PROBLEMS OF IMBALANCED LIQUIDITY IN LATVIAN COMMERCIAL BANKS AND POSSIBLE SOLUTIONS

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Abstract: At present many commercial banks in Latvia face the problem of imbalanced liquidity caused by the mismatch between the terms of borrowing and lending. Thus, during the last 5 years, a rapid growth of long-term lending was not sufficiently covered by long-term resources. Many banks were forced to transform significant amounts of short-term resources into long-term assets running the risk of imbalanced liquidity. In spite of the fact that the implementation of the government's anti-crisis programme will undoubtedly affect the banking sector and will lead to a gradual slowing down of lending growth rates, the problem of finding long-term resources will remain high on the banks' agenda. In the authors' opinion, an important role in attracting long-term bank resources should be played by the issue of securities: bonds, mortgage bonds, etc. as well as by the creation of subordinated liabilities. The present article is devoted to the analysis of the level of equilibrium of bank assets and liabilities by terms and amounts, to the identification of the existing problems in imbalanced liquidity risk management, and to the search for the optimal solution to these problems. The authors also reveal an interconnection between the imbalanced liquidity risk and other risks of a commercial bank (credit, interest rate, market, reputation risks, etc.). They identify the sources of the imbalanced liquidity risk, characterize the impact of each risk source and propose methods for controlling the risk.

Key words: gap analysis, imbalanced liquidity, bank risks, resource base, liquidity ratios, liquidity limits.

1. Introduction

The current tendencies of Latvian banking sector prove that the majority of Latvian commercial banks work in the conditions of imbalanced liquidity.

The nature of the liquidity risk lies in specific peculiarities of banking institutions activities. Thanks to a big amount of short-term resources banks can afford to offer long-term loans drawing their profit from higher interest rates on loans. It causes a situation with a discrepancy in the terms and the sums of assets and liabilities. As a result, the bank is exposed to the risk of being short of current liquidity in case a large number of depositors would like

to withdraw their money. The bank is able to collect its resource base either by attracting additional deposits at higher interest rates or by means of a compelled unprofitable realization (selling) of its other assets. Apart from that, another source of potential liquidity problems is bank sensitivity to the fluctuations in interest rates: in case they grow, some of the depositors could withdraw their money in search of higher income in other deposits (investments); obtaining liquid assets by means of loan borrowing could prove to be more expensive while some kinds of loans could turn out to be unavailable.

To resolve these problems bank policy should be sensible and prudent when balancing the terms and the sums of its assets and liabilities. It should also keep (a certain amount of) current liquidity and negotiable securities. Commercial banks could also strike contracts with other banks on reserve crediting in accordance with which the latter would be bound to allow credits in emergency cases.

Alongside with the problem of imbalanced liquidity having become quite acute, a lot of Latvian commercial banks find themselves in a position when their liquidity ratio[7] many times exceeds the required standard. That means they work with surplus liquidity and, therefore, do not use all existing resources so that they could obtain a maximally efficient financial and commercial result (N. Konovalova, 2007).

So, for instance, at the end of 2007 liquidity ratio of several banks made up more than 70% (FCMC, 2008) instead of standard 30%. In the 6-year period from 2002 to 2007 the average liquidity ratio within the system of Latvian commercial banks fluctuated between 48,1% and 62,1% (N. Konovalova, 2007).

The above-stated fact, indicative both of the assets and liabilities term imbalance and comparatively high liquidity ratios, means that bank liquidity must not be considered one-sidedly. The assessment of commercial bank liquidity should be carried out comprehensively on the basis of such techniques as gap-analysis, ratio methods, limiting, flow of funds, etc.

Taking into account the above-mentioned, the authors make a research of the problems of imbalanced liquidity in commercial banks considering the influence of both external and internal factors; reveal the reasons, which have caused them, as well as expose the drawbacks in the imbalanced liquidity risk management.

The aim of the research is to assess the level of imbalanced liquidity within different commercial bank groups in Latvia on the basis of gap-analysis, to reveal the most significant factors of risk influencing the imbalance of bank assets and liabilities, as well as to work out some recommendations on how to improve the imbalanced liquidity risk management for commercial banks.

The research tasks:

- to assess the level of assets and liabilities balance within different commercial bank groups in Latvia;
- to reveal the reasons for imbalanced liquidity in Latvian commercial banks;
- to estimate the influence of factors on the level of imbalanced liquidity;
- to expose the existing problems in banking liquidity management;
- to work out some suggestions on how to decrease the level of imbalanced liquidity for Latvian commercial banks.

The problems of imbalanced liquidity have been dealt with in the works of such foreign authors as Josepf F. Sinkey Jr., Peter S.Rose, Greuning H.Van, Brajovics Bratanovic S., Chris J. Barltrop, Diana McNoughton, O. Lavrushin, R. Olhova, A.Lobanov, A. Chugunov and others. However, inadequate attention is being paid to the problems of imbalanced liquidity risk in Latvia.

[7] The liquidity ratio is established as the ratio of high liquid assets (cash, correspondent accounts "nostro" with the terms up to 30 days and high liquid securities) to the current liabilities with residual maturity up to 30 days.

On the other hand, the activity of Latvian commercial banks confirms a necessity to estimate the level of imbalanced liquidity as well as to improve the methods of approach to the imbalanced liquidity risk management.

2. Importance of Liquidity Management

Liquidity risk is a risk of a bank not able to pay its legally required liabilities without substantial losses, as well as not able to overcome unforeseen changes in bank resources and/or market conditions, since it will not have adequate liquid assets (FCMC, 2007)

Liquidity risk is a greater concern and management challenge for banks in today's environment. Increased competition for consumer deposits, a wider array of wholesale and capital market products, and technological advancements have resulted in significant changes in funding structures and liquidity management techniques.

Traditionally, banks rely on retail deposits and savings accounts as a primary funding source. Generally, these deposits represent a stable and low-cost source of funds. For the past several years, core deposits as a percentage of liabilities have steadily reduced and may significantly go down in the future since retail consumers continue to evaluate the variety of competing savings vehicles and their relative yields. The growth in, and consumers' acceptance of e-technologies may boost this trend by making it easier for consumers to compare rates and to transfer funds between banking institutions easily and rapidly.

Increased reliance on market funding, however, has made banks more exposed to the price and credit sensitivities of major investors. As a rule, institutional investors are more credit sensitive and will be less willing than retail customers to provide funds to a bank facing real or perceived financial difficulties. A bank's ability to access the capital markets may also be adversely affected by events not directly related to them.

Along with the shift from relatively credit-neutral to credit- sensitive funds providers, banks have turned increasingly to asset securitization and other off balance-sheet operations. As these off balance-sheet activities have grown, they have become increasingly important in the management and analysis of liquidity. These activities can either supply liquidity or increase liquidity risk, depending on the specific transaction and then-current level of interest rates.

Banks are successfully adjusting to this secular shift by using market sources to meet their funding requirements. While employing market sources, banks are able to diversify their funding bases among funds providers and across maturities. Unlike core deposits, whose maturities are generally determined by the preferences of depositors, funds in the institutional markets can be accessed at a variety of tenors. Due to the many choices among market funding alternatives, banks can enjoy greater flexibility in managing their cash flows and liquidity needs.

The imbalanced liquidity risk is closely connected with other main risks in banking activity.

Realization of any risk at a bank entails a reduction of incoming payments, growth in expenses for attraction of resources, which, in its turn, leads to deterioration of the liquid position. Regardless of these factors, meeting the demand for liquid assets must be of a high priority for the bank. Refusal of funds for the customer may seriously undermine the trust in the bank (M.Kudinska, 2007).

The primary risks that may affect liquidity are: reputation risk, strategic risk, credit risk, interest rate risk, market price risk and operational risk. If these risks are not properly managed and controlled, they will eventually undermine a bank's liquidity position.

Reputation risk

Reputation risk is the current and prospective impact on earnings and capital arising from negative publicity. A bank's reputation for discharge its obligations and operating in a safe

and sound manner is essential to borrowing funds at a reasonable cost and retaining funds during troubled times. Negative public opinion, whatever the cause, may cause depositors, other funds providers, and investors to seek greater compensation, such as higher rates or additional credit support, for maintaining deposit balances with a bank or conducting any other business with it.

A bank that is exposed to significant reputation risk should seek to mitigate liquidity risk by diversifying the sources and maturities of market funding and increasing asset liquidity, as appropriate.

Strategic risk

Strategic risk is the current and prospective impact on earnings or capital arising from adverse business decisions, improper implementation of decisions, or lack of responsiveness to industry changes. No strategic goal or objective should be planned without prior considering its expected impact on a bank's funding abilities. The bank must be able to raise money required to meet its obligations at a tolerable cost. The ability to attract and maintain sufficient liquidity is often an issue at banks experiencing rapid asset growth. If management misjudges the impact on liquidity of entering a new business activity, the bank's strategic risk increases. Management should carefully consider whether the funding planned to support a strategic risk initiative will increase liquidity risk to an unacceptable level.

Credit risk

Credit risk is the current and prospective risk to earnings or capital arising from the counterparty’s failure to discharge a contractual obligation with the bank or otherwise to perform as agreed. A bank that assumes more credit risk, through asset concentrations or adoption of new underwriting standards in conjunction with untested business lines, may be increasing its liquidity risk. *Credit-sensitive wholesale funds providers* may be concerned about that the banks increased credit exposure could lead to credit problems and insufficient earnings. The bank's ability to meet its obligations may eventually be compromised. Institutional investors and rating agencies consider the level of overdue loans, nonperforming loans, allowances for loans and leases, and loan charge-offs as indications of trends in credit quality and potential liquidity problems. If credit risk is elevated, the bank may have to pay a premium to access funds or lure depositors. If credit risk has undermined the bank's financial viability, funding may not be available at any price. Most large bank failures have involved the combined effects of severe credit and liquidity aggravation.

Interest rate risk

Interest rate risk is the current and prospective risk to earnings or capital arising from fluctuations in interest rates. Changing interest rates affect income earned on assets and the cost of funding those assets. If a bank experiences a decline in earnings from a change in market interest rates, funds providers may question the financial stability of the bank and demand a premium. They may even refuse to provide funding.

A change in interest rates also affects the economic value of the balance sheet. For example, the present value of most investment securities decreases in a rising rate environment. To maintain the total value of assets serving as collateral in repurchase agreements or pledged against deposits, the bank may have to pledge or encumber additional securities, thus increasing its cost of funds. The cost of alternative funding sources also may increase as depositors and other lenders demand market interest rates in a rising rate environment.

Off-balance-sheet instruments that a bank uses to manage its interest rate risk may also cause liquidity risk. The cash flows of those instruments often are very sensitive to changes in rates, and, if not properly managed, can result in unexpected funding requirements or other cash outflows during periods of fluctuating interest rates.

Market price risk

Market price risk is the risk to earnings or capital arising from changes in the value of trading books comprising of financial instruments. Market price risk may result in volatile earnings. This risk is most prevalent in large banks that actively trade financial instruments. Market price risk is closely monitored by funds providers when assessing a bank's financial position and creditworthiness. If market price risk and its perceived impact on earnings or capital is too great, funds providers may require the bank to pay increased rates for funds, may not be willing to invest in longer-term maturities, or may refuse to provide funding whatsoever.

Operational risk

Operational risk is the current and prospective risk to earnings and capital arising from inadequate or failed internal processes, people and systems or from external events – various types of human or technical errors, contingencies, fire and other factors of this sort. Systems that directly affect liquidity include computer-based funds transfer systems, e-banking, and operations governing payment card usage (credit, debit, etc). If product lines change, management must adjust the systems to ensure that all transactions can be handled. Significant problems can develop very quickly if transaction processing systems fail or delay execution. If customers have difficulty accessing their online accounts, they may close them, which will diminish liquidity. Operational risk should be considered in the bank's contingency planning process.

Senior management should monitor various internal as well as market indicators of potential liquidity problems at the bank. These indicators, while not necessarily requiring drastic corrective action, may prompt senior management of the bank to do additional monitoring or analysis.

A liquidity problem may first show up in the bank's financial monitoring system as a downward trend with potential long-term consequences for earnings or capital. Examples of such internal indicators are:

- negative trend or significantly increased risk in any area or product line;
- concentrations in either assets or liabilities.
- deterioration of asset quality indicators;
- decline in earnings performance or projections;
- asset growth funded by volatile wholesale loans (see: OCC's Comptroller Handbook for Liquidity Management, February 2001).

Financial and Capital Market Commission (FCMC) has developed a rating system that serves for identifying, analyzing and assessing risks incurred by banking institutions (i.e., for assessing risk profile) and evaluating the quality and sufficiency of risk management methods used by institutions, as well as their adequacy to the volume and complexity of operations. FCMC suggests two aspects for the evaluation of liquidity risk management quality:

- Assets and liabilities cash flow maturity mismatch, which also includes the risk that a bank will be unable to meet its liabilities without suffering considerable losses due to its inability to overcome unexpected decrease in resources;
- Market liquidity risk, i.e. the risk that in case of necessity a bank will not have access to resources in the market, and/or that it will be unable to liquidate positions (e.g. sell its assets) in short time and without considerable losses. This also includes bank's inability to timely diagnose changes in market conditions (decrease in market liquidity).

Depending on certain criteria, a bank is included into one of four quality groups (Table 1)

Table 1. Characteristics of liquidity risk[8]

Risk groups	Assets and liabilities cash flow maturity mismatch	Market liquidity risk level
Low risk group	Commercial banks with balanced claims and liabilities; total position is positive starting with the group with residual maturity from 31 days; liquidity ratio for the past year exceeds 50% and is stable; cash and liquid money market instruments comprise a large proportion of liquid assets (more than 80%); scenario analysis reveals the absence of potential liquidity problems.	Commercial banks which funding sources are sufficiently diversified, that is, there are no concentrated positions (deposits of each individual customer/group of interrelated customers do not exceed 2% of bank's liabilities; loans of each individual loan providers (excluding shareholders and companies of the group) do not exceed 5% of bank's liabilities; amount of deposits/loans with the same maturity does not exceed 5% of bank's liabilities), volume of deposits is constantly growing, in case of necessity a bank can promptly attract resources from other sources without additional expenses or losses, and/or there are no problems for maintaining long-term and short-term liquidity, because in case of necessity it is possible to receive support from the parent bank or other companies of the group.
Moderate risk group	Commercial banks where the amounts of total negative liquidity positions are not substantial; total position is positive starting with the group with residual maturity from 91 days, and/or liquidity ratio for the past year is 30-50% and stable, and/or cash and liquid money market instruments comprise a substantial proportion of liquid assets, and/or scenario analysis reveals potential liquidity problems, but such problems are not substantial.	Commercial banks which funding sources are sufficiently diversified but do not meet some quantitative criteria defined for "low risk" rating; concentration does not exceed quantitative criteria defined for "low risk" rating more than three-fold, and/or volume of deposits is stable but it does not show a tendency to increase, and/or in case of necessity a bank can attract resources from other sources promptly enough and without substantial expenses or losses, and/or there are no expected problems for maintaining short-term liquidity, but there might be problems for maintaining long-term liquidity, because, for example, a substantial proportion of total assets is comprised of the assets, fast disposal of which is complicated (e.g. loans).
Substantial risk group	Commercial banks where the amounts of total negative liquidity positions are substantial; total position is positive starting with the group with residual maturity from 181 days, and/or liquidity ratio for the past year is average and shows a tendency to decrease and/or substantially fluctuates, and/or cash and liquid money market instruments comprise a small proportion of liquid assets (less than 50%), and/or scenario analysis reveals substantial potential	Commercial banks that have several funding concentrations; concentration does not exceed quantitative criteria defined for "low risk" rating more than ten-fold, and/or volume of deposits is unstable and shows a tendency to decrease, and/or a bank might be unable to promptly attract resources from other sources and/or this might be connected to substantial expenses or losses, and/or there are no problems for maintaining short-term liquidity, but substantial problems for maintaining long-

[8] FCMC's Banking Risk Assessment Manual, November 2007.

	liquidity problems.	term liquidity are expected, because, for example, long-term assets fast disposal of which is complicated dominate.
High risk group	Commercial banks where the amounts of total negative liquidity positions are large; total position is positive starting with the group with residual maturity from 361 days, and/or liquidity ratio for the past year is close to 30% or lower, it is possible that a bank fails to comply with certain liquidity ratio requirements, and/or cash and liquid money market instruments comprise an unsubstantial proportion of liquid assets, and/or scenario analysis reveals substantial potential liquidity problems.	Commercial banks that have substantial funding concentration due to the following reasons: deposits of each individual customer/group of interrelated customers exceed 20% of bank's liabilities, and/or credits of each individual creditor exceed 50% of bank's liabilities, and/or amount of deposits/loans with the same maturity exceeds 50% of bank's liabilities, and/or deposit base is unstable, and/or deposit volume substantially decreases, and/or in case of necessity a bank will be unable to attract resources from other sources, and/or there are substantial problems for maintaining liquidity.

3. The measurement of liquidity imbalance.

To assess a bank liquidity level it is necessary to analyse the state of assets and liabilities structure of commercial banks in the context of terms and sums and to estimate their liquidity position. Net liquidity position is estimated using gap-analysis - each term deposit group (up to 1 month, from 1 to 3 months, from 3 to 6 months, from 6 to 12 months, from 1 to 5 years and over 5 years) being studied separately.

A positive net liquidity position in each assets and liabilities term group indicates a surplus of placed resources over those attracted within a considered term group. The higher positive net liquidity position in the group up to 1 month is, the higher is the current bank liquidity. Positive net liquidity position in longer term groups indicates a shortage of long-term bank resources. The deficit of long-term bank resources could be reimbursed at the expense of the bank equity. However, in case bank equity proves not to be enough to cover its long-term assets, it could develop liquidity problems when the maturity of its long-term liabilities approaches.

The case of negative net liquidity position in each assets and liabilities term group indicates a surplus of attracted resources over those placed within this term group. The higher negative net liquidity position in the current group compared to the short- and long-term groups is, the higher is liquidity risk, since „short" resources are redirected into longer term investments, and there could be a term mismatch between the maturity of a bank short-term liabilities and its long-term asssets maturity.

Negative net liquidity position in „longer" terms will show that long-term resources are used not only for long-term investments but are also placed in shorter term assets. Such resource placement will positively characterize a bank liquidity.

Alongside with the net liquidity position a total liquidity position – the gap between assets and liabilities in the cumulative total position and in the order of increasing terms is estimated.

In order to estimate the level of imbalanced liquidity it is reasonable to divide all Latvian commercial banks into 4 groups:

1st group – banks fully owned by foreign investors;

2nd group – banks with mixed capital (Latvian and foreign capital);

3rd group– banks fully owned by private Latvian investors;

4th group – bank fully owned by the state**.**

Table 2. Characteristics of the groups of Latvian commercial banks

Group of banks	Number of banks in the group	Total assets at the end of 2006, million lats	Percentage of total assets
Group 1	9	8645452	57,85
Group 1	5	1917940	12,83
Group 1	6	685130	4,59
Group 1	1	3696141	24,73
Total	21	14954549	100,0

To carry out a comparative analysis of imbalanced liquidity in different bank groups the authors make use of relative gap indicators: the *net relative gap* and the *cumulative relative gap.*

The net relative gap is specified as the ratio of the absolute net gap value to total assets. The changes in the net relative gap indicator over time and in different bank groups are illustrated in Fig 1, which shows that the highest gap in 2006 was observed at 1 month term. It testifies to some surplus of current resources, a part of which is redistributed by banks to cover their short- and long-term active operations. The authors have established that the biggest current gap in 2006 was observed within the 3rd group of banks (33.53%); the equity of those banks has been built up on the basis of Latvian private business. This group was followed by the 1st group or foreign capital banks and then - the 2nd group banks, these with mixed capital; their current net gap being 21,24% and 20,22%, accordingly. The lowest current gap (10,7%) was observed in the 4th bank group or the state-owned bank, which makes it possible to conclude that only insufficient amount of current resources of this bank was redirected into longer term assets.

With terms becoming longer (within the range of 1 month to 1 year) the range of gap shrinks to testify to higher balanced assets and liabilities at the considered term period.

The analysis of long-term (over 1 year) assets and liabilities mismatch shows that the highest term mismatch, which is characterized by the shortage of long-term resources, was observed in the 2nd and the 3rd bank groups. In the 3rd bank group the relative net gap indicator in term deposits from 1 up to 5 years constituted 21%, and in term deposits over 5 years – 23,2 %. As concerns the 2nd group – they were 14,6% and 6,4%, accordingly.

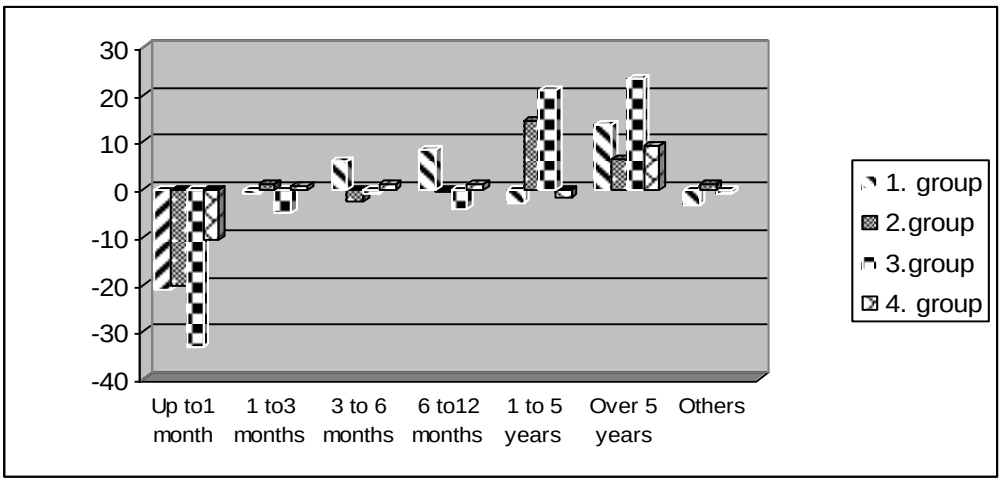

Figure 1. Latvian Commercial Bank's Asset Structure at the end of 2006 (in percentage*)*

It should be noted that the bank with the lowest assets and liabilities mismatch in the period from 1 to 5 years was the state owned bank (*Mortgage Bank*), the net relative gap of

which made up a little more than 1%. As concerns the period over 5 years the gap increase up to 9% was observed in *Mortgage Bank*. However, due to the bank's well-diversified long-term resource base (term deposits, mortgage bonds, subordinated liabilities and others) constantly increasing, any signs of liquidity risk do not threaten the bank.

The results obtained and worked out with the use of the *cumulative relative gap* made it possible for the authors to come to the same conclusions. Moreover, the *cumulative relative gap* vividly reveals high assets and liabilities term mismatch within the 3rd group of banks.

The characteristics of the change of the cumulative gap indicator at different terms are shown in Fig. 2.

A further analysis presupposes the assessment of percentage level of resource surplus or shortage within each term group in the context of bank groups. The total summary is given in Fig. 3.

The results of the analysis have shown that the 3rd group of banks suffered the most acute shortage of long-term resources. The resource shortage in terms from 1 to 5 years constituted 74,55%. The resource shortage in terms over 5 years constituted 71, 7%. Second biggest deficit of long-term resources is the 2nd bank group (with the resource shortage within the range from 1 to 5 years being 69%, and the resource shortage in the terms over 5 years - 42%). The 1st bank group, on the whole, was characterized by some resource surplus in the terms from 1 to 5 years (9%). At the same time a considerable shortage of resources has been estimated within this bank group in the terms over 5 years (51%). The above-mentioned fact can be explained because it was exactly these banks (particularly such branch leaders as *AS Hansabanka* and *AS SEB Unibanka)* that in line with their aggressive credit policy had placed the main part of their assets in long-term credits with the terms over 5 years, not always having a reliable long-term resource supply. *Mortgage Bank* has a quite sufficient coverage of its long-term placements within the terms of 1 to 5 years with a 5% surplus of its long-term resources coverage within this term group. At the same time, a 30% shortage of its long-term resources in the terms over 5 years is observed in this bank. However, as it was stated above, the well-diversified long-term resource base of the bank does not give reason to the authors to consider this circumstance to be negative.

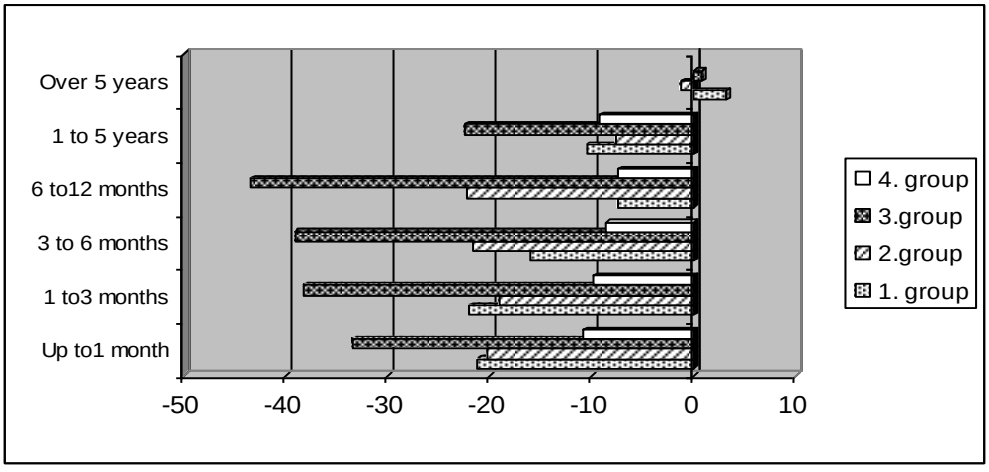

Figure 2. Latvian Commercial Bank's Liquidity Cumulative Gaps at the end of 2006, (in percentage to total assets)

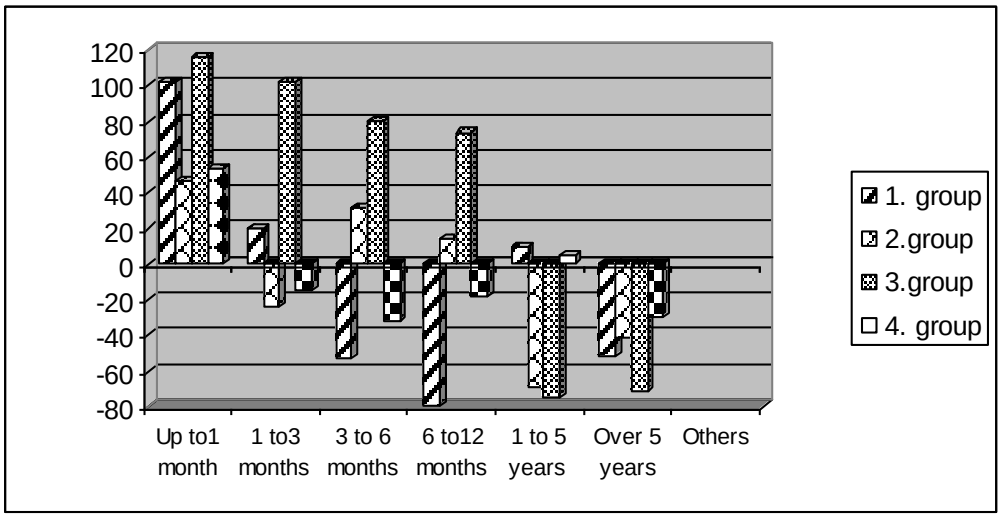

Figure 3. Relative Excess or Shortage of Latvian Commercial Bank's Resources at the end of 2006 (%)

The summary of the structure of assets and liabilities in the context of terms makes it possible to implement redistribution of surplus money resources between different term groups. Such redistribution is carried out on the basis of either transformation of long-term resources into short-term investments or short-term resources into long-term investments.

The following circumstance should be taken into account: the procedure of transformation of short-term resources into long-term investments could aggravate the situation in the context of bank liquidity. Therefore, a constant supervision over the state of the term structure of assets and liabilities, the observance of the established net liquidity position limits and the dynamics of the change of liquid funds must be provided. A bank can make a decision on the transformation of short-term resources into medium-term or long-term investments provided there is no danger to liquidity.

The short-term resources transformation coefficient is worked out as the ratio of gap between short-term resources and short-term assets to short-term resources.

In case there is surplus amount of short-term resources, a certain part of them could be redirected into long-term assets; however, in the authors' opinion, the transformation share of short resources being turned into long-term investments must not exceed 20%.

Figure 4 illustrates the transformation level within groups of Latvian commercial banks at the end of 2006.

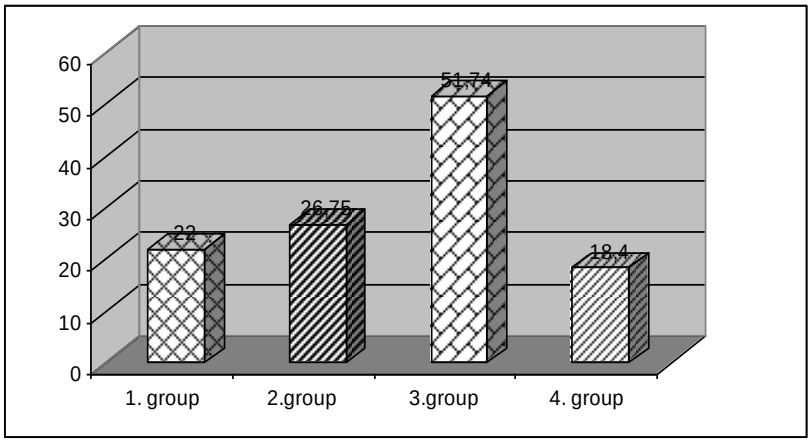

Figure 4. Latvian Commercial Bank's Resources Transformation Ratio at the end of 2006 (%)

The estimated transformation indicators prove the above-stated conclusions made by the authors. Thus, the highest indicator of short-term (within the terms up to 1 year) resources transformation into long-term assets (within the terms over 1 year) was observed in the 3rd bank group (51.74%), which testifies the highest degree of imbalanced liquidity risk in this bank group. The state owned bank had the lowest transformation indicator (18,4%), which confirms the authors' conclusions on a sufficiently good assets and liabilities term balance in this bank. The 1st bank group has the transformation indicator at the level of 22%, and the 2nd – at the level of 26, 75%, which stipulates the existence of the imbalanced liquidity risk, although less dangerous than in the 3rd bank group.

To assess the transformation risk in the case of short-term resources financing long-term assests, it is possible to make use of assets and liabilities superposition technique in the context of terms. It helps to estimate the level of the imbalanced liquidity risk taken by a bank. The superposition technique could be presented in the form of a matrix. The matrices were made using the 2006 financial statements of Latvian commercial banks as the source of information. Off-balance sheet items were not taken into account by the authors due to two reasons: firstly, because not all commercial banks state their off-balance deals in their annual financial statements, secondly, because off-balance operations only insufficiently effect the imbalanced liquidity risk. See balance matrices in Tables 3-6.

Table 3. Matrix for maturity-matched assets and liabilities of the first group of commercial banks as of December 31, 2006 (ths.LVL)

Assets/ Liabilities	Up to1 month	1 to3 months	3 to 6 months	6 to12 months	1 to 5 years	Over 5 years	Others	Total assets
Up to1 month	1795559							1795559
1 to 3 months		333861						333861
3 to 6 months	522534		460255					982789
6-12 months	369194			99202				468396
1 to 5 years	105545				3185631			3291176
Over 5 years	839426	67336				564136	275892	1746780
Others							26891	26891
Total liabilities	3632248	401197	460255	99202	3185631	564136	302783	8645452

Source: Latvian commercial banks' annual reports 2006

Table 4. Matrix for maturity-matched assets and liabilities of the second group of commercial banks as of December 31, 2006 (ths. LVL)

Assets/Liabilities	Up to1 month	1 to3 months	3 to 6 months	6 to12 months	1 to 5 years	Over 5 years	Others	Total assets
Up to1 month	834782							834782
1 to 3 months	23001	70767						93768
3 to 6 months			156909					156909
6-12 months				79590				79590
1 to 5 years	**280771**				125715			406486
Over 5 years	**84111**		**676**			201653		286440
Others			**48920**	**10938**			107	59965
Total liabilities	1222665	70767	206505	90528	125715	201653	107	1917940

Table 5. Matrix for maturity-matched assets and liabilities of the third group of commercial banks as of December 31, 2006 (ths. LVL)

Assets/Liabilities	Up to1 month	1 to3 months	3 to 6 months	6 to12 months	1 to 5 years	Over 5 years	Others	Total assets
Up to1 month	1063529							1063529
1 to 3 months		177513						177513
3 to 6 months			41129					41129
6-12 months				215640				215640
1 to 5 years	779040				264250			1043290
Over 5 years	457975	181348	33190	159059		212798	68849	1113219
Others							41821	41821
Total liabilities	2300544	358861	74319	374699	264250	212798	110670	3696141

As stated above, in the authors' opinion, the maturity mismatcing between asstes and liabilities is exposed as liquidity shortage or excess. Liquidity shortage is revealed in the case when long-term assets are financed by short-term liabilities, while liquidity excess is revealed in the case when a bank uses its long-term resources to fund its short-term assets. The results of calculations have exposed a predisposition of Latvian commercial banks to liquidity shortage. Long-term assets, financed by short-term liabilities in Tables 3-6 are displayed in bold. The authors called the ratio of these assets to the value of total assets as the imbalanced liquidity coefficient. The imbalanced liquidity coefficients are displayed in Fig. 5.

Table 6. Matrix for maturity-matched assets and liabilities of the fourth group of commercial banks as of December 31, 2006 (ths.LVL)

Assets/Liabilities	Up to1 month	1 to3 months	3 to 6 months	6 to12 months	1 to 5 years	Over 5 years	Others	Total assets
Up to1 month	131553							131553
1 to 3 months	3526	20250						23776
3 to 6 months	7956		16764					24720
6-12 months	8323			37383				45706
1 to 5 years					249055			249055
Over 5 years	**50918**				12334	139679	7389	210320
Others								-
Total liabilities	202276	20250	16764	37383	261389	139679	7389	685130

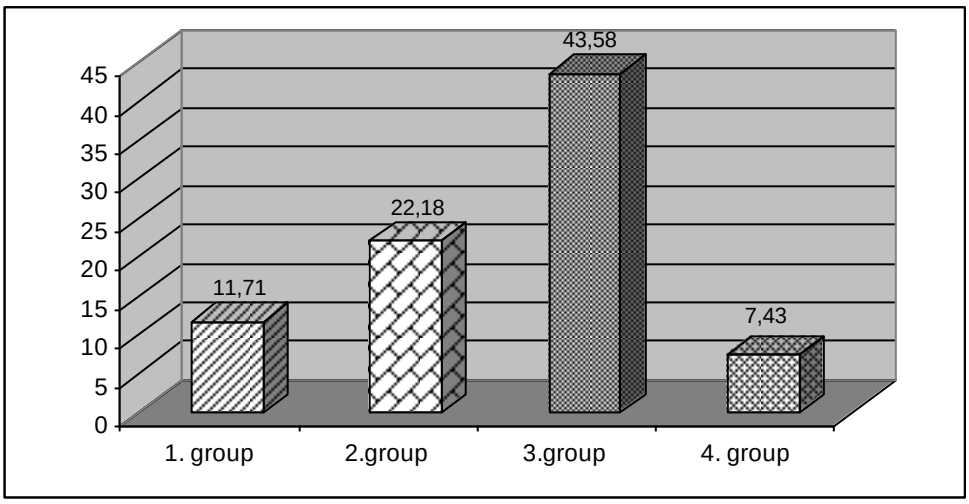

Figure 5. Latvian Commercial Bank's Liquidity Imbalance Ratio at the end of 2006 (%)

The imbalanced liquidity coefficients have confirmed the above-made conclusions with regard to the degree of the assets and liabilities mismatch of Latvian commercial banks in the context of different bank groups. The techniques used by the authors in the assessment of Latvian commercial banks liquidity risk made it possible to draw the following conclusions: the state owned bank *Mortgage bank* has the best balanced structure of its assets and liabilities (see Fig. 4 and 5). Being conservative in the context of risk, *Mortgage bank* pays great attention to the control of risks, including the liquidity risk.

It is necessary to note that the bank had a big portfolio of credits. In the assets structure, the portfolio of loans at the end of 2006 made up 72%, which is the highest ratio in the context of bank groups (see Fig. 6).

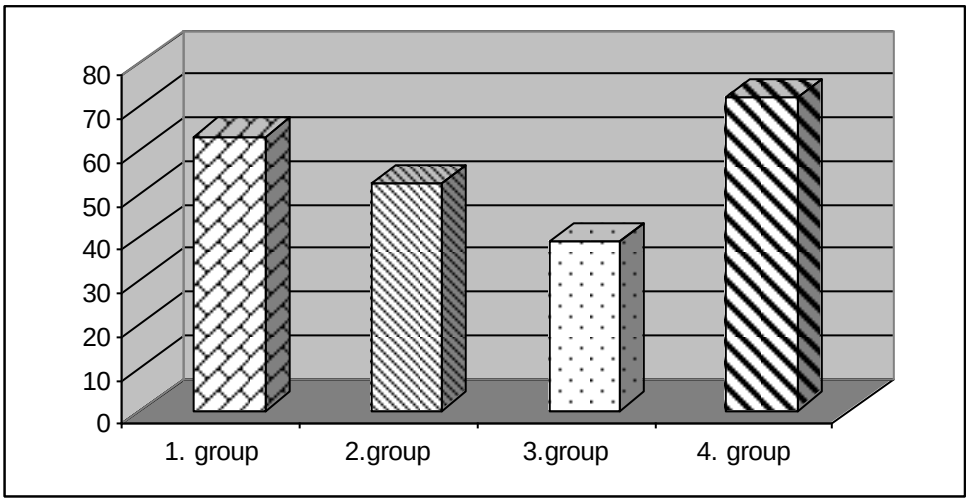

Figure 6. Latvian Commercial Bank's Portfolio of Loans in the Assets Structure at the end of 2006 (%)

A big proportion of loans demands a creation of adequate terms resource base. At the end of 2006, 58% of the resource base of the *Mortgage bank* was made up by its medium- and long-term resources, which had the following structure: 69% - commitments to credit institutions, 3% - deposits of private and juridical entities, 10% - the emission of mortgage bonds, 15% - the bank owned equity, 3% - subordinated resources. Thus, we can see that this bank has a well-diversified long-term resource base.

The 1st bank group – banks with foreign capital - is characterized by a sufficiently balanced liquidity level (11,7 % - the imbalanced liquidity coefficient and 18,4 % – the transformation coefficient). It is the biggest bank group – their share of assets in the system structure constitutes 58% (see Fig. 7). The majority of this group of banks is subsidiary companies of large European bank groups with a well-established risk management system.

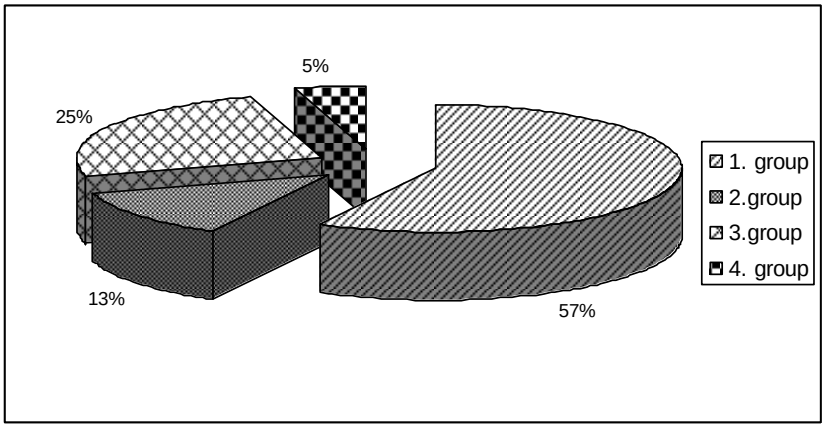

Figure 7. Latvian Commercial Bank's Asset Structure at the end of 2006, %

The 2nd bank group – banks with mixed capital – are on the borderline of balanced liquidity (22,2 % - the imbalanced liquidity coefficient and 26,75 % - the transformation coefficient). This situation can be explained by the fact that several banks in this group have not yet fully introduced an imbalanced liquidity risk control system.

The 3rd bank group - banks with Latvian private capital - experience the most acute problems with imbalanced liquidity. This bank group share in the bank system assets constituted 25% in 2006 (see Fig.7). The imbalanced liquidity coefficient of this group was 43,58% and the transformation coefficient was 51,7%, which testifies to the inadequite attention paid by the banks' administration to the liquidity management. This group of banks was characterized by a large amount of demand accounts and term deposits- up to 1 month - resources (62% of total liabilities) (see Fig. 8). The greatest part of short-term deposits make an unstable bank resource base, so called „hot money". Banks which invest their „hot money" into long-term or medium-term investments are highly exposed to the risk of imbalanced liquidity. Since this group of banks are quite active in crediting (the credit market share of this bank group being 20% (see Fig. 8) and their credit portfolio being 38,7% in the assets structure (see graph 6)), a considerable part of demand accounts and up to 1 month resources is used in credit operations.

The authors of the article strongly recommend that risk managers of this bank group should pay serious attention to the formation of long-term and medium-term liabilities, and, in particular, need to consider a possibility of issuing long-term debt securities, as well as possibility of attracting subordinated capital.

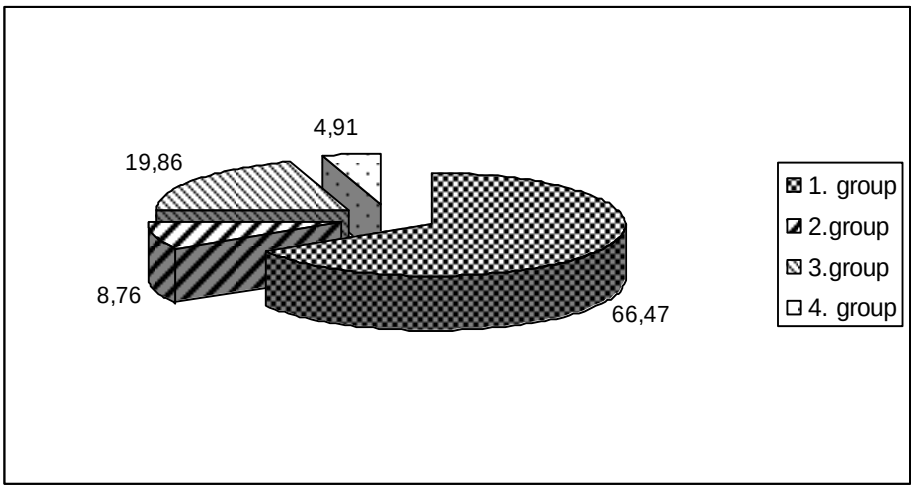

Figure 8. Latvian Commercial Bank's Credit Portfolio Structure at the end of 2006, %

4. Conclusions

Based on the results of the research the authors have come to the following conclusions:

1. On the basis of the gap analysis results it has been established that the state-owned *Mortgage Bank* is characterized by the lowest risk of maturity mismatch. At the end of 2006, its liquidity gap for the time period from 1 to 5 years was slightly above 1% of Bank's total assets. At the same time, this bank had the lowest up to 1 month gap ratio (10.7%) which is indicative of an insignificant redistribution of the bank's current liabilities into short- and long-term assets.
2. It has been discovered by the authors that the 3rd group banks, whose capital belong to Latvian private business, had the highest up to 1 month gap ratio (33.5%) at the end of 2006. This indicated a surplus of current liabilities (with residual maturities up 30 days), a certain share of which was redistributed by the banks to cover their short-term and long-term active operations.

3. The 1st group banks – established on the basis of foreign capital, and the 2nd group – mixed-capital banks, had a current gap ratio of 21.2% and 20.2% respectively.
4. The analysis of the long-term (over 1 year) assets and liabilities mismatching shows that it was the 3rd and the 2nd group banks that had the highest mismatch between asset-liability maturities characterized by the shortage of long-term resources. At the end of 2006 in the 3rd group of banks the liquidity gap ratio for the time period from 1 to 5 years was 21%, and for the time period over 5 years – 23.2%. In the 2nd group it was 14.6% and 6.4% respectively.
5. The computed results of the cumulative gap have revealed that the 3rd group banks are characterized by the highest maturity mismatches between liabilities and assets, which means that this particular bank group is exposed to a high liquidity risk.
6. The analysis of assets-liabilities structure also has revealed that it is the 3rd group banks that experience the most acute shortage of long-term resources: there was a 74.5% shortage of resources with residual maturities from 1 to 5 years and a 71.7% shortage of resources with maturities over 5 years at the end of 2006.
7. The second place with regard to long-term resources shortage was occupied by the 2nd group banks: at the end of 2006 the shortage of resources with residual maturities from 1 to 5 years was 69%, and for those over 5 years – 42%.
8. The 1st group of banks was characterized by the availability of certain amount of excess resources with residual maturities from 1 to 5 years (9%). On the other hand, the group had a sufficiently high deficit of resources with residual maturity over 5 years (51%).
9. The results of the analysis of variables showing the transformation of short-term resources into long-term assets have revealed that the 3rd group of banks had the highest transformation ratio (at the end of 2006 - 51.7%), which is indicative of the highest level of liquidity risk in this particular group. *Mortgage Bank* had the lowest transformation ratio (18.4%), which confirms the authors' conclusion of comparatively good balance between the bank's assets and liabilities with regard to the residual maturities.
10. Based on the built up matrices of maturity-matched assets and liabilities, the authors have come to the conclusion that the state-owned Mortgage bank had the best matched structure of assets and liabilities (its liquidity imbalance ratio was 7.43% at the end of 2006). The 1st group banks were characterized by a relatively low liquidity risk (their liquidity imbalance ratio was 11.7 %). Mixed-capital banks with liquidity imbalance ratio of 22.2 % are included by the authors in substantial risk group. Banks with Latvian private capital had the biggest risk of maturity mismatch. In this group average liquidity imbalance ratio made up 43.6% at the end of 2006.
11. On the whole, the level of assets and liabilities balance in Latvia could be considered sufficient, although commercial banks should pay more attention to their liquidity management.

On the basis of the obtained results and conclusions the authors of the study have worked out the following recommendations for commercial banks on how to reduce the level of maturity and amount mismatches between assets and liabilities, as well as on how to improve the liquidity management.

1. For the purpose of comparing the levels of liquidity risk assumed by different banks, the authors propose to use the liquidity imbalance ratio as well as the liquidity gap ratios.
2. To constantly assess the level of liquidity positions on the basis of gap analysis.
3. To establish and regularly review the limits for the gap positions.

4. To determine the standard values of long- and short-term liquidity ratios in internal normative documents and to monitor the compliance with these ratios.
5. To carry out a complex assessment of the liquidity positions.
6. To work out and introduce into liquidity management practice a system of various internal as well as market indicators of potential liquidity problems at the bank.
7. To conduct the analysis of factors influencing the liquidity imbalance and to identify the most significant factors that can threaten liquidity.
8. To constantly conduct the analysis of active operations of banks with a view of establishing the level of high-liquid assets with a subsequent control over their dynamics.
9. To practice a short-term liquidity planning based on cash flows.
10. To carry out the assessment of the bank's cash flows using a scenario analysis method (technique).
11. Under the threat of liquidity crisis, either to practice the regrouping assets, thus increasing the share of high-liquid resources, or to raise find additional capital through the following tools:

- share capital increase;
- acquiring subordinated liabilities;
- term deposits placed by customers;
- issuing debt securities;
- raising interbank loans.

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