

CREDIT RISK DYNAMICS IN CZECH REPUBLIC

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Abstract

This paper discusses the credit risk management in banks in the Czech Republic and its dynamics in the pre-crisis period, in the crisis and after crisis. In this period of time there are monitored basic indicators related to credit risk, value adjustments for the risk, the number of loans in default and links of individual variables.

This paper discusses the credit risk, and ways in which it operates in conjunction with the business cycle, as well as the development of credit risk in credit dynamics in the course of the business cycle. Damping of the fluctuations in the credit dynamics in the course of the economic cycle is devoted to, for example, Frait, Komárková (2008). Models of bank financing of Czech corporations and credit risk is discussed in a study Grešl, Jakubik (2008). The main objective of the paper is an analysis of the procyclicality of the three main banking entities in the Czech Republic. The sub-objective of this paper is assessment of the linearity of the relationship between the volume of granted loans and the number of adjustments to individual types of loans.

Keywords: Credit risk, economic cycle, pro-cyclicality, capital adequacy, adjustments

Introduction

The topic of this paper is the defining context of credit risk and its control methods in the banks in the Czech Republic in the years 2006-2011. The basic motivation of this work is to follow in this period of time the key characteristics associated with credit risk, creation of adjusting entries, the number of loans in default and to analyze the relations between variables, the scope of the impact and elimination of losses arising from credit risk-driven inefficiently in the individual banks, more specifically, in Komerční banka, a.s. Česká spořitelna, a.s. and Československá obchodní banka, a.s..

In addition, it will also be monitored the binding of value adjustments on the economic cycle. One of the tools for the analysis of degree of procyclicality in the behaviour of banks is the analysis of development

accumulated depreciation in the course of the business cycle. Pro-cyclicality in the formation of accumulated depreciation can be partially mitigated by gross profits development. This paper focuses on the linearity of the relationship between the volume of granted loans and the number of adjustments to individual types of loans.

The State of the banking sector is indicative for the condition of the entire financial market and, by extension, of the entire economy. The negative development in the banking sector has an impact on the stability of the financial system and the unstable financial system threatens the growth of the economy. Given the current level of link economies there is downside risk of spreading to other countries. Risks in the banking sector are significant enough that it has become the subject of international regulation.

Credit Risk And Its Determinants

Credit risk belongs to the most significant bank risks. This paper analyses the processes related to credit risk, its analysis, evaluation, and different aspects, which are affected by the economic cycle.

Credit Risk And Economic Cycle

Banks and other financial institutions are trying to maximize their profits, which require precise appreciation of the risks associated with their portfolio of assets. In addition, from the perspective of financial stability, it is important and interesting to figure out, if is the implicit credit risk driven by specific factors that can be specific for identification of common risk companies or systematic factors that can affect all companies at the same time. Systematic factors have a wider range of effects on financial stability, given that several banks may suffer substantial losses in their credit portfolio at the same time. In this context, significant relevance has the macroeconomic development, in particular, in credit risk evolution over time. The empiric results of various literatures claims that between credit risk and macro-economic development exists certain important links. Pederzoli and Torricelli (2009) or Jiménez and Saurina (2005). In fact, periods of strong economic growth, which are sometimes accompanied by robust credit growth, are sometimes followed, with some delay, by the growth of standard rates in the total level, alternatively as a result of imbalances created during these periods.

The state of the economy in certain phase of economic cycle can be a very important determinant of implicit risk and, therefore, also of a financial decisions. It is widely known that in the course of the recession, consumers shall suspend the premium services, leaves the "luxury" and therefore, banks will start to worry about defaults on loans and the increase in credit risk. In spite of some companies neglect this dimension. Macroeconomic conditions affect not only the credit risk, but also on speculation rates in companies.

Pro-cyclicality and the credit risk

Pro-cyclicality of the financial system is its ability to amplify fluctuations of economic activity in the course of the economic cycle through the pro-cyclical nature of the provision of loans and other activities of financial institutions.¹ The main prudential tools include differential capital requirements, classification of loans and tightening the rules for accumulated depreciation, the introduction of dynamic accumulated depreciation stricter assessment of the collateral or tougher criteria for the provision of certain classes of loans. From the tools of regulation and supervision are measures that involve more extensive requirements for disclosure, more regular and deeper supervision or regular stress testing.

Many publications find and explain the context between rapid credit growth and credit losses. The most common errors of banks in the field of money lending occur more in the boom times than in the period of medium - recession. This is the case on the ground that the period of expansion are both lenders and borrowers too much confident with their investment projects and their ability to pay or compensate the debts, charges and interest. Banks are too optimistic, thus they are optimistic in credit policy as such. By contrast, in times of recession the credit policy is much more conservative. Explanations are called "disaster myopia," which comes as a result of when in risk management in the period of expansion is not taken into account the probability of the negative developments of future events Guttentag and Herring (1984). In addition so-called "group behavior," which explains us why are bank managers ready to finance by the negative net present value of the project in the period of expansion – this is the case on the grounds that credit faults are judged more leniently if they are normal respectively common to the entire industry Rajan (1994). Managers behave like other managers in the industry, so they unnecessarily don't risk their status, and thus are able to finance projects whose net present value appears to be positive in the period of expansion, and of these, then subsequently in periods of recession become loans in default. Last but not least is the explanation so-called "institutional memory hypothesis" Berger and Udell (2003), which explains the highly cyclical profiles of loans and credit losses. This is because the hiring of still younger workforce that is less experienced. Those more experienced, who remember the period of recession and their lessons, those are less or no longer this period remember so well and report the distorted information. All these factors lead to fluctuations in the credit policy.

¹ Frait, J., Komarkova, Z.: Tools for the control of fluctuations in the credit dynamics in the course of the business cycle, 2008, p. 70, Available from: http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/financni_stabilita/zpravy_fs/fs_2008-2009/FS_2008-2009_clanek_1.pdf

There exist a clear cut of the direct relationship between the credit cycles and credit risk, which is explained by the fact that the rapid growth in the credit portfolio is positively associated with percentage growth in outstanding loans in the future. More or less those loans that are lent during the boom years have a higher probability of failure of default than those that are lent during the period of slow credit growth.² In the period of expansion are requirements for guarantees not so strict.

Macroeconomic determinants of credit risk

Risk management in Czech banks is based on an integrated approach that takes into account the legal and regulatory standards imposed by the Czech National Bank and other regulatory institutions. Most of the banks in their procedures reflect the development in all areas i.e. credit risk, market risk, liquidity risk, as well as regulatory risk, legal risk, operational risk, and environmental risk. However, there are various macroeconomic determinants of credit risk, which, in conjunction with the economic cycle can significantly influence the future development of each particular subject.

The interest for credit risk management significantly deepened the financial crisis, in particular the interest of regulators for the question of procyclicality behavior of credit dynamics. In the quantification of credit risk the Bank is based on quantitative and qualitative criteria, the effect of which is to determine the ratings. The Bank uses several types of credit ratings depending on the type of counterparty and transaction type. Continuous strengthening of credit risk management framework includes all of its folders, including regulations, instruments, procedures and knowledge of workers. Special emphasis is placed in the time of economic crisis to the framework of credit activities in retail banking, organization and processes in the prevention of credit frauds. The following paragraphs will therefore be given to each of the determinants of credit risk.

Inflation Expectations

One of the first determinants or more precisely channels acting in connection with economic cycle on the credit risk is the inflation expectations. Commercial banks assess the risk associated with providing loans to various applicants based on their credibility and provides for higher risk of higher interest rates. If the risk exceeds an acceptable level, banks will no longer be willing to give a loan for any high interest rate. At this moment is granted the loan. There is a ceiling of interest rates above the level no loan is granted (Stiglitz and Weiss, 1981; Wray, 1992; Wolfson, 1996). Under these conditions (especially if invoked a restrictive monetary

² JIMÉNEZ, G., SAURINA, J.: *Credit cycles, credit risk and prudential regulation*, Banco de España, 2005, p. 5

policy in an effort to curb inflation) starts the demand of loans to be less and less elastic and its elasticity can drop to zero.

Excessive focus on fight with inflation associated with the effort to increase short-term interest rates can complicate the access of small and medium-sized enterprises to loans, become more expensive mortgages and consumer loans to households. The result of this could be deceleration of economic growth, which in turn can have a pronounced negative impact on less developed member countries, or regions of the EU.

Cyclical output

Another determinant of credit risk in connection with company profitability is cyclical output. There are several reasons why the credit risk associated with the bank profitability can be pro-cyclical. First and foremost, lending mostly decrease during cyclical downturns, and that such period is commonly associated with the decrease in risk. Commissions also held by banks will be higher due to deterioration in quality of loans and capital could also have pro-cyclical behavior as the value of asset has a tendency to follow the phases of the cycle. In the second place, the demand for transactions in credit and stock markets would have been significantly reinforced during the economic boom and interest margin could grow stronger. Therefore, yields could grow faster than the cost of the head to increase of profits, by contrast, are likely to remain in force during the economic slowdown.

Current studies are trying to be one step ahead as well as two methods that estimate the cyclic output. One of these methods uses a variation of the real GDP of the segmented trend, while the second one uses the deviations from the trend of the GDP calculated by applying the Hodrick-Prescott filter (1980). In the periods during which the GDP exceeds its trend, the output gap is positive and if profitability is pro-cyclical, we expect to grow. Similarly, if GDP is below the trend we expect that profits will fall.

Probability of default

Another determinant of credit risk in connection with the economic cycle is the probability of default. Credit event of default is defined as a violation of the debtor's payment morale. In the regulatory terminology³ is typically used the concept of debtor's failure that occurs at the moment when it is likely that he doesn't pay off its own obligations duly and on time, without the lender went to the satisfaction of the claim in respect of reinsurance or at least one payment (significant for lender) is after due date for more than 90 days.⁴ Possible cases of default are delay, change, rejection (can occur on government debt of developing countries), the omission of payments (one of the most important credit events), debt restructuring (if changes the original

³ Czech National Bank [online]. Edict No.123/2007 Sb. Available from WWW: http://www.cnb.cz/cs/legislativa/obezretne_podnikani/obsah.html, p.108

⁴ Czech National Bank; *Financial Stability Report 2008/2009*; Glosary, p.108

terms of payment – the nominal value of debt, interest rates, debt priority - it is used for the prevention of real failure), bankruptcy, rating reduction (implicitly increase of probability of failure, rating of the reference obligation may fall below a predefined value), merger (after the merger of subjects may have the resulting entity a lower rating than the original reference entity), cross default (if there is default of different commitment of the company than the one that is the subject of the contract) or entry to a specific legal regime (e.g., bankruptcy, receivership). Link default and economic cycle consist of the fact that the probability of default is in a period of recession higher and lower at the time of expansion.

Adjusting entries and reserves

One of the very important determinants of credit risk in connection with the economic cycle, are adjusting entries and reserves. Banks classify all their assets from financial activities into five categories in accordance with the measures of the Czech National Bank, No. 123/2007 Coll. based on quantitative criterion (payment morale and financial statements) and qualitative criterion (detailed knowledge of the client, the client's behavior and history). Since the year 2008 banks have applied the principle of sharing in the classification of applicant and guarantor for claim in default in accordance with the rules of Basel II. All relevant classified exposures are assessed individually at least on a quarterly basis three levels of committees for adjustments, or whenever the need arises to recovery specialists. Adjustments are created on the basis of the present value of the expected future cash flows to the bank and, after considering all available information, including estimates of the value of the collateral and the expected length of collection of receivables process. Adjustments for other receivables are created on the basis of variant statistical models. For example, in Komerční banka, a.s., that is the subject of this research, there it is created on the basis of statistical models EL (=Expected Loss) and the ELBE model (=Expected Loss Best Estimation) that take into account the claims specifics such as the client segment, type of product and risk classification. In these models are values EL and ELBE defined pursuant to observations of past losses, new risk factors and with regard to the phase of economic cycle.

Credit risk dynamics in banks in Czech Republic

This chapter includes comparisons of risk management in each of the banking entities KB, a.s., ČS, a.s., ČSOB, a.s., their way of risk management, creation of adjustments and pro-cyclicality in the period 2006-2011. This paper analyzes the volume of granted loans and the adequacy of the value adjustments of each Bank. For the verification of hypotheses that Banks behave pro-cyclical is provided the regression analysis.

Credit risk management

Risk management at Komerční banka, a.s. (hereinafter referred to as "the Bank") is based on an integrated approach that takes into account the advanced risk management standards that are used within the group, Societe Generale, along with legal and regulatory standards imposed by the Czech National Bank and other regulatory institutions. Komerční banka in their procedures reflect development in all areas i.e. credit risk, market risk, liquidity risk, as well as regulatory risk, legal risk, operational risk, and risk of environmental concentration.⁵ Komerční banka uses for evaluation of credit risk scoring models, evaluation, LGD and EAD models, for mass retail bank uses statistical techniques and for corporate clients expert approach. Risk management control area is in accordance with requirements of Basel II. There exists a credit risk Control Department, which carries out periodic checks on the processes of providing and monitoring loans. Control activities are focused not only on the loan portfolio, but on management of the impact of the economic recession too.

[Table 1] shows the development of loan volume, creation of adjustments and the development of gross profits before the crisis in its course until the end of 2011.

Table 1 – The evolution of the volume of loans, adjustments and profits of Komerční banka, a.s. in 2000-2011.

Year	Adjustments	Granted loans	Gross profits in mill. Czk
2 000	13 719	287 623	14 933
2 001	15 574	285 083	3 386
2 002	11 582	163 806	11 362
2 003	8 168	160 149	12 896
2 004	7 405	156 764	13 323
2 005	7 316	185 225	11 790
2 006	9 095	252 505	11 427
2 007	10 393	304 521	14 328
2 008	13 142	364 040	16 257
2 009	14 871	372 303	13 549
2 010	15 877	384 593	16 075
2 011	17 211	434 486	11 456
TOTAL	144 353	3 351 098	150 782

Note: The value of the number of adjustments is negative.

Source: Own; the data are transposed from annual reports of Komerční banka, a.s. from the years 2000-2011.

⁵ Annual Report. In *Annual Report 2009, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2010 [cit. 2011-03-25]. Available from WWW: <http://www.kb.cz/file/u/about-bank/investor-relations/annual-reports/annual-report-2009/>, p.42

Adjusting entries and reserves

Adjustments are created on the basis of the present value of expected future cash flows to the Bank and, after considering all available information, including estimates of the value of the collateral and the expected length of the collection of receivables process. Pursuant to Basel II requirements are adjustments to other claims based on statistical models called EL (= Expected Loss) and the ELBE (= Expected Loss Best Estimation) that take into account claim specifics such as the client segment, type of product or risk classification. One of the tools for the analysis of degree of pro-cyclicality in the behavior of banks is the analysis of development accumulated depreciation in the course of the business cycle. Pro-cyclicality in the formation of accumulated depreciation can be partially mitigated by the development of gross profits. Economic downturn is mostly followed by growth of the volume of accumulated depreciation. If the banks behave in pro-cyclical way, the economic downturn would have been followed by an increase in the volume of accumulated depreciation.

[Table 2] examines the relationship between the volume of granted loans and the number of adjustments. For the pro-cyclicality estimation in the formation of accumulated depreciation were used the data from the Annual Reports of Komerční banka, a.s. from years 2000-2011.

Table 2 - The relationship between the volume of granted loans and the number of adjustments of Komerční banka, a.s.

Year	X_i	y_i	$x_i y_i$	x_i^2	Y_i	$(y_i - Y_i)^2$
2 000	13 719	287 623	3 945 899 937	188 210 961	318 640	962 040 021
2 001	15 574	285 083	4 439 882 642	242 549 476	362 102	5 931 991 057
2 002	11 582	163 806	1 897 201 092	134 142 724	268 570	10 975 466 362
2 003	8 168	160 149	1 308 097 032	66 716 224	188 580	808 312 663
2 004	7 405	156 764	1 160 837 420	54 834 025	170 703	194 288 752
2 005	7 316	185 225	1 355 106 100	53 523 856	168 617	275 809 721
2 006	9 095	252 505	2 296 532 975	82 719 025	210 299	1 781 308 451
2 007	10 393	304 521	3 164 886 753	108 014 449	240 712	4 071 640 805
2 008	13 142	364 040	4 784 213 680	172 712 164	305 121	3 471 488 626
2 009	14 871	372 303	5 536 517 913	221 146 641	345 631	711 388 649
2 010	15 877	384 593	6 106 183 061	252 079 129	369 202	236 891 808

2 011	17 211	434 486	7 477 938 546	296 218 521	400 457	1 157 950 382
TOTAL	144 353	3 351 098	43 473 297 151	1 872 867 195	3 348 634	30 578 577 296

Source: Own; the data are transposed from annual reports of Komerční banka, a.s. from the years 2000-2011.

Table 2 shows that along with the growing number of loans the Bank creates a higher number of adjustments. If the Bank has a higher number of loans, it is also more likely to increase the risk of non-repayment, hence the increase in credit risk therefore creates greater number of adjustments.

Capital adequacy

Komerční banka, a.s. manages equity capital in order to maintain a strong capital base necessary to the development of their business activities and to meet regulatory capital requirements in the current period and in the future. Bank in the capital planning process takes into account both internal and external factors, which are reflected in the corresponding individual intentions expressed in the form of limit values for Tier 1 and total capital adequacy ratios.

Within the framework of the second pillar of Basel II, which requires the establishment of a system for internal assessment of capital adequacy in relation to the risk profile (so called system of internally fixed capital), the Bank established and formed this system and describe the related strategy of capital adequacy. The Bank analyzes the effects of stress conditions on all risks within a given time views.

Česká spořitelna, a.s.

Credit risk management

The risk management processes in the Česká spořitelna are managed according to established risk management strategy, approved by the Board of Directors of the Bank, which contains the principles of risk management, including the processes of risk identification, monitoring and measuring system of limits and limitations.

In credit risk management Česká spořitelna uses unified methodology that includes rules for prudent credit process including many rules. The Bank credit risk management is based on information from its own portfolio as well as uses information from external sources, for example information from Credit Bureau or Central registry of loans. Česká spořitelna also uses ratings of renowned rating agencies. An extensive data base, which is available for the purpose of credit risk management, serve as a basis for

credit risk modeling and as a support for recovery of debts, valuation of claims and the calculation of losses.⁶

As a key instrument in risk management is in Česká spořitelna considered to be an internal rating, which is used to measure the risk of the counterparty and reflects the probability of debtor's failure in the next 12 months, and is in accordance with the requirements of the regulator, validated by an independent subject. In the context of risk management the Bank divides its client non-entrepreneurs "without default," and uses 8-speed rating range and 13-speed rating system for other clients. For all clients "in default" Bank uses grade "R", which are further divided according to the reason for the failure.⁷ For the determination of risk parameters, such as probability of default, loss on loans in default and credit conversion factors are used by the Česká spořitelna's own internal models which correspond with the requirements of Basel II. For monitoring of the amount of credit risk, risk assessment and portfolio management in default is currently used monitoring of risk parameters.

[Table 3] shows the development of loan volume, creation of adjustments and the development of gross profits before the crisis in its course until the end of 2011.

Table 3 - The evolution of the volume of loans, adjustments and profits of Česká spořitelna, a.s. in 2000-2011.

Year	Adjustments	Granted loans	Gross profits in mill. Czk
2 000	3 217	134 900	5 604
2 001	2 731	186 655	6 963
2 002	18 812	150 314	9 423
2 003	9 025	178 159	10 195
2 004	7 166	239 289	11 334
2 005	6 672	283 420	12 439
2 006	6 339	329 105	15 155
2 007	6 810	418 415	18 375
2 008	8 929	461 433	23 171
2 009	14 713	469 192	26 390
2 010	19 225	460 077	26 744
2 011	17 976	483 552	25 649
TOTAL	121 615	3 794 511	191 442

Note: The value of the number of adjustments is negative.

Source: Own; the data are transposed from annual reports of Česká spořitelna, a.s. from the years 2000-2011.

⁶ Annual Report. In *Annual Report 2009, Česká spořitelna, a.s.* [online]. Praha : Omega Design, s. r. o., 2010 [cit. 2013-03-20]. Available from WWW: http://www.csas.cz/banka/content/inet/internet/cs/VZ_2009.pdf, p.39

⁷ Annual Report. In *Annual Report 2009, Česká spořitelna, a.s.* [online]. Praha : Omega Design, s. r. o., 2010 [cit. 2013-03-20]. Available from WWW: http://www.csas.cz/banka/content/inet/internet/cs/VZ_2009.pdf, p.40

Adjustments for credit losses

The value adjustments methodology in Česká spořitelna is in accordance with international accounting standards (IFRS), with a monthly reassessment. Adjustments are calculated depending on if there is found out the depreciation. If that is the case, then adjustments are calculated on an individual basis, if this is not so, then are calculated the portfolio adjustments, whose amount is specified by using models based on historical experience of the Bank. In case of all receivables that are not detailed and in case of retail receivables with an exhibition of more than 5 million CZK Česká spořitelna uses the method of expected discounted cash flows. In the case of other retail receivables is the rate of depreciation determined statistically, based on historical experience with the course of the recovery of a similar type of claims.

[Table 4] examines the relationship between the volume of granted loans and the number of adjustments. For the pro-cyclicality estimation in the formation of accumulated depreciation were used the data from the Annual Reports of Česká spořitelna, a.s. from years 2000-2011.

Table 4 - The relationship between the volume of granted loans and the number of adjustments of Česká spořitelna, a.s.

Year	X_i	y_i	$x_i y_i$	x_i^2	Y_i	$(y_i - Y_i)^2$
2000	3 217	134 900	433 973 300	10 349 089	330 122	38 111 808 888
2001	2 731	186 655	509 754 805	7 458 361	329 204	20 320 194 593
2002	18 812	150 314	2 827 706 968	353 891 344	359 597	43 799 378 275
2003	9 025	178 159	1 607 884 975	81 450 625	341 100	26 549 632 611
2004	7 166	239 289	1 714 744 974	51 351 556	337 586	9 662 313 971
2005	6 672	283 420	1 890 978 240	44 515 584	336 652	2 833 689 474
2006	6 339	329 105	2 086 196 595	40 182 921	336 023	47 859 277
2007	6 810	418 415	2 849 406 150	46 376 100	336 913	6 642 538 513
2008	8 929	461 433	4 120 135 257	79 727 041	340 918	14 523 831 481
2009	14 713	469 192	6 903 221 896	216 472 369	351 850	13 769 168 432
2010	19 225	460 077	8 844 980 325	369 600 625	360 378	9 939 974 348
2011	17 976	483 552	8 692 330 752	323 136 576	358 017	15 759 043 757
TOTAL	121 615	3 794 511	42 481 314 237	1 624 512 191	4 118 360	201 959 433 621

Source: Own; the data are transposed from annual reports of Česká spořitelna, a.s. from the years 2000-2011.

Table 4 shows that as Komerční banka as Česká spořitelna make up a higher number of accumulated depreciation with growing number of granted loans in order to prevent the probability of credit risk increase.

Capital adequacy

The calculation procedure of capital requirement to credit risk has been based on the internal rating and its own parameters estimates since the year 2007. The calculation of risk-weighted assets is carried out on monthly basis. Standard calculation is regularly updated by stress testing, within its framework there are simulated impacts of sudden changes in the market environment especially macroeconomic effects. Česká spořitelna provides capital on an individual and consolidated basis. Individual capital adequacy of Česká spořitelna in 2009 exceeded the level of 8.00% required by the Czech national bank.⁸

Ceskoslovenska obchodni banka, a.s.

Credit risk management

The process of risk management in ČSOB is based on single principle, using a method that reflects both expected losses incurred under normal circumstances and unexpected losses, which are based on statistical models. These models use the probabilities derived from historical experience, tailored to the current economic environment.

Risk management monitoring is carried out on the basis of the determination of the limits that reflect the business strategy and the level of accepted risk. ČSOB has credit risk management Committee (CRC), which has overall responsibility for the development of credit risk strategies and implementing of principles, frameworks, policies and limits for credit risk. The Committee is responsible for the key issues relating to the management of credit risks, adopts fundamental decisions regarding to credit risks management and monitors their performance.⁹

[Table 5] shows the development of loan volume, creation of adjustments and the development of gross profits before the crisis in its course until the end of 2011.

⁸ Annual Report. In *Annual Report 2009, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2010 [cit. 2011-03-25]. Available from WWW: http://www.csas.cz/banka/content/inet/internet/cs/VZ_2009.pdf, p.43

⁹ Annual Report. In *Annual Report 2009, Československá obchodní banka, a.s.* [online]. Praha: 2010 [cit. 2013-03-18]. Available from WWW: http://www.csob.cz/WebCsob/Csob/O-CSOB/Vztahy-k-investorum/Vyrocnni-pololetni-zpravy/Vyrocnni-zpravy/VZ_CSOb_2009.pdf, p.45

Table 5 - The evolution of the volume of loans, adjustments and profits of Československá obchodní banka, a.s. in 2000-2011.

Year	Adjustments	Granted loans	Gross profits in mill. Czk
2 000	18 809	348 820	6 465
2 001	14 623	417 743	8 913
2 002	10 177	418 143	9 286
2 003	10 744	441 596	7 445
2 004	6 697	426 058	9 723
2 005	7 031	472 631	13 399
2 006	7 005	340 279	12 442
2 007	7 299	411 129	12 638
2 008	6 380	411 644	374
2 009	10 720	395 774	19 876
2 010	12 466	399 741	15 338
2 011	12 565	449 291	12 970
TOTAL	124 516	4 932 849	128 869

Note: The value of the number of adjustments is negative.

Source: Own; the data are transposed from annual reports of ČSOB, a.s. from the years 2000-2011.

Adjustments

Adjustments are controlled by the management of the Bank, in particular, their adequacy. There are monitored market values, the adequacy of adjustments for losses from diminution in value. The amount of collateral reporting to individual claims does not exceed their book value. Revenues from realized collateral are used to reduce or to pay outstanding claims. The Bank also takes advantage of the collective adjustments and in particular for credits and loans, where there is no objective proof attesting to the individual's impairment and thus reflect the write-down included in a group of assets. The amount of collective adjustments and, above all, credits and loans, where so far does not exist objective proof attesting to the individual diminution in value and thus reflect the depreciation included in a group of assets. The amount of collective adjustments is assessed on the basis of statistical estimates, at the end of each financial year. Any losses from diminution in value are estimated based on historical losses in the portfolio, current economic conditions, the approximate amount of delay between the time when there may be a loss of, and the time when the loss is to be assessed in the formation of adjustments on loss from the reduction of values, and expected receipts and revenues after diminution in value.

[Table 6] examines linearity of the relationship between the volume of granted loans and the number of adjustments. For the pro-cyclicality estimation in the formation of accumulated depreciation were used the data

from Annual Reports of Československá obchodní banka, a.s. from the years 2000-2011.

Table 6 - The relationship between the volume of granted loans and the number of adjustments of Československá obchodní banka, a.s.

Year	x_i	y_i	$x_i y_i$	x_i^2	Y_i	$(y_i - Y_i)^2$
2 000	18 809	348 820	6 560 955 380	353 778 481	-448 400	635 558 994 958
2 001	14 623	417 743	6 108 655 889	213 832 129	52 874	133 129 416 351
2 002	10 177	418 143	4 255 441 311	103 571 329	585 282	27 935 599 089
2 003	10 744	441 596	4 744 507 424	115 433 536	517 384	5 743 852 775
2 004	6 697	426 058	2 853 310 426	44 849 809	1 002 012	331 723 539 994
2 005	7 031	472 631	3 323 068 561	49 434 961	962 016	239 497 639 074
2 006	7 005	340 279	2 383 654 395	49 070 025	965 129	390 438 097 362
2 007	7 299	411 129	3 000 830 571	53 275 401	929 923	269 147 172 932
2 008	6 380	411 644	2 626 288 720	40 704 400	1 039 973	394 797 596 139
2 009	10 720	395 774	4 242 697 280	114 918 400	520 258	15 496 318 539
2 010	12 466	399 741	4 983 171 306	155 401 156	311 175	7 843 987 724
2 011	12 565	449 291	5 645 341 415	157 879 225	299 319	22 491 462 810
TOTAL	124 516	4 932 849	50 727 922 678	1 452 148 852	6 736 948	2 473 803 677 748

Source: Own; the data are transposed from annual reports of ČSOB, a.s. from the years 2000-2011.

Table 6 shows that, as Komerční banka and Česká spořitelna as well as in Československá obchodní banka, a growing number of loans make up a higher number of accumulated depreciation to pose the probability of an increase in credit risk.

Capital adequacy

The capital adequacy of ČSOB as part of KBC Group (KBC Group) is monitored using the Basel II. rules and indicators. The Bank applied the single group access to internal capital system (SVSK). Group access to SVSK has been approved by both top management of KBC, and by the authorities of ČSOB. This access takes into account requirements of maternal and local regulatory institutions.

Analysis of pro-cyclical behavior of bank subjects

One of the tools for the analysis of degree of pro-cyclicality in the behavior of banks is the analysis of development accumulated depreciation in the course of the economic cycle. Pro-cyclicality in the formation of accumulated depreciation can be partially mitigated by the development of gross profits. Economic downturn is mostly followed by growth of the volume of accumulated depreciation. If the banks behave pro-cyclically, the economic downturn would have been followed by an increase in the volume of accumulated depreciation.

For research of the pro-cyclicality, which is defined as the deepening of the fluctuations of the economic cycle activities of the financial sector,¹⁰ especially banking lending has been spoken hypothesis No 1.

Hypothesis No. 1:

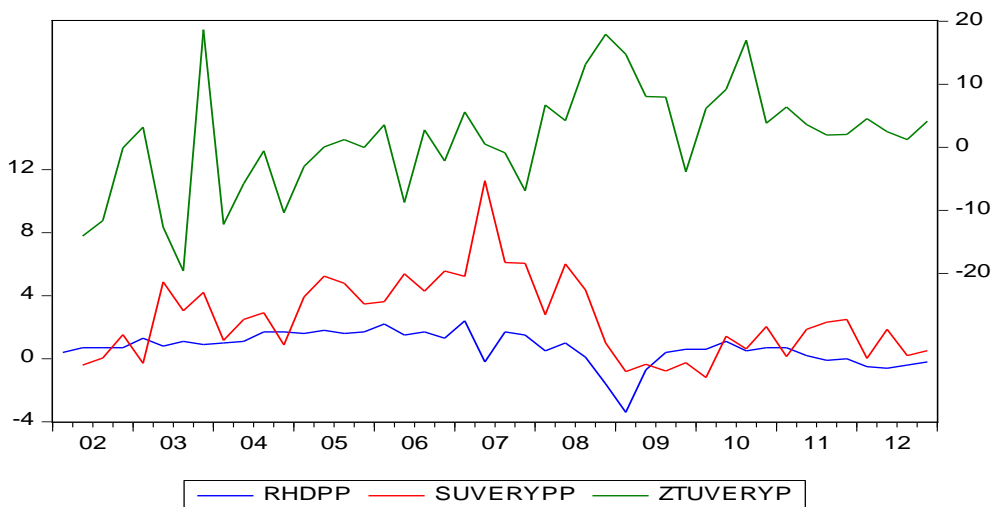
H0: The financial sector does not increase the volume of bank loans in a time of economic boom and at the same time does not reduce the volume of granted loans in times of economic contraction.

Ha: The financial sector increases the volume of bank loans in a time of economic boom and at the same time reduces the volume of granted loans in times of economic contraction.

In order to verify the verity of the hypothesis is proved the empirical research by means of econometric software. The variable quantity represents the volume of standard loans provided by the financial sector and as an independent variable with real GDP in the Czech Republic, the interbank rate PRIBOR (set out at the end of the month) and the volume of loss-making loans. From the Chart No. 1 can be traced, that the volume of granted loans by financial sector in the Czech Republic (red curve) roughly follows the evolution of real GDP in the CZECH REPUBLIC (blue curve). The volume of granted loans and the trend of real GDP have shown a growing trend since the beginning of the reference period, while in 2007 grew both quantities the fastest and then the trend reverses. Trends in the volume of loss-making loans has reached the highest level in 2003 and then in 2008 and 2010.

¹⁰ GERŠL, A., JAKUBÍK, P.: „Pro-cyclicality of the financial system and simulation of feedback effect.” Available from:
http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/financni_stabilita/zpravy_fs/FS_2009-2010/FS_2009-2010_clanek_III.pdf

Chart no. 1 - Quarterly volume of provided and loss-making loans along with the development of real GDP



Note: Quarterly trends in the volume of loans of the financial sector in the Czech Republic midst-quarterly in% (SUVERYPP) is shown on the left axis of the red curve along with the CZECH REPUBLIC'S real GDP quarterly percentage changes and the right axis is the development of the volume of loss-making loans midst-quarterly in%.

Source: Czech National Bank; available from:

http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=CAABBA&p_sestuid=&p_lang=CS

All time series have been revised to exhibit stationary, while only in one case it was necessary to modify the PRIBOR time series for the first gap. In Annex A, is for example showed the test for examination of the stationary for a time series of the total volume of standard loans provided by financial institutions in the Czech Republic. For the verification of the validity of the hypothesis No. 1 is designed the model, more precisely OLS regression model, where as explained variable performs the total volume of standard loans in the Czech Republic and the explanatory variables include real GDP, PRIBOR and the volume of loss-making loans. From the model in Annex B results that artificial variable of real GDP (where No. 1 is in the time series indicated in the midst-quarterly growth of real GDP by 1.3% and more) have a positive effect on the volume of standard loans provided by financial institutions. Specifically, it was measured that in midst-quarterly growth of real GDP by at least 1.3% occurs to growth of the volume of standard loans in the Czech Republic. Furthermore, it was measured that at the volume of standard loans does not affect the interbank rate PRIBOR neither the volume of loss-making loans, which leads to negative coefficient, which indicates that in the period of economic boom apparently decline the volume of loss-making loans.

In Annex C, is introduced another model of OLS regression, where as explained variable is again the total volume of standard loans in the Czech Republic and the explanatory variables include real GDP, PRIBOR and the volume of loss-making loans. In this case, artificial variable of real GDP (where No. 1 is in the time series indicated in the midst-quarterly decline of real GDP) negatively affect the volume of standard loans provided by the financial institutions.

Results

From the output of the model results that in midst-quarterly downtrend of real GDP things are drawing to drop in the volume of standard loans in the Czech Republic. Furthermore, it was measured that on the volume of standard loans does not affect the interbank rate PRIBOR neither the volume of loss-making loans. In loss-making loans were measured out negative coefficient once again.

From the outputs of the models from the annexes B and C result that the total volume of standard loans in the Czech Republic provided by financial institutions tends to rise in times of economic boom (when is midst-quarterly growth of real GDP minimally by 1.3%), while decreases in the period of economic contraction (when is midst-quarterly decrease of real GDP), thus the null hypothesis No. 1 is rejected and the alternative is hereby approved. The financial sector in the Czech Republic, according to above mentioned findings presented to behave pro-cyclical.

We can therefore say that along with growing number of provided loans the Bank creates a higher number of accumulated depreciation. If the Bank has a higher number of provided loans, it is also higher probability of increase of non-repayment risk hence the increase of credit risk, and therefore the Bank creates a higher accumulated depreciation.

I realize the fact that in order to be able to make relevant conclusions, it would be necessary to carry out a much larger analysis with a larger number of variables. In that case, then the results should show the extent to which these factors affect the behavior of the banks. Furthermore, it is necessary to take into account the fact that the results may not have significant informative character mainly due to the fact that the data used for research are not so long, in order to take stock of a sufficiently long period, which would include the whole economic cycle.

Conclusion

This contribution deals with the issue of credit risk management in banks in the Czech Republic and their determinants. In each particular chapter are analyzed basic risk management attributes, determinants and indicators associated with credit risk, adjustments formation to given type of risk, number of loans in default and reciprocal links of individual variables.

In addition, the allowance is focused on the development of credit risk and its changes over the economic cycle. Study suggests possible link of credit risk with financing in various sectors during the phases of the economic cycle.

The aim of the project and its main focus was the description of the specific procedures of credit risk management in Komerční banka, a.s. Česká spořitelna, a.s. and Československá obchodní banka, a.s. In addition, there was presented their approaches to the risk measurement, its provisioning and minimizing, but also a description from the perspective of capital adequacy and method of making adjustments. Subsequently, the project shows the development of making adjustments against the number of granted loans and against the development of gross profit in each bank subjects. Another objective was to make analysis, for a consideration to found out if these banks behave pro-cyclical.

Applied regression analysis indicated that the analyzed subjects make adjustments in pro-cyclical manner. In the case that would be made a larger type of regression analysis, which would include more variables and all the banking entities in the Czech Republic and has proved to be the case, as well as for other banking entities, we could assume that dynamic accumulated depreciation might contribute to the economy in the form of creating buffer, from which it would be possible to draw on in times of economic downturn. In practical terms, the dynamic accumulated depreciation would be problematic from series of reasons, and it would have to be preceded by ensuring its compliance with other elements of the international framework of financial institutions regulation.

References:

BERGER, A. UDELL, G, (2003): *“The institutional memory hypothesis and the pro-cyclicality of bank lending behavior”*. BIS Working Paper, no 125, Basel, January.

Czech National Bank (2011); *Financial Stability Report 2008/2009*; [online]. Available from WWW: http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/financni_stabilita/zpravy_fs/fs_2008-2009/index.html

Czech National Bank [online]. ARAD. Available from WWW: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=CAABBA&p_sestuid=&p_lang=CS

Czech National Bank [online]. Edict No.123/2007 Sb. Available from WWW: http://www.cnb.cz/cs/legislativa/obezretne_podnikani/obsah.html

Czech National Bank [online]. Glosary. Available from WWW: <http://www.cnb.cz/cs/obecne/slovník/1.html>

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2000, Česká spořitelna*,

a.s. [online]. Praha: Omega Design, s. r. o., 2001; Available from WWW: http://www.csas.cz/banka/appmanager/portal/banka?_nfpb=true&_pageLabel=downloads_subportal03&dtree=cs&slnod=17&docid=internet/cs/dow_vyrocni_zpravy_ie.xml#17

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2001, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2002; Available from WWW:http://www.csas.cz/banka/content/inet/internet/cs/CSvyrocni_zprava_2001_cz.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2002, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2003; Available from WWW:

http://www.csas.cz/banka/content/inet/internet/cs/CZ_CS_VZ_2002.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2003, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2004; Available from WWW: http://www.csas.cz/banka/content/inet/internet/cs/vz_2003_cz.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2004, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2005; Available from WWW: http://www.csas.cz/banka/content/inet/internet/cs/vz_2004_cz.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2005, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2006; Available from WWW:

http://www.csas.cz/banka/content/inet/internet/cs/CS_VZ2005_web.pdf

Česká spořitelna, a.s.; *Annual Report*. In *Annual Report 2006, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2007; Available from WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/VZ_2006.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2007, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2008; Available from WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/VZ_2007.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2008, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2009; Available from WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/VZ_2008.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2009, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2010; Available from WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/VZ_2009.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2010, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2011; Available from

WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/VZ_2010.pdf

Česká spořitelna, a.s. [online]. *Annual Report*. In *Annual Report 2011, Česká spořitelna, a.s.* [online]. Praha: Omega Design, s. r. o., 2012; Available from WWW:http://www.csas.cz/static_internet/cs/Obecne_informace/FSCS/CS/Prilohy/vz_2011.pdf

Československá obchodní banka, a.s.; *Annual Report*. In *Annual Report 2000, Československá obchodní banka, a.s.* [online]. Praha: 2001. Available from WWW:<http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s.; *Annual Report*. In *Annual Report 2001, Československá obchodní banka, a.s.* [online]. Praha: 2002. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2002, Československá obchodní banka, a.s.* [online]. Praha: 2003. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2003, Československá obchodní banka, a.s.* [online]. Praha: 2004. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2004, Československá obchodní banka, a.s.* [online]. Praha: 2005. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2005, Československá obchodní banka, a.s.* [online]. Praha: 2006. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2006, Československá obchodní banka, a.s.* [online]. Praha: 2007. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2007, Československá obchodní banka, a.s.* [online]. Praha: 2008. Available from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocní-a-pololetní-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2008, Československá obchodní banka, a.s.* [online]. Praha: 2009. Available

from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocni-a-pololetni-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2009, Československá obchodní banka, a.s.* [online]. Praha: 2010. Available

from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocni-a-pololetni-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2010, Československá obchodní banka, a.s.* [online]. Praha: 2011. Available

from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocni-a-pololetni-zpravy.aspx>

Československá obchodní banka, a.s., *Annual Report*. In *Annual Report 2011, Československá obchodní banka, a.s.* [online]. Praha: 2012. Available

from WWW: <http://www.csob.cz/cz/Csob/Vztahy-k-investorum/Stranky/Vyrocni-a-pololetni-zpravy.aspx>

FRAIT, J., KOMÁRKOVÁ, Z.: Tools for the control of fluctuations in the credit dynamics in the course of the business cycle, 2008, available from WWW:http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/financni_stabilita/zpravy_fs/fs_2008-2009/FS_2008-2009_clanek_1.pdf

GERŠL, A., JAKUBÍK, P.: „Pro-cyclicality of the financial system and simulation of feedback effect.“ Available from WWW:

http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/financni_stabilita/zpravy_fs/FS_2009-2010/FS_2009-2010_clanek_III.pdf

GUTTENTAG, J., HERING, R. (1984): “Credit rationing and financial disorder.” *The Journal of Finance* 39, 1359-82.

IMÉNEZ, G., SAURINA, J.: Credit cycles, credit risk and prudential regulation, Banco de España, 2005

Komerční banka, a.s.; *Annual Report*. In *Annual Report 2000, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2001; Available from WWW:

<http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2000-vyrocni-zprava.pdf?a41a39ec1125515ac2edc636b78760b1>

Komerční banka, a.s.; *Annual Report*. In *Annual Report 2001, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2002; Available from WWW:

<http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2001-vyrocni-zprava.pdf?55a92df3d636eb15406f4b05353fbaf>

Komerční banka, a.s.; *Annual Report*. In *Annual Report 2002, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2003; Available from WWW:

<http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2002-vyrocni-zprava.pdf?55a92df3d636eb15406f4b05353fbaf0>

Komerční banka, a.s.; *Annual Report*. In *Annual Report 2003, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2004; Available from WWW:

<http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2003-vyrocni-zprava.pdf?683789ace6362be739b8991382090521>

- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2004, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2005; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2004-vyrocni-zprava.pdf?683789ace6362be739b8991382090521>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2005, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2006; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2005-vyrocni-zprava.pdf?683789ace6362be739b8991382090521>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2006, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2007; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2006-vyrocni-zprava.pdf?55a92df3d636eb15406f4b05353fbaf0>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2007, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2008; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2007-vyrocni-zprava.pdf?55a92df3d636eb15406f4b05353fbaf0>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2008, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2009; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2008-vyrocni-zprava.pdf?c0c848f1fe287854759f4d3213510895>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2009, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2010; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2009-vyrocni-zprava.pdf?55a92df3d636eb15406f4b05353fbaf0>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2010, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2011; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2010-vyrocni-zprava.pdf?4cb0a8b0e6f12ecef4e7d52352577b9>
- Komerční banka, a.s.; *Annual Report*. In *Annual Report 2011, Komerční banka, a.s.* [online]. Praha: ENTRE, s.r.o., 2012; Available from WWW: <http://www.kb.cz/file/cs/o-bance/vztahy-s-investory/publikace/vyrocni-zpravy/kb-2011-vyrocni-zprava.pdf?eeb75525319871a5caeff01b1e417d1a>
- PEDERZOLI, Ch., TORRICELLI, C.: Rating systems, procyclicality and Basel II: an evaluation in general equilibrium framework, 2009, available from: <http://link.springer.com/article/10.1007%2Fs10436-009-0128-8?LI=true#>
- RAJAN, R. (1994): “Why bank credit policies fluctuate: a theory and some evidence”. *Quarterly Journal of Economics*, 109, pp 399-441.
- STIGLITZ, J.; WEISS, A. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review*. July 1981, vol. 71, no. 3, p. 393–410.

WOLFSON M. H. 1996. A Post-Keynesian Theory of Credit Rationing. Journal of Post Keynesian Economics. Spring 1996, vol. 18, p. 443–470.
 WRAY L. R. 1992. Alternative Approaches to Money and Interest Rates. Journal of Economic Issues. 1992, vol. 26, no. 4, p. 1145–1178.

Annex

Annex A - Test investigation of stacionarity for a time series of the total volume of standard loans to financial institutions in the Czech Republic

Annex A

Null Hypothesis: SUVERYPP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.092764	0.0348
Test critical values:		
1% level	-3.596616	
5% level	-2.933158	
10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Note: the time series of the total volume of standard loans in the Czech Republic (SUVERYPP) was tested by a widespread examination of the ADF stationary test, while from the result is evident, that the null hypothesis is rejected and SUVERYPP so does not have a unit root.

Source: Czech National Bank

Annex B - OLS regression Model, where as the dependent is a time series midst-quarterly change of total volume of standard loans in the Czech Republic

Dependent Variable: SUVERYPP

Method: Least Squares

Date: 03/16/13 Time: 09:50

Sample (adjusted): 2002Q2 2012Q4

Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RHDPP0	1.813058	0.851860	2.128352	0.0397
ZTUVERYP	-0.023358	0.045573	-0.512543	0.6112
D(PRIBOR)	0.487124	0.857332	0.568186	0.5732
C	2.080510	0.481479	4.321083	0.0001
R-squared	0.140673	Mean dependent var		2.551126
Adjusted R-squared	0.074571	S.D. dependent var		2.587080
S.E. of regression	2.488750	Akaike info criterion		4.749846
Sum squared resid	241.5612	Schwarz criterion		4.913679
Log likelihood	-98.12170	Hannan-Quinn criter.		4.810263
F-statistic	2.128123	Durbin-Watson stat		1.258114
Prob(F-statistic)	0.112260			

Note: OLS regression model, where as the dependent variable entered a time series of midst-quarterly change of total volume of standard loans in the Czech Republic (SUVERYPP) in %, while the independent variable in the form of dummy variables of real GDP in the Czech Republic (RHDPP0, where the number 1 is in time series shown in growth of real GDP by 1.3% and more) is statistically significant with a positive sign, while the remaining independent variables in the form of midst-quarterly change of total volume of the loss-making loans in % and the first gap of time series PRIBOR are not statistically significant. According to the DW model test reports auto-correlation of residues which could help the inclusion of other statistically significant variables to the model.

Source: Czech National Bank

Annex C - OLS regression Model, where as the dependent is a time series midst-quarterly change of total volume of standard loans in the Czech Republic

Dependent Variable: SUVERYPP

Method: Least Squares

Date: 03/16/13 Time: 20:35

Sample (adjusted): 2002Q2 2012Q4

Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RHDPP1	-2.274365	1.026416	-2.215833	0.0326
ZTUVERYP	-0.005545	0.047108	-0.117710	0.9069
D(PRIBOR)	0.649504	0.842692	0.770750	0.4455
C	3.043072	0.422593	7.200958	0.0000
R-squared	0.148111	Mean dependent var		2.551126
Adjusted R-squared	0.082581	S.D. dependent var		2.587080
S.E. of regression	2.477957	Akaike info criterion		4.741154
Sum squared resid	239.4706	Schwarz criterion		4.904987
Log likelihood	-97.93481	Hannan-Quinn criter.		4.801570
F-statistic	2.260197	Durbin-Watson stat		0.985567
Prob(F-statistic)	0.096619			

Note: OLS regression model, where as the dependent variable entered a time series of midst-quarterly change of total volume of standard loans in the Czech Republic (SUVERYPP) in %, while the independent variable in the form of dummy variables of real GDP in the Czech Republic (RHDPP1, where the number 1 is in time series shown in real GDP decline) is statistically significant with a negative sign, whereas the remaining independent variables in the form of midst-quarterly change of total volume of the loss-making loans in % and the first gap of time series PRIBOR are not statistically significant. According to the DW model test reports auto-correlation of residues which could help the inclusion of other statistically significant variables to the model.

Source: Czech National Bank