in 1992. In the years between 1992–96, the financial sector accessibility to foreign markets was rather limited (see Figure 4)¹⁹ and domestic capital as well as money markets were underdeveloped. It should be added, that although some restrictions on the capital account were present until 1994, they were not binding for financial sector capital flows even before 1994. The more important reason for negligibility of financial sector initiated capital flows during those years lies more on smaller credibility of domestic banking sector — the number of banks was high, but they were small and lacked sophisticated banking experience. As a result, the Estonian banking sector was vastly dependent on domestic deposits (see Figure 5). At the same time the domestic propensity to save was also considerably low – domestic savings amounted to 11...16% from GDP during 1994–98, the households savings amounted to 6...12% from GDP at the same period (Pikkani, Randveer 2000). This meant that financial recourses for the use by financial sector were fairly constrained and the level of financial intermediation was therefore low.

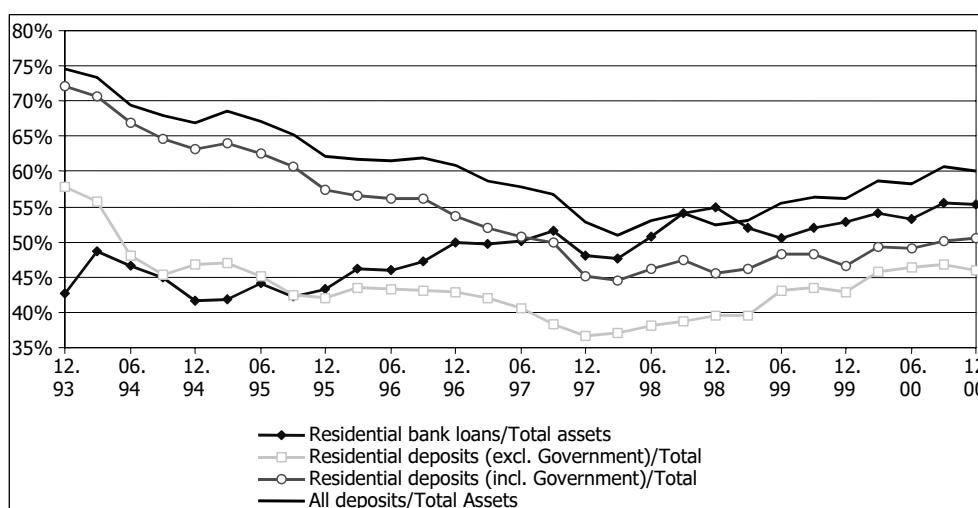


Figure 5. Share of bank-deposits and bank-loans in banking sector's total assets

The ongoing economic reforms, introduction of new financial structures and increased monetary stability yielded into increase in external confidence about Estonia. In 1996–97, the financial sector experienced rapidly increasing ability to attract foreign capital. This was supported by favourable foreign conditions at the world capital markets and by several structural developments²⁰ (Randveer 1999). The changed environment called also a need for changes in monetary policy operational framework. In 1996 the averaging of reserve requirements was introduced, excess reserves became remunerated and the spread of DEM–EEK forex operations was abolished. Those factors together with the small size of

¹⁹ In those years, the foreign capital flows to private sector consisted mostly of foreign direct investments to private sector. Those flows were not very closely connected to domestic borrowing or banks' liquidity. It can be claimed that those flows could have had some indirect impacts on domestic monetary conditions, but the foreign monetary component had nevertheless secondary role in Estonian monetary conditions during those years.

²⁰ For example in 1996, the Tallinn Stock Exchange was opened, which widened the set of marketable financial instruments and deepened the financial intermediation.

domestic financial market and increased capital flows enhanced the integration of Estonian financial sector with foreign money and capital markets. As a result, the importance of banks' foreign reserves as liquidity buffer increased. The liquidity management of the banking sector was shifted to the use of banks' foreign reserves²¹ and the role of domestic money market in banks' liquidity management became secondary.

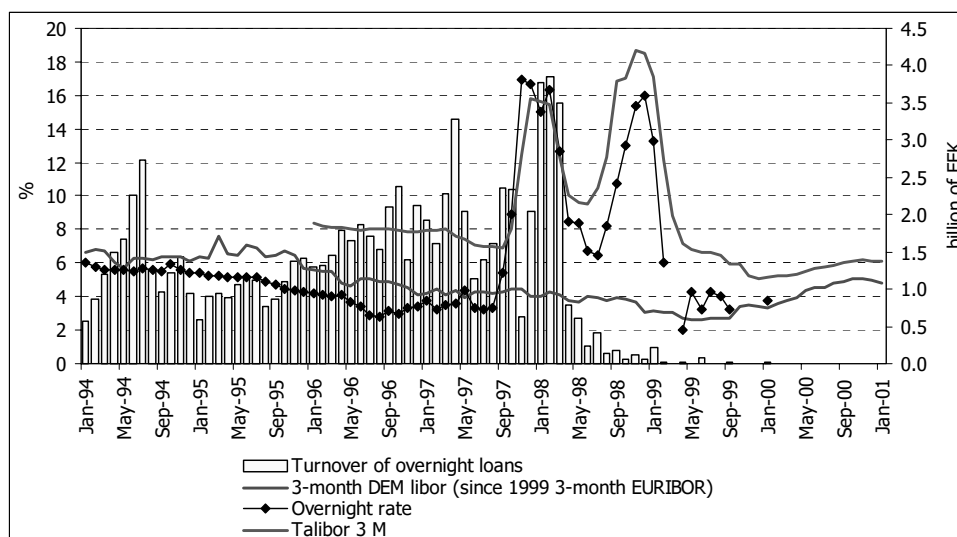


Figure 6. Estonian short-term money-market rates and 3-month DEM Libor (since 1999 3-month Euribor)

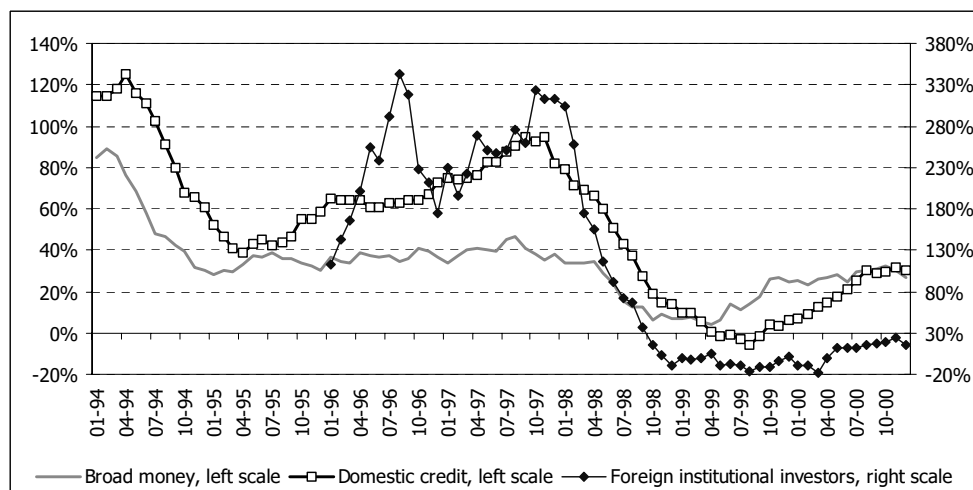


Figure 7. Annual growth of domestic credit, broad money and foreign financing.

²¹ The abolishment of spreads in central bank "forex window" eliminated transaction costs in currency conversion between EEK and DEM (since 1999 between EEK and all euro-area currencies). This means, that banks can convert DEM (EUR) nominated foreign assets to EEK and vice versa at zero cost. Consequently, the interest rate margins between DEM (euro) and EEK money markets decreased. The averaging of reserve requirements was aimed to smooth fluctuations in overnight money market.

Closer integration with foreign markets and use of foreign reserves as a liquidity buffer created necessary preconditions to let foreign interest rate signals (especially signals from the anchor currency) to pass more clearly into the domestic financial sector. This means that domestic money market quotations are closely following the movements in the anchor currency's interest rates (for example, interest rate hike in euro area in 1999–2000 directly yielded into an increase in quotations of Estonian money market rates). Technically – the domestic money market yield curve consists of the anchor-currency yield curve and the Estonian kroon's forward differential. Consequently, the importance of the foreign monetary signals at the transmission mechanism increased in 1996–97. Moreover, since 1998, the dominant players in Estonian financial markets are non-residents. This means that the first link in the transmission chain is the link between domestic and foreign money markets, as there is no interest rate policy by Eesti Pank. Also, the changes in risk-premium and supply and demand conditions in the money market are relevant in forming domestic interest rates, as we can see from the sharp impact of Asian and Russian crisis on Estonian money-market rates (See Figure 6).

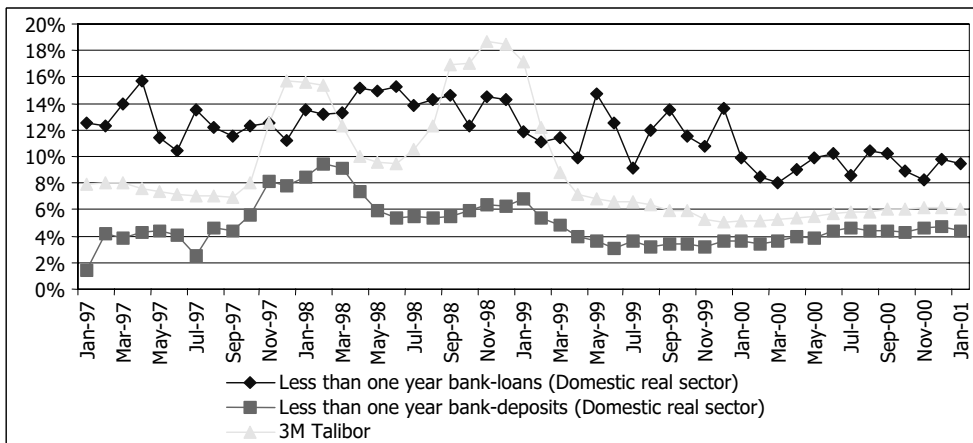


Figure 8. 3-Month Talibor and short-term lending and deposit rates for domestic real sector

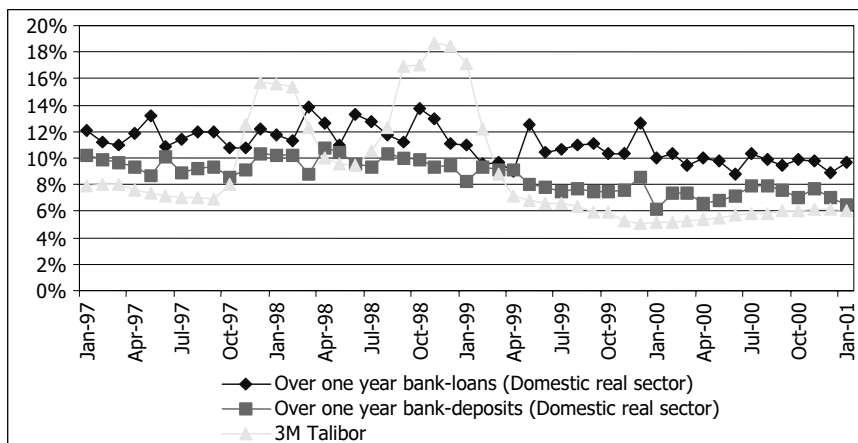


Figure 9. 3-Month Talibor and long-term lending and deposit rates for domestic real sector

In 1996–97, Estonian financial sector gained rapidly growing access also to foreign capital markets. The banking sector started to finance the gap between domestic credit and domestic deposits with the long-term borrowing from foreign institutional investors²² (see Figure 7). The long-term foreign capital was attracted mostly as subordinated liabilities, issued long-term securities or as long-term borrowing. The interest rate of those issues has mostly been indexed to 3–6 month DEM LIBOR or 3–6 months EURIBOR (plus risk-premium). As a result, foreign interest rates can rather explicitly affect the price of Estonian financial sector's credit resources. Moreover, it is reasonable to assume, that the foreign interest rates can affect the retail deposit rates in Estonia, as foreign financing can be viewed as a substitute for domestic deposits. At the same time, given the secondary role of domestic money markets, interest rates in domestic (EEK) money markets probably do not have so obvious causal connection with the domestic retail rates²³ (See Figure 8 and 9)

As we can see from Figure 8 and Figure 9 the interest rate transmission from domestic money market rates or retail deposit rates to the lending rates is not obvious. The critical question is, whether the pass-through of monetary signals into lending rates comes through the deposit rates or directly from foreign interest rates. As we hypothesized, retail deposit rates are dependent on foreign interest rates, as banking sector can easily substitute domestic deposits with borrowing from foreign institutional investors. Under such hypothesis, it seems reasonable to assume that lending rates are also more dependent on foreign interest rates than on domestic deposit rates, as foreign rates determine the cost of financial sector resources. This presumption is also supported by the fact that considerable share of real sector bank loans are extended under floating interest rate, that is usually linked to the euro (DEM) interest rate²⁴ (see Table 1). Thus, it is reasonable to believe that foreign interest rates are (to some extent) automatically passed to Estonian real sector loans. For example, increase in EURIBOR (DEM LIBOR) increases directly the base rate of floating rate loans and interest rate payments of initially extended floating rate loans.

Table 1. Role of floating rate loans in real sector long-term borrowing (as a share of turnover of loans)

Date	Real sector		Private enterprises		Households	
	Fixed	Floating	Fixed	Floating	Fixed	Floating
1997	53.3%	46.7%	54.1%	45.9%	53.3%	46.7%
1998	44.8%	55.2%	47.3%	52.7%	39.7%	60.3%
1999	64.4%	35.6%	62.2%	37.8%	71.6%	28.4%
2000	60.6%	39.4%	64.1%	35.9%	52.8%	47.2%
1997-2000 Average	56.2%	43.8%	57.3%	42.7%	55.2%	44.8%

It should still be noted, that the EURIBOR link in the loan rates does not necessarily mean full pass-through of foreign interest signals into domestic real sector credit rates because of the changes in the risk margin. Several factors can affect the risk margin and thus the pass-

²² At the same time banking sector was willing to take higher risks by extending credits on short-term resources also.

²³ This does not exclude the possibility that domestic money market rates can carry information about domestic risk-premium, but obviously, the link is not so evident. The pass-through of short-term money market rates into real sector credit rates is not very obvious as well. Time-deposit rates are more coherent with money market rates than lending rates; however, the average share of time deposits in 1994–97 was only about 28 per cent. The role of indexation in deposit rates is insignificant.

²⁴ The interest rate of floating-rate loans is usually linked to six-month EURIBOR (since 1999) or six-month DEM LIBOR (before 1999).

through. Foreign monetary signals can therefore be for some periods insulated from domestic real sector credit rates and for some periods, they can possibly be amplified by financial sector²⁵. For example, in 1999–2000 foreign interest signals seemed to be insulated from the real sector, as risk margins decreased.

There are also exchange rate and asset price channels considered in relevant literature. The latter possible effects are however left to further researches. It should nevertheless be noted, that in spite of kroon's fixed exchange rate with DEM (*de facto* also with EUR), the exchange rate of Estonian kroon vis-à-vis other currencies is floating as the exchange rate of DEM (EUR) vis-à-vis other currencies changes (See Figure 10). Considering the small size of Estonian economy, it is obvious that those exchange rate fluctuations are not affected by the interest rate developments of EEK but are determined by the developments of EUR exchange rate in international markets. In addition, the banking sector exposure in net open position of non-euro currencies is modest. Therefore, the impact of exchange rate will affect Estonian real sector directly rather than through the impacts from financial sector²⁶.

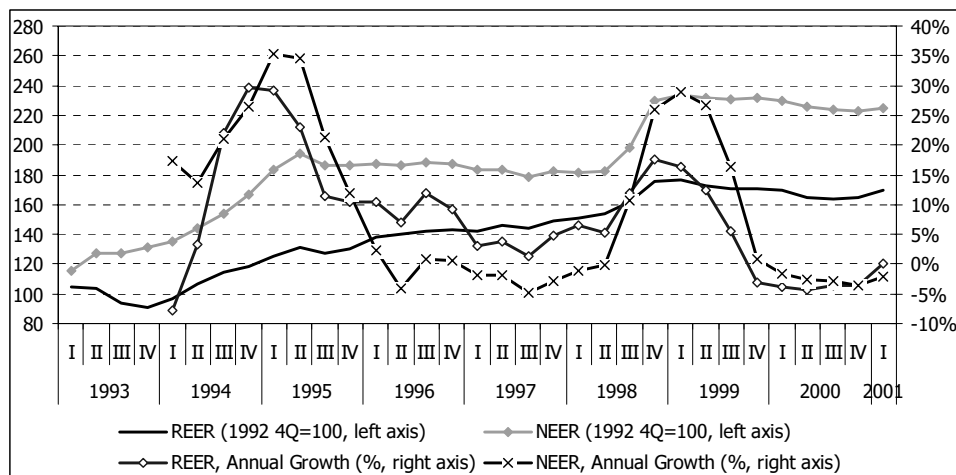


Figure 10. Real and nominal effective exchange rates.

2.2. From Financial Prices to Spending: Structural Issues and Experience

The traditional interest rate channel, represented by the IS-LM model, is supposed to work through real interest rates, influencing consumers' and investors' decisions. However, extracting information from market yields can be extremely difficult when the financial markets are shallow. Moreover, the determination of *real* interest rates in a disinflating transition country is not obvious but complicated issue²⁷. The link between inflation expectations and actual inflation can therefore be obscure and changing. The relevance of

²⁵ International experience may support amplified effect of the transmission of foreign monetary conditions. (See Arora & Cersiola 2000; Frankel, Schmukler and Servén 2000).

²⁶ Whereas real sector loans are connected mostly with EUR (DEM before 1999), real sector foreign currency deposits consist also of non-euro currencies (about 50% of foreign currency deposits are in USD). This can implement some wealth effects, as changes in exchange rate affect the EEK nominated value of those deposits.

²⁷ With limited experience of market processes and especially if market participants' confidence has been destroyed by hyperinflation the expectations may be rather volatile and backward looking.

real interest rates in transmission chain can be smaller under such circumstances. Therefore it is believed that at the early years of transition the explicit effects of domestic interest rates on the real sector activity is rather difficult to distinguish in Estonia.

There are several reasons, why the treatment of real interest rate effects on real sector activity at the early 1990s can be ambiguous in Estonia. First, the (*ex post!*)²⁸ real interest rates were substantially negative until 1997 as the inflation exceeded the level of nominal interest rates. This makes the link between interest rate movements and real sector behaviour more difficult to explain, as real sector had less incentive to pay attention to the interest rates. Second, the rate of financial intermediation was relatively low at the beginning of transition (See Figure 2). Therefore, the changes affecting real sector balance sheets (freedom to borrow – in other words, to expand the liabilities' side of their balance sheets) may have been more relevant in such countries than changes in interest rates (Kamin, *et al* 1998). This proposition can hold also when we consider real sector saving decisions. In low-income economies, the households' propensity to save can be more dependent on the income and wealth effects than on the interest rates. Third, both private and financial sector credit-assessment skills were underdeveloped at the early years of transition, which can also reduce possible interest rate effects through non-adequate borrowing assessments.

The relevance of interest rates has however increased during the years. Therefore, some recent empirical results have indeed found links between interest rates and real sector behaviour. The empirical estimation of Estonian Monetary Transmission mechanism (Pikkani 2001) suggests that interest rates can have relatively strong impact on the Estonian real activity. Also the study of Estonian interest rates' term structure (Palm & Rell 2001) shows that for some cases (for some economic sectors) there can be precedence of interest rate increase before the decrease in real activity.

The credit channel emphasizes informational problems in financial market and stresses the fact that banks are special financial intermediaries, who are designed to solve those problems. Credit channel effects can appear as a change in external finance premium or as a change in credit availability. Unfortunately, we do not have data of individual loan-contracts to explicitly identify possible credit effects in Estonia. Instead, we try to identify some assumptions that rely behind the credit channel and see if they are relevant in Estonia. The bank loan channel is supposed to work, when bank loans are not perfectly substitutable for the real sector with some alternative form of external financing or when the banking sector is vastly dependent on domestic liabilities (on the liabilities that are subject to reserve requirements)²⁹. Factors that can affect this channel can be divided into: i) importance of small banks; ii) banks' health; iii) importance of small firms; and iv) availability of non-bank finance (Kashyap & Stein. *The Role...* 1997).

The importance of small banks and banks' health issues determine the banking sector

²⁸ There is only slight evidence of the existence of rationality in Estonian inflation expectations (Sepp & Rell 2001). Sepp & Rell did not find rationality in household sector expectations. Moreover, they did not find adaptive elements also in households' expectations - it seemed that the households have persistent assumption about future inflation rate (Sepp & Rell 2001).

²⁹ There are two different distinguishable approaches to credit channel – The first suggests that banks are dependent on reservable deposits and contraction in reserves will prompt to banks to contract their balance sheets. The second suggests that there are significant numbers of bank-dependent firms that cannot mitigate bank lending with other sources of finance (Cecchetti 1999).

ability to substitute domestic deposits with other liabilities for preventing the contradiction in their balance sheets³⁰. Estonian banking sector ability to raise easily funds from abroad means under CBA that when the foreign (re-)financing conditions are loose, the domestic credit supply may follow the credit demand at the given interest rate level (see Chapter 1.3). Thus, the contradiction in domestic deposits does not necessarily yield contradiction in credit supply in Estonia, as banks can attract foreign liabilities (or in the short-term use their foreign reserves) instead of domestic deposits to fulfil the credit demand. However, when the tightening of monetary conditions means also weaker ability to substitute domestic deposits with foreign resources, the credit effects can be present from the bank lending side.

As it is typical to banking-oriented financial system, the corporate bond market in Estonia is shallow and closed emissions dominate. The domestic debt securities market has remained mainly into short-term market, thus it is more connected to money and forex swap market than to retail lending market. Therefore, it has only a minor role for real sector as a substitute of bank borrowing.³¹ In domestic financial system, the most relevant substitute for real sector bank-loans can be leasing financing. However, the leasing companies are almost fully owned and financed by the banking sector. Therefore the supply-conditions in the leasing market cannot differ considerably from the conditions in the bank lending market. Thus, for the real sector the only considerable competitor for banks' intermediated finance can be direct borrowing from foreign capital markets (see Figure 11).

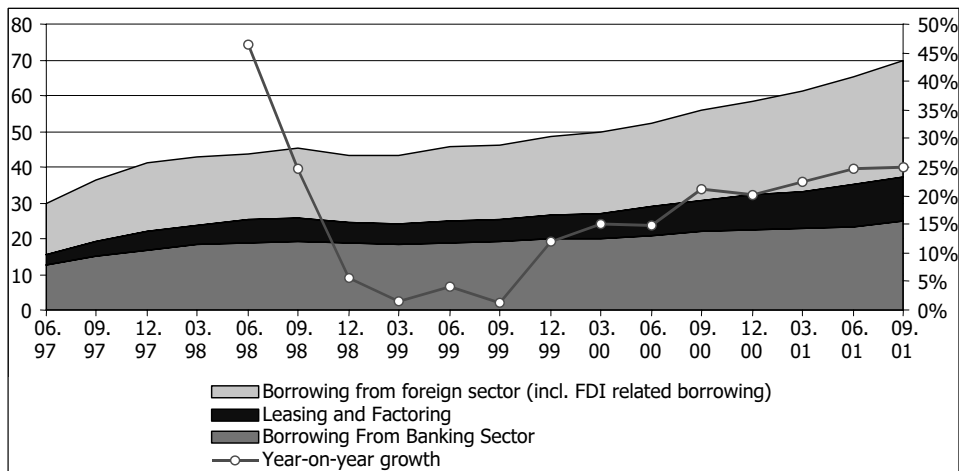


Figure 11. Real sector borrowing (EEK bn) from different sectors. (Foreign borrowing includes also FDI related foreign borrowing)

³⁰ Some researches argue that tightening monetary conditions leads greater cutback in lending by smaller banks, thereby supporting the existence of credit channel (Kamin et. al. 1998; Kashyap & Stein. What... 1997).

³¹ Small role of stock and bond financing was supported also by Estonian privatization model, which was mainly based on direct sales to strategic investors. This supported the development of corporate governance in the direction of concentrated ownership.

The foreign capital markets are accessible to a limited group of larger enterprises³². Those enterprises are able to raise funds from other sources, when the domestic credit-supply is restricted³³. However, the majority of the companies are rather small. Those enterprises are more dependent on banking sector in financing their activities. This means that they have limited ability to substitute the bank financing, when the domestic credit supply is restricted. The interest rate and credit channel effects can therefore have stronger impact on smaller enterprises and households.

The developments in Estonia are supportive to proposal that in addition to interest rate effects, credit effects may also be present. Before 1996–97 domestic credit supply was quite restricted, as credit rationing is induced if the banks perceive themselves to be facing hard budget constraints (Kamin *et al* 1998). At the same time enterprises were probably less sensitive to the interest rate changes (see above), thus those factors may suggest that real sector was more dependent on the availability of loans than on the price of loans during this period. Restricting loan availability by banks in those years can be alternatively explained by imperfect or missing legislation and by underdeveloped market structures. These factors increased moral hazard and asymmetric information problems. The moral hazard problems occurred not only from the side of the firms but also from the side of the banks. The banks extended insider loans to their owners rather than loans to unknown firms during this period. Therefore, the restricted loan supply can be interpreted as the effect of credit rationing. As credit rationing was not initiated by monetary policy shock, we cannot interpret it as a pure credit channel effect. This, nevertheless, does not change the intuitive proposal that loan supply was rather restricted and selective during the period, which had implications that were more relevant on real sector activity than the interest rate signals.

Foreign financed increase in financial intermediation relaxed the banking sector dependence on domestic resources in 1996–97 and led into extensive credit growth, rising equity prices and falling interest rates. Under the currency board's money supply mechanism the capital inflow was automatically passed into increasing money supply and credit growth. The central bank ability to sterilize those flows was rather limited, as there is no room for discretionary monetary policy in the currency board³⁴. In the context of transmission mechanisms, it is significant that expansive monetary developments in 1996–97 yielded into deepening financial intermediation and increased the importance of the link between monetary developments and real sector activity. The link between domestic credit and domestic demand increased substantially during those years. The real sector (*ex post*) real interest rates achieved positive values, however the link between real interest-rates and real sector credit demand remained unclear, as the increase in real rates was accompanied by rapid credit growth. Nevertheless, foreign monetary signals started to pass to the domestic real sector more evidently through increased use of LIBOR-linked interest rates, implementing direct cash-flow effects on lenders and borrowers.

³² It is usually assumed that foreign financing is accessible to enterprises that have considerable amount of foreign ownership and that are more export oriented. The foreign financing is accessible also to bigger infrastructure enterprises.

³³ The experience of 1998–99 suggests that decrease in domestic bank lending was partly substituted with foreign financing (Vesilind & Liiv 2001). However, as the growth of foreign financing was based on the credit from mother companies, the latter can be viewed as internal not external financing. Direct lending of the companies from abroad remained difficult for the whole period.

³⁴ Concerned with the credit growth the Estonian authorities introduced several measures in 1997 to cope with capital inflow. Those measures included tightening of reserve requirements, increased capital adequacy ratio and creation of the Stabilization Reserve Fund from the fiscal surplus, which was invested abroad.

The expansive capital inflow in 1997–98 did not change the small role of corporate bond market and non-perfect substitutability of bank intermediated finance. The impact of the Asian and Russian crisis suggests that the tightening of monetary conditions during those times did not yield into powerful interest rate channel, as the lending rates of enterprise loans did not follow the increase in money market rates. Moreover, even domestic deposit rates increased above the lending rates (see Figure 8 and 9). At the same time foreign financing conditions worsened, credit growth decreased substantially (see Figure 7) and commercial banks started to discuss about more conservative approach in selecting borrowers. Those developments may suggest that during those periods some credit rationing effects might have been present in the form of decrease in availability of bank credit³⁵. The empirical estimation of Estonian Monetary Transmission mechanism (Pikkani 2001) suggests also that there can be credit effects existent that have relatively strong impact on the Estonian real activity.

³⁵ However, it is difficult to distinguish whether the decrease in domestic borrowing during those periods was mainly caused by credit channel effects or by a decrease in credit demand.

Conclusions

One of the key issues in assessing monetary policy is the analysis of monetary transmission mechanism. This mechanism is influenced by several factors – the set-up and consistency of present macroeconomic “policy-mix”, including the choice of monetary regime; the structure of economy, including the structure of financial sector; and the links between different sectors, including foreign, financial and real sectors, are just few of those factors. The effectiveness of different transmission channels is highly dependent on the evolution of financial systems and market structures and its evaluation is a challenging task even for advanced economies.

The features of currency board imply an important aspect for monetary transmission mechanism in Estonia – there is no active monetary policy. The price stability objective in Estonia is tied to the anchoring role of exchange rate, and all the necessary adjustments are left to the market. Under fixed exchange rate and under free capital mobility Estonian monetary conditions are therefore closely linked to monetary policy in Europe – in addition to the changes in Estonian risk-premium, the interest rate developments, therefore also monetary policy actions of European Central Bank, can directly influence Estonian interest rates. Furthermore, the increased integration of Estonian financial sector with foreign markets during the last ten years has strengthened this link substantially. The strongly anchored Estonian and European monetary connections are also recognized by ECB, who stated in April 2000 that ECB might agree on case-by-case basis that accession countries with euro-based CBAs may participate in ERM II with a CBA.

Foreign monetary signals transmit widely into Estonian financial sector. The consequences of those monetary signals to the behaviour of Estonian enterprises and households depend on several aspects beginning from the impact of substantial structural changes in Estonian economy during the last decade and ending with the factors influencing households’ and enterprises’ everyday decisions. The evidence from financial structure and real sector financing patterns suggests that in addition to the interest rate channel the existence of credit channel effects in Estonia is highly possible.

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