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# UPRAVLJANJE RIZIKOM LIKVIDNOSTI

## Rezime

Upravljanje rizikom likvidnosti predstavlja značajnu aktivnost svake banke. Da bi bila sposobna da odgovori dospelim obavezama, banka teži da osigura i zadrži potreban nivo likvidnosti svakodnevno. Iako svaka poslovna banka ima sopstvenu metodologiju izračunavanja potrebnog nivoa likvidnosti, datu u okviru usvojenih politika, centralna banka je donela Odluku o upravljanju rizikom likvidnosti, koja predstavlja obavezujuću politiku upravljanja rizikom likvidnosti.

**Ključne reči:** finansijski rizik, rizik likvidnosti, izloženost

**JEL:** C53, D81, G11, G21

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# LIQUIDITY RISK MANAGEMENT

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## Summary

Liquidity risk management is a major activity of every bank. To be able to honor its matured liabilities, a bank strives to provide and maintain the required level of liquidity on a daily basis. Although each commercial bank has its own methodology of calculating the required liquidity level, in line with its adopted policies, the central bank has enacted the Decision on Liquidity Risk Management, prescribing the obligatory liquidity risk management policy.

**Key words:** financial risk, liquidity risk, exposure

**JEL:** C53, D81, G11, G21

## Uvod

U poslovanju bilo kog privrednog entiteta nužno postoji rizik. Rizik se može različito definisati, ali sa aspekta finansija, on predstavlja mogućnost nastanka gubitka. Mnogi umesto termina rizik koriste termin izlaganje gubitku. Razlozi upotrebe ovog termina su okolnosti ili ishodi u kome je gubitak moguć, bez obzira da li je došlo do gubitka ili ne.

Finansijske institucije (banke) su izložene finansijskim rizicima. Jedan tip finansijskog rizika je rizik likvidnosti. Sam rizik likvidnosti nije moguće u potpunosti izbeći (anulirati), zbog same prirode bankarskog poslovanja (ročnosti depozita i plasmana), ali je itekako moguće, aktivnom politikom upravljanja rizikom likvidnosti, umanjiti njegove negativne efekte. Primenom racio analize i drugih tehnika, banke teže da pouzdano izmere rizik likvidnosti, te obezbede sposobnost da odgovore na ugovorene finansijske obaveze.

## Likvidnost i upravljanje likvidnošću

Likvidnost je sposobnost finansijske institucije (banke) da izmiri svoje obaveze u rokovima dospeća. Upravljanje likvidnošću je ključni zadatak finansijske institucije i sastavni je deo upravljanja aktivom i pasivom. Banka zavisi od sopstvene sposobnosti da obezbedi tekuću likvidnost. Likvidnost je bankama potrebna za kompenzaciju očekivanih i neočekivanih nestabilnosti u bilansu, kao i za osiguranje sredstava za redovno poslovanje. Banka mora da obavlja otkup depozita, izmiruje sopstvene obaveze i da investira u kredite (plasmene) i investicioni portfolio. Likvidnost se može posmatrati kao stok ili tok. Trajna nelikvidnost vodi u nesolventnost i pokazatelj je nestabilnosti poslovanja.

Ako se posmatra kao stok, onda se za ocenu likvidnosti koriste bilansni podaci, i to onaj deo aktive koji se odmah može pretvoriti u gotovinu. Aktiva se i klasifikuje i evidentira u bilansu banke po likvidnosti, a u slučaju pojave nelikvidnosti, banka može prodati deo aktive, može da povuče likvidna sredstva sa finansijskog tržišta ili da povuče sredstva od centralne banke. Zbog obezbeđenja likvidnosti menadžment banke teži što kvalitetnijoj aktivi.

To je što utrživija, likvidnija aktiva.

Ako se likvidnost posmatra kao tok, uzima se u obzir i sposobnost banke da operacijama na finansijskom tržištu ostvari priliv likvidnih sredstava. Većina finansijskih transakcija, baš kao i svaka obaveza, ima uticaja na likvidnost finansijske institucije - banke. Efikasno upravljanje likvidnošću podrazumeva premošćavanje jaza (gepa) između ročnosti depozita i ročnosti plasmana. Ročna neusklađenost uključuje finansiranje srednjeročnih i dugoročnih plasmana iz kratkoročnih izvora.

Upravljanje likvidnošću je od izuzetnog značaja, jer nelikvidnost jedne finansijske institucije može prouzrokovati posledice za ceo finansijski sistem, te mogu nastati sistemske posledice.

Procena likvidnosti zasniva se na prognoziraju rasta depozita i potrebi angažovanja dodatnih sredstava. Problem tražnje za novim sredstvima se javlja ako banka odobri veći obim kredita od rasta depozita ili ako odobri više kredita uz isti rast depozita, a centralna banka podigne stopu obavezne rezerve. Dodatna likvidna sredstva banka obezbeđuje ili pozajmicom od centralne banke ili od drugih banaka.

Upravljanje likvidnošću, na kratkrok, se postiže putem upravljanja aktivom, a na srednji rok i kroz upravljanje strukturom pasive. Nivo likvidnosti je individualan za svaku finansijsku instituciju, a bilansna pozicija aktive može likvidno varirati, u zavisnosti od potražnje za sredstvom iz aktive. Zadatak finansijskog menadžera je da u bilansima uvek ima precizno određene aktive (finansijske instrumente) koje su lako utržive. Sama aktiva bilansa se analizira istorijski, prema potrebama za finansiranjem, prema tekućoj likvidnosti i po očekivanim budućim potrebama za finansiranjem i po mogućnostima za dalje, buduće privlačenje sredstava. Taj iznos likvidne aktive, koji banka održava da bi imala tekuću likvidnost, zavisi od njene depozitne strukture i zahtevima za smanjenje, održaj ili rast kreditnog i investicionog portfolia.

Potrebe za gotovinskom likvidnošću se utvrđuju sastavljanjem preseka ročnosti sa očekivanim prilivima i odlivima u budućim vremenskim periodima. Razlika u prilivu i

## Introduction

Operations of all business entities always entail certain risks. Risks can be defined in different ways, but from the aspect of finance, they represent the possibility of loss. Instead of the term *risk*, many people prefer the term *loss exposure*. The reasons to use this term are circumstances or outcomes in which a loss is possible, regardless of whether that loss was actually materialized or not.

Financial institutions (banks) are exposed to financial risks. One type of financial risks is liquidity risk. Liquidity risk itself is impossible to fully avoid (annul), due to the very nature of banking business (maturity of deposits and placements), but it surely is possible, through an active liquidity risk management policy, to mitigate its negative effects. By implementing ratio analyses and other techniques, banks are striving to measure liquidity risk in a reliable way, thereby ensuring their own capability to honor the arranged financial liabilities.

## Liquidity and Liquidity Management

Liquidity is the ability of a financial institution (bank) to settle its liabilities upon their maturity. Liquidity management is the key task of every financial institution, being an integral part of assets and liabilities management. A bank depends on its own ability to provide current liquidity. Banks require liquidity to compensate expected and unexpected volatilities in their balance sheets, and to ensure funds for their regular operations. Banks have to purchase deposits, settle their own liabilities and invest in loans (placements) and investment portfolios. Liquidity can be viewed either as a stock or as a flow. Permanent illiquidity leads to insolvency and indicates unstable business operations.

If viewed as a stock, liquidity is assessed on the basis of balance sheet data, in particular the section of assets that can promptly be turned into cash. Assets are classified and recorded in a bank's balance sheet according to liquidity, and in case of illiquidity, the bank can sell a part of its assets, it can either withdraw liquid funds from the financial market or withdraw funds from the central bank. In order to ensure liquidity, a bank's management strives towards

assets of the highest possible quality. And those are marketable, liquid assets.

If liquidity is viewed as a flow, what is also taken into consideration is the bank's ability to achieve an inflow of liquid funds through its operations on the financial market. Most financial transactions, just like every liability, exert an impact on liquidity of a financial institution (bank). Efficient liquidity management implies bridging the gap between the maturity of deposits and maturity of placements. Maturity mismatch includes the financing of middle-term and long-term placements from short-term sources.

Liquidity management is of utmost importance, given that illiquidity of one financial institution may cause some serious consequences to the entire financial system, thereby leading to systemic repercussions.

Assessment of liquidity is based on projecting the growth of deposits and the need to engage additional funds. A problem with demand for new resources occurs if a bank extends a volume of loans higher than the growth of deposits, or if it allows several loans with the unchanged growth of deposits, and the central bank increases the required reserves rate. Additional liquid funds are procured by a bank through a loan either from the central bank or from other banks.

Short-term liquidity management is achieved through asset management and in the medium term through liability management as well. The liquidity level is individual for each financial institution, and the balance sheet items on the asset side can vary in terms of liquidity, depending on the demand for the concerned assets. The task of a financial manager is to always keep precisely defined, easily marketable assets (financial instruments) on the balance sheet. Balance sheet assets themselves are analyzed historically, according to the needs for finance, according to current liquidity and expected future needs for finance and according to the possibilities for future mobilization of funds. The amount of liquid assets, which the bank keeps in order to maintain current liquidity, depends on its deposit structure and requests for reduction, maintenance or growth of its lending and investment portfolios.

The needs for cash liquidity are determined

odlivu svakog budućeg perioda je polazna tačka za budući višak ili manjak. U praksi, finansijska institucija - banka obezbeđuje likvidnost visokolikvidnim sredstvima iz trgovačkog portfolia ili prodajom manje likvidnih sredstava (višak imovine ili ulaganja). Usled cikličnih, sezonskih i drugih činioca ukupni zajmovi i depoziti se mogu kretati u suprotnim smerovima, što rezultira većom tražnjom za zajmovima od količine raspoloživih depozita. Institucija koja se oslanja na upravljanje aktivom treba da ograniči rast zajmova na nivo koji može podržati raspoloživim depozitima. Alternativa je da se potrebe za likvidnošću obezbede preko izvora pasive, kao što je tržište novca.

Problem likvidnosti nastaje kada deponenti počnu da masovno povlače svoje depozite, najčešće zbog negativnih glasina po finansijsku instituciju, banku (rizik reputacije). Tako nastaje nezaustavljiva lavina, tzv. juriš na banke (*bank run*) - situacija kada se rapidno povlače sredstva, a banka nema mogućnosti da obuzda zahteve deponenata. Naravno, ovo ne važi samo za jednu finansijsku instituciju - banku, već, iskustveno, kad krene povlačenje iz jedne finansijske institucije (banke, investicionog fonda), ono se prelijeva i na druge institucije, te i druge dovodi u problem nelikvidnosti. Zato postoji sistem osiguranja depozita, kojim se sprečava problem nastanka nelikvidnosti institucija, a za deponente predstavlja garanciju sigurnosti sredstava.

Sam proces upravljanja likvidnošću ima zadatak da:

- Uveri deponente, tj. tržište da je banka sposobna da izmiruje obaveze;
- Omogući banci da izmiruje obaveze;
- Obezbedi izbegavanje neželjene prodaje aktive;
- Omogući uzajmljivanje sredstava od centralne banke, uz zalogu hartija od vrednosti;
- Da smanji spread koji je vezan za rejting i kreditni *default* - koji banka mora da plati pri uzajmljivanju sredstava na tržištu.

Zakonodavstvo u svim zemljama propisuje oprezno regulisanje likvidnosti, najviše zbog samog uticaja nelikvidnosti jedne finansijske institucije na celokupan finansijski sistem. Zbog toga i postoji stalni zahtev nadzornih tela i organa (centralna banka) sa naglaskom na

zalihama stabilne aktive. Bankama je u interesu da utvrde opreznu politiku likvidnosti, a ne da radi većih bonusa za menadžere ugrožavaju opstanak institucije. Oprezni menadžment se oslanja na ograničenja koja obezbeđuju likvidnost: ograničenje plasmana i depozita, zajma i kapitala, korišćenja sredstava po različitim izvorima, donjeg i gornjeg procenta likvidnih sredstava u odnosu na ukupnu aktivu, ograničenje određenog izvora (pasive), itd.

Rizik likvidnosti spada u grupu vodećih finansijskih rizika u bankarstvu. Predstavlja mogućnost da banka ne poseduje dovoljno likvidnih sredstava za izmirenje dospelih obaveza ili rizik pojave neočekivanih odliva likvidnih sredstava. On obuhvata:

- Ročni aspekt, povlačenje i opoziv - moguća neusklađenost između plaćanja obaveza i naplate potraživanja (uzimajući u obzir kašnjenja u naplatama) ili neočekivane visoke odlive po osnovu plaćanja;
- Strukturalni aspekt - odnosi se na troškove likvidnosti nastale usled zatvaranja gepeva likvidnosti, koji bi se promenili ako bi samo refinansiranje poskupelo zbog smanjenja kreditnog rejtinga;
- Aspekt neočekivanog događaja - mogućnost da budući događaji uslove potrebu za većom likvidnošću, no što je sada potrebna;
- Aspekt finansiranja - mogućnost da institucija ne bude u stanju da izmiri budući novčani tok;
- Aspekt tržišta - mogućnost da lako utrži aktivna nije tako lako utrži, kao i da se na tržištu ne dobije nominalna vrednost gotovinskog ekvivalenta (ili minimalno umanjena), već značajno umanjena, što teoretetski znači, da je institucija, iako solventna, nelikvidna;

Rizik likvidnosti predstavlja i mogućnost pojave nedostatka sredstava potrebnih za zadovoljenje pojačane tražnje klijenata za kreditima (tada nastaje i potreba za finansijskim sredstvima) ili povlačenja depozita od deponenata. Pri nastanku problema sa likvidnošću, banke dolaze do sredstava unovčavanjem nenovčanih bilansnih pozicija ili pribavljanjem novih izvora sredstava. Ali u krajnjoj nuždi banke mogu da posegnu za sredstvima kod centralne banke, te da uzmu kredit za održanje likvidnosti.

by composing a cross-section of maturities with expected inflows and outflows in the future time intervals. The difference in inflows and outflows in each of these future periods is the starting point for future surpluses or deficits. In practice, a financial institution (bank) provides liquidity by means of highly liquid funds from the trading portfolio or by selling less liquid funds (surplus of assets or investments). Due to cyclical, seasonal and other factors, the total loans and deposits can move in opposite directions, which results in demand for loans being higher than the amount of available deposits. An institution relying on asset management should limit the growth of loans to the level that can be supported by available deposits. Alternatively, the needs for liquidity can be met through liability sources, such as money market.

A problem with liquidity occurs when depositors start to massively withdraw their deposits, most typically due to negative rumors about the financial institution, i.e. bank (reputational risk). This is what triggers an unstoppable avalanche, the so-called bank run - a situation when funds are being rapidly withdrawn, with the bank being unable to control the demands of its depositors. Of course, this does not involve just one financial institution (bank). On the contrary, the experience has shown that once the funds start to be withdrawn from one financial institution (bank, investment fund), the situation then spills over to other institutions, making them, too, face the problem of illiquidity. This is why there is a deposit insurance system, which prevents the problem of illiquidity in financial institutions, at the same time providing a guarantee for the depositors that their funds are safe.

Liquidity management process itself has the task to:

- Convince the depositors, i.e. the market that the bank is capable of honoring its liabilities;
- Enable the bank to settle its liabilities;
- Enable the bank to avoid the fire sale of assets;
- Enable borrowing from the central bank, with securities as collateral;
- Reduce the spread related to rating and credit default, which the bank has to pay when borrowing funds on the market.

Legislation in all countries prescribes prudential liquidity regulations, mostly because of the impact that illiquidity of one financial institution can have on the entire financial system. This is the reason why there is a permanent requirement of supervisory bodies and authorities (central bank) insisting on stable asset supplies. It is in the banks' interest to define a prudent liquidity policy, and not to jeopardize the institution's survival for the sake of higher bonuses for their managers. Prudential management relies on limitations ensuring liquidity: limited placements and deposits, loans and capital, usage of funds from different sources, lower and upper percentage of liquid funds compared to total assets, limitation of certain sources (liabilities), etc.

Liquidity risk is one of the major financial risks in banking. It implies the possibility of a bank not owning sufficient liquid funds to settle its matured liabilities, or the risk of unexpected outflows of liquid funds. It encompasses the following:

- Maturity aspect, withdrawal and cancellation - potential mismatch between settling liabilities and collecting receivables (defaults being taken into account) or unexpectedly high outflows in respect of payments;
- Structural aspect - referring to liquidity costs due to closing liquidity gaps, which could change if the refinancing price went up due to lowered credit rating;
- Unexpected event aspect - possibility of future events conditioning the necessity for a liquidity level higher than the one required at the moment;
- Financing aspect - possibility of an institution not being able to settle its future cash flow;
- Market aspect - possibility of easily marketable assets becoming less marketable, and not getting the nominal value of the cash equivalent (or minimally reduced equivalent) on the market, but a considerably reduced one, which theoretically means that the institution, though solvent, is illiquid.

Liquidity risk also refers to the possibility of a lack of funds required to satisfy the increased clients' demand for loans (the need for financial funds also arises at that moment), or the possibility of depositors withdrawing their

Rizik likvidnosti nastaje usled naglih promena u podmirivanju obaveza banke, koja je prinuđena da proda deo aktive po nižoj ceni i/ili uzajmi sredstva sa kamatom višoj od realne.

Postoji kolizija između likvidnosti i profitabilnosti. Banka mora da održava likvidnost, ali, sa druge strane sasvim je razumno da želi i veću profitabilnost, dakle, želi da plasira što je moguće više sredstava. Viši plasmani dovode do povećanja izloženosti riziku likvidnosti. Korelacija između rizika likvidnosti i profitabilnosti ogleda se u pravilu da su jeftiniji izvori sredstava kraćeg roka dospeća, a profitabilniji plasmani dužeg roka dospeća.

S obzirom da plasmani nisu podobni za održanje likvidnosti, banka uvek mora raspolagati sa portfoliom lako utrživih hartija od vrednosti - finansijskih instrumenata koji nose niske prinose (lako utržive hartije i gotovina, uz sredstva na deviznim računima i izdvojena sredstva kod centralne banke čine primarnu rezervu likvidnosti). U svrhu obezbeđenja likvidnosti zakonom je propisana i stopa obavezne rezerve kod centralne banke.

Ne postoje dve finansijske institucije - banke na koje bi se primenjivale iste politike likvidnosti i iste procedure za obezbeđenje likvidnosti, ali je svaka finansijska institucija - banka dužna da razvije organizaciju i sistem merjenja likvidnosti. Na rizik likvidnosti se može dvojako gledati. Kao na onaj koji nastaje usled neusklađenosti izvora i plasmana po dospeću i na onaj koji nastaje usled nemogućnosti banke da proda aktivu (po razumno očekivanoj ceni) i uzajmi sredstva (po razumno očekivanoj ceni). Radi obezbeđenja stabilnog, pouzdanog i profitabilnog bankarstva finansijske institucije - banke ugrađuju smernice iz Bazelskog sporazuma.

## Planiranje likvidnosti

Kod planiranja likvidnosti procenjuju se budući novčani tokovi banke i istražuju se mogućnosti obezbeđenja likvidnosti. Planiranje se vrši uz pretpostavku normalnih ekonomskih uslova, uslova krize likvidnosti i uslova opšte tržišne krize. Na osnovu predviđanja, koristeći raspoloživu likvidnu imovinu banka planira sredstva za obezbeđenje likvidnosti. Često se polazi od najgoreg mogućeg scenarija po banku. U plan se unosi i procena o sposobnosti za

zaduživanjem i rejtingu banke na finansijskom tržištu. U planu se zahteva analiza aktive promenljive utrživosti, analiza pasive sa neugovorenim dospećem (neki specifični oblici štednje i depoziti po viđenju).

Aktiva se kategorizuje po stepenu likvidnosti. Svaka pozicija ima drugi stepen likvidnosti. Banke koriste kategorizaciju pa svrstavaju bilansne pozicije aktive u likvidne i nelikvidne hartije od vrednosti, utrživu aktivu, manje likvidnu aktivu i fiksnu aktivu.

Kod pozicija pasive (depoziti po viđenju), koristi se iskustveno - istorijska analiza, procena na osnovu istorijskih kretanja obaveza. Kompleksniji modeli uzimaju u obzir i kretanje kamatne stope, tržišne promene i opšte makroekonomske promene.

Planiranjem stvaramo preduslove za efikasno suočavanje sa potencijalnom narušenom likvidnošću. U svakom planu nalaze se: utržive hartije, diverzifikacija izvora likvidnosti, kalkulisanje premije rizika likvidnosti u proizvod banke.

### Likvidnost Vs. Utrživost

Likvidnost je „strožiji“ pojam od utrživosti. Utrživost podrazumeva da, ako se želi prodati hartija, za nju uvek postoji spremno tržište (kupac), dok likvidnost znači da postoji tržište, ali i da je možete prodati bez znatnog popusta. Pravilo je da što je likvidnost/utrživost niža, mora postojati veći prinos, kako bi se privukli investitori. Iskusni investitori uzimaju u obzir koliko je verovatno da će im biti potreban novac u kratkom roku i prema toj hartiji postavljaju minimalno potreban nivo likvidne imovine u portfoliu. Različite investicije (oblici finansijske imovine) se mogu različito vrednovati:

	Sigurnost	Prinos	Likvidnost / Utrživost
<b>Obveznice</b>			
Kratkoročne	Najveća	Vrlo stabilan	Dobra / Dobra
Dugoročne	Vrlo dobra	Vrlo stabilan	Dobra / Prosečna
<b>Akcije</b>			
Povlašćene	Relativno dobra	Stabilan	Dobra / Prosečna
Obične	Često najniža	Varira	Dobra / Slaba

deposits. When faced with liquidity problems, banks procure funds by cashing non-monetary balance sheet items or by acquiring new sources of finance. As a last resort, banks can rely on the funds provided by the central bank, taking a liquidity loan.

Liquidity risk occurs due to sudden changes in settling liabilities of a bank, which is forced to sell a section of its assets at a lower price and/or borrow funds at an interest higher than the real one.

There is a collision between liquidity and profitability. A bank has to preserve liquidity, but, on the other hand, it is quite reasonable that it also wants higher profitability, meaning that it wants to place as many funds as possible. Higher placements lead to increased exposures to liquidity risk. The correlation between liquidity risk and profitability is reflected in the rule that sources of finance with shorter maturity are cheaper, whereas placements with longer maturity are more profitable.

Given that placements do not help maintain liquidity, a bank's portfolio always has to contain easily marketable securities - financial instruments with low revenues (easily marketable securities and cash, alongside the funds on FX accounts and funds held separately at the central bank, account for the primary reserves of liquidity). With a view to preserving liquidity, there is also a legally prescribed rate of required reserves held at the central bank.

You cannot find two financial institutions (banks) to which you could apply the same liquidity policies and the same liquidity maintenance procedures, but each financial institution (bank) is obliged to develop its own organization and a system of liquidity measurement. There are two ways to consider liquidity risk. As a risk occurring due to the mismatched maturities of sources and placements, and as a risk occurring due to the bank's inability to sell its assets (at a reasonably expected price) and borrow funds (at a reasonably expected price). In order to ensure a stable, reliable and profitable banking, financial institutions (banks) implement the Basle Accord guidelines.

## Liquidity Planning

The process of liquidity planning includes the assessment of a bank's future cash flows and the exploration of possibilities for providing liquidity. The planning is conducted under the assumption of normal economic conditions, liquidity crisis conditions and the conditions of a general market crisis. Based on its projections, using the available liquid assets, a bank is planning the funds for the preservation of liquidity. It frequently starts from the worst-case scenario for the bank. The plan is also to include the assessment of the bank's creditworthiness and rating on the financial market. Moreover, the plan requires the analysis of assets with variable marketability, and the analysis of liabilities with unfixed maturity (some specific forms of savings and sight deposits).

Assets are categorized according to their liquidity level. Each item has a different level of liquidity. Banks resort to categorization, thereby classifying balance sheet items on the asset side into liquid and illiquid securities, marketable assets, less liquid assets and fixed assets.

When it comes to items on the liability side (sight deposits), a bank uses the experience-based, historical analysis, i.e. the assessment based on historical movements of liabilities. Some more complex models also take into account the interest rate movements, market changes and general macroeconomic changes.

By planning, we generate the preconditions to efficiently deal with the potentially threatened liquidity. Each plan contains: marketable securities, diversification of liquidity sources, and calculation of the liquidity risk premium into the bank's product.

### Liquidity versus Marketability

Liquidity is a more "rigid" term than marketability. Marketability implies that, if someone wants to sell a security, there is always a ready market (buyer) for it, whereas liquidity means that the market exists, but that you can sell it with no substantial discount. The rule is: the lower the liquidity/marketability, the higher the revenue, for the sake of attracting investors. Experienced investors take into account how probable it is that they will be needing money in the short term, and in respect of that security



## Politika upravljanja rizikom likvidnosti

Politiku i strategiju upravljanja rizikom likvidnosti odobrava Upravni odbor finansijske institucije - banke ili Odbor za upravljanje rizicima. Izvršni odbor i senior menadžment uspostavljaju, primenjuju i ocenjuju politike, primenjuju strategije, nadgledaju i daju preporuke za poboljšanje efikasnosti procesa upravljanja rizikom likvidnosti i nadziru upravljanje rizikom likvidnosti. Gledano kroz funkcije, Tresury funkcija: dnevno upravlja likvidnošću i rizikom likvidnosti, optimizuje gotovinski tok, obezbeđuje sredstva za poslovanje poslovnih jedinica, planira kratkoročnu i dugoročnu likvidnost. Središna služba: preporučuje metodologiju za upravljanje rizikom likvidnosti, nadgleda limite, analizira gotovinske tokove u normalnim i očekivanim stresnim situacijama, planira poslovanje u slučaju nepredviđenih okolnosti. Pozadinska služba izvršava: odliv sredstava, proverava dokumentaciju koja se odnosi na odliv, meri rizik i izveštava o izloženosti riziku. Interna revizija vrši: reviziju procesa upravljanja rizikom likvidnosti, obezbeđivanje usaglašenosti poslovanja sa politikama i limitima, izveštavanje Odbora za reviziju.

Da bi efikasno upravljala rizikom likvidnosti banka mora da izradi adekvatnu politiku upravljanja istim, da ima menadžment informacioni sistem (MIS), da poseduje odgovarajuću organizacionu strukturu i da ima pripremljen plan obezbeđenja likvidnosti u slučaju nepredviđenih događaja.

Proces upravljanja rizikom započinje prikupljanjem podataka o prilivu i odlivu sredstava. Ti tokovi se kategorizuju i na osnovu istih se računaju neto potrebna sredstva, koja se mapiraju na skalu dospuća (ročnosti). Dalje, sama procena odvijanja poslovnih aktivnosti (subjektivna analiza menadžmenta) je veoma bitna, jer i ona utiče na neto potrebna sredstva. Dobijeni rezultati se unose u bazu i testiraju (*back testing*), te se tako formiraju neto potrebna sredstva prema predviđenim (modeliranim). Testiranje (koje je zasnovano na predhodnim događajima i dobijenim rezultatima) je važan korak, jer potvrđuje pretpostavke iz procesa merenja. Za potrebe top menadžmenta (kao

i za potrebe Upravnog Odbora) sastavljaju se izveštaji po kojima se donose odluke. Izveštaji moraju biti realna slika stanju u portfoliima i odraz procene rizika likvidnosti. Oni su sažeti i precizni da bi ispunili svoju namenu - pravovremeno i pravilno donošenje relevantnih upravljačkih odluka.

Rizikom likvidnosti se upravlja:

- Upravljanjem aktivom, to jest uticajem na veličinu likvidne aktive (na primer, pretvaranjem manje likvidnih oblika imovine u novac);
- Upravljanjem pasivom, tj. povećanjem obaveza u situacijama nelikvidnosti, novim zaduživanjem na tržištu novca i kapitala, privlačenjem depozita klijenata, itd;
- Upravljanjem aktivom i pasivom, tj. kombinacijom gore navedenih metoda.

Upravljanjem aktivom i pasivom se upravlja rizikom likvidnosti, ali i drugim povezanim finansijskim rizicima (kamatnim rizikom, tj. rizikom promene kamatne stope, kreditnim, rizikom reputacije ili poverenja).

### Upravljanje aktivom

Banke povećavaju likvidnost efikasnim upravljanjem aktivom. One poseduju rezerve likvidnosti, koje se dele na primarne i sekundarne rezerve likvidnosti. Primarne čine izdvojena sredstva kod centralne banke, sredstva na deviznim računima u inostranstvu i gotovina. Rezerve se mogu i ne moraju koristiti od strane banke, u zavisnosti od zemlje do zemlje. Rezerve delimo na obavezne rezerve (*Required reserves*) - koje propisuje centralna banka i višak likvidnosti (*Excess reserves*) - deo sredstava na računima centralne banke, koji prelazi iznos obavezne rezerve i koje banka može koristiti. Poslovnom politikom banke, tj. politikom likvidnosti banka može da ima i sigurnosne rezerve (likvidnosti), definisane procentom u odnosu na depozite po viđenju.

Delovi aktive koje banka koristi za obezbeđenje likvidnosti su: gotovina i gotovinski ekvivalenti, obavezna rezerva, sigurnosna rezerva (ako politikom banke postoji), plasmani kod finansijskih institucija, dužničke hartije od vrednosti, akcije i udeli u investicionim fondovima. Dalje tu su i krediti dati klijentima (plasmani) i osnovna sredstva. Kako je u aktivni najveći udeo kredita, postoji

they set a minimally required level of liquid assets on the portfolio.

Different investments (types of financial assets) can be valued differently:

	Safety	Revenue	Liquidity / Marketability
<b>Bonds</b>			
Short-term	The highest	Very stable	Good / Good
Long-term	Very good	Very stable	Good / Average
<b>Shares</b>			
Preferred	Relatively good	Stable	Good / Average
Common	Often the lowest	Varying	Good / Poor

## Liquidity Risk Management Policy

The policy and strategy of liquidity risk management is approved by the Board of Directors or Risk Management Committee of the concerned financial institution (bank). The Executive Board and senior management establish, implement and assess relevant policies; implement strategies; issue recommendations to improve the efficiency of the liquidity risk management process; and supervise liquidity risk management itself. Viewed by functions - Treasury Department: manages liquidity and liquidity risk on a daily basis; optimizes cash flows; procures funds for the operations of business units; plans short-term and long-term liquidity. Middle Office: recommends methodology for liquidity risk management; supervises relevant limits; analyzes cash flows in normal and expected stressful situations; conducts contingency planning. Back Office: deals with the outflows of funds; executes the check-ups of relevant documentation referring to outflows; measures the risk and reports on the relevant risk exposure. Internal Audit: conducts the audit of liquidity risk management process; harmonizes business operations with relevant policies and limits; reports to the Auditing Committee.

In order to manage liquidity risk efficiently, a bank must prepare an adequate liquidity risk management policy, and have the management information system (MIS), alongside the

appropriate organizational structure and a prepared liquidity contingency plan.

The risk management process commences with the collection of data on inflows and outflows of funds. These flows are categorized and, based on them, the net funds required are calculated, which are then mapped on the maturity scale. Furthermore, the assessment of business activities (subjective analysis of the management) is, in itself, very important, because it also impacts the net funds required. The obtained results are entered into the database and tested (back-testing), thereby establishing the net funds required according to the predicted (modeled) amounts. Testing (based on past events and obtained results) is a significant step, given that it confirms the assumptions made in the measurement process. For the sake of top management (and the Board of Directors), the bank compiles and submits relevant reports, which are used as the basis in decision-making. The reports have to realistically depict the position in the portfolios, and reflect the liquidity risk assessments. They are concise and precise, so that they could fulfill their purpose - i.e. facilitating timely and proper managerial decisions.

Liquidity risk is managed by means of:

- Asset management, i.e. by affecting the size of liquid assets (for instance, by turning less liquid types of assets into cash);
- Liquidity management, i.e. by increasing liabilities in illiquidity situations, through new borrowings on the money and capital markets, through attracting client' deposits, etc.;
- Asset and liquidity management, i.e. by combining the above stated methods.

Through asset and liability management one manages liquidity risk, but other related financial risks as well (interest rate risk, credit risk, reputational or confidence risk).

### Asset Management

Banks increase their liquidity by means of efficient asset management. They own liquidity reserves, which are divided into primary and secondary reserves of liquidity. Primary reserves include the funds allocated at the central bank, funds on foreign FX accounts and cash. Reserves can, but do not have to be used by the bank, depending on the country.

problem upravljanja kreditnim rizikom, koji u slučaju *default*-a povećava rizik likvidnosti.

Da bi se odgovorilo na dnevne potrebe za likvidnošću, dnevno se meri neto likvidnosna pozicija banke, kroz procenu izvora likvidnosti i procenu dnevnih obaveza.

### Upravljanje pasivom

Upravljanje pasivom se primenjuje radi povećanja likvidnosti kroz prodaju hartija od vrednosti ili kratkoročno uzajmljivanje na tržištu novca za premošćavanje problema likvidnosti. Ovako banka povećava likvidnost bez smanjenja aktive.

U pasivi bilansa banke nalaze se depoziti deponenata, međubankarski depoziti, zajmovi centralne banke, depoziti matične banke.

Kada se govori o riziku likvidnosti i pasivi bilansa, polazna tačka je procena strukture, vrste i stanja (stabilnosti i kvaliteta) depozita. Za ovu procenu moramo razmotriti:

- Izbor depozitnog proizvoda - sagledati različite vrste depozita, po broju računa, saldu (iznosu), uslovu deponovanja, valuti, dospeću, pasivnoj kamati i poreskim troškovima;
- Upravljanje depozitima - sagledati sistem evidentiranja i praćenja depozitnih transakcija i pristupa računima, obračuna i načina plaćanja kamata, praćenje strukture depozita (radi utvrđivanja koji su depoziti stalnog karaktera, stabilni, koji su sezonski, a koji nepostojani);
- Koncentraciju depozita - obično u bankama mali broj klijenata drži procentualno velika deponovana sredstva (u odnosu na ukupne depozite). Za svaki ovakav depozit treba izraditi pregled uslova ročnosti, cena i raspolaganja. Banke se sve više oslanjaju na ovakve depozite (i sredstva finansijskog tržišta), a sve manje na depozite po viđenju i na kratko oročena sredstva.

Za banku je bitna mogućnost pristupa finansijskom tržištu, i to tržištu novca, radi kratkoročnog zaduživanja. Najčešće se banke zadužuju na međubankarskom tržištu (segmentu tržišta novca). Tu se javlja problem nemogućnosti sigurne i pouzdane procene količine i cene sredstava sve dok se ne pojavi banka sa viškom sredstava kao ponuđač istih. Promene na interbankarskom tržištu često uzrokuju nemogućnost banke da uzajmljuje

sredstva po zadovoljavajućoj kamatnoj stopi (onoj koja obezbeđuje profit).

### Upravljanje aktivom i pasivom

Banke procenjuju strukturu dospeća aktive i pasive, prilive i odlive i tako određuju koju likvidnu aktivu da zadrže, da bi zadovoljile željenu granicu odstupanja dospeća. Banke moraju i da procene mogućnost plaćanja obaveza iz novčane mase prodane aktive („skladište likvidnosti“), što se dešava u kriznim situacijama po banku. Ovde dolazi do izražaja sama analiza utrživosti aktive, koja daje odgovor na pitanje: Koliko će se sredstava dobiti od prodaje aktive i koliko se dugo traži kupac aktive? Banke, najčešće, izrađuju planove (modele) za nastupanje ovakvih kriznih situacija na osnovu ranijih iskustava.

Upravljanje aktivom i pasivom predstavlja kombinaciju dva gore navedena metoda. Iskustva govore da je, u praksi, nemoguće razdvojiti ove metode, te primenjivati samo jedan.

### Merenje rizika likvidnosti

Merenje i praćenje likvidnosti banke se kontinuirano sprovodi, ali prvo pitanje je kako izmeriti rizik likvidnosti? Kako predvideti neto potrebna sredstva (NPS)?

Iznos neto potrebnih sredstava i likvidnosti definišu rizik likvidnosti:

$$RL = L - NPS$$

gde je: RL - rizik likvidnosti; L - likvidnost, izvor gotovinskih sredstava; NPS - neto potrebna sredstva.

Kada je RL negativan, postoji rizik likvidnosti i tada su neto potrebna sredstva veća od raspoloživih likvidnih resursa. Ako je RL veći od nule, banka je sposobna da zadovolji zahtev za neto potrebnim sredstvima. Razume se postoje i sofisticiraniji modeli merenja, ali karakteristično je za svaku banku da primenjuje sopstvenu metodologiju. Najčešće korišćeni metodi su: analiza gega likvidnosti, analiza racia likvidnosti, indeks likvidnosti i likvidnost u riziku (*Liquidity at risk - LaR*).

### Analiza gega likvidnosti

Gep likvidnosti je razlika između prosečnog iznosa kredita (plasma) i prosečnog depozita. „*Negativan gep*“ znači da su depoziti manji od

Reserves are further divided into required reserves - prescribed by the central bank, and excess reserves - a section of funds on the central bank's accounts, exceeding the required reserves amount and available to banks to use. According to its business policy, i.e. liquidity policy, the bank can also have safety reserves (of liquidity), defined as a percentage of sight deposits.

The sections of assets used by the bank to ensure its liquidity are: cash and cash equivalents, required reserves, safety reserves (if prescribed by the bank's policy), placements to financial institutions, debt securities, stocks and shares in investment funds. Furthermore, this includes loans to clients (placements) and fixed assets. Given that the largest part of assets is accounted for by loans, there is a problem with credit risk management, which in case of a default increases the liquidity risk as well.

In order to meet the daily needs for liquidity, a bank measures its net liquidity position on a daily basis, through the assessment of liquidity sources and assessment of its daily obligations.

### **Liability Management**

Liability management is used to increase liquidity through the sales of securities or short-term borrowing on the money market, for the purpose of bridging a liquidity gap. This way a bank increases its liquidity without reducing its assets.

The liability side on a bank's balance sheet includes clients' deposits, interbank deposits, loans granted by the central bank, deposits of the parent bank.

When it comes to liquidity risk and balance sheet liabilities, the starting point is the assessment of structure, type and state (stability and quality) of deposits. For the purpose of this assessment, the following has to be considered:

- Selection of a deposit product - consider different types of deposits, according to account number, balance (amount), condition for depositing, currency, maturity, passive interest and tax-related costs;
- Deposit management - consider the system of recording and monitoring deposit transactions and access to accounts, interest calculation and manner of payment, monitoring deposit structure (in order to

determine which deposits are permanent and stable, which are seasonal, and which are unstable);

- Deposit concentration - typically, a few bank clients hold the largest percentage of deposited funds (in relation to total deposits). For each of these deposits, the bank should prepare a breakdown of conditions, maturities, prices and availability. Banks have been increasingly relying on such deposits (and the financial market's funds), and less on sight deposits and deposits with short maturities.

For a bank it is important to have the possibility to access the financial market, in particular money market, for the purpose of short-term borrowing. Most frequently, banks borrow on the interbank market (the money market segment). The problem they face there is that sometimes it is impossible to have a safe and reliable assessment of the amount and price of funds until a bank with a surplus of funds occurs, offering those funds. Changes on the interbank market often make it impossible for banks to borrow funds at the satisfactory interest rate (the one providing profit).

### **Asset and Liability Management**

Banks assess the structure of asset and liability maturities, inflows and outflows, thereby determining which liquid assets to keep, in order to satisfy the desired limit of maturity mismatch. Banks also have to assess the possibility of paying their liabilities from the money supply of the sold assets ("liquidity storage"), which happens in the situations critical for a bank. What comes to prominence here is the analysis of assets marketability, providing the answer to the question: How much funds will the bank get from selling assets and for how long will it be seeking the buyer of those assets? Most often banks prepare plans (models) for such emergency situations, based on their previous experiences.

Asset and liability management is a combination of the two above stated methods. The experience has shown that, in practice, it is impossible to separate these methods, and implement only one of them.

kratkoročnih potraživanja i da je potrebno da se obezbede dodatna likvidna sredstva ili prodajom aktive ili zaduživanjem. Gep likvidnosti može da bude statički (*static gap* - odnos postojeće aktive i pasive) i dinamički gep (*dynamic gap* - odnos aktive i pasive uz projekciju buduće tražnje za kreditima i raspoloživosti novih depozita, i uz očekivana povlačenja postojećih depozita i otplate postojećih kredita). Kada su obaveze veće od likvidnih potraživanja, postoji rizik likvidnosti, koji taj gep stvara, jer je jasno da banka nema dovoljno sredstava da izmiri svoje dospele obaveze. Dalje, banka se suočava i sa problemom pribavljanja potrebnih sredstava ili plaćanja viših kamatnih stopa na zajam (na tržištu), kako bi osigurala neophodne izvore likvidnosti.

Struktura likvidnosti po rokovima predstavlja segmentirani set potreba za likvidnošću na kratak, srednji i dugi rok. Trebalo bi imati na umu da se neke od potreba za likvidnošću stvaraju tokom vremena, a druge nastaju neočekivano.

- Dnevna/Nedeljna likvidnost - veoma kritična jer ima neposredan uticaj na likvidnost banke. Banka polazeći od neto potrebnih sredstava, koristi lestvicu (skalu) dospeća, pri dnevnom upravljanju likvidnošću, kao efikasno oruđe za uspešan kontinuirani monitoring (praćenje) rizika likvidnosti i predviđanju budućeg rizika;
- Kratkoročna likvidnost - od nedelju dana do 3 meseca;
- Srednjoročna likvidnost - od 3 meseca do 1 godine (sa intervalima 3-6 meseci i 6-12 meseci);
- Dugoročna likvidnost - duže od 1 godine (sa intervalima 1-3 godine, 3-5 godina, 5-10 godina i preko 10 godina) - strateško pozicioniranje banke.

Pri obavljanju finansijskih transakcija nastaje gep. Odobravanjem novih kredita povećava se aktiva, po povećanju primljenih depozita povećava se pasiva, pa i gep između aktive i pasive. Za upravljanje likvidnošću, banke izrađuju tabele, gde unose sve svoje pozicije aktive i pasive u određene vremenske intervale. Takva tabela pokazuje lestvicu dospeća. Procenjeni neto viškovi ili manjkovi u određenim vremenskim serijama dobra su pretpostavka za buduće planiranje likvidnosti banke.

Procenjujući novčane tokove banke važno je dati akcenat uticaju tržišnih rizika na njihovu vrednost, što se posebno odnosi na kamatne prihode. Relevantan vremenski okvir za aktivno upravljanje likvidnošću je kratak, obuhvata likvidnost tokom jednog dana (*intra-day liquidity*). Da bi banka upravljala likvidnošću na osnovu gepa ona mora neutralizovati nedostatak sredstava ili pravilno plasirati višak sredstava.

### Analiza racia likvidnosti

Kod merenja likvidnosti mogu se koristiti indikatori likvidnosti, racia, koji su vrlo jednostavni, za primenu u bankama i uporedivi, na celokupan bankarski sistem.

1. Racio novčanih sredstava daje informaciju o raspoloživim likvidnim sredstvima za obezbeđenje likvidnosti usled povlačenja depozita. Što je racio veći, veća je likvidnost.

$$RNS = G + R + Dev + HoV / \Sigma A$$

Racio novčanih sredstava = Gotovina + Račun rezervi + Devizni račun + Utržive hartije od vrednosti / Ukupna aktiva

2. Racio ukupnih depozita je odnos ukupnih depozita i ukupne aktive

$$RED = \Sigma D / \Sigma A$$

3. Racio kratkoročnih depozita je odnos kratkoročnih depozita i ukupne aktive

$$RKD = kD / \Sigma A$$

4. Racio likvidnih rezervi je odnos zbira gotovine i računa rezervi sa depozitima

$$RLRz = G + R / \Sigma D$$

5. Odnos neto kredita i ukupne aktive daje podatke o veličini aktive koja je investirana u kreditni portfolio. Kako kreditni plasmani predstavljaju najnelikvidniji oblik imovine, ovaj indikator se može uzeti kao inverzni indikator likvidnosti. U aktivi banaka je visok udeo plasmana, što preko kreditnog rizika dovodi u pitanje likvidnost. Banka bi sopstvenim politikama trebalo da propiše maksimalnu vrednost ovog indikatora, radi održavanja likvidnosti.

## Liquidity Risk Measurement

Measuring and monitoring a bank's liquidity is conducted continuously, but the biggest question is how to measure liquidity risk? How to predict the net funds required (NFR)?

The amount of net funds required and liquidity defines the liquidity risk:

$$LR = L - NFR$$

where: LR stands for liquidity risk, L for liquidity, source of cash funds, and NFR for net funds required.

When LR is negative, there is liquidity risk, in which case the net funds required are higher than the available liquid resources. If LR is higher than zero, the bank is capable of meeting the requirements for net funds required. Naturally, there are some more sophisticated measurement models, but it is characteristic for each bank to apply its own methodology. Most frequently used models include: liquidity gap analysis, liquidity ratio analysis, liquidity index and Liquidity at Risk (LaR).

### Liquidity Gap Analysis

Liquidity gap is the difference between the average loan (placement) amount and the average deposit. "Negative gap" means that deposits are lower than the short-term receivables and that it is required to provide additional liquid funds either by selling assets or by borrowing. Liquidity gap can be static (static gap - relation between the existing assets and liabilities), and dynamic (dynamic gap - relation between assets and liabilities with the projection of future demand for loans and availability of new deposits, expected withdrawals of current deposits and repayments of current loans). When liabilities are higher than liquid receivables, there is liquidity risk, generated by that gap, because the bank clearly has no sufficient funds to settle all its matured obligations. Furthermore, the bank is facing the problem of procuring necessary funds or paying higher interest rates on loans (on the market), in order to ensure required sources of liquidity.

The structure of liquidity per maturities represents a segmented set of demands for liquidity in the short, medium and long term.

One should bear in mind that some of the demands for liquidity are generated over time, whereas others occur unexpectedly.

- Daily/Weekly liquidity - rather critical, because it has a direct impact on a bank's liquidity. Starting from net funds required, the bank uses a scale of maturities in its daily liquidity management, as an efficient tool for a successful, continuous monitoring of liquidity risk and prediction of future risks;
- Short-term liquidity - from one week to 3 months;
- Middle-term liquidity - from 3 months to 1 year (with intervals of 3-6 months and 6-12 months);
- Long-term liquidity - longer than 1 year (with intervals of 1-3 years, 3-5 years, 5-10 years and over 10 years) - strategic positioning of a bank.

In the process of conducting financial transactions, a gap is created. By granting new loans, assets are increased, and by receiving new deposits, liabilities are increased, hence is also the gap between assets and liabilities. For the purpose of liquidity management, banks prepare tables, in which they enter their items on the asset and liability side, within certain time intervals. Such tables indicate the scale of maturities. The estimated net surpluses or deficits within certain time series are a good assumption for the future planning of a bank's liquidity.

When assessing cash flows of a bank, it is important to focus on the impact of market risks on their value, which particularly refers to interest income. The relevant time frame for active liquidity management is short, encompassing liquidity within one day (intra-day liquidity). In order to be able to manage liquidity based on the gap, the bank has to neutralize the lack of funds or properly place the surplus of funds.

### Liquidity Ratio Analysis

When measuring liquidity, a bank can use liquidity indicators, i.e. ratios, which are very simple to implement in banks, and comparable at the entire banking system's level.

1. Cash funds ratio provides information about the available liquid funds for preserving liquidity after a withdrawal of deposits. The higher the ratio, the higher the liquidity.

$$R_{inv} = nK / \Sigma A$$

6. Odnos depozita i kredita daje informaciju o sposobnosti banke da rast kreditnog portfolia podrži depozitima.

$$RDK = \Sigma D / K$$

Banke se ne oslanjaju samo na ove ovde navedene indikatore, one koriste i druge, sofisticiranije, razvijene na bazi širih bilansnih agregata i kombinaciju više indikatora. Male banke koriste odnose (racia) data od nacionalnog supervizora (kontrolora, CB) za praćenje likvidnosti.

Najčešće korišćeni indikatori su: „skala dospeća“ priliva i odliva; odnos likvidne prema ukupnoj aktivi; odnos likvidne aktive prema depozitima po viđenju; odnos tekućih obaveza prema nelikvidnoj aktivi; itd.

### Indeks likvidnosti

Indeks likvidnosti (*liquidity index*) meri veličinu mogućeg gubitka banke koji proizilazi iz „prinudne“ prodaje aktive u odnosu na normalnu tržišnu cenu te aktive. On je jednak:

$$ILq = \sum_{i=1}^N \left[ W \left( \frac{P}{P^*} \right) \right]$$

gde je:  $W_i$  - procenat svakog dela aktive u portfoliju banke;  $P_i$  - cena imovine pri iznenadnoj, „prinudnoj“ prodaji;  $P_i^*$  - stvarna tržišna cena aktive.

Što je veća razlika u ceni, logično, manja je likvidnost finansijske institucije - banke.

### Likvidnost u riziku (Liquidity at Risk - LaR)

Ovaj metod se koristi za određivanje vrednosti gotovinskih tokova povezanih sa različitim bilansnim i vanbilansnim pozicijama banke.

$$LaR = pL - CaR$$

Likvidnost u riziku = verovatnoća pristupa određenom iznosu likvidnost - gotovina (*cash flow*) u riziku.

### Analiza scenarija i ispitivanje krizne situacije

Analiza mogućih kretanja uključuje projekcije kamatne stope. Za ispitivanje kriznih situacija razmatraju se različiti ekstremni događaji, kao:

- Povlačenje depozita za X%;
- Nemogućnost refinansiranja svih sredstava;
- Nemogućnost refinansiranja X% novca / komercijalnih zapisa;
- Jednodnevni pad od X% u glavnom indeksu akcija;
- Značajna promena u kamatnoj stopi;
- Restrikcije vezane za konvertibilnost valute na novim tržištima;
- Kriza novih tržišta;
- Nastanak gubitaka po kreditima;
- Poslovni rizici;
- Ad hoc analiza specijalnih događaja.

Banke obično na novim tržištima ispituju (planiraju) sopstvene aktivnosti za moguće krizne situacije, kroz procenu uticaja krize po neizmirenim kreditima, depozitima klijenata, likvidnosti tržišta kapitala, itd. Pretpostavke koje se koriste u testovima stresnih situacija revidira menadžment, radi obezbeđivanja njihove kompatibilnosti i aktuelnosti. Scenarija se zasnivaju na različitim potrebama za finansiranjem, izvorima na raspolaganju, uticaju svake potrebe u odnosu na određeni vremenski period. Kod identifikovanja uticaja treba uzeti u obzir promene u tržišnoj percepciji banke. Banka treba da odredi odnos neto viška/manjka između predviđenih izvora likvidnosti i njihove iskorišćenosti, putem kombinovanja visine izvora i njihovu iskorišćenost sa scenarijima i nivoima stresa (krize), kao:

- Normalno poslovanje
- Sistemski ekonomski problemi
- Sistemski poremećaj na tržištu
- Sistemski poremećaji u platnom prometu
- Kriza izvora finansiranja specifična za svaku banku

Svi ishodi stresnih situacija se razmatraju za izradu plana aktivnosti. Takođe je bitno da se svi pokazatelji likvidnosti i izveštaji o genu ponovo obračunaju pod novim stresnim (kriznim) uslovima.

$$CFR = C + R + FX + Sec / \Sigma A$$

Cash funds ratio = Cash + Reserves Account + FX Account + Marketable Securities / Total Assets

2. Total deposit ratio is the relation between total deposits and total assets.

$$\Sigma DR = \Sigma D / \Sigma A$$

3. Short-term deposit ratio is the relation between short-term deposits and total assets.

$$stDR = stD / \Sigma A$$

4. Liquid reserves ratio is the relation between the sum of cash and reserves accounts, and deposits.

$$LRR = C + R / \Sigma D$$

5. Net loans to total assets ratio provides information about the size of assets invested in the credit portfolio. Given that loans are the least liquid form of assets, this indicator can be taken as an inverse indicator of liquidity. The banks' assets have a high share of placements, which through credit risk also jeopardizes liquidity. By means of its own policies, each bank should prescribe the maximal value of this indicator, in order to preserve liquidity.

$$Rinv = nL / \Sigma A$$

6. Deposits to loans ratio provides information about the bank's ability to support the credit portfolio's growth by means of deposits.

$$DLR = \Sigma D / L$$

Banks do not rely only on the above stated indicators, but instead use some other, more sophisticated ones, developed on the basis of wider balance sheet aggregates and combination of several indicators. Small banks use ratios provided by the national supervisor (controller, central bank) for the purpose of liquidity monitoring.

Most frequently used indicators include:

“scale of maturities” of inflows and outflows; liquid to total assets ratio; liquid assets to sight deposits ratio; current liabilities to illiquid assets ratio; etc.

### Liquidity Index

Liquidity index measures the size of a bank's possible loss caused by a “fire” sale of assets, compared to the normal market price of those assets. It equals:

$$LIq = \sum_{i=1}^N \left[ W \left( \frac{P}{P^*} \right) \right]$$

where:  $W_i$  stands for the percentage of each section of assets in the bank's portfolio;  $P_i$  for the price of assets in case of a sudden, “fire” sale;  $P_i^*$  for the real, market price of assets.

The bigger the difference in price, logically, the lower the liquidity of the concerned financial institution (bank).

### Liquidity at Risk - LaR

This method is used to determine the value of cash flows related to various balance sheet and off-balance sheet positions of a bank.

$$LaR = pL - CaR$$

Liquidity at Risk = Probability of reaching a certain liquidity level - Cash Flow at Risk.

### Scenario Analysis and Contingency Planning

The analysis of possible trends includes interest rate projections. In order to examine potential emergency situations, different extreme events are considered, such as:

- Withdrawal of deposits by X%;
- Inability to refinance all funds;
- Inability to refinance X% of money/commercial papers;
- One-day drop by X% in the main index of shares;
- Substantial change of interest rates;
- Restrictions related to convertibility of currency on the emerging markets;
- Crisis on the emerging markets;
- Loss in respect of loans;



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## Zaključak

U bankarstvu jedan od najznačajnijih finansijskih rizika je rizik likvidnosti. Sposobnost plaćanja ugovorenih obaveza zavisi od sposobnosti finansijske institucije - banke da u adekvatnom roku obezbedi gotovinu ili lako utrživu aktivu o dospeću sopstvenih obaveza. Povremena nelikvidnost nije retkost, niti poseban problem, ali stalna, latentna nelikvidnost može prouzrokovati šire poremećaje - prelivanje nelikvidnosti na ceo finansijski sistem. Centralne banke propisuju minimalni nivo likvidnosti određivanjem nivoa pokazatelja likvidnosti, koji ima različitu vrednost za mesec, više dana ili jedan dan. Svaka banka ima sopstvenu metodologiju za planiranje izračunavanje i upravljanje rizikom likvidnosti. One proizilaze iz usvojenih politika od strane viših upravljačkih instanci u strukturi banke. Radi obezbeđenja većeg nivoa profitabilnosti menadžment teži većim plasmanima, ali uvažavajući koncept održavanja likvidnosti.

- Business risks;
- Ad hoc analysis of special events.

On the emerging markets banks typically examine (plan) their own activities in case of potential emergencies, by assessing the impacts of the crisis on outstanding loans, clients' deposits, capital market liquidity, etc. The assumptions used in stress testing are revised by the management, in order to ensure that they are compatible and up-to-date. The scenarios are based on various funding requirements, available sources, impact of each requirement compared to a certain time period. When identifying these impacts, one should take into account the changes in the market perception of the bank. The bank should determine the ratio of net surplus/deficit between the predicted sources of liquidity and their utilization, by combining the level of these sources and their utilization with the scenarios and stress (emergency) levels, in case of:

- Normal business operations;
- Systemic economic problems;
- Systemic market disturbances;
- Systemic disturbances in the payment system;
- A bank specific crisis concerning the sources of finance.

All outcomes of stressful situations are to be considered during the preparation of a business

activity plan. Also, it is rather important for all liquidity indicators and gap reports to be recalculated under new stressful (emergency) circumstances.

## Conclusion

One of the most significant financial risks in banking is liquidity risk. The ability to honor the contractual liabilities depends on the financial institution's (bank's) ability to provide cash or easily marketable assets within the adequate deadline upon maturity of its own liabilities. Occasional illiquidity is not rare, nor does it pose a particular problem, but permanent, latent illiquidity can cause wider-reaching disturbances - the spillover of illiquidity onto the entire financial system. Central banks prescribe the minimal level of liquidity by determining the levels of liquidity indicators, which take different values for a whole month, several days or a single day. Each bank has its own methodology for liquidity risk planning, calculation and management. They arise from the policies adopted by several management levels within the bank's structure. In order to provide higher profitability, the management strives towards bigger placements, at the same time, however, respecting the concept of maintaining liquidity.