EARLY DIAGNOSTICS OF LOAN PORTFOLIO'S QUALITY

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Abstract

Purpose – The research aims to explore methods for early diagnostics of the loan portfolio's quality in commercial banks and provide recommendations for practical application of the credit ratings system based on the model elaborated by Mortgage Bank.

Design/methodology/approach – The requirements of supervisors of the banking sector, theoretical and applied methods, and their suitability for timely identification of loan portfolio's risks were examined. The credit rating model was reviewed as part of Internal Ratings Based (IRB) approach used for assessment of loan portfolio's quality. A hypothetical loan portfolio was established to evaluate the risk diagnostics system of Mortgage Bank.

Findings – A comparison of practical results with theoretical requirements leads to a conclusion that the credit ratings model established at Mortgage Bank is suitable for early diagnostics of changes to the loan portfolio's quality, though it could be improved to reflect more varied results.

Research limitations – The conclusions were drawn based on a hypothetical (not fully representative) loan portfolio compiled by selecting real entrepreneurs whose data complied with all the requirements of the rating model.

Practical implications – A commercial bank having a well-developed early diagnostics of loan portfolio's quality can assess the level of credit risk more accurately. As a result, the bank has a loan portfolio of enhanced quality and more stable financial indices. The author, based on experience of Mortgage Bank, provides recommendations on how to use the credit ratings for assessment of the borrowers and consummate of exhaustive credit ratings system.

Social implications – Good quality risk management system expands the spectrum of borrowers and riskier projects in the branches crucial for the national economy of Latvia. In this way the banks promote development of the national economy and employment.

Originality/value – Experience of Mortgage Bank demonstrates that wisely applied and well-maintained credit rating system is an efficient tool not only in early diagnostics of loan portfolio's quality, but also in generation of supplementary advantages.

Keywords: credit rating, credit risk, IRB approach, loan portfolio

1. INTRODUCTION

Due to significance of the banks for the global economy a successful, profitable and competitive financial system is of paramount importance. Since year 2007 the financial sector has been going through enormous changes and constant improvement. The financial crisis that evolved from the United States mortgage loans market shattered the foundations of the global financial system. In response new global standards, known as *Basel III* were created to strengthen the regulation, supervision and risk management of the banking industry. The European Central Bank (ECB) (2013) has prepared to take on new banking supervision tasks as part of a single supervisory mechanism. It brought forward yet another assignment for the lending institutions – in order to continue functioning in future, it was essential to identify in good time the operational deficiencies as regards quality of the loan portfolio. Thus a functioning risk management system reduces the adverse impact and consequences of risks.

Before introduction of Basel Accords the financial instruments, derivatives, securitisation, a.o. were considered as safer risk management solutions. However, the situation has changed and now

the major problems of the banks concern identification and assessment of risks and compliance with risk management, capital adequacy and liquidity requirements. From year 2008 to year 2011 the financial indices deteriorated due to various reasons, mostly because of imprudent lending and belated assessment of the loan portfolio. The situation unfolded so that measures undertaken to improve quality of the loan portfolio (which mostly involve work with delinquent borrowers) entailed clearing up of the consequences of customers' problems already long overdue.

The topic of early diagnostics of loan portfolio's risks is interesting not only for the commercial banking sector as a whole and individual banks; it is also topical for the companies, their ability to undertake credit obligations for development of economic activities or repay already existing obligations thus affecting welfare of numerous households by debt burden. Every bank has to decide on the customers' level of quality or risk it is ready to service and which markets and branches of the national economy it should enter. Hence follows the necessity to establish the tolerable risk level for a loan and individual customer, branch or industry and bank as a whole. As a result, the banks devise complex risk management systems comprising manifold measures, methods and measurements performed by various departments of the bank.

In most cases, the analysts of the commercial banks are able to comment on and assess confirmed facts, whereas forecasts are voiced with caution and often contradict each other. It makes getting a loan for small and medium-size enterprises (SMEs) difficult and encumbers assessment of their existing and potential operations the more so as SMEs form the corner-stone of Latvian economy. Since lately Mortgage Bank (2010b) has been delegated by government of Latvia to promote economic development of the state, exactly SMEs are lending target customers of the bank. Limited availability of funds is a serious obstacle preventing development of recently founded SMEs that have not started working as yet.

The purpose of the research stems from a major risk management assignment of Mortgage Bank i.e. to perform good quality early diagnostics of the loan portfolio while getting ready for the functions of development bank related to servicing of increased credit risk loan portfolio**. The purpose is:** to explore the methods for early diagnostics of changes to the loan portfolio's quality and provide recommendations for practical application of the credit ratings model.

To achieve the purpose the following **assignments** have to be accomplished**:**

1. To examine the requirements of the banking supervisors, theoretical and applied methods and their suitability for timely identification and assessment of loan portfolio's risks.
2. To review the credit ratings model as a part of Internal Ratings Based (IRB) approach used to assess the loan portfolio's quality.
3. To establish a hypothetical loan portfolio to model and to assess suitability of the credit risk ratings system established at Mortgage Bank for performance of efficient early diagnostics of loan portfolio's quality and prepare proposals for its improvement.

It is of utmost importance that Mortgage Bank (2010e) improved its risk management system, including identification of the borrower and loan risk levels as accurately as possible in order actions could be undertaken as early as possible to prevent the identified and forecasted deterioration of the portfolio.

Since Mortgage Bank abides by Latvian Law on Credit Institutions (1995), Financial and Capital Market Commission (FCMC) regulations (2007b) and other acts governing information disclosure in financial statements, some issues pertaining to Mortgage Bank are described without customers' data and specific calculations.

2. LITERATURE REVIEW

Risk identification and assessment issues are explored at large by classical credit theory. Also international banking supervisors, such as Basel Committee on Banking Supervision (BCBS) and Committee of European Banking Supervisors (CEBS) have scrutinized these issues by drafting various requirements (Basel Accord - *Basel I, Basel II Pillars* and *Basel III* - with regulatory adjustments), standards, regulations and methods. Nevertheless, the aggregation of theoretical recommendations and methods for assessment of the loan portfolio has not spared the banking

sector from losses, especially those stemming from deterioration of loan portfolio's quality. The recommendations and models failed to include the initial risks embedded in the prospective projects that the entrepreneurs had to face. Therefore now the loan investments made into the companies must be classified as unreasonable.

Many authors, like Rurane (2005, 2006), Kudinska (2005), Kutuzova (2001) and Lavrushin et al. (2007) have tackled the notion of risk, risk types and assessment, including also identification of various loan portfolio's risk levels and their assessment.

Kutuzova (2001) describes formation of the risk as follows: „risk forms due to data deviations from current and future situation assessments". This definition tallies with the notion that for the purposes of loss prevention the commercial banks should adequately assess the current situation of their transactions, business partners and future changes.

Kudinska (2005) has explored historically evolved internal and external risk identification and management processes and emphasized importance of risk management in the bank. Although research compiled in her book captures the time span from 1995 to 2003, subsequent events of the global and Latvian economy prove viability of the described methods and reveal their weaknesses.

FCMC (2009c) defines credit risk as possible occurrence of loss in case a counterparty fails or refuses to fulfil liabilities to the bank in accordance with contractual terms.

Z-score formula elaborated by Altman (1968), cited in Kudinska (2005), is popular for company-inherent risk assessment and forecasting of probability of bankruptcy. The formula is based on multi-discriminant analysis and is a linear function weighted by coefficients using data from company's financial statements. The formula produces a numerical value which shows the probability of company going into bankruptcy (hence it is probability category).

From the viewpoint of practical application Z-score formula is convenient, although according to the opinion of Kudinska (2005), which would be hard to disagree with, it is not feasible to use and trust Z-score formula on every occasion in the changing economic environment of Latvia. Also Rurane (2005), commenting on usage of Z-score formula, points out that assessment of solvency done in line with these coefficients is not always impartial as the coefficients disregard peculiarities of some industries the more so as the changes to coefficients' values do not always reflect improvement or deterioration of the company's financial standing.

Another historically important model was developed by Chester (1974), cited in Kudinska (2005), which was a model for forecasting non-compliance with the terms of loan agreement. For the bank to assess the credit risk it is important both – to follow up on and identify in good time the probability of delinquent loan payments and non-compliance with other provisions of the loan agreement. Chester's model has 2 equations; the coefficients used are based on financial data. The obtained result shows the probability of non-compliance with the terms of loan agreement.

Both of the aforementioned models can be easily used for calculation purposes, however they do not include business environment impact assessment and industry peculiarities and their application is hampered by recommendations and requirements of supervisory institutions.

FCMC (2009a) has established various parameters for initial assessment of credit risk for the purposes of granting a loan that, apart from individual financial data, include analysis of qualitative indicators, for example purpose of the loan, repayment sources, borrower's financial involvement, development of the respective branch of the national economy and geographical region, borrower's position therein as well as competence of the company's management, a.o.

Looking from the viewpoint of management theory Rurane (2005, 2006) suggests that the banks evaluated the customer more comprehensively as the banks' options for assessment of financial creditworthiness are restricted (annual reports show the financial standing as at the end of year). As defined by Rurane (2006), the main purpose of financial analysis is to acquire as many major parameters as possible which would allow for completer assessment of the changes to company's financial standing, structure of profit and loss and assets and liabilities. Also during validity of the loan agreement, as a rule, the banks assess creditworthiness according to Rurane (2005) approach – external financial analysis i.e. one carried out outside company and based only on publicly available

reports of the company. It means that the bank can obtain only limited information about company and its operations.

As regards risk management in the commercial banking system BCBS (2001, 2004) suggests using the Internal Ratings Based (IRB) approach to calculate capital adequacy requirements vis-à-vis credit risk. BCBS (2004) considers that an approach based on bank's own assessment of its counterparties and exposures may fulfil the New Basel Capital Accord. In line with IRB approach (BCBS, 2005), the Basel Committee allows the following formula (1) for calculation and assessment of the expected losses of the loan portfolio.

$$EL = PD * LGD * EAD, \quad (1)$$

where PD – average percentage,
LGD – percentage of exposure,
EAD – estimate of the amount outstanding in the respective currency.

The credit risk indicators used in rating systems, in line with requirements and formula (1) are given in Table 1.

Table 1

Credit risk parameters to be used in internal ratings-based approach

Parameters	Definitions
EL Expected losses	The amount the bank could lose, on an average, given its portfolio of credits at a particular time period.
PD Probability of default	The risk that a debtor does not comply with the principal and interest agreements during one year; it gives the average percentage of obligors that default in the course of one year.
EAD Exposure at default	The amount of the outstanding financial capital during one year, or until maturity, in case maturity is below one year.
LGD Loss given default	It measures the loss, as percentage of credit volume.

Source: BCBS (2005); Monica and Monica (2010)

The problem of aligning of bank's exposure with equity capital adequacy was solved to a certain extent in 2004 when BCBS published *Basel II* recommendations to promote stability of the financial system. *Basel II* includes recommendations for assessment of exposure amount and application of models for calculation of equity capital adequacy. The words "to a certain extent" imply that although there are international standards and methodology for calculation of capital adequacy, each bank has devised and uses its own individual criteria and parameters for application of the methodology. The BCBS (2011) has maintained the formula (1) for *Basel III*.

Basel II requirements are transposed by fundamental FCMC regulatory documents. FCMC regulations (2007b) have transposed usage of IRB approach in calculation of minimum capital requirements of the bank. FCMC regulations (2007c) define requirements for introduction of IRB approach. FCMC regulations (2009a) for assessment of asset quality govern assessment of quality of loans. Whereas FCMC regulations (2009b), among other liquidity risk assessment methods, list a requirement to introduce rapid alert system at the bank for assessment of asset quality, including loan portfolio.

Pluto, Tasche (2010) have researched practical application of IRB approach. The internal rating systems form a part of risk assessment procedure used for initial granting of loan in line with internally established criteria for identification of the type of borrower and category of loan. The rating system is based on a variety of pre-set criteria that are to be assessed for each borrower giving the borrower points. At the end, depending on the assigned assessment, the rating grade of the borrower is identified. There are no rules or suggestions for choosing the criteria and assessment parameters. The major requirement pertaining to IRB approach systems is that the assigned rating grade or indicators shouldn't discriminate the borrowers in case they failed to meet their loan obligations.

Pluto, Tasche (2010) have come to the conclusion that in practice it is quite often that the rating systems are designed as instruments of statistics or by partially combining them with statistical regression or other mathematical methods.

In their research Monica, Monica (2010) posed a question whether formula (1) underlying IRB approach (BCBS, 2001) could be applied to the banking practice after year 2008 when banks started introducing *Basel II*. The answer was affirmative. It is a significant affirmation as Mortgage Bank (2010c, 2010e) uses formula (1) in its credit rating system.

In accordance with definitions given in table 1, the credit risk is a quantitative probability that the borrower might default on its obligations towards the bank (PD reflects probability of default within 1 year). Pluto, Tasche (2010) conclude that PD is usually derived from bank's internal historical default data that may be supplemented by external default data. The fact that not all institutions have readily available default data laid out according to *Basel* requirements encumbers application of IRB approach. In such a case the bank itself has to make adjustments to the calculation. According to Pluto, Tasche (2010) there are differences between *Basel* theory and banking practice in deriving all three parameters - PD, LGD and EAD.

Pluto, Tasche (2010) noted that internal ratings have a supplementary effect with ample application options: the internal ratings are used in granting of loans, they are included in the system of limits, used for establishment of risk oriented price (for example interest rate or commission) and calculation of losses. The authors emphasize that for the rating system to be effective the credit risk management measures must be practiced on a daily basis.

Other researchers Monica, Monica (2010) observe that dual or bidimensional internal rating system, where grades are linked to the debtor and type of credit instrument, implies more accurate evaluation. The first stage of bidimensional internal rating system would involve determination of the grade of debtor reliability (PD), then setting up of the facility grade (EL) related to this PD, in terms of specific structure of the credit instrument. The system parameters (PD, LGD, EAD) are established in accordance with historical data of the bank, external information and judgment of experts.

All research papers highlight significance of the opinion of experts who have the authority to judge (and change) the rating obtained from quantitative analysis. As concluded by Monica, Monica (2010) the most important elements in risk management (analysis) are people and corporate culture. The statistical-mathematical models of the banks do not play the major role in rating due to the following reasons: difficulty of the models to align the qualitative factors in a correct manner, interaction complexity of various factors, absence of historical data, swift and unpredictable changes to the economy. All in all the rating systems incorporate both quantitative and qualitative parameters. The weighting of these parameters is rather approached from the viewpoint of expert's judgement than statistical instruments.

It is essential for the banks to establish the optimum number of grades used in rating system and provide accurate definitions of those grades, as well as grading criteria. The supervisors do not govern the number of grades the bank uses when applying IRB approach. There are various types of rating systems, depending on borrower, potential risk, availability of historical information, link with the external rating.

In line with Italian banking experience where banks evaluate the credit risk based on borrower and operational risks, Butera, Faff (2006) have produced an exhaustive research on various types of rating systems and application of IRB approach models, their strengths and weaknesses. Most banks assign the ratings based on assessment of borrower's default risk and also take into PD and LGD. The majority of banks are able to produce PD adequately, however, due to absence of information, only a few are capable of providing reliable estimates of LGD. Analysis of financial information is at the core of every credit rating model. Butera, Faff (2006) point out that necessity to use historical information („historical" PD) is a negative aspect since lending is a forward-looking process, therefore country's macroeconomic indicators are important. The authors suggest using bottom-up technique to extract historical data and top-down approach to calibrate the PD results for specific

branches. As a result Butera, Faff (2006) recommend using the system consisting of several models; adjustments should also be made in line with indicators of borrower's economic cycle.

Stefanescu, Tunaru, Turnbul (2008) research states that rigorous requirements of *Basel II* towards identification of probability of default (application of IRB approach) may result in great technical challenge when default data are unavailable or insufficient. Opinion poll conducted among US banks demonstrated that exactly low-risk borrowers provided incomplete information. Analysis of low-risk borrowers manifests two problems – insufficiency of information and (unbiased) ability of the credit rating system to predict development of risks. These are solved by a Bayesian approach.

Jayadev (2006) conducted survey on the credit ratings system and its architecture among Indian banks. The results demonstrated that banks take into account different (various) risk factors when rating the borrower (company). The risks could be split in the following groups:

1) Financial risk identified from analysis of financial statements;

2) Industry risk – industry analysis, external factors, such as state rules (restrictions) and overall political situation, etc.;

3) Management risk – professional experience of managers and financial discipline of the company, a.o.

Most banks arrive at the overall credit rating by arithmetic summation of scores under various positions considering weight and importance of each position. The banks also review the ratings model at least once a year. This is a useful exercise for the employees of the bank in order to locate mistakes made in the assignment of ratings. It has to be done by an independent expert not involved in assigning of the rating.

Jayadev (2006) provides recommendations for improvement of quality of internal ratings systems which were used also in perfection of rating system of Mortgage Bank(2010c).

The major conclusions of Jayadev's (2006) research are as follows: the internal ratings systems differ substantially among the banks; the number of grades and associated risks vary from bank to bank; **there is no model of ratings system that could be used by all banks**. Since development and launching of the ratings system is a lengthy process involving several employees, it is of utmost importance that they applied the system's principles homogeneously. The internal rating systems require supervision and oversight on the part of management to ensure accuracy of the results.

The commercial banking sector is subject to rigid, varied and standardised requirements and recommendations issued both by EU (BCBS, CEBS, EBS - in future) and Latvian supervisors (FCMC). The regulatory documents contain theoretical requirements that the banks should comply with when assessing the credit risk, however these documents do not provide any implementation methods or instruments. The BCBS (2011, 2013b) has proposed to revise rating-based approach to enhance a risk management and clarify the evaluation. The BCBS (2013a) initial analysis of outcomes for banks that have used the IRB approach for credit risk highlights widespread differences in banks' average risk weights and shows differences in underlying risk and a variety of banking and local supervisory practices.

Practical recommendations for early diagnostics of credit risk can be obtained by comparing the ratings system of Mortgage Bank with research on the models of foreign banks.

3. METHODOLOGY

The risk management system includes the aggregate of rating methods, management processes, data acquisition and information systems (BCBS, 2004). In order to verify objectivity of the credit ratings system created at Mortgage Bank in assessment of individual client and total loan portfolio, there was a hypothetical data base prepared for the purposes of research. The research lasted from September 2011 till March 2012. The results of the research refer to assessment of loan portfolio's quality. The rating system was modelled using data of real borrowers.

3.1. Hypothetical data base

The structure of Mortgage Bank's borrowers has changed considerably due to fundamental alternation of the operational direction of the bank brought about by the decisions of the Cabinet of Ministers of the Republic of Latvia on transformation of the bank. In accordance with the Cabinet of Ministers decree (3 December 2009), the largest share of the loan portfolio of Mortgage Bank is business loans to various industries that as at the end of year 2011 amounted to 93.6% of the total loan portfolio. As mandated by government, Mortgage Bank lends to various business segments and branches of economy that comprise manifold risk. The borrowers are diverse in terms of business experience, credit history and financial results. The bank lends both – to business start-ups, recently established companies and experienced entrepreneurs.

The criterion for compilation of the data base – the real Mortgage Bank's customers must represent all the data necessary for modelling: submitted financial statements, historical data stored in IT system (capturing at least two years). Some of the selected borrowers had a credit history with Mortgage Bank from year 2006. Particular attention was paid to the borrowers' ability to make repayments in year 2011 as timeliness of payments is essential for ratings. Some customers are selected with a loan contained an increased risk. As a result, there were 119 customers selected representing 22 industries. The breakdown of customers by industries is shown in Figure 1.

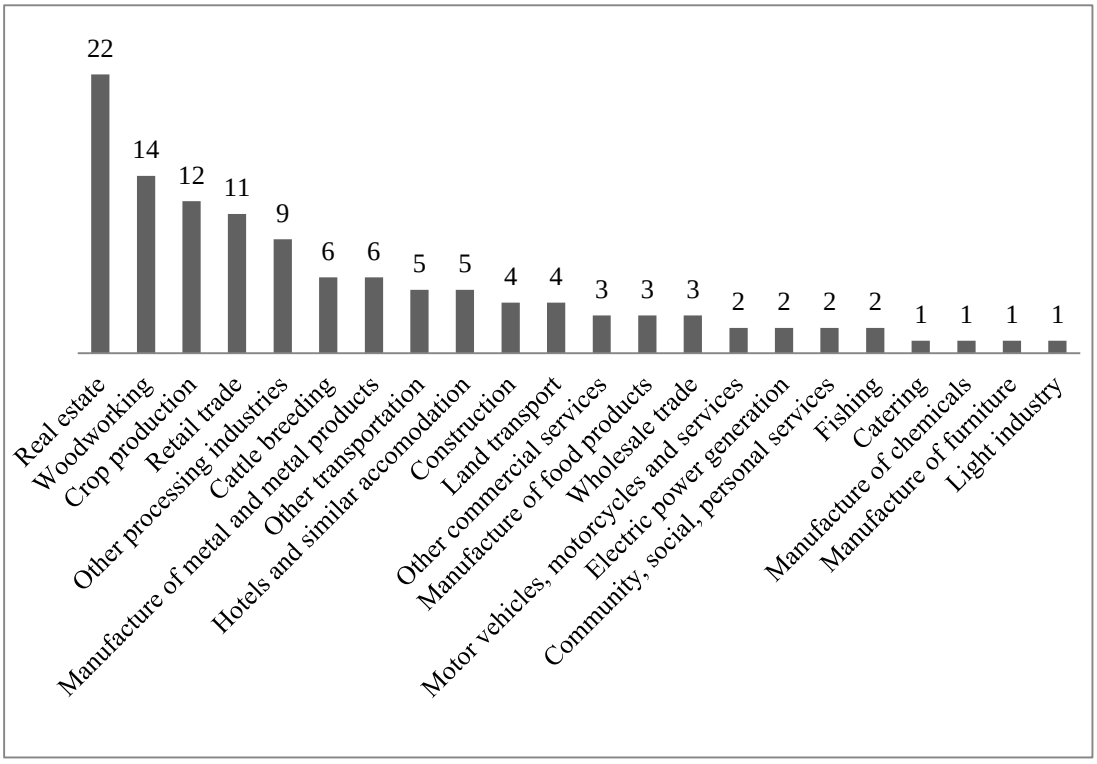

Figure 1. Number of customers (included in database) split by industry
Source: prepared by the author based on the hypothetical data base of Mortgage Bank (2011)

3.2 Questionnaire survey of experts

Trends of economic development affect the borrowers' businesses and ability to meet their obligations towards the banks. The rating system of Mortgage Bank (2010d) requires assessing the branches of the national economy, their impact on company's operations and predicting the changes to quality of the loan portfolio's section representing the respective branch. In practice the banks use not only publicly available secondary macroeconomic data, but also rely on experts' judgments.

The judgements are built on experience and subjective opinion which are often exploited when there is shortage of accurate information, historically accumulated data and when statistical data processing methods cannot be used.

For the purposes of research 12 experts – employees of Mortgage Bank filled in the questionnaires in order to identify the algorithm coefficients of the credit rating. Questionnaire of industry expert was drafted to assess the overall situation of the industry where the company operates. The questionnaire includes 4 sections with 10 criteria for each industry to be assessed on a 5 points scale, as shown in Table 2.

The experts were tasked with assessment of the industry of their competence on the basis of their opinions, lending experience and statistical analysis data of the aggregated financial results of the industry for the previous year (Central Statistical Bureau, 2012).

Table 2

Industry Criteria Included in Questionnaire of Industry Expert

No.	**Sections of questionnaire**	**Criteria to be evaluated**
1.	Demand	Diversification of demand Demand increase prospects Volatility of demand
2.	Competition	Intensity of competition Threat of newcomers
3.	Financial interest	Earnings before interest and taxes (EBIT) Proportion of equity capital Return on equity (ROE)
4.	Supply	Sufficiency of raw materials Personnel availability risk

Source: Mortgage Bank (2010c)

Upon summary and analysis of the criteria evaluated by industry experts (where „6" denotes "no risk at all" and „0" – "very high risk"), the proportion of each industry in the credit rating algorithm was calculated. The coefficients to be used in calculation of number of points for each borrower of the respective industry ranged from 0.083 to 0.184.

3.3 Individual assessment of customer

The Mortgage Bank uses detailed indicators for assessment of company for the credit rating purposes. The chosen indicators are similar to the criteria used by foreign banks. The coefficients of company's creditworthiness and financial strength assessment done in line with a specific scale are used as parameters of the internal credit ratings system. The credit rating value is calculated on the basis of operational quantitative and qualitative indicators of the company. Table 3 shows the aggregation of major individual factors to be evaluated.

Table 3

Credit Rating Factors

Quantitative (objective) factors *Customer's financial indicators account for 40% of the total assessment, including such*	**Qualitative (subjective) factors** *Parameters to be assessed by bank's experts account for 60% of the total assessment, including such parameters as:*

indicators as:	
1. Proportion of equity capital. 2. Profitability of assets. 3. Liquidity coefficient. 4. Liability coverage ratio.	1. Branch of the national economy where company operates (cycle, competition level, a.o.). 2. Company's basic activity (market share, competitive advantages, operational stability, a.o.). 3. Management, owners (professionalism, experience, credibility, financial prudence, consistency, strategic planning, transparency, credit history, a.o.). 4. Financial independence (stress resilience, additional financing options, a.o.). 5. Risk of extraordinary situations (legislative impact, operational and market risks and other external exposures that may influence company's basic activity).

Source: Mortgage Bank (2010c)

Whereas company's financial – economic indicators can be calculated and clearly expressed as coefficients, the subjective factors, being no less important, are difficult to interpret. The qualitative factors describe company's performance and ability to react to internal and external influence. The forecasts of future co-operation are based on the factors that are difficult to assess (calculate).

To perform actual modelling, there was a credit rating file prepared for the selected hypothetical data base customers where to enter the summarised expert evaluations and results of calculations. Assessments of all the parameters are interpreted initially by means of mathematical algorithm (linear function) – assessment of each factor gives a certain number of points (more important parameters are given more points). At the end, the assessment of all the borrower's parameters is calculated and each customer is assigned sum total of the points.

The following methods were used in the research: economic, financial data analysis methods, graphical method, assessment, statistical data analysis (comparison, grouping).

4. PRACTICAL SOLUTIONS FOR EARLY CREDIT RISK PREVENTION IN MORTGAGE BANK

Carrying out credit risk management Mortgage Bank ensures that assessment is in compliance with FCMC (2009c) regulations. Most frequently encountered risk factors for customers (which are classified at the bank) are listed below in Table 4.

Although credit risk factors are compiled in strict group it doesn't ensure early diagnostics of loan portfolio's quality changes, i.e. identification of these factors in good time and reacting accordingly. Determination of credit risk level (i.e. assigning the rating) is incorporated in a process of early diagnostics. The bank has developed its own approach to credit risk classification in compliance with FCMC (2009c) recommendations to use internal credit rating system for effective supervision of individual loans.

Table 4

Credit risk factors

Nr.	Factors
1.	Negative social, political, legislative and (or) economic changes.
2.	Accelerating inflation, more expensive power resources and other costs.
3.	Lower income and turnover.
4.	Negative collateral value and sales market changes.
5.	Unlawful actions of third persons and resulting in loss of collateral and/or bank's claim rights and (or) reduction of collateral's value.

Source: Mortgage Bank (2010a)

Branch analysis. Particular rating level reflects borrower's ability to fulfil liabilities regardless of adverse economic circumstances and occurrence of unforeseen events. The problem lies in correctly assessing credit rating because probability of borrowers' default (PD) depends on macroeconomic indicators in each branch and on phase of economic cycle. Taking that into consideration Mortgage Bank (2010a, 2010d) prepared:

1) Assessment of each sector which was performed periodically by experts in lending and professional knowledge in each branch (in which bank is lending).
2) Expertise methods for national economy, so the experts could master nuances which could influence loan portfolio's quality.
3) Unitary perception level of different branches of economy and evaluating them by unitary rating criteria.

Bank must have a valid breakdown of loans into grades, at the same time evading from vast concentration by borrowers and by loan rating scale (BCBS, 2008). Economic branches are classified in 3 groups by expertise level accordingly to planned credit risk level in credit portfolio (Mortgage Bank, 2010b). The branch experts use various internal (primary data, analysis of financial indicators of particular clients) and external resources (secondary data from available data bases, registers, statistical data from CSB) to obtain information about state of branch.

Analysis of quantitative and qualitative factors. To ensure objectivity it's essential to update credit rating at least once a year (when clients' financial reports are submitted) for those clients whose evaluation is based on outdated financial indicators. Credit rating is consolidated assessment of company's creditworthiness and financial stability according to special value scale which is calculated based on quantitative and qualitative operational indicators (as seen in table 3). Customers must be assigned one of 5 risk grades which are mentioned in table 5.

Summarizing the data. To assess credit risk and determine rating system suitability - classic approach and expected losses calculation formula (1) are used. Experts at Mortgage Bank (2010c) used similar term conception as mentioned in Table 1. Precise definition is:

PD (probability of default) - probability that a debtor does not comply with the principal and interest agreements during one year; which is determined based on data from credit rating agencies or bank experts' evaluation, including use of historical data.

For better understanding and application of formula (1) review of example is needed. If quantity of delayed (i.e. subject to exposure at default, EAD) loan is EUR 200 000 and probability of default (PD) as identified by experts is 10% and loss given default (LGD) for this loan (after selling of the collateral a part of the loan will be lost) is 25% then expected losses are EUR 5 000 (200 000 x 0.1 x 25%).

Table 5

Internal rating assessment

Grade	Assessment
A	Customer with successful performance indicators
B	Customer with particular performance advantages
C	Customer with an average (medium) operational risk
D	Customer with sensibility to possible changes
E	Unsuccessfully functioning customer

Source: Mortgage Bank (2010b)

This type of assessment must be carried out for every customer (or homogenous client group) to forecast and calculate expected total exposure at default caused by - single client with a big loan portfolio or part of the portfolio consisting of loans to a particular branch of economy (where downslide is observed) or for whole segmented credit portfolio.

It's essential to accent that above mentioned stages are part of the fully established risk management system which includes methods, processes, control mechanism, data gathering and informational technology systems. While developing rating system a lot of requirements must be

fulfilled.

5. SIMULATION RESULTS OF HYPOTHETICAL DATA BASE

Each borrower from selected data base was assessed: each parameter (in table 3 mentioned factors) was assigned with corresponding numerical value and in the end calculated total point sum. Acquired value could be either positive or negative. Every client's data is codified in form of excel spread sheet to get evaluation of hypothetical loan portfolio. Total client division accordingly to risk level is portrayed in Table 6.

As seen in table 6 that according to internal risk assessment rating (as defined in table 5) - clients with successful performance indicators (grade A) are only five. Other customers contain higher or lower level of risk. Results show that the most serious work should be done with D grade customers (35% of total number of clients and 40% of total loan portfolio). Also resources should be used to improve loan quality for C level customers - so these ones would continue qualitative cooperation with bank and not worsen their market position. Only 26% of customers could be considered as "secure" (grade A and B) and there is no need to plan extra resources for improving cooperation.

Above mentioned result can't be fully applied to total loan portfolio of Mortgage Bank because of these two reasons:

1) Hypothetical data base don't represent exact loan portfolio structure of Mortgage Bank but was chosen by other criteria.

2) Because rating algorithm was made with prudence regarding client's evaluation, then results shows indications of early warning, i.e. credit rating assessment points to potential risk or is "worse" than real loan portfolio data.

As a comparison should be noted that according to the annual report the bank business' loan portfolio contained 80.51% credits without indications of impairment (corresponding to grades A and B) at the end of 2011 (Mortgage Bank, 2012), but reduced to 72.98% in 2012 (Mortgage Bank, 2013). This is acceptable to Mortgage Bank, which is being restructured due to EC regulations. The restructuring is not related to the quality of loan portfolio, but to the EC requirement to cease state support for the bank that could lead to distortions of credit markets.

Table 6

Customer division of hypothetical data base according to risk level assessment

Data base indicator	A	B	C	D	E	Total
Number of customers	5	26	41	42	5	119
Density (percent)	4%	22%	34%	35%	4%	100%
Total liabilities, LVL, ths	5.320,3	24.883,9	49.234,8	58.258,2	9.715,2	147.412,5
Density of liabilities (percent)	4%	17%	33%	40%	7%	100%

Source: the author's calculation based on the hypothetical data base

The main task of hypothetical data base was to review rating assessment objectivity in comparison to client's actual operational results and demonstrate that this method could be used to

acquire different results. Essential modelling result for credit rating use and future prognosis is shown in Figure 2. Particular image represents all customers of hypothetical portfolio and their disposition at the diagram is determined by two dimensional parameters:

1) ”solvency rating” is determined by the probability of failing to fulfil obligations - client is evaluated accordingly to its paying discipline (indicator PD);
2) ”collateral security” is determined accordingly to adequacy of - client’s loan security (indicator LGD).

Figure 2 shows that clients are positioned evenly along both dimensions depending on their risk grades ranging from ”safe” (minimal risk) to ”unsafe” (high risk) client, as well as from ”safe” (adequate) to ”unsafe” (inadequate, losses value) collateral.

Predictable ”behaviour” of clients was modelled depending on changes to macroeconomic indicators and real estate prices. The results show that evaluating from bank’s standpoint (shown with arrows) - clients in grades A and B (in section with small expected losses) are stripped of their good evaluation because of increasing prices of collateral (value of collateral deteriorates over 100%). However, clients in grades C and D (positioned in centre) are more affected by worsening macroeconomic indicators. The research demonstrates that in such a way it’s possible to model and project changes to quality of individual client’s loans, risk groups and quality of the whole loan portfolio.

Hence it’s possible to calculate the expected losses (EL) in regard to changes of both dimensions (”solvency rating” and “collateral cover”). It should be emphasized that obtained results could be interpreted from different standpoints.

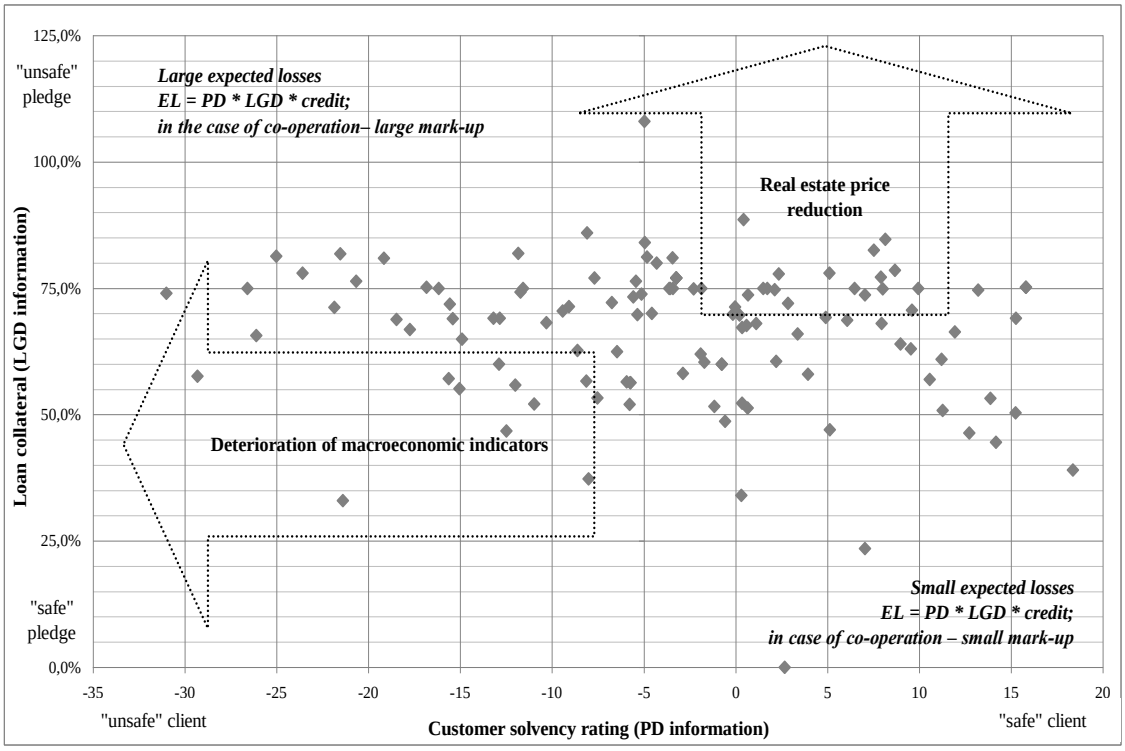

Figure 2. Dependence of loan portfolio’s quality on changes to rating parameters
Source: prepared by the author based on the hypothetical data base of Mortgage Bank (2011)

For example - evaluating connection between rating assessment outcome (number of points) and client’s loan balance – author established that there is no interaction and influence between the two mentioned, because result division is too ambiguous. Extra advantage is that it’s possible to determine a surcharge (by calculating extra costs for bank) for cooperation with the client depending on its risk level. In practice, extra costs could be offset for by adjusting interest rate or

commission.

Based on operational results - it's verified that principles of established credit ratings system comply with empirically inspected:

1) Establish identification order for the main factors of default.
2) Form point scale for every factor (6 - very good, 0 - very bad).
3) Construct algorithm for client assessment by objective and subjective factors' scale, set "weight" (importance) for each factor.
4) Sort borrowers by results (obtained points), form one type groups - which are assessed by the same risk level. In each group borrowers are characterized by similar "behavior" (payment discipline) indicators and similar influence on amounts of credit portfolio losses.
5) Establish risk level definitions based on borrowers' characteristic in each group setting.

Results loan portfolio's ratings of hypothetical data base shows:

1) Obtained risk level assessment reflects actual cooperation quality with bank.
2) Model could be used to evaluate client before awarding the loan and during further cooperation.
3) It's possible to use this model to project expenditures and make adequate compensation system.

6. RECOMMENDATIONS FOR IMPROVEMENT OF CREDIT RATINGS SYSTEM

The results of modelling of the credit rating system demonstrate that the model is suitable for early quality diagnostics of the Mortgage Bank's loan portfolio. Assessment (especially early) of credit risk is a complex process that requires support and prioritising on the part of the bank's management as well as resources, qualified specialists with professional knowledge and co-operation of the involved structural units. Establishment of effective credit rating system at the bank is a lengthy, labour-consuming and resources demanding process in need of constant development.

The following are **recommendations for improvement** of credit rating system:

1. Organizational structure and procedures shall be tailored so as to prevent potential conflict of interest, subjectivity and interpretations among employees. An independent team of experts not taking part in decision making about loans shall keep the system updated. Available customer data shall be analysed within a single system. Feedback must be established to follow up on compliance of the rating with subsequent changes to customer's quality and to identify the qualities signalling of the necessity to change the risk grade.

2. The industry evaluation system must be sustained, including high professional qualification of experts and uniform approach to evaluation. Industry evaluations shall be reviewed at least once a year, whereas adjustments shall be made upon experts' judgements comprising analysis of the changes to the financial standing of the existing customers in the context of fluctuations of macroeconomic indicators. It would be useful to summarise and maintain evaluation data in order to use them when recommending either augmentation or slowing down of lending.

3. Specific types of credit ratings shall be devised depending on the structure of the bank's loan portfolio or target segments of the bank, for example a simplified algorithm for homogeneous groups of customers – less riskier industries, start-ups without credit history, etc.

7. SUMMARY AND CONCLUSIONS

The credit rating model of Mortgage Bank and its fundamental components (structure, assessment criteria, factors, algorithms, grades) comply with requirements of the commercial banking supervisors and internationally acknowledged models.

Modelling of hypothetical data base demonstrates that by skilful exploitation of rating system it is possible to minimize the negative impact on the loan portfolio. The risk management system comprising a rating model is an efficient instrument that can be used for:

1) assessment of loan portfolio's risk levels, forecasting of changes to loan portfolio's quality;

2) assessment of expected losses within the framework of IRB approach to calculation of capital adequacy;
3) forecasting of bank's expenditure and establishment of adequate compensation system;
4) establishment of lending and industry limits, specification of criteria for granting loans, optimisation of procedures for supervision of borrowers.

The research concluded that **credit rating system based on a model elaborate at Mortgage Bank is an adequate and efficient instrument for early diagnostics of changes to the loan portfolio**.

Every bank has to continue improving its own risk management system to preclude loan portfolio's deterioration that could have been identified and prevented if the bank had an efficient diagnostics system for assessment of loan portfolio's quality.

REFERENCES

1. Basel Committee on Banking Supervision (BCBS) (2001), "The Internal Ratings-Based Approach (Supporting Document to the New Basel Capital Accord)". Available at: *http://www.bis.org/publ/bcbsca05.pdf* (Accessed 13 January 2012).
2. Basel Committee on Banking Supervision (BCBS) (2004), "International Convergence of Capital Measurement and Capital Standards". Available at: *http://www.bis.org/publ/bcbs107.pdf* (Accessed 13 February 2012).
3. Basel Committee on Banking Supervision (BCBS) (2005), "An Explanatory Note on the Basel II IRB Risk Weight Functions". Available at*: http://www.bis.org/bcbs/irbriskweight.pdf* (Accessed 15 February 2012).
4. Basel Committee on Banking Supervision (BCBS) (2008), "Cross-sectoral review of group-wide identification and management of risk concentrations". Available at: *http://www.bis.org/publ/joint19.pdf* (Accessed 13.01.2012).
5. Basel Committee on Banking Supervision (BCBS) (2011), "Basel III: A global regulatory framework for more resilient banks and banking systems", December 2010 (rev. June 2011). Available at*: http://www.bis.org/publ/bcbs189.htm* (Accessed 13 November 2013).
6. Basel Committee on Banking Supervision (BCBS) (2013a), "Regulatory consistency assessment programme (RCAP) - Analysis of risk-weighted assets for the banking book". Available at *http://www.bis.org/publ/bcbs256.htm* (Accessed 13 November 2013).
7. Basel Committee on Banking Supervision (BCBS) (2013b), "The Proposed Revised Ratings-Based Approach", Working Paper No 23. Available at *http://www.bis.org/publ/bcbs_wp23.htm* (Accessed 13 November 2013).
8. Butera G., Faff R. (2006), "An integrated multi-model credit rating system for private firms", *Review of Quantitative Finance and Accounting, Vol. 27(3), 311-340, DOI: 10.1007/s11156-006-9434-7.* Available at: *http://www.springerlink.com/content/6110235164577121/* (Accessed 9 March 2012).
9. Cabinet of Ministers Order No 820 dated 3 December 2009 on the Concept for Transformation of the State-owned Joint Stock Company Mortgage and Land Bank of Latvia into a Development Bank // Ministru kabineta 03.12.2009. rīkojums Nr.820 par koncepciju "Par valsts akciju sabiedrības "Latvijas Hipotēku un zemes banka" pārveidi par attīstības banku", "Latvijas Vēstnesis", 4 December 2009, No. 191 (4177).
10. Central Statistical Bureau of Latvia // LR Centrālā statistikas pārvaldes (2012), "Business Finance-Key Indicators"// „Uzņēmējdarbības finanses-galvenie rādītāji". Available at: *http://www.csb.gov.lv/statistikas-temas/uznemejdarbibas-finanses-galvenie-raditaji-30309.html* (Accessed 3 March 2012).
11. European Central Bank (ECB) (2013), "Opinion on a proposal for a Regulation of the European Parliament and of the Council establishing uniform rules and a uniform procedure for the resolution of credit institutions and certain investment firms in the framework of a Single Resolution Mechanism and a Single Bank Resolution Fund and amending Regulation (EU) No 1093/2010 of the European Parliament and of the Council (CON/2013/76)". Available at

http://www.ecb.europa.eu/ecb/legal/1353/1330/html/act_12873_amend.en.html (Accessed 14 November 2013).

12. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija (2007a), „Internal Ratings Based Approach, Advanced Measurement Approach, Internal Model Method and Internal VaR Model Uses Authorization Rules" // „Uz iekšējiem reitingiem balstītās pieejas, attīstītās mērīšanas pieejas, iekšējā modeļa metodes un riskam pakļautās vērtības iekšējā modeļa izmantošanas atļauju saņemšanas noteikumi" *(pieņemti 2007. gada 2. maijā Nr. 64) "Latvijas Vēstnesis" 18 May 2007, No. 80*
13. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija (2007b) "Regulations on Information Disclosure and Transparency" // "Informācijas atklāšanas un iestādes pārredzamības normatīvie noteikumi" *(accepted 2 May 2008, Nr. 61), "Latvijas Vēstnesis", 10 May 2007, No. 75.*
14. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija (2007c), „The Minimum Capital Adequacy Rules" // „Minimālo kapitāla prasību aprēķināšanas noteikumi", *"Latvijas Vēstnesis" 10 May 2007, No. 75.*
15. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija (2009a), „Assessment of Asset Quality and Provisioning Regulations" // „Aktīvu kvalitātes novērtēšanas un uzkrājumu veidošanas normatīvie noteikumi", *"Latvijas Vēstnesis", 27 March 2009, No. 49*.
16. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija (2009b) "Liquidity Requirements, Compliance Procedures and Liquidity Risk Management Regulations" //„Likviditātes prasību, to izpildes kārtības un likviditātes riska pārvaldīšanas normatīvie noteikumi", *"Latvijas Vēstnesis" 5 January 2010, Nr. 1 (4192)*.
17. Financial and Capital Market Commission (FCMC) // Finanšu un kapitāla tirgus komisija, (2009c) „Regulations for Credit Risk Management"//„Kredītriska pārvaldīšanas normatīvie noteikumi", *"Latvijas Vēstnesis", 5 January 2010, No. 1 (4192)*.
18. Jayadev M. (2006), "Internal Credit Rating Practices of Indian Banks", Reviewed work(s), Economic and Political Weekly, Vol. 41(11), Money, Banking and Finance (Mar. 18-24, 2006), pp. 1069-1078. Available at: *http://www.jstor.org/stable/4417972 (Accessed 3 March 2012).*
19. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka (2010a), Credit Risk Management Policy / Kredītriska pārvaldīšanas politika (18.10.2010.), Rīga
20. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka (2010b), Credit Risk Strategy / Kredītriska stratēģija, (18.10.2010.) Rīga
21. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka (2010c), Rules for the assessment of the borrower's internal rating system / *Noteikumi aizņēmēja novērtēšanai pēc iekšējās kredītreitinga sistēmas (17.08.2010), Rīga*
22. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka (2010d), Terms on classfication of the branches of the national economy for lending purposes / *Noteikumi par tautsaimniecības nozaru kreditēšanas līmeņiem (29.10.2010), Rīga*
23. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka (2010e), The Risk Management Policy / Risku pārvaldīšanas politika (18.10.2010.), Rīga
24. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka, 2012, JSC Mortgage and Land Bank 2011 Annual Report / VAS Hipotēku un zemes banka 2011.gada pārskats. Available at: *http://www.hipo.lv/lv/par_banku/finansu_informacija* (Accessed 3 March 2012).
25. JSC Mortgage and Land Bank (Mortgage Bank) // Hipotēku banka, 2013, JSC Mortgage and Land Bank 2012 Annual Report / VAS Hipotēku un zemes banka 2012.gada pārskats. Available at: *http://www.hipo.lv/lv/par_banku/finansu_informacija* (Accessed 13 November 2013).
26. Kudinska M. (2005), "Commercial Risks and Relevance to Equity" // „Komercbanku riski un to atbilstība pašu kapitālam", *Datorzinību centrs, Rīga.*
27. Kutuzova O. (2001), "Finance and credit" // "Finanses un kredīts" SIA "Biznesa augstskola Turība", Rīga.
28. "Latvian Law on Credit Institutions" // "LR Kredītiestāžu likums", *(pieņemts 1995.gada 5.oktobrī) Saeima, Rīga: "Latvijas Vēstnesis", 24 October 1995, No. 163 (446)*.
29. Monica D., Monica B. M. (2010), "Internal Ratings Systems: An Empirical Approach, Studies in Business and Economics", 2010, Vol. 5(1), pages 71-79. Available at: *http://eccsf.ulbsibiu.ro/RePEc/blg/journl/515dudian&balcan.pdf* (Accessed 15 February 2012).

30. Pluto K., Tasche D. (2010) "Internal-Ratings-Based Approach", John Wiley & Sons, Ltd. All rights reserved, DOI: 10.1002/9780470061602.eqf09023. Available at: *http://onlinelibrary.wiley.com/doi/10.1002/9780470061602.eqf09023/full* (Accessed 9 January 2012).
31. Rurāne M. (2005), "Finance Management" // "Finanšu menedžments", *RSEBAA, Rīga*.
32. Rurāne M. (2006), „Finance Governance" // "Finanšu pārvaldība", *Latvijas izglītības fonds, Rīga*.
33. Stefanescu C., Tunaru R., Turnbull S. (2008), "The credit rating process and estimation of transition probabilities: A Bayesian approach", *Journal of Empirical Finance 16 (2009) 216–234*, available at: *http://www.sciencedirect.com/science/article/pii/S0927539808000844* (Accessed 9 March 2012).
34. Лаврушин О.И,, Афанасьева О.Н., Корниенко С.Л. (2007), "Banking: Modern Credit System" // **„**Банковское дело: современная система кредитования", *3-е изд., доп., Кнорус, Москва.*