THE EVALUATION MODEL OF A COMMERCIAL BANK LOAN PORTFOLIO

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Abstract. As in other countries where the traditional banking is dominating, the major part of banks' assets and loan interest income makes a significant share of banks' income. Inappropriate loan portfolio evaluation might have negative impact on a commercial bank's performance, the overall banking system, and the economic growth of the country. It is not enough for a bank to have a precise strategy, high lending culture, and observance of general principles to ensure the further growth of profitable loans. It is necessary to apply various evaluation methods of historical and present data, of ratios and factors enabling to implement coherent and comprehensive loan portfolio evaluation, and to encompass different factors as far as possible. Due to a complex business environment and intense competition between banks, it is not enough to evaluate a commercial bank loan portfolio only through the aspect of credit risk, i.e. loss probability level aspect, as is suggested by the scientists. As to every business subject striving for a successful performance and further development, it is essential for a bank to earn profit by financing the other subjects, and to establish the level of assets liquidity.

Keywords: loan, bank, loan portfolio, evaluation, profitability, liquidity.

1. Introduction

Individual loan or loan portfolio credit risk evaluation models presented in the research papers and discussed by practitioners are general and proposed to use irrespective of loan portfolio structure (Altman *et al.* 2002; Atiya 2001; Diamond and Raghuram 2005; Diez – Canedo 2002; Duffie and Singleton 2003; Saunders 1999; Saunders *et al.* 2002). Portfolio evaluation models analysed in the research works and suggested to use in practice are mostly orientated to portfolio credit risk evaluation and are standardized and tailored only for the large globally acting banks. Already in the first implementation stage, such credit risk models cause problems to the banks of transition economy countries. This is stipulated not only by lack of experience and knowledge of those banks, but first of all by lack of data. The collection of reliable data is the most complicated stage of credit risk model implementation even for the larger branches of international banks performing in such markets, as for a thorough evaluation of loss distribution in a country or a specific industry the data on long period is necessary. Furthermore, banks are not willing to share information about default obligations as they are pursuing to solve such problems with their clients themselves.

It all goes to show the deficiencies of research and discussions on evaluation of a commercial bank loan portfolio. In addition, the analysis of academic research papers and practical discussions reveals that particularly local banks performing in the transition economy countries meet with the most difficulties in evaluating loan portfolio, as due to the lack of available data they cannot apply loan portfolio evaluation methods suggested by the experts. Accordingly, the problem of this research is how to evaluate loan portfolio of a commercial bank on the basis of credit risk, profitability and liquidity aspects.

Research object is evaluation of a commercial bank loan portfolio.

Research goal is to conceptualise the evaluation model of a commercial bank loan portfolio (EMCBLP) on the basis of credit risk, profitability and liquidity factors.

Research objectives:

1. To analyse researches on the peculiarities of loan portfolio evaluation.
2. To evaluate application possibilities of individual loan and loan portfolio credit risk evaluation models.
3. To define the importance of evaluation of commercial bank loan portfolio profitability and liquidity factors.
4. To formulate concept of a commercial bank loan portfolio evaluation.
5. To prepare the evaluation model of a commercial bank loan portfolio on the basis of credit risk, profitability and liquidity factors.

2. Theoretical aspects of evaluation of a commercial bank loan portfolio

As the bank grants various kinds of loans to its customers, an analysis of the kinds of loans is performed. Loan portfolio is defined as the total of bank's loans with the purpose to receive profit in the form of interest. Summarizing the views of various scientists, commercial bank's loan portfolio is defined as the total of loans granted by the bank in a certain period of time or the total of loan balances at a certain moment.

The purpose of the evaluation of commercial bank's loan portfolio is to gather as much as possible information on its structure, the loans it is comprised of. Research showed that the best way to reflect bank's loan portfolio structure is to divide it according to main sectors of bank's activity: corporate banking; business banking and personal banking. In the process of analysis and evaluation of composition of loan portfolio, one must take into account that every area of bank's activity has a different degree of risk, profitability and influence on bank's liquidity. In the assessment of own loan portfolio, the most purposeful way would be to divide it into three main segments or sub-portfolios, each of them could have its own groups, subgroups depending on the kind of borrower, loan purpose, collateral, currency, term and other criteria. This approach allows distinguishing the most risky areas of activity, for the evaluation of which maximum attention should be paid, also the groups of customers which are most attractive and profitable for the bank.

In order to analyse the principles of credit risk evaluation models, the analysis of credit risk conception and the influence of credit risk on bank's loan portfolio evaluation should be performed. Summarizing the credit risk definitions presented by both Lithuanian and foreign scientists, they can be divided into 2

groups: when risk is associated solely with the fact of default, when customer fails to meet its obligations to pay the interest and (or) the principal, and when the risk is defined not only as a default, but also the facts (for instance, the change in customer's credit rating or creditability) that increase the risk of default. In summary, the definition of the credit risk – the risk that the borrower would fail to meet its obligations to the bank according to the agreement and (or) that borrower's credit rating or creditability will be reduced.

In order to assess the principles of operation of different credit risk evaluation models, the analysis of credit risk evaluation methods was performed. The New Basel Capital Agreement includes three approaches for credit risk evaluation: Standardized Approach; Foundation Internal Ratings Based – F-IRB Approach (F-IRB); Advanced Internal Ratings Based – A-IRB Approach (A-IRB) (Oesterreichische Nationalbank 2004b). It is stated that a bank, considering which credit risk evaluation method to apply, must consider the relation between the accuracy of the model and the cost of its implementation and exploitation, because, for instance, if a bank decided to implement the advanced internal ratings based approach, it probably wouldn't be capable to implement it properly and this way the application of this method would not be accurate and would not give the expected results (Atman 2001).

It is determined that in order to select the credit risk evaluation model that best reflects bank's requirements, the most purposeful is to differentiate according to whether the individual loan or the portfolio evaluation would be performed, later on – depending on the features of using the model.

Main individual loan credit risk evaluation models are probability of default models: actuary, credit scoring, option and credit margin. The scientific authors (Saunders 1999; Saunders *et al.* 2002) distinguish three main categories of traditional probability of default calculation models: expert systems, including artificial neuron networks, credit scoring models and rating systems. Actuary models use the historical data to estimate the probability of change in credit rating. The biggest defect of such models is that they do not take into consideration that in reality probability of default or change in credit rating is variable and may be different in future depending on economic conditions, business cycle or other (Altman *et al.* 2003). Scoring models apply statistical data processing methods and historical data to obtain borrower's credit score, which can be used to allocate the borrowers to groups (Crouhy and Galai 2000). The models of this type are based on the determination of one quantitative measure for a borrower,

which is obtained when customer's data is entered into statistical models (Cundiff 2001). Foreign scientists distinguish these forms of methods: linear probability model, probit model, artificial neuron networks, decision tree, logit model, and discriminant analysis (Altman *et al.* 2002; Altman *et al.* 2003; Atiya 2001; Bessis 1998; Diez – Canedo 2002; Saunders 1999; Saunders *et al.* 2002). It is concluded that main defects in individual loan evaluation using scoring models are that in creation of models characteristics of bank's borrowers who were granted a loan are used, while it is not known whether the persons (or entities) whose applications for loans were rejected would have been able to meet their obligations or not. Additionally, the size of groups of borrowers that met their obligations and failed to meet their obligations are not equal. In not rare cases the scoring model result (obtained credits score) is ignored in decision taking.

When option and credit margin models are used to calculate the probability of default, market information (prices of securities and equities) is used, that is why these models can be used only if there is a well-developed financial market in the country. Credit equivalent position evaluation models are used to forecast the level of repayment of loans or the usage of credit lines (limits) in case of default. Repayment level models valuate the level of loan repayment as the function of loan security. Derivative models, allowing transforming derivative positions to credit positions are also assigned to the group of credit position models. Also, models are divided into: heuristic models, empirical-statistical models, and causal models (Oesterreichische Nationalbank 2004a, 2004b). Foreign banks in practice usually apply hybrid models that include two or more above-mentioned models.

Analysis of application of loan credit risk valuation models showed that Lithuanian commercial banks can use only the actuary and scoring models, but because of the lack of data they cannot use the advantages of option and credit margin, credit position evaluation and repayment level models.

Analysis of features of application of different models showed that credit risk valuation principles and features of application of models differ depending on whether the loan is granted to legal customer or private customer. Mostly used criteria for evaluation of legal persons creditability are distinguished by quantitative indicators (solvency, cash flow, profitability and other indicators) and qualitative indicators (qualification of the management, competitive environment, business prospects, etc.), which are mostly evaluated using expert methods, comparing with other enterprises and using information received from the enterprise and external sources. Main criteria for assessment of Private person's creditability are the ability of the borrower to repay the loan, reputation, property owned, economic conditions and other factors.

One of the main principles for credit risk evaluation based on the New Basel Capital Agreement (Basel II) is the allocation of borrowers to a certain group or rating. Rating system takes into account all factors influencing loan evaluation process, including abstract units, methodology which is used to evaluate the risk, the responsibility of main personnel and rating information for internal use (Basel Committee on Banking Supervision 2000b). Research shows that the banks that use internal rating systems substantially reduce their credit risk because rating system allows the banks to carry out complexional assessment of the risk of activity of entity. This makes decision taking easier in granting loans, individual loans and loan portfolio valuation, reporting to management, assessing provision adequacy, profitability, pricing analysis, etc. Scoring models are best to use for evaluating loans granted to private persons.

The analysis of scientific literature on portfolio credit risk evaluation models showed that portfolio loss models are distinguished into market value (*CreditMetrics*) and probability of default models (*Credit Risk+* and *Credit Portfolio View)*. The difference between these models is that market value models assess the probability of the change in loan rating, and probability of default models – only the probability of default.

One of the most popular market value models is CreditMetrics (J. P. Morgan) model. Market value model evaluates loan portfolio in market value. Also it evaluates the risk related to the change in market value of the portfolio. The evaluation includes several parameters, which are also included in probability of default models, but also takes into consideration changes in borrowers status and repayment level and credit risk correlation. For the application of this model, data on market price of different ratings securities (loans) should be collected, that is why this model is hard to apply in the countries which do not have developed financial market – there is a lack of market data. Probability of default models as Credit Risk+ (CSFB) and Credit Portfolio View (Tom Wilson) models are used most widely by large foreign banks. Credit Risk+ model is one of the default models and differs from market value models because this model valuates only two positions at any moment – the presence of the default and the absence of the default. The results of research of various scientists have shown that most portfolio

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risk evaluation models are similar in their core structure and can produce almost identical results, if the input parameters are identical. The success of credit risk models is in biggest part determined by the proper and adequate selection of initial parameters.

In the loan portfolio credit risk analysis, the importance of the portfolio diversification is discussed. In evaluating diversification, mostly used measure is Herfindahl-Hirschman Index (HHI). Gini coefficient (G) is mostly used to evaluate the inequality of distribution, but it is also suggested to be used to determine the concentration of loan portfolio.

In the analysis of **application possibilities of portfolio credit risk models** it is determined that implementation of internal credit risk models in the banks of emerging market economy countries would take long not only that there is a lack of data and know-how, but also that strong relations between banks and their customers could disturb technical implementation of credit risk evaluation (Crouhy and Galai 2000). Additionally, data of fairly long period is needed in order to assess the loss distribution and its changes in a country or economic activity. Most often models formulated on theoretical basis are quite sophisticated and the whole model evaluation mechanism is based on advanced programming tools. Usage of KMV or CreditRisk + models would suit the demands of banks in transition economy countries and their country situation (Crouhy and Galai 2000). CreditMetrics is hardly compatible with credit rating systems; this can cause an increase in required capital. KMV is more borrower-oriented, and CreditRisk + needs individual default assessment, which does not always depend on the rating.

The analysis of application of loan portfolio credit risk evaluation models in Lithuania showed that currently it is impossible to apply Credit Metrics and KMV models, the application of Credit Portfolio View model is complicated. Thus there remains only the possibility to apply CreditRisk + model, but it can be applied only to the extent of the registry of loans (the database of the whole Lithuania).

Theoretical research showed that credit risk evaluation both of individual loans and the whole portfolio is more important than the integration of standard models implemented by other banks. This decision has its advantages at first because such models are simpler, use available data, and, most importantly, are fitted for the country bank systems and economical conditions; they are more suitable for a bank in terms of cost. Second, knowledge and experience, gained while implementing these simpler models, helps to prepare

for implementation of new models. Third, such models help to create databases necessary for internal rating implementation according to the recommendations of the Basel Committee. This helps to reach two objectives at one time.

3. The place of loan profitability and liquidity factors in evaluation system of bank loan portfolio

Analysis of scientific literature showed that banks always seek to compensate the loss for likely default with adequate amount of income which bank receives in the form of interest. Interest rate is the price the borrower has to pay to his creditor for lending him money for a certain period. Most of the scientists define interest as the price of a loan.

Main model for determining the interest rate is cost-plus, which comprises the interest rate for every loan of 4 components: price of bank's credit resources, operational cost of loan servicing, risk premium which compensates possible losses in case of default, and profit margin. The other model for setting interest rate – *price-leadership* model allows the bank to move in banking market. *Risk-based* method for setting interest rate is directly linked to *scoring* system, because it helps to set loss (risk) margin in relation to the risk of the borrower. It is determined that the interest or the margin of the loan depends on the cost of loan processing, losses because of probable default and cost of capital (Oesterreichische Nationalbank 2004a). The analysis of interest rate setting models helped to determine the interest rate factors that can be divided into two groups, i.e. factors specifying the size of net profit from the loan and factors linking the aspects of bank's operational cost and possible losses. In order to determine not just the profit generated from a single loan, the whole loan portfolio profitability assessment methods and principles need to be analysed.

Literature analysis determined that the profitability of loan portfolio is mostly evaluated on quantitative basis and to a great extent depends on its quality, i.e. credit risk. Main coefficients determining portfolio profitability are interest margin to average loan balance ratio and interest margin to bank's share capital ratio analysis. In the assessment of bank's loan portfolio, it is important to evaluate how bank calculates base interest rate, what criteria and indices are used. The assessment of the principles of calculating risk margin is included in the final interest rate for the loan. It is another aspect. When setting the risk margin, bank has to evaluate not only credit risk, but also interest rate, operational and other risks.

Literature analysis shows that loan portfolio liquidity is important not only to the state of individual loans and the portfolio comprised of them (Kudinska 2002). The importance of loan liquidity in loan portfolio evaluation system shows in the way that this factor helps to find equilibrium between credit risk and profitability, because liquidity of the loan reduces its credit risk, and this reduces provision expense, which increases loan profitability and vice versa.

Objective approach is used when bank's loan liquidity is analysed, i.e. in loan liquidity evaluation process, the aspects of loan term and loan securitization are analysed. It is determined that these criteria are best in reflecting loan liquidity both in terms of time (loan term) and promptitude in realization (collateral). Thus liquid loan is defined as the loan with the maturity shorter than 1 year and (or) it is secured with liquid, easily and fast sellable collateral.

In the process of literature analysis the term "liquidity of the loan" was not met and no methods to evaluate the liquidity of the loan were found. Most of the scientists attribute factors regarding loan term or collateral to the assessment of borrower's credit risk, but the collateral to loan amount ratio most of the time has no influence on the probability of default (except for the personal guarantees). Also, Basel Committee on Banking Supervision recommends that collateral should not be considered together with other criteria for loan assessment (Basel Committee on Banking Supervision 2000a).

Loan term – is the term for which bank lends money. Often scientists attribute loan term to the factors regarding credit risk. From the point of utilization of monetary resources, loan liquidity is understood as the opportunity to return the money lent and to relend it to another borrower on better conditions. In this approach, short-term loan is more liquid than the long-term loan, i.e. if credit risk is out of context, bank will recover the money lent sooner. Also, in terms of money value, currently the value of money is much higher. It is determined, that it is necessary to assess loan payment terms and amounts overdue that are in time of valuation.

The other factor is collateral. In some countries collateral is not regarded as one of the criteria for evaluation of loans, that is why it is not taken into consideration when determining loan risk group (the value of collateral reduces the amount of provisions). In other countries collateral is considered as one of loan evaluation criteria, thus it influences both loan risk group and the provisions. Collateral is a very important factor not

only in the case when the possible losses or increased risk are "amortized", but also in case bank decides to sell the collateral, or to sell or in some other way transfer the loan to other creditor. It is much easier to sell or transfer a loan which is secured with liquid collateral. Also, the selling or some other use of loan portfolio (for instance, pledging it) is much simpler when loans and portfolio are evaluated in terms of liquidity.

4. The conception of evaluation of a commercial bank loan portfolio

The assessment of measures to evaluate loan portfolio of a commercial bank helped to determine that one of the main objects of evaluation is credit risk. The problem in evaluating loan portfolio credit risk appears when the certain constructed credit risk evaluation model is being implemented practically. Banks often face not only the problem that such models are expensive and probably will not cover their costs, but also deal with the lack of necessary data in terms of quantity and variety which is needed to implement the model and obtain required results. That is why the suggestion to solve this problem for a commercial bank is to start portfolio valuation at first from individual loans and only then proceed to aggregate loan portfolio evaluation.

As the size of loan portfolio grows, in order to remain competitive and profitable, the bank has to decide and form the criteria, which could be used to properly evaluate loans or their groups (sub-portfolios). Individual loans have to be evaluated not only in terms of credit risk, but also in terms of profitability and liquidity. Thus the bank needs to approve principles for determining loan rating (group) which could be used to designate the principles for credit risk evaluation, which include qualitative and quantitative factors, take into account external factors and the rating set by external institutions or organizations. Loan profitability evaluation comprises income, related to interest commission and other income generated by the loan, operational expenses and interest expenses that are related to credit resources. Loan liquidity is evaluated by analysing collateral and loan terms.

The complexity of loan evaluation depends on what part of the sub-portfolio the loan constitutes. Individual loan ratings (groups) are aggregated in order to evaluate different sub-portfolios, so that the bank could evaluate the most risky, profitable and safest in terms of liquidity areas of financing. Every sub-portfolio additionally is evaluated in terms of diversification, private persons financing sub-portfolio – also in terms of profitability, because due to large operational

cost and the specifics of financing of this area, it is not worth to evaluate every loan individually in terms of profitability. Further on, the aggregate loan portfolio is evaluated using the systems of relative indicators of loan portfolio and comparing it to general trends in banking system of the country.

Literature analysis showed that this loan portfolio of a commercial bank conforms to evaluation conception which can be based on consistent (individual loan, sub-portfolios (large-scale projects, business and private persons financing)) and aggregate loan portfolio evaluation. It is distinguished by its complex, because it includes not just credit risk factors evaluation, but also profitability and liquidity factors evaluation, which make it possible to construct detailed and scientifically based evaluation of loans in a commercial bank (EMCBLP) model.

5. Evaluation model of a commercial bank loan portfolio

5.1. Principles of loan classification into sub-portfolios

Analysis of literature showed that for analysis and evaluation of loan portfolio, most purposive way would be to classify loans into 3 main parts – sub-portfolios:

1. Large-scale projects financing sub-portfolio includes loans granted to: large enterprises or groups of them; financial intermediaries; local and central government.
2. Business financing sub-portfolio includes loans granted to SMEs and farmers.
3. Private persons financing sub-portfolio includes loans granted to individuals: consumer loans, mortgages, credit card overdrafts and other loans to private persons.

This is the first stage of the evaluation of loan portfolio of a commercial bank.

5.2. Instrumentation of evaluation of individual loans and sub-portfolios

The second stage of evaluation of the loan portfolio of a commercial bank is evaluation of individual loans and sub-portfolios based on criteria of credit risk, profitability and liquidity. At first factors determining individual loan rating or group are analysed as loan sub-portfolios are comprised of separate individual loans.

The principles and the extent of specification in evaluation of individual loan depend on the sub-portfolio of the loan. The evaluation of loans in large–scale projects financing sub-portfolio is carried out in great detail,

with much attention towards the assessment of credit risk, liquidity and profitability. For loans in business financing sub-portfolio, slightly simplified, automated evaluation system which requires less expert analysis is applied. Loans in private persons financing sub-portfolio are evaluated only in the aspect of credit risk, except for mortgage loans, for which the liquidity is also assessed. The profitability for loans in private persons financing sub-portfolio is analysed only in evaluation of the whole sub-portfolio.

The establishment of the **credit risk rating of the loan** begins with the assessment of qualitative and quantitative factors, i.e. assessment of the creditability of the loan recipient. The creditability of **legal persons** is assessed by evaluation of 6 main qualitative indicators: the history of cooperation with the customer; evaluation of the ownership structure; competitive status of the customer; evaluation of customer's activities; evaluation of management and quality of the accounting. Expert analysis is applied for evaluation of these indicators. Quantitative factors reflect the financial status of the legal person, which is analysed through the numbers or ratios. In assessment of both large–scale projects and business financing loans ratios indicating the financial status of the entity or its perspectives are calculated. These ratios include certain financial leverage, liquidity, operational and profitability ratios. Next stage of establishment of the credit risk rating (group) of the loan is the assessment of external factors. In order to evaluate these factors, experts' analysis of the country risk and economic activity risk is carried out. Additionally, the trends of the economy of the country are analysed and final credit risk rating is corrected based on this analysis.

Factors mentioned above are assessed to a certain group. In order to select and use loan rating structure, banks are suggested to use the system of 8 ratings: the first 3 ratings groups are for acceptable (small) risk loans, other 3 – for average (average and doubtful) risk loans, and the last 2 – for non-performing loans.

In valuation of separate aspects of the loans for both legal and private persons, every factor is assigned to one of 8 groups (ratings), and the final score depends on the weight of the factors. Risk rating 1 indicates that the risk is minimal, and, correspondingly, risk rating 8 indicates the maximal credit risk.

Final credit group (rating) can be adjusted based on the conclusions made in expert analysis. These conclusions must be substantiated. The larger the amount of the loan, the bigger is the influence of the expert analysis in the establishment of final risk group. In establishing credit risk rating for the loans in large–scale

projects financing sub-portfolio, the same methodology of evaluation of credit risk is used as for loans in business financing portfolio valuation, but expert analysis has much greater influence on the final score.

In valuation of the loans in **private persons** financing sub-portfolio, i.e. individual loans granted to private persons, in the aspect of credit risk and establishing credit risk rating basically the same creditability assessment principles are applied, but from the external factors only country rating is assessed. The following qualitative factors are evaluated: age, marital status, education, customer's employer, and the duration of work at current employer, ownership of real estate, insurance, and relations with the bank, credit history and meeting obligations. Quantitative factors: debt ratio, disposable income to monthly credit repayments ratio. Only country rating is taken into account and the same principles as for assessment of the country rating of legal persons are used.

Next stage in establishing the final rating (group) of the loan is the analysis of factors reflecting **loan liquidity**. In the establishment of loan liquidity rating (group), the following factors are used:

- The *term* of the loan is assessed.
- *Collateral* is calculated as a loan amount to collateralised property times security coefficient ratio.

Loan profitability rating is established based on what income (fees and commission) bank earns from granting a loan and what income is received from the customer in granting other than credit banking services.

After the individual loan is evaluated in aspects of credit risk, profitability and liquidity, the **final loan rating** (FLR) is established. The final rating of the loan mostly depends on the credit risk rating, and only adequate liquidity of the loan can reduce possible loss regarding loan repayment. Loan profitability in case of default loan would not be this important as when granting loan with high interest rate, bank would get just bigger interest which the customer would pay, but in case of default it can lose the principle. Based on these principles, at first credit risk (CR) and liquidity (L) group is established, then the relation of this group with profitability (P) is used to derive the final rating of the loan based on the following formula:

$$FLT = (0.8*((0.7*CR) + (0.3*L))) + (0.2 + P). \quad (1)$$

Such assessment principles, when at first two fundamental aspects of the assessment are distinguished – credit risk – liquidity, and after that the influence of the profitability is evaluated allows to carry out adequate assessment of factors. This principle derives more detailed information.

In assessing credit risk of different loans, it is necessary to take into account that not always detailed analysis of the loan is purposeful since in consideration of granting small loans such analysis may be loss-making, in terms of the operational cost to carry out such analysis may exceed potential profit. That is why the bank has to determine the amount above which the loans have to be assessed in most details, and under which fewer criteria can be applied.

After the loans are evaluated based on principles stated above, next stage in evaluation of loan portfolio is evaluation of separate sub-portfolios. At first, depending on the purpose of the analysis, the distribution of individual loans in terms of various ratings (by rating, amount, economic activity, etc.) in all portfolios is assessed. As the loans in private persons financing sub-portfolio were not assigned a profitability rating, the loans in this portfolio are analysed in the aspect of credit risk, and mortgage loans – additionally in the aspect of liquidity.

Next criterion for the assessment of loan sub-portfolios is the amount of provisions. Another factor is the calculation of expected loss in assessing loan sub-portfolios.

In another stage of the model the results of evaluation of sub-portfolio are summarized and it is verified whether the bank keeps the limits and procedures regarding loan portfolio set by the supervisors and internally; indicators of loan portfolio are calculated and compared to the indicators of previous periods. Main indicators of loan portfolio include aggregate and, based on the general principle of the model, credit risk, profitability, liquidity and the relation of these factors determining indicators. Aggregate indicators include loan portfolio (LP) to assets (A) ratio, loan portfolio to capital (C) ratio. The assessment of these indicators is necessary because this way it is determined what part of the assets is comprised of loans and if bank's capital is adequate to absorb possible loan losses.

Loan portfolio credit risk indicators show the size of the credit risk in the portfolio and how it is managed. The following indicators are analysed: non-performing loans (NpL) to loans ratio, overdue loans (OL) to loans ratio, loan write-offs (LWo) in a certain period to loans ratio, non-performing loans to capital ratio, the assessment of diversification. The loan portfolio profitability indicators include net interest income from crediting activities (NII) ratio; net commission income (NCI) derived from crediting activities to loan portfolio ratio; the share of net interest income from crediting activities in bank's aggregate income (BaI). The liquidity of

loan portfolio is reflected by the analysis of relative indicators (long-term (LTL) and short-term loans (STL) share in loan portfolio, analysis of collateral (AoC)).

Further on, indicators determining relation between credit risk and profitability, profitability and liquidity, liquidity and credit risk are assessed. The assessment of these indicators is necessary in order to analyse and evaluate bank's loan portfolio in 3 aspects: credit risk, profitability and liquidity. Relation between credit risk and profitability factors is analysed using the following indicators: net interest income from crediting activities to non-performing loans ratio; provisions (P) to loan portfolio ratio; net interest income to secured loan amount ratio; net interest income to short- or long- term loans ratio. Relation between liquidity and credit risk factors is assessed using these indicators: non-performing loans to secured loans (SL) ratio; analysis of share of non-performing loans in long-term loans; analysis of share of non-performing loans in short-term loans.

After the analysis of both aggregate and relative credit risk, profitability and liquidity reflecting loan portfolio indicators, the indicators are compared with the overall country banking system tendencies (**fourth** stage of evaluation of loan portfolio in a commercial bank). Assessment of correlation with country's economic indicators helps to determine if bank's loan portfolio growth and changes in certain indicators correspond with the rates and tendencies of development of the economy in the country. Final structure of the evaluation model of loan portfolio of a commercial bank is presented in Fig. 1.

The **last stage** of loan portfolio evaluation is presenting the conclusions on current state of loan portfolio, its changes and formulating suggestions towards the management of loan portfolio or improvement of evaluation of loan portfolio.

Additionally, banks should initiate the establishment of common databases or improvement of their own database that in longer period of time, with the expansion of their activities and growth of loan portfolio, more detailed loan evaluation models could be used.

6. Conclusions

In order to get more comprehensive results of loan portfolio evaluation, loans that form a loan portfolio should be distributed into sub-portfolios according to activity segments of a bank: large-scale projects, corporate and private clients. Such approach to loan portfolio enables banks not just properly distribute resources with a purpose to get a maximum profit, but also designate appropriate consideration while evaluating risk of individual loans or sub-portfolios.

The attention was paid to credit risk evaluation of loan or loan portfolio mostly in research studies. The following methods and models of individual loan credit risk evaluation are established: actuary, scoring, credit margin, option, credit equivalent position and repayment level models and heuristic, empirical – statistical and causative models. It has been identified that the banks of transition economy countries are able to use only actuary and scoring models and will not be able
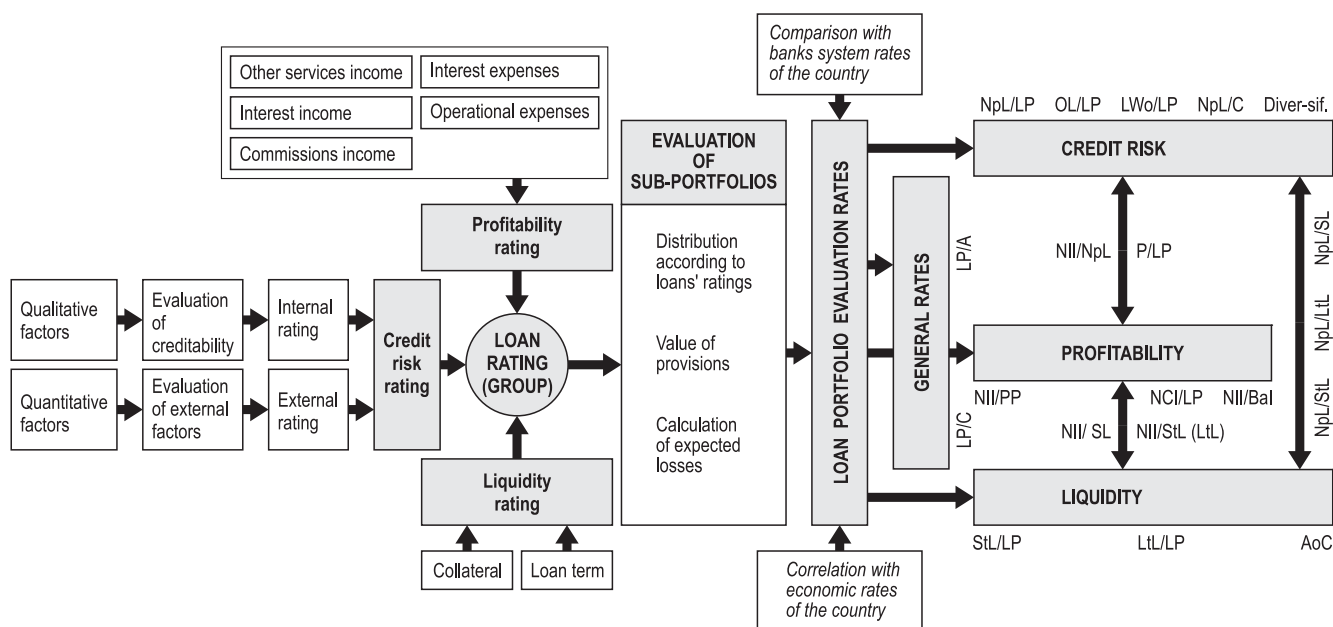

Fig. 1. The structure of the evaluation model of a commercial bank loan portfolio

to embrace the advantages of other models due to lack of available data. While analysing portfolio credit risk evaluation models that are distributed to market value and probability of default, it is estimated that due to lack of data it is almost impossible to adapt Credit Metrics and KMV models. The possibilities of using CreditPortfolio View model in practice are limited and Credit Risk+ model can be adapted only to the extent of loan register.

It was discovered that both individual loan and loan portfolio profitability factors are significant aspects of portfolio evaluation. In the course of the research survey it has been estimated that the profitability of loan portfolio is influenced by two main factors – interest and commissions income. In the process of interest rate determination models' analysis, 2 loan profitability factors' groups have been distinguished, i.e. factors describing bank's receivable net profit from granted or being granted loan value and factors integrating bank's operational expenses and possible loss aspects. Loan liquidity has been determined using the following two factors – loan term and loan security means, therefore it has been suggested to describe liquid loan as loan having repayment term of not longer than 1 year and (or) for loan transaction implementation security pledged liquid promptly realizable obligations implementation ensuring means. It was estimated that the influence of loan profitability and liquidity factors on the evaluation of a commercial bank loan portfolio is important as it helps to perform more complex evaluation. And not only loss probability is evaluated (credit risk aspect), but also profit that is generated by a bank from main activity, and liquidity of major part of bank asset – loans.

The conception of evaluation of a commercial bank loan portfolio has been formulated on the basis of which comprehensive and complex evaluation of a commercial bank loan portfolio can be executed considering credit risk, profitability and liquidity factors. Referring to the conception of evaluation of a commercial bank loan portfolio a sequential bank's loan portfolio evaluation model (EMCBLP) has been established.

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