Notes on the monetary transmission mechanism in the Czech economy

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This paper discusses several empirical aspects of the monetary transmission mechanism in the Czech economy. The introduction briefly describes the evolution of monetary policy in the Czech Republic since the early 1990s. Section I discusses the forecasting model used currently by the Czech National Bank (CNB). Section II describes the development of the financial system in the Czech economy, focusing on the importance of changes in this system for monetary policy transmission. Section III looks at some empirical characteristics of the Czech monetary transmission mechanism.

Introduction

At the beginning of 1998, the CNB joined the group of inflation targeting central banks. The switch from a regime based on monetary targeting and a fixed exchange rate to inflation targeting and a floating exchange rate was the consequence of a currency crisis of the Czech koruna (CZK) in May 1997, which was partly related to the currency crises in Southeast Asia. The currency peg had provided the Czech economy with a nominal anchor since the beginning of the economic transformation in 1991. It was a crucial component of economic policies during the early 1990s, but it started to become less helpful as capital account liberalisation progressed in the middle of the decade. In order to address the issue of the "impossible trinity", the peg was gradually relaxed. The most significant change consisted in widening the fluctuation band of the koruna against a basket of the deutsche mark and the US dollar to ±7.5% around a central parity in February 1996.

Monetary transmission during most of the 1990s was heavily influenced by three structural characteristics of the Czech economy at the time. First, the real sector was going through a deep transformation from the centrally planned to a market based economy. Second, the banking sector was also going through a restructuring process. However, this process was not very successful. Commercial banks were still state-owned at the time and restructuring resulted in a massive bail-out: bank loans totalling more than 23% of GDP (at 2003 prices) were transferred from commercial bank balance sheets to the state between 1991 and 2003. Third, the overall degree of monetisation of the economy was very low. The volume of loans to households was negligible and many corporations borrowed abroad in order to avoid the high nominal cost of funds in the domestic currency.

The main instruments of monetary policy at the time were sterilisation via open market operations and minimum reserve requirements. Despite frequent and substantial overshooting of the monetary target, the desired path of inflation was typically achieved, in large measure because the fixed exchange rate minimised the exchange rate pass-through.

After the widening of the exchange rate fluctuation band in February 1996, the role of the exchange rate channel gained greater significance. In theory, the CNB could have continued to pursue monetary targeting under such circumstances. However, it soon became clear that

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short-term interest rates would have to be given greater prominence. Even while the exchange rate was fixed, short-term interest rates played a greater role in the monetary policy execution than controlling the quantity of money. In other words, what mattered in practice even before inflation targeting was introduced was the "cost of money" rather than the "quantity of money".

I.   Current model of the monetary transmission mechanism

The inflation forecast of the CNB is based on a small calibrated macroeconomic model. While the short-term forecast (for the current and the next quarter) is based on an expert forecast, on a longer time horizon the model-based forecast prevails. The forecast is unconditional, with a Taylor-type reaction function that includes feedbacks from the lagged short-term interest rate, the output gap and the deviation of inflation four quarters ahead from the target. The exchange rate is determined endogenously on the basis of a modified version of uncovered interest rate parity, which takes into account the equilibrium speed of nominal appreciation of the koruna estimated by the Kalman filter.

The transmission of monetary policy actions – changes in nominal interest rates – to economic developments occurs through three main channels in this model.

The first channel is the direct exchange rate channel based on the modified uncovered interest rate parity condition. An increase in the nominal interest rate leads to an appreciation of the exchange rate; this decreases the price of imported goods and services and leads, via a version of the Phillips curve, to lower domestic CPI inflation. And vice versa: a cut in the nominal interest rate leads to a depreciation of the exchange rate, higher prices of imported goods and services and higher inflation.

The second channel is the indirect exchange rate channel. In this case, real economic developments are influenced by the exchange rate indirectly, via the so-called real exchange rate gap. This gap is defined as the deviation of the actual real exchange rate from its equilibrium level, ie, the level consistent with long-run differentials in productivity growth between the Czech Republic and its main trading partners. For instance, a strengthening of the real exchange rate above its equilibrium level slows output growth, which leads, via the Phillips curve, to lower inflation.

The third channel is the direct interest rate channel. It is based on a relationship between the real interest rate gap and domestic demand (consumption and investment). The real interest rate gap is defined as the deviation of the actual real interest rate from its equilibrium level, which is determined by the long-run characteristics of the economy such as the marginal product of capital, country risk premium, etc. When the real interest rate is higher than its equilibrium level, the negative output gap widens (the positive output gap narrows), and the rate of inflation decreases.

The model is closed by the monetary policy reaction function. This equation represents a forward-looking monetary rule for setting interest rates in order to minimise deviations of expected inflation and the actual output gap from their target or equilibrium levels, subject to maintaining a desired level stability of the nominal interest rate.

There is an ongoing discussion on the calibration of the model and its features. As the part of the regular verification of model properties, the strength of the direct exchange rate channel, as well as some other channels, is tested by sophisticated Bayesian estimation methods. The results of these tests have basically confirmed earlier assumptions on calibration ranges.

II. Development of the banking sector and monetary transmission

There were three main periods in the development of the Czech banking sector over the past 15 years: the early transformation period, which ended with the currency crisis in May 1997; the consolidation period, during which commercial banks were restructured and total credit contracted; and the period of expansion, especially of household credit, which started in 2002 after privatisation and restructuring of the major banks had been completed.

In the early years of the economic transformation there was very strong corporate demand for credit (Graph 1). The CNB used credit ceilings to avoid an expansion of credit above the monetary plan. In addition, because of the fixed exchange rate – and, hence, absence of exchange rate risk – as well as lower foreign compared to domestic interest rates, corporate demand for foreign currency loans was relatively strong (Graph 2). This demand was partly accommodated by foreign banks supplying direct cross-border credit to entities with relatively high credit ratings, and partly by domestic banks making loans denominated in foreign currencies to their Czech customers.

Graph 1

Bank loans by sector

Millions of CZK
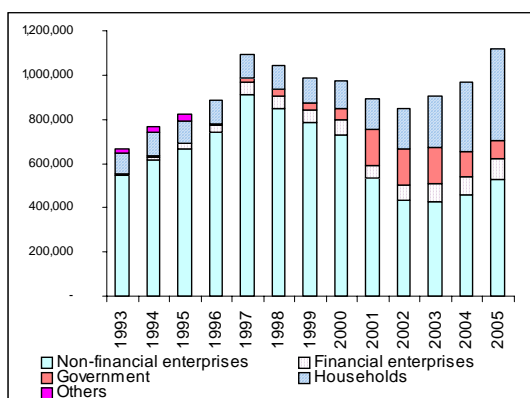
Graph 2

Foreign currency loans

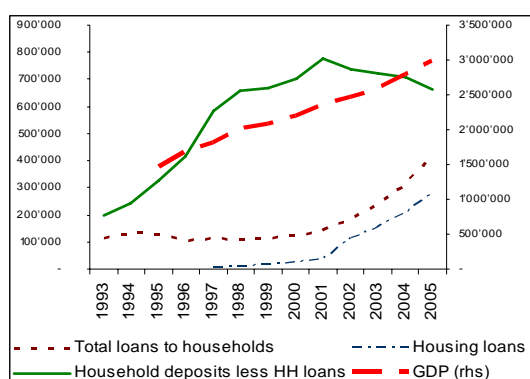Percentage of total loans
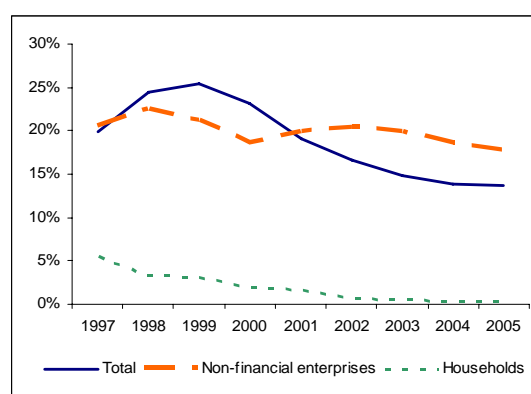
Source: Czech National Bank.

Households were a net source of funding for the Czech commercial banks during this period, given that the volume of loans to households was negligible (Graph 3). One reason was that interest rates were high and the purchasing power of households was low. In addition, because of a weak institutional and legal framework, the housing market was underdeveloped and banks did not market retail products such as consumer or mortgage credit.

Household deposits were for the most part held in the Czech koruna. Although there was some increase in foreign currency deposits related to the gradual liberalization of foreign currency transactions for households, the proportion of foreign currency deposits quickly levelled off. Following the currency crisis in May 1997 the proportion of foreign currency deposits declined sharply to about 10% of the total, where it has remained since (Graph 4). The share of foreign currency deposits in the Czech Republic is thus low in comparison with other CEE economies.

Graph 3

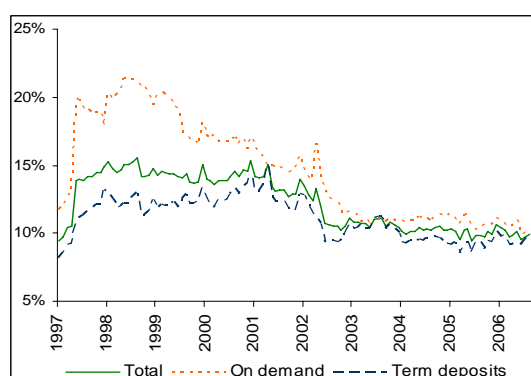**Household loans and deposits**

Millions of CZK

- - - - Total loans to households   - · - · - Housing loans
——— Household deposits less HH loans   ▬ ▬ GDP (rhs)

Graph 4

Household foreign currency deposits

Percentage of total deposits

——— Total   · · · · · On demand   - - - Term deposits

Source: Czech National Bank.

The period of fast credit creation from 1993 to 1996 was followed by a period when major banks got into deep financial difficulties. During this consolidation period (from 1997 to 1999), large state-owned commercial banks received substantial financial support from the government to clean up their balance sheets. As a result, they were very cautious in their lending policies (Graph 5). Even following the privatisation of banks in the late 1990s, new foreign owners focused on internal restructuring. As a result, credit growth was very subdued until 2002.

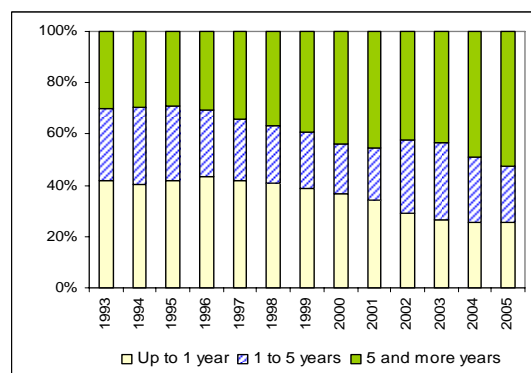Graph 5

Total loans and deposits

Percentage of GDP

——— Total loans   - - - - Total deposits   - - - Loans to households
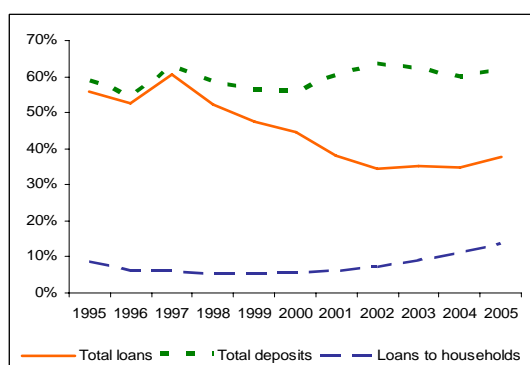
Graph 6

Maturity structure of bank loans

Percentage of total loans

☐ Up to 1 year   ▨ 1 to 5 years   ▧ 5 and more years

The start of the most recent phase of the banking sector development in 2002 coincided with the onset of a period of very low nominal interest rates. As banks completed restructuring and their capital base was strengthened, they became ready for the credit expansion. The expansion took place predominantly in the area of household lending (Graphs 1, 3 and 5). The growth of mortgage loans and consumer credit has averaged around 30% per annum for the past five years (Graph 3).[2] As a result, the share of household loans increased to 30% of

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[2]   These data refer to bank loans only. Non-bank financial institutions have also developed rapidly. They have mostly targeted the consumer credit market. In the 1990s, only car leasing loans were relatively developed.

total bank loans in this short period (Graph 1). However, the overall share of bank credit in GDP and the share of household loans in total loans remain very low compared to the euro area average.

Since 2005, corporate credit growth has also accelerated, reaching double-digit growth rates. The demand for foreign currency loans at the retail level has remained negligible and the overall proportions of foreign currency loans as well as deposits have continued to decline (Graphs 2 and 4). Unlike those of other countries in the region, Czech households are not willing to take on foreign exchange risk, despite continuing appreciation of the domestic currency vis-à-vis the euro.

Another indication of household risk aversion is the tendency to fix interest rates on mortgage loans for a relatively long duration (for Czech conditions) of around 3 years. The banks typically offer the possibility to fix the interest rate for 1 to 5 years, with the yield curve being relatively steep. Even though banks offer very low 1-year fixings for advertisement purposes, few households take a relative advantage of such offers. At the same time, fast growth of the residential mortgage market and greater stability in the corporate sector are reflected in a large increase in the share of long-term loans (Graph 6).

The interest rate sensitivity of the corporate sector is difficult to assess because a very liquid swap market has developed, with market-makers being mainly large London-based banks. It can be assumed that the corporate sector often uses the swap market for changing the interest rate profile of its liabilities. Exporters are also active users of foreign exchange derivatives, which can in addition help them to reduce their interest rate exposure.
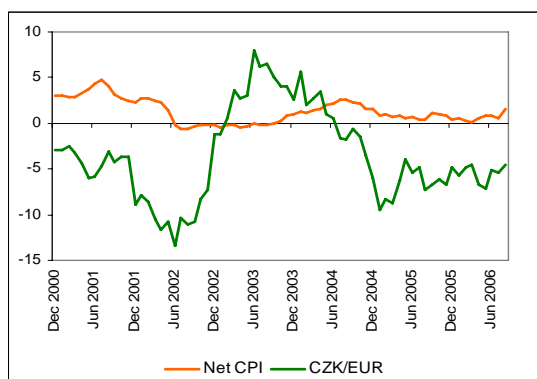
III.   Some empirical observations on the Czech monetary transmission mechanism

As noted above, since the introduction of a more flexible exchange rate regime in 1996, the role of the exchange rate channel has gained greater significance in the Czech monetary transmission mechanism. Several estimates of the exchange rate pass-through were made, with the results typically indicating that a 1 percentage point depreciation of the koruna was translated into approximately 0.33 percentage points higher inflation in the late 1990s. The high exchange rate pass-through reflects a relatively high share of imported goods in the production and consumption baskets, as well as a high degree of openness of the Czech economy. As shown in Graph 7, exchange rate developments and inflation have remained correlated in the recent period of flexible exchange rates, although the pass-through seems to have declined somewhat.

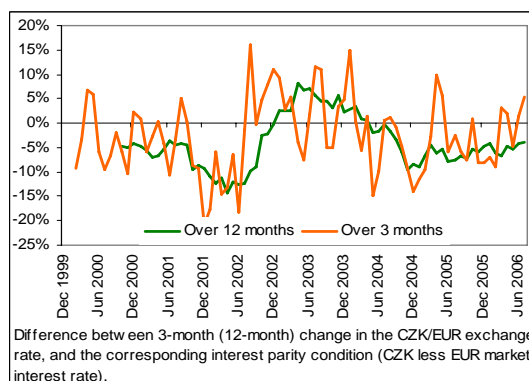| Graph 7	Graph 8
Changes in exchange rate and inflation	**Deviation of exchange rate changes from interest parity condition**
12-month percentage changes	In percent

Difference between 3-month (12-month) change in the CZK/EUR exchange rate, and the corresponding interest parity condition (CZK less EUR market interest rate).

Relatively high exchange rate volatility presents a considerable challenge for modelling of the inflation process for forecasting purposes. As shown in Graph 8, the risk premium derived ex-post from the interest parity condition shows considerable volatility in both the short term and the longer term. Moreover, the CNB modelling framework underestimates currency appreciation in the long term, which induces a pro-inflationary bias of the forecast. Capturing the effect of trend appreciation in a modelling framework is very difficult because the observed appreciation seems to be unrelated to capital inflows or interest rate differentials. For instance, there were periods when the koruna appreciated even though interest rates in the Czech Republic were lower than in the euro area. Appreciation thus seems to be driven mainly by unobservable expectations of economic agents.

Another challenge for modelling of the inflation process is frequent adjustment of indirect taxes and regulated prices. The CNB modelling framework therefore uses CPI adjusted for changes in indirect taxes and regulated prices as a better approximation of underlying inflation (Graph 7). The monetary policy rule in the model then focuses on the reaction to secondary effects of changes in indirect taxes and regulated prices.

Regarding the interest rate channel, transmission between the policy rate and money market rates is generally quick and complete. However, transmission between money market rates and bank loan rates is slower and less complete. For shorter maturities, especially consumer credit, interest rates adjust with a longer lag and tend to be sticky (Graph 9). For 3-year mortgage loans, which are the most widespread in the Czech Republic, interest rates adjust more quickly to changes in money market rates (Graph 10). This effect is again less pronounced for interest rates on 5- to 10-year loans, which also tend to be sticky.
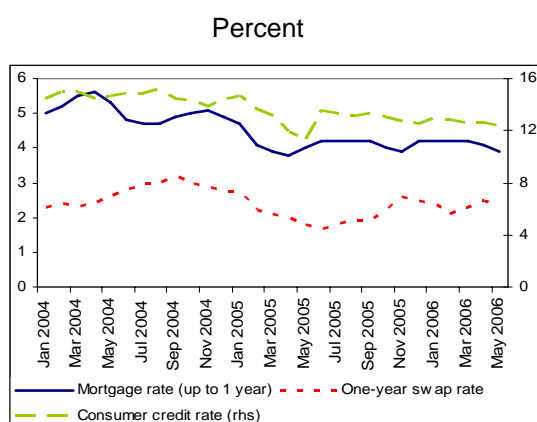
Graph 9	Graph 10
Short-term interest rates	**Medium-term interest rates**
Percent	Percent
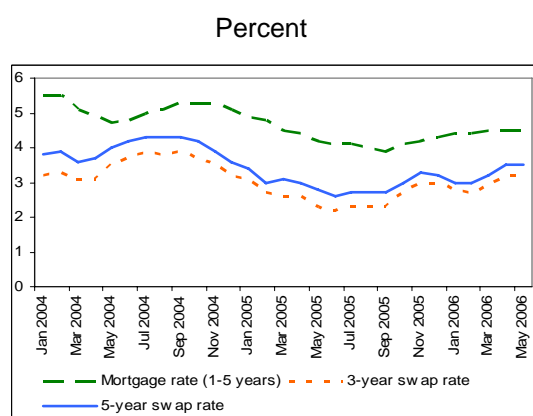
In general, one can notice that the interest rate pass-through is increasing over time. One reason for this improvement is that banks' capacity and willingness to accept risks have increased due to the strengthening of their balance sheets and greater competition and financial innovation in the banking industry. Greater competition has also contributed to a gradual decrease in spreads between money market rates and mortgage rates (Graph 11). In addition, evidence of an occasional negative correlation between changes in money market rates and loan rates, and lower volatility of spreads (Graph 12), points to smoothing of interest rate changes by the banks in order to keep the customers.
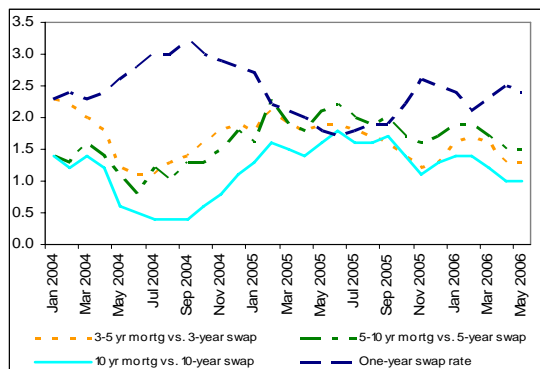
One should note that these changes on the supply side of the banking industry occurred at a time when the Czech inflation target was undershot for several years in a row, resulting in very low nominal interest rates. It is far from obvious whether monetary tightening would reduce credit expansion significantly under these circumstances. Apart from mortgage loans, interest rate margins in the Czech Republic are much higher than in the euro area, and the interest rate elasticity of demand is much lower. Banks could thus easily absorb somewhat

lower margins if the Czech National Bank raised interest rates, while consumers and firms would not necessarily reduce their demand for loans significantly.

Graph 11

Interest rate spreads

Mortgage rate, less swap rate, in percent

Graph 12

Volatility of interest rate spreads

Standard deviation of interest rate spreads

3-5 yr mortg. vs. 3-year swap — 5-10 yr mortg vs. 5-year swap
10 yr mortg vs. 10-year swap — One-year swap rate

3-5 yr mortg. vs. 3-year swap — 5-10 yr mortg vs. 5-year swap
10 yr mortg vs. 10-year swap — Cons. credit vs. 1-year swap