# Credit market and prediction of its future development

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2008

# CREDIT MARKET AND PREDICTION OF ITS FUTURE DEVELOPMENT IN THE CZECH REPUBLIC

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## INTRODUCTION

This study focuses on the credit market in the Czech Republic. The aim of this paper is to carry out an econometric investigation of supply and demand on the credit market and to predict the development in the future.

The first part of the paper briefly characterizes the credit market in the Czech Republic. As a result of banking crisis, the growth rate of credits provided to private sector has decreased sharply and is recovering only gradually. It has caused many problems especially to nonfinancial companies.

Next chapter discuss the essence of disequilibrium model. Credit markets are very often characterized by the fact that the interest rate does not clean the market and the discrepancy between credit demand and credit supply occurs. The fact that it is impossible to measure credit demand and credit supply quantities can be solved by the use of disequilibrium model. In the framework of disequilibrium model, the credit demand and credit supply functions are estimated under the restriction that the minimum of the two determines credit.

The last chapter describes the data used and the empirical findings. The analysis is based on quarterly data covered the period from the first quarter of 1994 to the fourth quarter of 2006. Based on parameter estimates, the volume of credit demand and credit supply is calculated and compared with the actual volume of credit. The future development of the Czech credit market is predicted.

**Key words**: credit market, lending activity, disequilibrium model, credit demand and supply

## CREDIT MARKET IN THE CZECH REPUBLIC

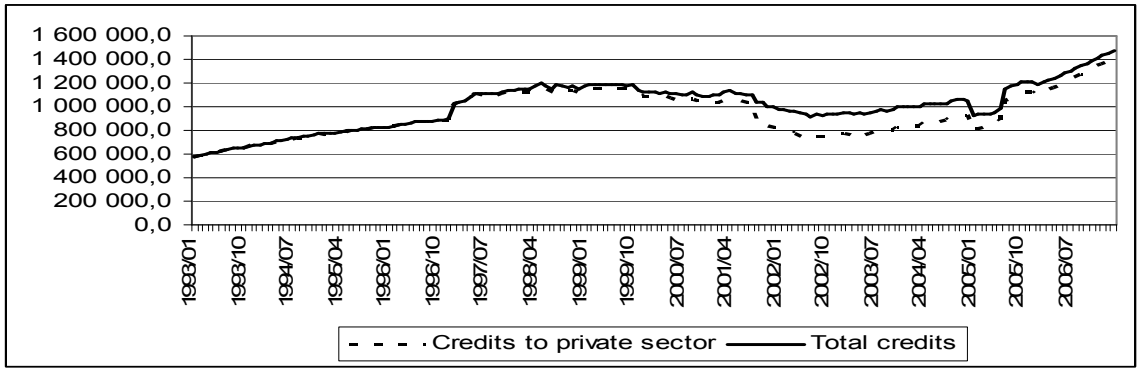
### Lending activity of Czech banks

The beginning of transition period was connected with rapid growth of lending activity. The enormous demand for credits needed to privatization was satisfied mainly because of massive flow of short-term foreign capital. Czech banks increased their sources by credits from abroad and profited from lower foreign interest rates. Rapid increase of monetary stock, together with sharp growth of wages and consumption caused huge increase of aggregate demand, current account deficit and monetary crisis in May 1997. The recession which followed the crisis negatively influenced financial situation of Czech companies and increased credit risk.

Banks provided loans under the conditions of insufficient legislative, lack of needed knowledge and experiences, short credit history of borrowers, problems of small and medium sized banks and economic recession. This had to manifest in huge amount of classified loans. As a result of necessity to create loan loss provisions and higher caution of banks in granting credits, the growth rate of credits provided to private sector started to decrease in 1998. In the period 1999 - 2004, even the volume of credits decreased (see Figure 1).

Not until the beginning of 2004, the unfavourable development of volume of provided credits changed. The reason is that banks started to offer more and more products to households (mainly mortgage loans and consumer loans).

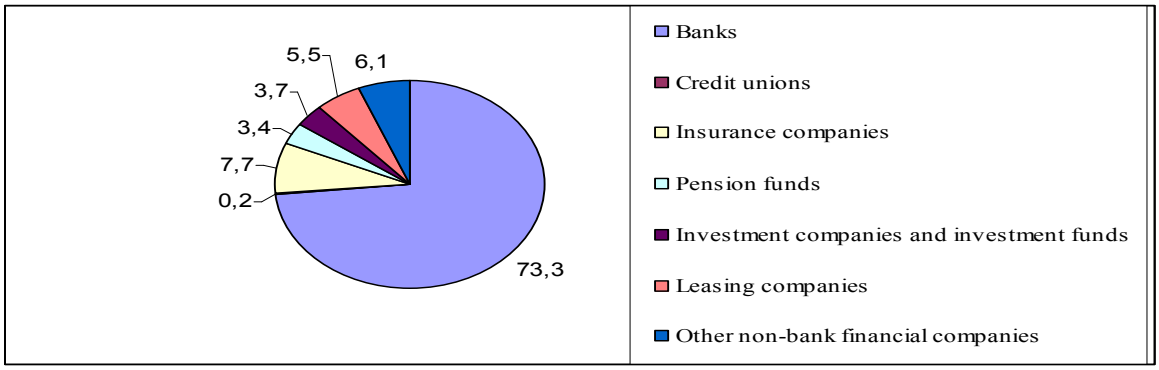
Figure 1 – Credits provided to private and public sector in the Czech Republic (mil. CZK)




Source: Czech National Bank

The decline of growth rate or even the decline of volume of provided credits has always serious impact on the whole economy. The more the economy depends on banking sector, the worse are the unfavourably effects of such situation. Capital markets should offer alternative sources of financing in standard market economies; however, the Czech capital market fulfils this function only partly. As well as in most new EU member countries, banks plays dominant role in financing in the Czech Republic (see Figure 2).

Figure 2 – Assets of financial sector in the Czech Republic (in %, as of the end of 2006)




Source: Czech National Bank

According to banks, the decline in their lending activity was a result of lack of good entrepreneurial projects and bad financial situation of borrowers, both because of economic recession. But banks were often accused of their unwillingness to provide credits and of their investing in safe state securities. Therefore it is useful to have a look at the structure of banks´ assets (see Table 1).

Table 1 – Structure of banks´ assets in the Czech Republic (in %)

| Year | Deposits with CNB | Deposits with banks | Credits | Securities | Fixed assets | Other assets |
|---|---|---|---|---|---|---|
| 1993 | 6,9 | 20,5 | 55,2 | 6,5 | 2,7 | 8,2 |
| 1994 | 7,6 | 22,1 | 50,3 | 10,2 | 2,9 | 7,0 |
| 1995 | 8,9 | 17,1 | 45,9 | 17,7 | 3,1 | 7,3 |
| 1996 | 7,0 | 19,2 | 46,2 | 15,3 | 3,2 | 9,1 |
| 1997 | 8,5 | 21,7 | 44,5 | 14,4 | 2,9 | 8,0 |
| 1998 | 11,1 | 20,4 | 41,7 | 16,7 | 3,3 | 6,8 |
| 1999 | 10,9 | 22,8 | 37,6 | 19,1 | 2,5 | 7,1 |
| 2000 | 10,6 | 21,7 | 35,0 | 22,9 | 2,2 | 7,6 |
| 2001 | 12,8 | 22,4 | 36,9 | 19,1 | 2,3 | 6,5 |
| 2002 | 19,9 | 15,9 | 36,1 | 18,4 | 2,3 | 7,4 |
| 2003 | 19,2 | 11,8 | 39,4 | 21,2 | 2,2 | 6,2 |
| 2004 | 17,1 | 15,2 | 40,7 | 20,1 | 2,0 | 4,9 |
| 2005 | 17,5 | 14,0 | 39,8 | 22,3 | 1,7 | 4,7 |
| 2006 | 12,9 | 31,5 | 40,8 | 9,1 | 1,9 | 3,8 |

Source: Czech National Bank

Table 1 documents that the decline in volume of credits manifested in lower share of credits on banks´ assets, too. At the beginning of transition period, credits amounted half of all assets. At the end of nineties, their share is was only 35 %. Banks actually invested in securities (mainly in state bonds, bonds emitted by Czech National Bank and other bonds). However, deposits with Czech National Bank increased, too. This could be because of risk weights, used in capital requirement calculation. Credits had the unified risk weight 1.0 but deposits in CNB and state securities had the risk weight 0.0 so there was no need to hold the capital for them.

The data in Table 1 are influence by the concentration of Czech banking sector. Big banks control nearly two thirds of the market (see Table 2).

Table 2 – Market shares of groups of banks in credits (in %)

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| big banks | 77,5 | 73,6 | 69,0 | 64,4 | 60,3 | 61,7 | 60,8 | 59,9 | 57,7 | 56,2 |
| medium sized banks | 12,0 | 13,7 | 15,8 | 18,6 | 22,3 | 18,3 | 21,1 | 20,9 | 23,4 | 20,0 |
| small banks | 1,2 | 1,3 | 2,0 | 2,5 | 3,4 | 4,4 | 2,1 | 3,5 | 2,6 | 6,4 |
| branches of for. banks | 8,1 | 9,4 | 10,4 | 11,0 | 10,0 | 10,1 | 8,9 | 10,1 | 7,3 | 8,0 |
| building societies | 1,3 | 2,0 | 2,8 | 3,5 | 4,0 | 5,5 | 7,1 | 5,6 | 9,0 | 9,4 |

Source: Czech National Bank

Table 3 – Share of credits on total assets (in %)

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| big banks | 38,4 | 31,9 | 33,7 | 35,6 | 38,7 | 40,8 | 37,4 | 43,5 |
| medium sized banks | 34,6 | 35,6 | 35,4 | 42,1 | 51,5 | 53,2 | 60,7 | 68,3 |
| small banks | 50,1 | 45,5 | 46,6 | 45,6 | 41,2 | 48,4 | 53,4 | 59,1 |
| branches of for. banks | 28,5 | 30,5 | 29,1 | 38,4 | 35,3 | 29,9 | 31,3 | 39,8 |
| building societies | 24,1 | 23,8 | 24,5 | 25,4 | 28,6 | 31,3 | 30,1 | 34,9 |

Source: Czech National Bank; author's calculation

The increase of lending activity of small and medium sized banks was not sufficient to balance the decline of lending activity of big banks (see Table 3). Also the sector of building societies provides more and more credits.

## Structure of credit portfolio of Czech banks

The quality of credit porfolio is being assessed from 1994 (see Table 4).

Table 4 – Classified loans in the Czech Republic (in %) *

| Year | Classified loans | Watch loans | Substandard loans | Doubtful loans | Loss loans |
|---|---|---|---|---|---|
| 1994 | 36,5 | n/a | n/a | n/a | n/a |
| 1995 | 33,1 | n/a | n/a | n/a | n/a |
| 1996 | 29,3 | n/a | n/a | n/a | n/a |
| 1997 | 26,9 | 22,8 | 10,0 | 11,0 | 56,2 |
| 1998 | 27,1 | 22,8 | 12,9 | 13,8 | 50,5 |
| 1999 | 32,2 | 31,7 | 13,5 | 13,2 | 41,6 |
| 2000 | 28,9 | 33,3 | 21,3 | 10,6 | 34,8 |
| 2001 | 20,8 | 36,1 | 15,5 | 14,2 | 34,2 |
| 2002 | 15,8 | 47,5 | 18,4 | 7,7 | 26,4 |
| 2003 | 11,2 | 56,5 | 16,9 | 6,1 | 20,5 |
| 2004 | 10,8 | 62,5 | 16,3 | 4,5 | 16,7 |
| 2005 | 11,7 | 63,1 | 13,1 | 6,0 | 16,8 |
| 2006 | 10,9 | 64,3 | 12,7 | 5,7 | 17,3 |

Source: Czech National Bank

* Classified loans in % of total loans, each category of classified loans in % of total classified loans.

The first peak of classified loans was in 1994 and it was connected with troubles of small and medium sized banks. Huge amount of classified loans was reached in 1997 – 1999 and it concerned problems of big state owned banks (Ceska sporitelna, Ceskoslovenska obchodni banka, Komercni banka). However, the quality of credit portfolio is much better nowadays. The substantial reduction in classified loans is a result of transfer of nonperforming loans from banks to a special agency (Konsolidacni banka, resp. Ceska konsolidacni agentura) and more cautious of banks in granting credits. Also the structure of classified loans is much more favourable: more than 60 % of classified loans are watch loans, which have high probability of full repayment (in contrary, more than one half of classified loans belonged to category "loss" i.e. loans with the highest credit risk in 1997).

Table 5 – Credits provided to economical sectors (in %)

| Year | Nonfinancial | Financial | Governmental | Crafts | Households | Other |
|---|---|---|---|---|---|---|
| 1993 | 72,0 | 10,8 | 0,5 | 7,6 | 6,1 | 3,0 |
| 1994 | 70,0 | 12,4 | 0,3 | 7,8 | 6,3 | 3,2 |
| 1995 | 71,2 | 13,1 | 0,4 | 7,9 | 4,5 | 2,9 |
| 1996 | 69,6 | 17,1 | 0,5 | 7,1 | 4,4 | 1,2 |
| 1997 | 71,1 | 13,7 | 1,4 | 5,1 | 4,6 | 3,1 |
| 1998 | 70,1 | 10,8 | 2,5 | 3,9 | 5,6 | 7,1 |
| 1999 | 69,0 | 9,4 | 3,1 | 3,2 | 7,2 | 8,1 |
| 2000 | 66,4 | 9,2 | 5,1 | 2,6 | 9,5 | 7,2 |
| 2001 | 56,0 | 6,4 | 17,2 | 2,4 | 12,3 | 5,7 |
| 2002 | 48,5 | 7,6 | 18,8 | 2,4 | 17,5 | 5,2 |
| 2003 | 45,0 | 8,7 | 19,2 | 2,6 | 22,2 | 4,8 |
| 2004 | 45,5 | 8,0 | 11,4 | 2,8 | 28,0 | 4,3 |
| 2005 | 43,5 | 10,1 | 7,1 | 2,8 | 31,4 | 5,1 |
| 2006 | 42,3 | 7,1 | 5,0 | 2,9 | 40,5 | 2,2 |

Source: Czech National Bank

Data in Table 5 documents dramatic changes in structure of credit portfolio. Since 1999, the importance of credits provided to nonfinancial companies is constantly decreasing (from 70 % in 1998 to only 42 % of total credits now). So the reduction of lending activity has significantly influenced mainly nonfinancial companies. On contrary, the share of credits provided to households has increased fivefold. This is caused not only by increasing importance of loans from building society and mortgage loans (which are the common way how to finance housing needs) but also by the fact that banks prefer retail banking and offer wide scale of consumer credits for households. The reason lies in lower risk of loans provided to households (see Table 6).

Table 6 – Classified and nonperforming loans according to economical sectors (in %)

| Year | Classified loans | | | Nonperforming loans | | |
|---|---|---|---|---|---|---|
| | Total | Nonfinancial | Households | Total | Nonfinancial | Households |
| 2002 | 9,8 | 27,7 | 6,7 | 9,1 | 14,5 | 4,3 |
| 2003 | 10,1 | 21,8 | 6,1 | 6,2 | 10,1 | 3,7 |
| 2004 | 11,3 | 21,1 | 5,4 | 4,8 | 7,2 | 3,4 |
| 2005 | 12,3 | 17,0 | 5,1 | 3,9 | 5,2 | 3,2 |
| 2006 | 16,2 | 16,4 | 4,7 | 3,6 | 4,6 | 2,9 |

Source: Czech National Bank, author's calculation

Credits to households are really less risky, both for classified loans (watch, substandard, doubtful and loss loans) and for nonperforming loans (substandard, doubtful and loss loans). But this is true only for credits to households totally: consumer loans are even more risky than loans to nonfinancial companies. E.g., only 1.6 % of loans for housing belonged to nonperforming loans at the end of 2005, but on contrary 7.8 % of consumer credits was nonperforming at the same time.

# DISEQUILIBRIUM MODEL

Disequilibrium model enables to estimate a credit demand and a credit supply function under the restriction that the minimum of the two determines credit. This strategy avoids the usual identification problem of

equilibrium models as either the demand or the supply function determines the volume of credit in given period. The general form of the disequilibrium model can be written as follows. Actual level of provided credits is:

$$L = \min(L_S, L_D)$$

where L … real volume of provided credits;
$L_S$ … real credit supply;
$L_D$ … real credit demand.

Credit supply is a function of chosen determinants:

$$L_S = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \varepsilon$$

where $x_i$ … determinants.

And finally, credit demand function can be written as follows:

$$L_D = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

A lot of researchers used disequilibrium model for analysis of selected credit markets, e.g.: Pazarbasioglu (1996) analyzed credit market in Finland; Agénor et all. (2001) in Thailand; Calza et all. (2001) in eleven EU countries; Catao (1997) in Argentina; Ghosh and Ghosh (1999) in Korea, Indonesia and Thailand; Baek (2005) in Korea; Nehls and Schmidt (2004) in Germany; Bajaras and Steiner (2002) in Columbia, Peru and Mexico. Commercial loans market analyzed Sealey (1997) for USA, Martin (1990) for Great Britain, Laffont and Garcia (1977) for Canada and Nenovsky et all. (2003) for Bulgaria. Table 7 brings the summary of determinants used in studies mentioned.

Table 7 – Possible determinants of credit demand and credit supply functions

| **Determinants of credit demand functions** | **Exp. sign** |
|---|---|
| expected fixed investments or industrial production | + |
| short-term or long-term interest rate | - |
| expected inflation | + |
| GDP | ? |
| indebtedness of private sector | - |
| capital market index | + |
| volume of credit in previous period | + |
| difference between interest rate of loans and corporate bonds | - |
| retained profits of companies | ? |
| **Determinants of credit supply function** | **Exp. sign** |
| deposits | + |
| bank's capital | + |
| interest rate for loans | + |
| market capitalisation of corporate bonds and shares | + |
| expected inflation | - |
| expected industrial production | + |
| volatility of prices of banks´ shares | - |
| lending capacity of banks | + |
| GDP | + |
| share of capital on assets | + |
| share of classified loans on total loans | - |
| interest rate margin | + |
| profitability of banks | + |
| competition on bank market | ? |
| volume of credit in previous period | + |
| difference between interest rate of loans and corporate bonds | + |
| rate of minimum required reserves | - |
| capital market index | + |
| share of created reserves and loan loss provisions on classified loans | - |
| cost of banks for deposits | - |
| dummy variables for specific influences (changes in regulation, banking or financial crises) | ? |

Source: Author's survey

The Table shows possible determinants. However, not all of them are suitable for the analysis of Czech credit market. Some of them has no sense to use (like capital market index, minimum required reserves, volatility of prices of banks´ shares, difference between interest rate of loans and corporate bonds etc.), for some other time series are not available (e.g. indebtedness of private sector). Therefore only a part of them was used for the analysis (see next chapter).

# EMPIRICAL ANALYSIS OF CZECH CREDIT MARKET

The analysis is based on quarterly data covered the period from the first quarter of 1994 to the fourth quarter of 2006. All bank data were provided by the Czech National Bank, other data were taken from International Financial Statistics of International Monetary Fund.

We expected credit demand to be a function of following determinants:

- interest rate for loans as a price of loans (IRL);
- gross domestic product, three quarters lagged - as lately as the borrower earn some money, his creditworthiness is sufficient for obtain a loan ($GDP_{t-3}$);
- rate of inflation, measured by consumer price index, as an indicator of general macroeconomic environment (INFL).

We expect negative signs for interest rate and for inflation as an increase in costs of borrowing (measured by interest rate) and deterioration of macroeconomic environment (indicated by increasing inflation) should lead to fall in demand for credit. We expect positive sign for $GDP_{t-3}$ as it covers the transaction demand for credit.

And credit supply function will be estimated for these determinants:

- lending capacity (total bank liabilities minus required reserves and liquidity requirements minus cash in vault minus equity capital) as a measure of banks´ ability to borrow (LECA);
- gross domestic product as a measure of borrowers´ ability to repay debts (GDP).

We tried to use also interest rate margin as a determinant of credit supply but it had almost no explanatory power so we decided to exclude it from the estimation. We expect positive signs both for lending capacity and for GPD.

The parameter estimates for credit demand and credit supply were obtained from the regression models provided by EView 4.1. All variables are statistically significant at 5 % tolerance level (see Table 8).

Table 8 – Parameter estimates for credit demand and credit supply

| **Demand** | | **Supply** | |
|---|---|---|---|
| Const. | 10.07 (0.000) | Const. | -7.19 (0.047) |
| IRL | 2.941 (0.028) | LECA | 1.08 (0.000) |
| $GDP_{t-3}$ | 0.63 (0.000) | GDP | -0.29 (0.000) |
| INFL | 0,79 (0.002) | | |
| R-squared | 0.6811 | R-squared | 0.8374 |

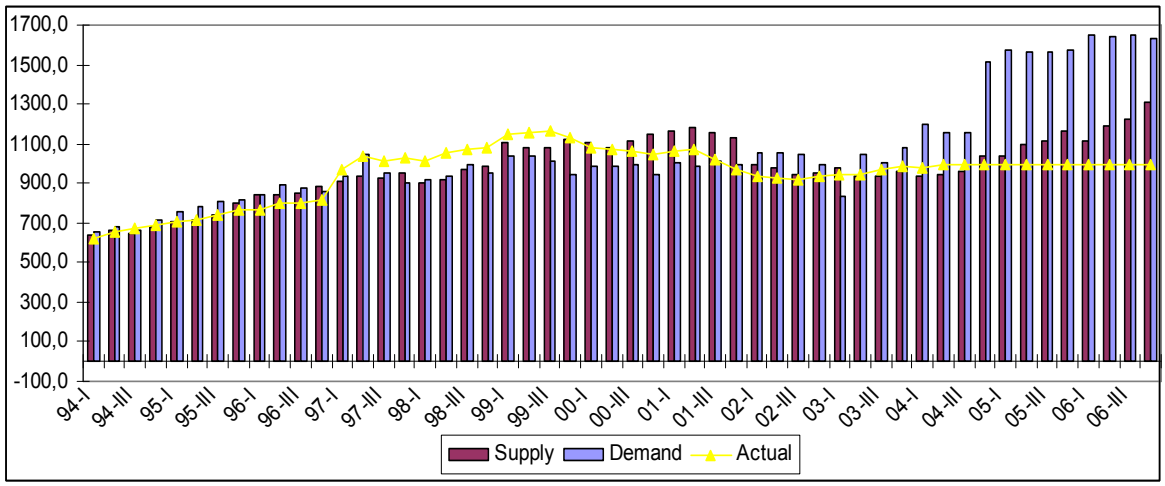
Source: Author's calculation

For credit demand function, we expected negative signs for interest rate and inflation and positive sign for GDP. However, our expectation has proved only for GDP. Positive sign for inflation can be explained by the fact that borrowers do not perceive inflation as an indicator of general macroeconomic environment. The relationship between interest rates and actual volume of credits was for the most part of the analysed period negative. However, in period of the sharpest decline of interest rates the volume of credit provided to private sector decreased, too.

We have expected positive signs for both determinants of credit supply. In case of lending capacity, according to our expectation the positive sign appears. However, the coefficient shows inverse relationship between current output and credit supply. It can be explain very simple: banks may behave anticyclical. If they expect a decline in output in the future they can lower the credit supply in the present.

As a next step of the analysis, based on parameter estimates the volume of credit demand and credit supply will be calculated and compared with the actual volume of credit (see Figure 3). The differences are caused by estimation error.

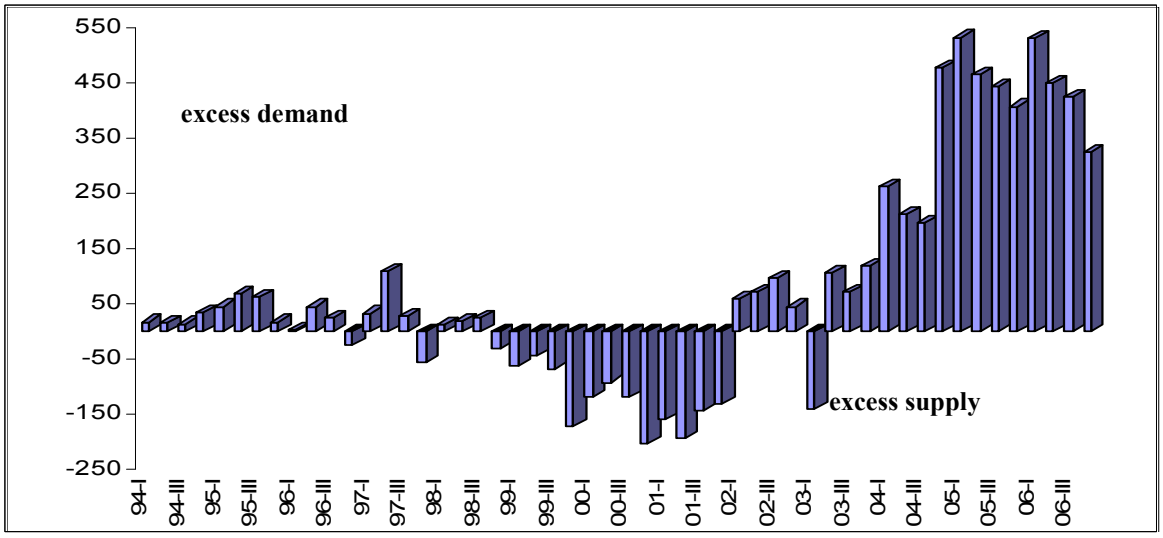
Figure 3 – Credit supply, credit demand and credit provided to private sector in the Czech Republic (billions CZK)




Source: Author's calculation

Figure 3 expresses the estimated credit supply and credit demand functions (bars) as well as credit provided to private sector (solid line). As we can see, in some periods existed the excess of demand whereas other periods were characterized by the excess of supply. Figure 4 shows us the calculated excess of credit demand and credit supply.

Figure 4 – Excess credit demand and credit supply in the Czech Republic (billions of CZK)



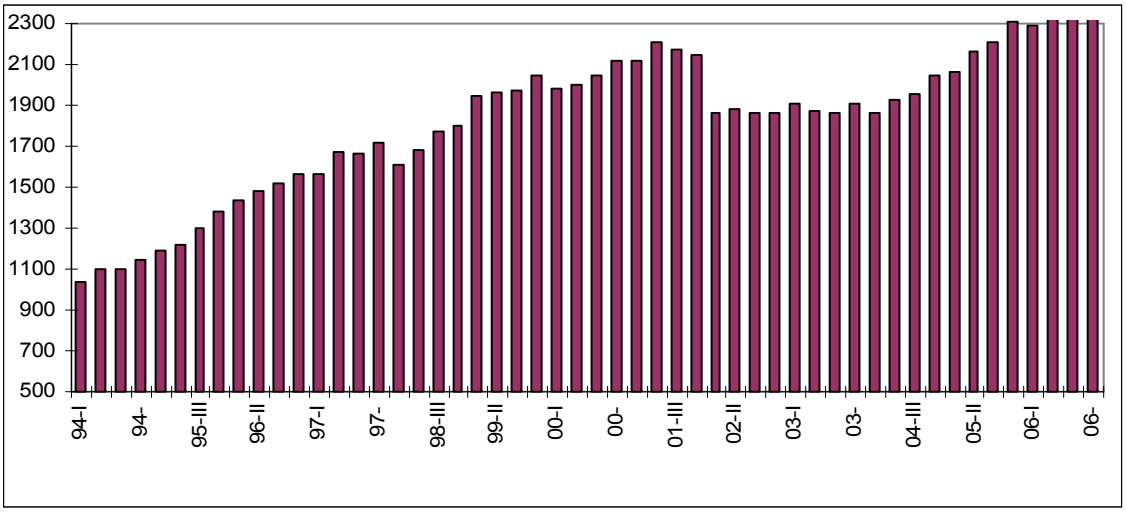

Source: Author's calculation

Nearly the whole first third of the analyzed period was characteristic by the excess of credit demand. On the other hand, the excess of credit supply existed in the second third of the period (from 1999 to 2002). The last part of the analyzed period is characteristic by the huge excess of credit demand. These results are quite surprising: almost the whole period of decreasing lending activity (1999 – 2003 - see Figure 1) belongs to period with excess of credit supply. It is evident that the decrease of credits provided to private sector was initially caused by demand factors and only lately (beginning in second quarter of 2002) banks reduced the credit supply and the volume of credit in the Czech Republic was supply-restricted.

From the second quarter of 2002, the massive excess of credit demand exists on Czech credit market. Banks reduced the credit supply and the volume of credit in the Czech Republic was supply-restricted. The reduction of credit supply was caused mainly by moderate decrease of total liabilities and by considerable

increase of resources held on reserves accounts. These two factors together led to a fall of lending capacity (see Figure 5).

Figure 5 – Lending capacity of Czech banks (billions of CZK)

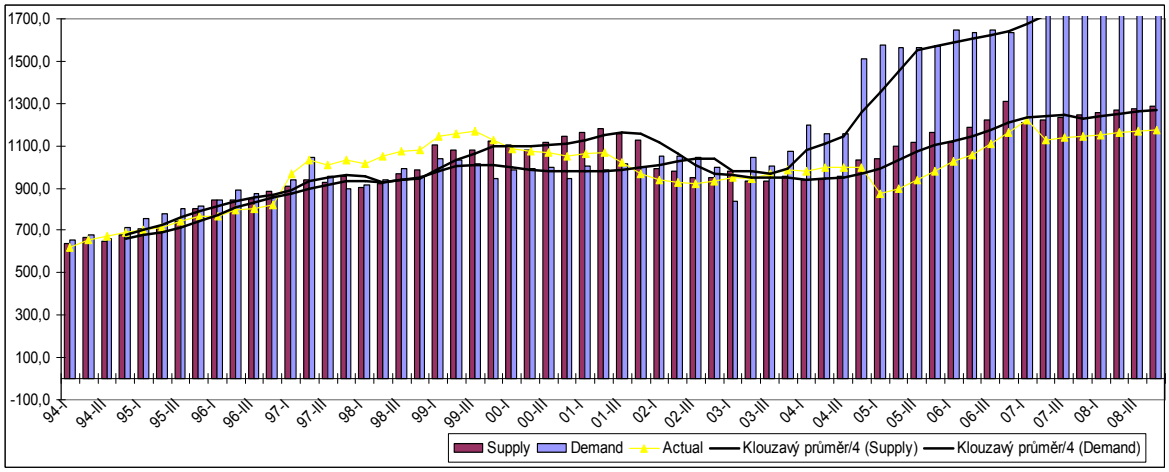



Source: Author's calculation

The lending capacity of banks (and thus credit supply, too) gradually increases from the second half of 2004. Figure 5 also points to the fact that the lending capacity of banks is much higher than the supply of credits so loans represent only minor part of available lending capacity.

Figure 6 shows the prediction of future development on the Czech credit market. It is possible to see from trend lines (moving averages) of supply and demand and from predicted volume of credit supply and demand, both credit demand and credit supply will probably growth. However, the growth rate is higher for credit demand so the Czech credit market will be characterized by the excess of demand in future, too.

Figure 6 – Prediction of future development on the Czech credit market




Source: Author's calculation

According to data in Figure 6, it is possible to expect that the volume of credit provided to private sector will increase, too. The expectation can be confirmed by the fact credits to private sector increased during the whole 2007.

# CONCLUSION

The aim of this paper was to carry out an econometric investigation of supply and demand on the credit market and to predict the development in the future.

The beginning of transition period was connected with rapid growth of lending activity. As a result of necessity to create loan loss provisions and higher caution of banks in granting credits, the growth rate of credits provided to private sector started to decrease in 1998. In the period 1999 - 2004, even the volume of credits decreased. Also the share of credits on banks´ assets declined. The increase of lending activity of small and medium sized banks was not sufficient to balance the decline of lending activity of big banks.

Since 1999, the importance of credits provided to nonfinancial companies is constantly decreasing. On contrary, the share of credits provided to households has increased fivefold. The reason lies in lower risk of loans provided to households.

A lot of researchers used disequilibrium model for analysis of selected credit markets. So there is a list of possible determinants of credit demand and credit supply. However, not all of them are suitable for the analysis of Czech credit market. We expected credit demand to be a function of interest rate for loans, GDP lagged and rate of inflation. Credit supply was estimated for lending capacity and GDP.

Based on parameter estimates the volume of credit demand and credit supply was calculated and compared with the actual volume of credit. Some periods were characterized by the excess of demand (the whole first third of the analyzed period and the period from the second quarter of 2002) whereas for other periods the excess of supply was typical (from 1999 to 2002). The decrease of credits provided to private sector was initially caused by demand factors and only lately banks reduced the credit supply and the volume of credit in the Czech Republic was supply-restricted.

It is highly probable that the trend of increase in credit demand, credit supply and volume of credit provided to private sector will continue in near future. We can expect the excess of demand, too.

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