The Financial Crisis Impact on Credit Risk Management in Commercial Banks

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Abstract **Credit risk has been and still remains the essential and core risk in commercial bank activities. The causes of recent financial crisis reveal not only systemic or structural imbalances, but the necessity to keep and strengthen the principles of credit risk management. Moreover, the lessons that should be learned indicate the weakness of the credit risk management systems and models used by commercial banks and forces to re-evaluate them. This article presents the analysis of the influence of recent global financial crisis on credit risk management in the commercial banks and provides summarized challenges faced by banks for credit risk management improvement.**

Index Terms: **credit risk management, financial crisis, commercial bank.**

I. INTRODUCTION

The global financial crisis started at the middle of 2007 in USA and has boosted considerable debate and analysis of its causes and of the lessons that need to be learned. In the scientific discussions there are no doubts as of importance of credit risk management in commercial bank. But the subsequences of financial crisis show that the methods and systems used should be re-evaluated seeking to improve the current situation in credit risk management and to minimize the possible losses of other turmoil or crisis.

Most of scientific researches focus on the analysis of resent global financial crisis impact on the economy or their indicators (Racickas, Vasiliauskaite, 2010; Avadanei, 2011; Moshirian, 2011; Claessens, Kose, 2013). The causes of financial crisis are analyzed pointing on global structural imbalances (Jagannathan, Kapoor and Schaumburg, 2013), behavioral factors (Mortreul, 2010; Ashby, 2010; Moshirian, 2011), factors determining the global scale and severity (Claessens, Kose, 2013; Stiglitz, 2010), regulatory issues (Moshirian, 2011; Kane, 2012; Imbierowicz, Rauch, 2014),

weaknesses in banking (Claessens, Demirguc-Kunt, Moshirian, 2009; Jickling, 2009; Sakbani, 2010; Stiglitz, 2010; BIS, 2010b; Gonzalez-Paramo, 2011a, b; Vermorken, 2011; Firtescu, 2012; Cabal, 2013). Thus there is a great scientific interest in defining the causes of recent financial crisis although the analysis of credit risk management practices and changes is rather limited, especially in context of its application in particular economy. The most important studies on risk management improvement are of Jorion (2009), Golub and Crum (2009), Ashby (2010), Flaherty, Gourgey and Natarajan (2013).

The analysis of the main causes of recent global financial crisis shows that the key underlying and basic principles of risk management have been abandoned (Gonzalez-Paramo, 2011b). That is why the **problem** arises – how to improve the credit risk management in post-crisis commercial banking. The object of this paper is credit risk management. The **aim** of this paper is to analyse the impact of recent financial crisis on credit risk management in commercial banks. The **objectives** are as follows:

- to analyse the main causes and lessons from recent global financial crisis;
- to identify challenges for credit risk management improvement in post-crisis period banking;
- to overlook the global financial crisis impact on banks' loan portfolio in Lithuania.

Methods of the research: comparative analysis of scientific literature, statistical analysis.

II. RESENT GLOBAL FINANCIAL CRISIS: CAUSES AND LESSONS

Financial crisis – the economic situation that is related to the banking panic, which includes significant production and financial sector losses, causes havoc on international markets, creates the stock market's downfall, financial bubbles, currency crises, and foreign loans, leads a sharp decline in economic activity and has a potential to cause economical recession (Racickas, Vasiliauskaite, 2010). Crises are, at the certain level, extreme manifestations of the interactions between the financial sector ant the real economy (Claessens, Kose, 2013). Before the 2007, the crises were characterized

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by an exponential growth of the financial sector, when the size of financial institutions and the number of financial transactions both outgrew levels that could plausibly be considered to be socially or economically optimal (Kapoor, 2010). But financial system, markets and incentives have changed: finance became increasingly focussed on the short term and just-in-time finance proved to be destabilizing increasing both the speed and the scope of contagion in the system, financial system became less transparent, with opacity and high uncovered leverage internationally, low interest rates inflating the prices (Kapoor, 2010; Ashby, 2010). In such situation any shock or market disturbance meant the loss in confidence, stop in transactions, and cross-border impact. Thus current financial crisis had a wide range of factors and worldwide impact.

The current financial crisis began in 2007 and gathered strength in 2008. The *first stage* of the crisis (from July 2007 until August 2008) was described as the beginning of the American mortgage crisis with enormous write-downs by banks because of bad mortgages, and the first bankruptcies. The *second stage* (from September 2008) raised the liquidity crisis - banks, in particular, faced unparalleled liquidity stress hurting their ability to lend. And the *third stage* as the result

of liquidity crisis paralyzed credit access businesses, households and banks, and shoking economic activity. It distrusted whole banking system (Grigor'ev, Salikhov, 2008). The stages of financial crisis are differently distinguished by scholars; for example, Sakbani (2010) stresses the five ones, adding central banks' actions and international payments imbalances. The crisis was extreme as destruction, estimated at US$ 50 trillion equivalent to one year of world GDP (Aisen, Franken, 2010). It has been described as the worst since the Wall Street Crash and Great Depression (1920s and 30s) (Ashby, 2010) and even as the greatest crisis in the history of finance capitalism (Turner, 2009).

The global financial crisis of 2007-2009 is associated with the plunge in the value of stocks, bonds, property, and other assets. This crisis has been painful reminder of the multifaceted nature of crises (Claessens, Kose, 2013). Moreover, the crisis was unprecedented in its global scale and severity, as problems were exported via diverse channels such as commerce, currencies, investments, derivatives into other countries (Stiglitz, 2010, Moshirian, 2011).

The causes of recent financial crisis may be summarized into four major categories: fundamental, finance industry, regulatory and behavioral (Picture 1).

- Global imbalances (current account)
- Excess elasticity in international monetary and financial system
- Labor supply shock
- US monetary policy

- Extensive borrowing by finance institutions and private sector
- Financial disequilibria and asset price bubbles
- Information asymmetry and lack of transparency
- Low banks' capital
- Insufficient level of liquid assets
- Deviation from credit risk management principles

FUNDAMENTAL   **FINANCE INDUSTRY**   **GLOBAL**
as spread through

CAUSES
of financial crisis

RESULTED in
contraction of liquidity
& credit availability

- commerce
- currencies
- investments
- derivatives

REGULATIONS   **BEHAVIORAL**

- Fragmented regulation/inadequate supervision
- Failure of regulators to adapt to finance evolution
- No systemic risk regulations
- Conflict of interest: rating agencies and issuers of financial instruments

- Short-term and excessive risk-taking incentives
- Biased system of incentives
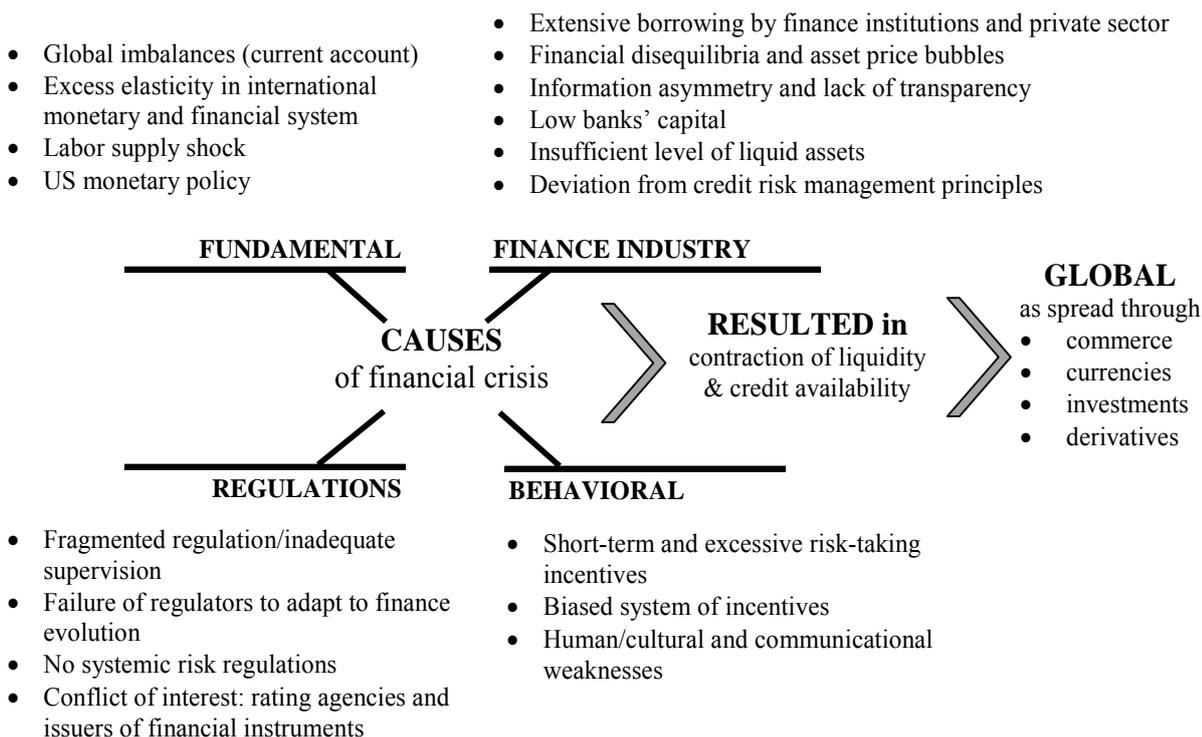- Human/cultural and communicational weaknesses

Fig. 1. The causes of financial crisis

There are various views on the fundamental causes, stressing the US monetary policy, global imbalances (current account) and excess elasticity in international monetary and financial system, huge worldwide labour supply shock leading to excess in liquidity and money supply, lack of regulations (on shadow banking system, on lending standards

in sub-prime mortgage, or overall regulatory forbearance and financial deregulation). Jagannathan, Kapoor and Schaumburg (2013) presented the broad view, that causes of financial crisis can be viewed as side-effects of inability to cope with such events as: inability of emerging economies to absorb savings through domestic investment and consumption

due to inadequate national financial markets; the inability of exchange rates to act as shock absorbers due to capital controls motivated by immediate national objectives; the inability of the US economy to adjust to the perverse incentives caused by huge moneys inflow leading to a breakdown of checks and balances at various financial institutions.

Gonzalez-Paramo (2011b), member of the Executive Board of ECB, has indicated these elements and causes characterising the crisis, that also appear in different studies as of Cabal (2013), Firtescu (2012), Vermorken (2011), Sakbani (2010), Stiglitz (2010):

- the extensive borrowing by financial industry and the private sector due to the prevailing low interest rates;

- the building up of financial disequilibria and asset price bubbles;

- the biased system of incentives that led investors to excessive risk-taking;

- the failure by regulators to adapt to the state of the evolution of financial system;

- the market failures related to information asymmetry and lack of transparency about risk and characteristics of the different products;

- the existence of obvious conflicts affecting key agents needed in the securitisation process;

- the failure of investors to conduct due diligence, blindly relying on information and model that proved to be inappropriate to capture some very relevant risks.

According to Cabal (2013), causes of global financial crisis are low bank capital and insufficient levels of liquid assets because of *balance sheet expansion* (as is associated with higher and excessive financial leverage) and *substantial liquidity risk* (taking in mind that causes of failures are lack of liquidity, rather than insolvency), *mismatches between assets and liabilities* (as banks had assets having high liquidity premium (i.e. poor liquidity) and funded them with liabilities that cost them low liquidity premium (i.e. high liquidity)). Thus the amount of reserves held by banks was either insufficient or of inadequate quality to support the write-offs and reductions in asset values (Vermorken, 2011). The excessive on- and off-balance sheet leverage accompanied by a gradual erosion of the level and quality of the capital base and by banks holding insufficient liquidity levels are named as the main reasons of the severe economic and financial crisis (BIS, 2010b). Moreover the banking system was not able to absorb the systemic trading and credit losses nor could it cope with the reintermediation of large off-balance sheet exposures that had built up in the shadow banking system. The crisis was further amplified by a procyclical deleveraging process and by the interconnectedness of systemic institutions through an array of complex transactions. During the most severe episode of the crisis, the market lost confidence in the solvency and liquidity of many banking institutions. The weaknesses in the banking sector were transmitted to the rest of the financial system and the real economy, resulting in a massive contraction of liquidity and credit availability (BIS, 2010b).

The causes of financial crisis may be summarized as the overconfidence in ability of portfolio managers to generate returns, the adequacy of models and data used to estimate risks, the ability and willingness of monetary authorities to mitigate the effect of downturns in asset prices, the efficiency of markets (Gonzalez-Paramo, 2011a), inadequate supervision of financial system, ill understood financial innovation, opaque accounting rules, conflict of interest: rating agencies and collateralize debt obligations/mortgage issuers (Vermorken, 2011).

A lot of scientists and organizations have analysed the causes of resent global financial crisis. But Jickling (2009) has summarized and indicated the causes most widely and deeper. They are: imprudent mortgage lending, housing bubble, global imbalances, securitization, lack of transparency and accountability in mortgage finance, rating agencies, mark-to-market accounting, deregulatory legislation, shadow banking system, non-banks runs, off-balance sheet finance, government-mandated subprime lending, failure of risk management systems, financial innovation, complexity, human frailty, bad computer models, excessive leverage, relaxed regulation of leverage, credit default swaps (CDS), over-the-counter derivatives, fragmented regulation, no systematic risk regulator, short-term incentives, tail risk, black swan theory. Also it should be mentioned, that in many cases, the crisis or failure is the result of a combination of cause rather than one factor.

It is widely accepted that one of the cause of the deep financial crisis has been the deviation from well established principles in risk management by financial institutions. The fundamental and essential risk management practices declare: "know your counterparties", "invest only in products you understand", "do not outsource credit risk management by relying exclusively on external credit assessments", and "do not rely exclusively on quantitative models, however sophisticated" (Gonzalez-Paramo, 2011b). Most of these principles have been abandoned.

In a wider holistic approach not only structural causes, absence of rules and regulations, but human decisions could be named as responsible as human passions led behaviours (Mortreul, 2010): borrowers have been instrumentalized; credit risk management was over-sighted; and individual credit regulation was too permissive; financial and technical innovations allowed for the diffusion of expositions to risk; complexity was not mastered; and accounting norms and financial reporting did not help trust and confidence. The similar view to causes is provided by Ashby (2010) research of risk management experts, stressing the importance of behavioural aspects more than methods: human/cultural weaknesses at the industry-wide, inter-firm and intra-firm levels; communication weaknesses within some financial institutions; weaknesses in the prudential regime for banks, credit unions and investment firms, coupled with flawed supervision.

The lessons that should be learned can be summarized from Mortreuil (2010), who points the importance of good regulations, as regulations lead to virtuous behaviour, which

is quintessential to virtuous culture. The system of financial regulations has to be robust, reliable, and fair. Even more difficult task would be to tackle endemic incentive problems in the financial sector that encourage excessive risk taking and short termism (Kapoor, 2010). The corporate governance principles should be re-implemented and responsibility shared, the relationships between regulators and those they regulate must be revised, the competences and expertise to implement regulatory changes must be developed (Kane, 2012). Moreover the values of accountability, respect to customer, common good versus personal interest and fair wages and fair prices should be put into practice (Mortreuil, 2010). In addition to regulations of financial sector, the policy and institutional changes that would promote higher saving in developed countries and legal reforms that would promote capital into developing countries would help to recover globally (Jagannathan, Kapoor, Schaumburg, 2013) and changes to the structure of the financial system is required (Kapoor, 2010). The in deep analysis of financial architecture, regulations and regulators, their new roles and capacity may be found in a study of Moshirian (2011).

The outlook for improvement of risk management may be analysed by key lessons provided by Flaherty, Gourgey and Natarajan (2013). First lesson indicates, that history doesn't always repeat itself exactly. It's important to signify that number of risk managers only considered past events rather than tested future scenarios. But in many cases the most influential and powerful risks are those that have never experienced and thus cannot be seen and measured. Second lesson points out that models are not well-suited to handle new complex instruments. Third lesson signifies that investors take too much comfort in standard risk metrics and discount the probability of adverse tail events. Fourth lesson remarks misguided compensation structures encourage excessive risk taking. Fifth lesson stresses that the risk management functions have to be the part of investment process.

The lessons that would be critical to the future success of institutional risk management were developed by Golub and Crum (2009). First, institutions must recognize the paramount importance of liquidity. Second, investors in securitized products need to look through data to the behaviour of the underlying assets. Third, institutions must always be cognizant that financial certification is useless during systemic shocks. Fourth, the market's appetite for risk can change dramatically. Fifth, the market's level of risk can change dramatically. Sixth, institutions need to manage their level of risk rather than letting the market determine their level of risk. Seventh, institutions must adapt to the increasing importance of policy risk. And eighth, institutions must always remember that by the time a crisis strikes, it's too late to start preparing for it.

Ashby (2010) summarises important lessons from financial crisis, firstly, for finance institutions: improvement of risk cultures, redesigning compensation arrangements, learning lessons from outside the financial services sector, improving internal control. Secondly, for regulators: beware the regulatory pendulum, as only limited increases of capital

requirements may be justified, but significant increases would be very costly; it is more important not what to implement, but how to implement; proper market incentives should be promoted.

III. THE CHALLENGES FOR CREDIT RISK MANAGEMENT IMPROVEMENT

Credit risk is the potential loss due to the non-performance of a financial contract, or financial aspects of non-performance in any contract (Global Association of Risk Professionals, GARP). For commercial banks it's a greatest source of risk. Loans are the largest source of credit risk, but credit risk (counterparty risk) may also be inherent in other types of assets, such as bonds, short-term debt securities and derivatives, and in off balance-sheet commitments, such as unused credit lines or limits, guarantees and documentary credits. Country risk and settlement risk are also regarded as credit risks.

The effective *credit risk management* is a critical component of a comprehensive approach to risk management and essential to the long-term success of any banking organization (BIS, 2000). Credit risk management aims to restrict losses due to credit risks arising from customer and other exposures to an acceptable level whilst seeking to optimise the risk/return ratio. Banks should have a keen awareness of the need to identify, measure, monitor and control credit risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for risks incurred (BIS, 2000).

Before global financial crisis a lot of banks have invested significantly in their credit risk management improvement. Specifically, banks invested in methods, resources, processes, and technology to assess, monitor, manage, and model their credit risk (KPMG, 2007). The traditional credit risk measurement models (expert systems, neural networks, rating systems, including bank internal rating systems and credit scoring systems) have been developed to new approaches models (Saunders, A. Allen, L, 2002):

- Optional pricing model such as KMV and Moody's;
- Reduced form models such as KPMG and Kamakura;
- VAR models such as CreditMetrics;
- Time varying models such as CreditPortfolio View;
- Mortality models such as Credit Risk Plus.

The main causes of these approaches implementing were (Saunders, Allen, 2002):

- structural increase in bankruptcies;
- disintermediation;
- more competitive margins;
- declining and volatile values of collateral;
- the growth of off-balance-sheet derivatives;
- technology;
- the BIS risk-based capital requirement.

Other scientists (Valvonis, 2004; Cibulskiene, Rumbauskaite, 2012) group credit risk models according Basel II requirement prepared by Falkenstein E., Boral A.,

Carty V. and Caoutte, Altman E.I. and Narayanan P. into three groups of models:

1. Models of *probability of default* (actuary, option, scoring, credit margin). Result: Probability of Default (PD) – probability that debtor would not be able to meet his obligations for the bank on time.

2. Models of *credit position* (credit equivalent position, loss given default). Result: Loss Given Default (LGD) – an average loss in the case of default of particular loan or under particular circumstances; and Exposure of Default (EAD) – the amount of the loan in case of default.

3. Models of *portfolio loss* (market value, probability of default). Result – Expected Loss (EL) – the evaluated level of default of the whole group (how much bank will lose if it grants a loan of a particular risk to the debtor of particular risk); Unexpected Loss (UL) – shows deviation from the average.

Before financial crisis most of the banks effort was focused on compliance with Basel II and other regulatory requirements, also to optimize risk management processes by quantitative models. The main aims of Basel II were (BIS, 2006):

1. Ensuring that capital allocation is more risk sensitive;

2. Ensuring that credit risk, operational risk and market risk are quantified based on data and formal techniques;

3. Enhance disclosure requirements which will allow market participants to assess the capital adequacy of an institution;

4. Attempting to align economic and regulatory capital more closely to reduce the scope for regulatory arbitrage.

Basel II is divided in three pillars: minimum capital requirements, supervisory review process and market discipline. The first pillar deals with maintenance of regulatory capital calculated for three major components of bank risk: credit risk, operational risk, and market risk. For the measurement of credit risk two principal options were proposed (BIS, 2001b; Berzin, Truck, Rachev, 2003):

- Standardized approach (STD).
- Internal Rating-Base (IRB): Foundation IRB and Advanced IRB.

The STD approach is the conceptually the same as the Basel I, but it is more risk sensitive as the bank allocates a risk weight to each of its assets and off-balance-sheet positions and produces a sum of risk weighted assets (RWA). Individual risk weights depend on the broad category of borrower which are sovereigns, banks and corporate. Under Basel II the risk weights are refined by the reference to a rating provided by external credit assessment institution such as rating agencies.

Under IRB Approach bank is allowed to use their own internal estimates of borrower creditworthiness to assess credit risk in their portfolios, subject to strict methodological and disclosure standards. As different types of loan exposures have different loss characteristics distinct analytical frameworks are provided. The results of each borrower's creditworthiness estimation translate into estimates of a potential future loss amount, which forms the basis of

minimum capital requirements. The risk elements involved in such assessments include *(i) the probability of default, (ii) loss given default, (iii) exposure at default and (iv) effective maturity*. These risk components form a part of the calculation of the risk weighting to be applied to particular exposures within defined asset classes. In the foundation methodology, banks estimate the probability of default associated with each borrower, and the supervisors supply the other inputs.

In the advanced methodology, a bank with a sufficiently developed internal capital allocation process is permitted to supply other necessary inputs as well. Given the enhanced sophistication of the IRB Approach and its reliance on internal risk assessments, it should be noted that it is subject to numerous conditions and can only be used with the regulator's approval. The approvals are made if the bank's risk rating systems meet stated minimum criteria. Under both IRB approaches, the range of risk weights is far more diverse than those in the STD approach, resulting in great risk sensitivity.

Basel Accords also declare the position on *credit risk mitigation*. Credit risk mitigation is the reduction of credit risk by taking collateral, obtaining credit derivatives or guarantees or taking an offsetting position subject to a netting agreement (BIS, 2001a). Basel I recognized only collateral instruments and guarantees. Since 1988, the financial market has become more liquid and the number of credit protection suppliers has increased. The new products as credit derivatives have allowed banks to sell or transfer those risks that they don't wish to retain. Basel II credit risk mitigation framework offered a choice of approaches that allowed different banks to strike different balances between simplicity and risk – sensitivity. There were 3 treatments of credit risk mitigation: standardised, foundation IRB and advanced IRB. Although the treatments of collateral, netting and credit derivatives and guarantees are based on similar concepts, the risk weight schemes are different. While credit risk mitigation techniques generally reduce credit risk, they do not fully eliminate it.

Notwithstanding Basel II introduced new approach to credit risk management and bank capital requirement, the role of Basel II before and after the global financial crisis has been discussed widely. There were discussions that recent financial crisis demonstrated weakness of Basel II and/or increasing the effect of crisis. The main responsibilities ascribed to Basle II in connection with the financial crisis are the following (Cannata, Quagliariello, 2009):

- the average level of capital required by the Basel II is inadequate and this is one of the reasons of the recent collapse of many banks;
- the Basel II Capital Accord, interacting with fair-value accounting, has caused remarkable losses in the portfolios of intermediaries;
- capital requirements based on the Basel II regulations are cyclical and therefore tend to reinforce business cycle fluctuations;
- in the Basel II framework, the assessment of credit risk is delegated to non-banking institutions, such as rating agencies, subject to possible conflicts of interest;

- the key assumption that banks' internal models for measuring risk exposures are superior than any other has proved wrong;

- the Basel II provides incentives to intermediaries to deconsolidate from their balance-sheets some very risky exposures.

It should be mentioned that Basel II rules were not actually applied in major countries when crisis erupted. In Europe most of the banks started to apply the new rules in 2008 and the US regulatory agencies have decided to postpone its implementation to 2010 (Cannata, Quagliariello, 2009). And it is not sensible to blame Basel II because it did not prevent unregulated intermediaries from excessive leveraging and risk taking.

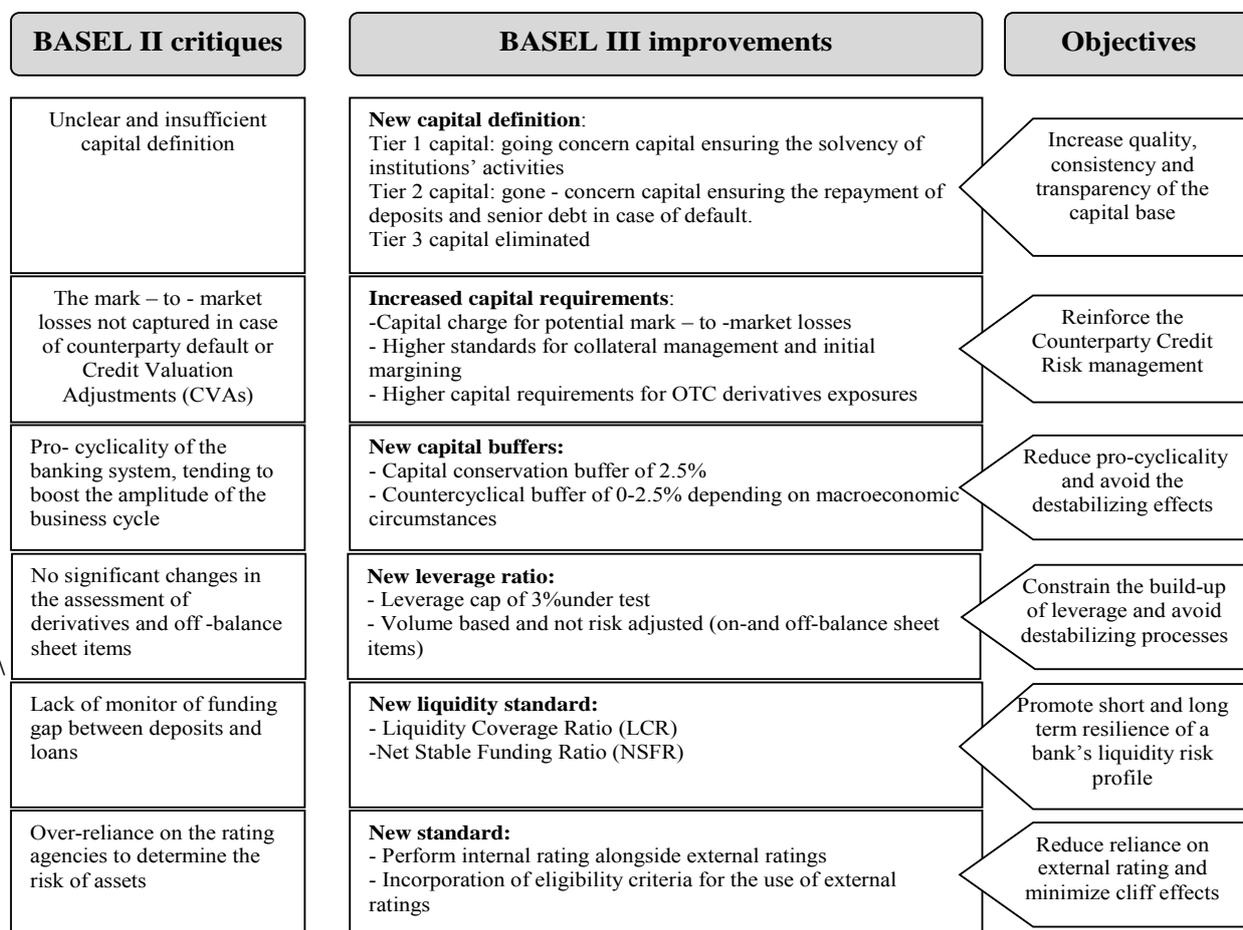| BASEL II critiques	BASEL III improvements	Objectives
Unclear and insufficient capital definition	**New capital definition**: Tier 1 capital: going concern capital ensuring the solvency of institutions' activities Tier 2 capital: gone - concern capital ensuring the repayment of deposits and senior debt in case of default. Tier 3 capital eliminated	Increase quality, consistency and transparency of the capital base
The mark – to - market losses not captured in case of counterparty default or Credit Valuation Adjustments (CVAs)	**Increased capital requirements**: -Capital charge for potential mark – to -market losses - Higher standards for collateral management and initial margining - Higher capital requirements for OTC derivatives exposures	Reinforce the Counterparty Credit Risk management
Pro- cyclicality of the banking system, tending to boost the amplitude of the business cycle	**New capital buffers:** - Capital conservation buffer of 2.5% - Countercyclical buffer of 0-2.5% depending on macroeconomic circumstances	Reduce pro-cyclicality and avoid the destabilizing effects
No significant changes in the assessment of derivatives and off -balance sheet items	**New leverage ratio:** - Leverage cap of 3%under test - Volume based and not risk adjusted (on-and off-balance sheet items)	Constrain the build-up of leverage and avoid destabilizing processes
Lack of monitor of funding gap between deposits and loans	**New liquidity standard:** - Liquidity Coverage Ratio (LCR) -Net Stable Funding Ratio (NSFR)	Promote short and long term resilience of a bank's liquidity risk profile
Over-reliance on the rating agencies to determine the risk of assets	**New standard:** - Perform internal rating alongside external ratings - Incorporation of eligibility criteria for the use of external ratings	Reduce reliance on external rating and minimize cliff effects

Fig. 2. The main Basel III improvements (prepared according BIS, 2011)

Picture 2 represents the main criticized aspects of Basel II and the Basel III prepared improvements that are very important for credit risk management. Basel III reforms for enhancing credit risk coverage stresses the importance of raising credit risk management standards. Measures to reduce credit risk include higher Risk Weighted Assets (RWA), the new Credit Value Adjustment (CVA) charge, identification of Wrong Way Risk and upgrading stress test. These changes are intended to strengthen the banking sector's ability to survive significant downturns by managing risk, understanding exposure and minimising the impact of negative events.

Basel III will be costly for banks due to capital required to be retained and the investments needed to implement changes. The complexity and number of IT systems and data stores, coupled with multiple processes, make the task of architecting the Basel III changes a significant challenge (Capgemini, 2011).

As from Ashby (2010) research, the system of credit risk management during financial crisis hasn't failed, but there were implementation failures as management of low probability high impact events and systemic risks, over-reliance on complex quantitative risk assessment tools, poorly implemented risk appetite frameworks. Credit risk management is one of the most important for bank survival, but it should be considered together with other risks (BIS, 2000), in particular with liquidity risk as they have close relationships and both influence bank's probability of default with regard to borrower defaults and fund withdrawals. Dia

(2013) introduced a reverse link between deposits and loans, by assuming that the supply of deposit funds is affected by the equilibrium quantity of loans. The main relationship may be drawn: higher credit risk accompanies higher liquidity risk through depositor demand (Cornett et al., 2011). Thus the Basel III effort to regulate and monitor asset quality and credit risk in conjunction with liquidity risk management is necessary and important (Imbierowicz, Rauch, 2014).

The major credit risk management techniques as selection (among counterparties and products, with models and officers as most important participants), limitation (of crediting amounts based on risk profile), diversification (credit risk spread among different types, sectors and geographies), credit enhancement (improving credit quality by guaranteed assets) (Van Gestel, Baesens, 2009) were developed, however they should be improved based on practice of recent financial crisis.

The changes as proposed by Jorion (2009) first of all should be by changing risk management from returns-based information (used for value at risk method) to position-based information (used for forward-looking stress tests), that allows to assess the data for new instruments, markets and managers, helps to reveal hidden risks and style drifts. It corresponds to BIS (2010a) backtesting (comparing forecasts to realised outcomes) consultative document, suggesting other methods beside or instead of value at risk model, as it is important to test the quality of the entire forecast distribution. Weaknesses of valuation at risk method were discussed in SSG (2008) report and further in SSG (2009) report it was summarised, that methods of stress testing and scenario analysis (for estimation of known and unknown risks) are developing for valuation of loss of secured funding of certain asset classes, a collapse in foreign exchange swaps, operational crisis, counterparty failure, mutual fund redemptions, and ABCP (asset-backed commercial paper) illiquidity.
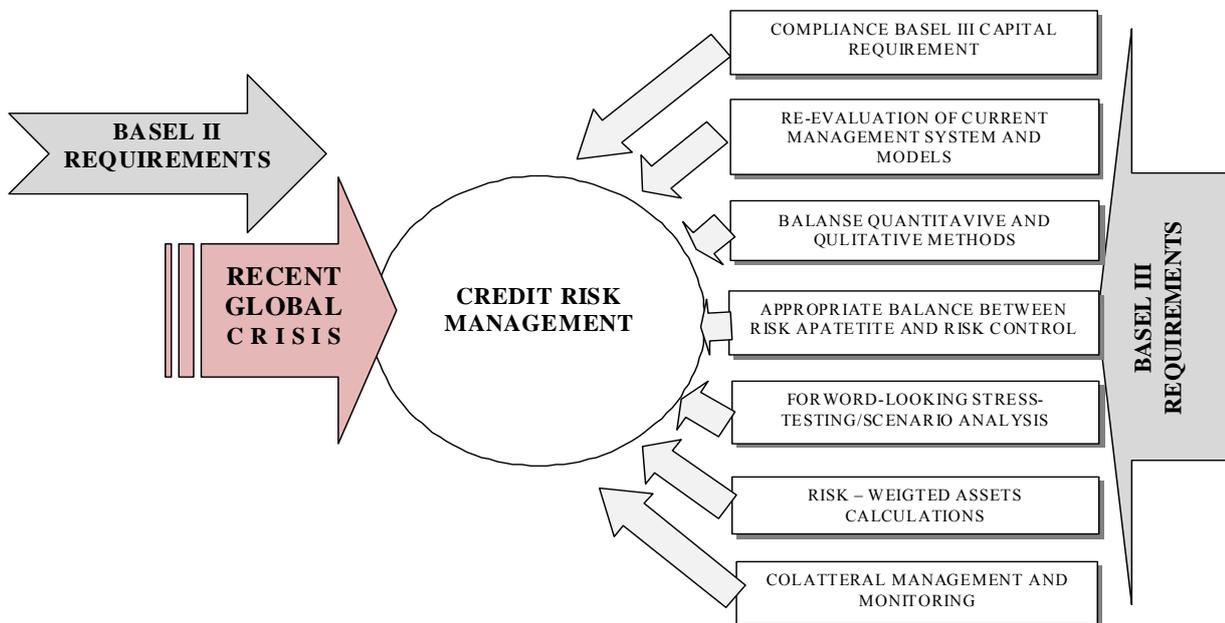
Fig. 3. The main aspects of credit risk management improvement

The crisis also revealed a number of shortcomings in banks' risk management of counterparty credit exposures, including in particular the areas of back-testing, stress testing and monitoring of wrong way risk.

- *Back-testing*: the difficulties in statistical interpretation of back-testing results for counterparty credit risk suggest that many firms did not appropriately consider problems that were identified by back-testing; the use of models with poor backtesting results contributed to an underestimation of actual losses.

- *Stress testing*: stress testing of counterparty credit risk was not comprehensive; was run infrequently, sometimes on an ad hoc basis; and, in many banks, provided inadequate coverage of counterparties or the associated risks.

- *Wrong way risk*: Transactions with counterparties, such as the financial guarantors, whose credit quality is highly correlated with the exposure amount, contributed to the losses during the crisis.

The improvement of credit risk management is possible and may be successful with implementing the essential principles as Golub and Crum (2009) discussed:

- credit risk management must become an integral part of an institution's governance and culture;

- the alignment and management of institutional interests are critical;

- institutions need an independent risk management organization with strong subject-matter expertise;

-    institutions need to understand their fiduciary responsibilities to their clients;
-    a top-down perspective is necessary, a bottoms-up risk management process is vital;
-    institutions need to get portfolio managers to think like risk managers;
-    risk models require vigilance and scepticism;
-    institutional risk management does not mean risk avoidance.

The Picture 3 discloses the summarized approach and identifies the main aspects of credit management improvements. Even well developed risk management systems do not guarantee the escape from losses, as unexpected or hardly measured systemic risks occur, related to regulatory or structural changes in capital markets and contagion risks. As a result of recent financial crisis the risk management systems will develop because of improved regulations, developing forward looking scenarios, rethinking the data provided by models and allowing specialists to be flexible in deciding on model assumptions and risk measures,

use of reverse stress tests, scenario analysis, and risk measurement models for structured credits (Jorion, 2009), improving collateral management practices (SSG, 2009).

IV. THE ANALYSIS OF CREDIT RISK MANAGEMENT RESULTS IN LITHUANIA

At the beginning of financial crisis Lithuanian economy and financial sector felt rather limited direct influence of global crisis as Lithuanian banking system is based on traditional banking model, has no close or direct connections with US financial institutions and investment banks. Lithuanian financial market is small; the complex products are not widely spread, and are very domestic orientated (Bank of Lithuania, 2008). The largest part of banking system in Lithuania is controlled by Scandinavian banks and their conservative strategy before and during financial crisis has secured the biggest banks in Lithuania from the default.
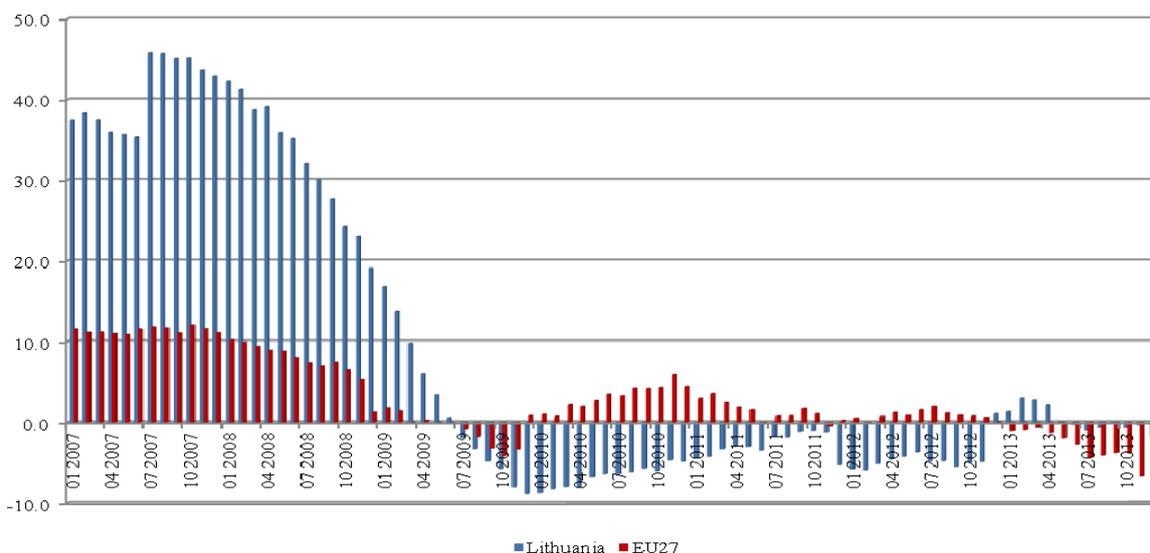
Source: ECB and Bank of Lithuania calculations.

Fig. 4. The dynamics of gross loan portfolio in Lithuania and EU27 countries, in percents

The analysis of economic data shows that Lithuanian banking system was influenced indirectly by the turmoil in global financial system. At first, along with the rise of interest rates on interbank loans in global markets, interest rates on loans increased in Lithuania, too. Moreover, banks tightened requirements for the borrower risk assessment. The above reasons determined lower ability of enterprises and households to borrow.

On other hand, the impact of financial crisis directly affected businesses with the decreased demand on Lithuanian products and services as the most of export countries went to recession. These facts have straitened access on external financing for the companies.The dynamics of gross loan

portfolio in Lithuania comparing with EU27 shows that Lithuanian banks have demonstrated much faster growth than EU27 banks (Picture 4). From the beginning of 2007 till the middle of 2008 the Lithuanian banking system demonstrated the growth of about 40% while EU27 loan portfolio growth was restrained – decreased from 11.8% to 8%.

The global financial crisis determined the unexpected decline of loan portfolio in Lithuania and EU27. Only at the beginning of 2010 EU27 banks had the small increase of their gross loan portfolio. Lithuanian banking system gross loan portfolio remained with the very negative dynamic till the end of 2012. The improving economical situation in Lithuania made positive impact on loan portfolio growth in 2012, but

starting from June 2013 the loan portfolio dynamic was slightly negative again.

As scientific studies show (Lakstutiene, Krusinksas, Platenkoviene, 2011) the loan portfolio dynamics has direct correlation with GDP and this interaction enables to make assumptions regarding the loan portfolio growth for the next year.
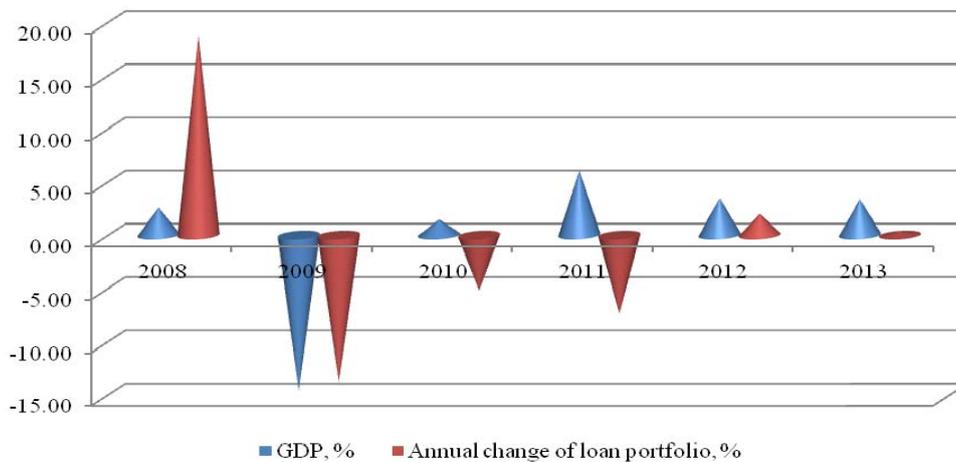
Source: SEB bank and Bank of Lithuania calculations.

Fig. 5. The dynamics of loan portfolio and GDP, in percent

As Picture 5 shows, the dynamics of loan portfolio is in correlation with GDP, but starting from 2010 it shows the higher GDP growth comparing with loan portfolio dynamics. The Bank of Lithuania (2013a) has reported that banks have eased their general credit standards as applied to nonfinancial corporations for a second period. During the past period banks eased access to lending to small and medium-sized enterprises, and for large enterprises they did it slightly more moderately (the credit standards as applied to long-term loans and short-term loans became equally eased).

The review of the bank lending survey (Bank of Lithuania, 2013c) shows that the demand of non-financial corporations for bank loans and credit lines increased in 2013 IIIQ, although to a lesser extent than half a year ago. Major contribution to the enterprises' borrowing requirement came from the inventories and working capital as well as fixed investment financing. In the opinion of the respondents (Bank of Lithuania, 2013c), in 2014 the demand for business loans will keep rising, housing loans will boost the loan portfolio as well. The loan portfolio of the banking sector will increase by about 3% over a year.

The main criterion indicating the results of banks' credit risk management is the part of non-performing loans compared to total loan portfolio (Picture 6). By analysing credit risk management of Lithuanian banking system the important fact is the bankruptcy announcement of two commercial banks in Lithuania (AB Snoro bankas – December 7, 2011, AB Ūkio bankas – May 2, 2013). It shows that Lithuanian banking system had problems with credit risk management before global financial crisis and during it as one of the main reasons of bank's bankruptcy was insufficient credit risk management, especially credit risk concentration and high ratio of non-performing loans.

The non-performing ratio had dramatically increased from 7.2% (IQ 2009) to 18.9% (IIQ 2010) as the ratio of loan to business customers retrogressed to the level of 25.7%. Starting from IQ 2010 the non-performing ratio has showed the improving tendencies and at the end of IIIQ 2013 it has decreased till the 11.3%. The biggest change of non-performing ratio reduction was influenced by the loans to business customers ratio (24.5% (IIQ 2010) to 13.3% (IIIQ 2013)). Consumer credit non-performing ratio showed very slow decreasing tendency (16.3% (IQ 2012) to 13.6% (IIIQ 2013) as the housing non-performing loans ratio remains at the level of about 7.5%. The Bank of Lithuania has indicated two factors of banks' loan portfolio improvement (Bank of Lithuania, 2013b):

- The debt repaying ability increases due to lowered interest rates and stronger financial status of the borrowers. The two thirds of non-financial enterprises were operating profitably as the demand for products and services was rapidly increasing. This tendency allows to make more optimistic outlook for future improvement of loan portfolio ratio of Lithuanian banks.

- Banks wrote off the not expecting to recover (bad) loans from their balances.
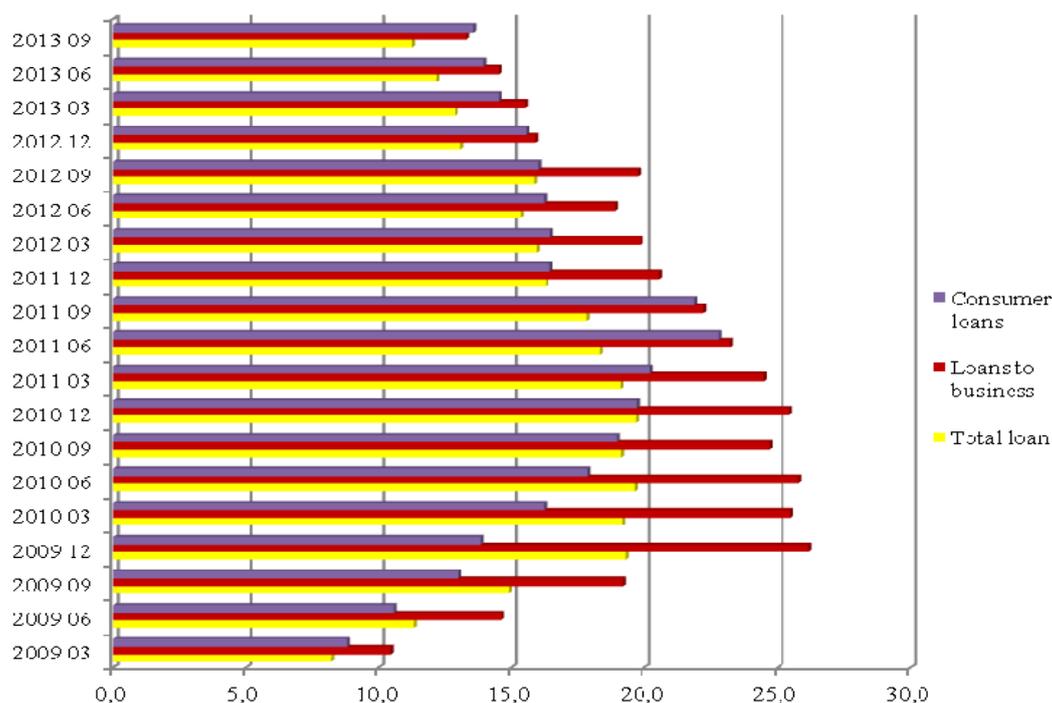
Source: Bank of Lithuania calculations.

Fig. 6. Non-performing loans of banking sector to loan portfolio in Lithuania, in percent

The increased demand for a labour force and the growing financial assets managed by households generates forecast for the improvement of customer and housing non-performing loans ratio.

To address the market failures revealed by the financial crisis, the Basel Committee on Banking Supervision proposed a number of fundamental reforms to the international regulatory framework as part of a new Basel III Accord. Within the EU, the European Commission has decided to implement Basel III through the use of a Regulation and a Directive. The Commission published its original formal proposals for the Capital Requirements Regulation (CRR) and amended Capital Requirements Directive (CRD) in July 2011. This collective package of legislation is commonly referred to simply as CRD IV (KPMG, 2013). The aim of these regulations is to improve the resiliency of the banking sector by requiring more and higher quality capital and more balanced liquidity. The key elements of CRD IV/CRR are:
  - higher quality capital base;
  - higher minimum capital requirements;
  - additional requirements for calculating risk-weighted assets (RWAs);
  - leverage ratio;
  - liquidity standards.

According to the calculations of the Bank of Lithuania (2013b), the capital adequacy ratio would decrease by 1.8 p.p. — down to 11.8%, and would still remain significantly above the minimum required for Tier I capital (4.5%), provided under the new standards of the CRD IV.

VI. CONCLUSIONS

The causes of recent financial crisis are summarized into four major categories: fundamental, finance industry, regulatory and behavioral. Low bank capital and insufficient levels of liquid assets because of balance sheet expansion, substantial liquidity risk mismatches between assets and liabilities raised the necessity to propose fundamental reforms to the international regulatory framework as part of a new Basel III Accord. The purpose is to improve the resiliency of the banking sector by requiring more and higher quality capital and more balanced liquidity. The improvements are: new capital definition, increased capital requirements, new capital buffers, new leverage ratio, new liquidity standard, and new standard for internal ratings and use of external ones.

The improvement of credit risk management is firstly related to following and consolidation of credit risk management principles in everyday operations and strategic management, recognizing the importance of liquidity, improving of risk cultures and managing level of risk, redesigning compensation arrangements, improving internal control, learning lessons from outside the financial services sector. With compliance to Basel III requirements the most important changes are fulfillment of capital requirement, re-evaluation of current management system and models, balancing qualitative and quantitative methods, secure balancing between risk appetite and risk control, application

of forward-looking stress-testing/scenario analysis, risk-weighted assets calculations, collateral management and monitoring. The credit risk management techniques were defined and were developing continuously starting from Basel I and then Basel II, although not all financial institutions applied Basel II rules at the start of financial crisis. Thus it is important not only to improve standards and regulations, but to follow their global implementation.

The influence of financial crisis on Lithuanian banking sector was indirect, as major banks are of Scandinavian origin, have limited market of complex financial products or derivatives, and are mostly domestically oriented. But the rise of interest rates on interbank loans, tightened requirements for borrowers, and increased business risk because of worldwide uncertainty and economic recession, determined contraction in credit availability. And if Lithuanian banking sector was increasing rapidly compared to EU27 average (measured by gross loan portfolio), the fall at the end of 2008 and beginning of 2009 was comparatively sharper and the recovery period is much longer compared to EU27. The more significant increase of loan portfolio is still only on 2014 forecasts, stressing the recovery of business activities, rising GDP, eased general credit standards. The ratio of non-performing loans indicates stabilizing situation in banks' loan portfolios, as interest rates decreased, businesses (and other borrowers) revive and bear less risk, the major part of bad loans is already written off the balance. The compliance to Basel III requirements allows to draw positive tendencies, stability and safeness as major indicators will remain significantly above the minimum requirements.

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