

# **Impact of liquidity on profitability of commercial banks in Armenia**

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## Abstract

This study aims to investigate impact of liquidity on profitability level for the sample of commercial banks operating in Armenia. The 2008 crisis emphasized how important it is for banks to have an efficient liquidity management. New and stricter standards were defined by regulators to make financial system stable and resilient. On the other hand, it is a widely known problem faced by financial managers, whether funds should be invested in assets that boost more profit but result in slight liquidity, because of being long-term or in short-term assets that are less profitable but are highly liquid.

The ultimate goal of this research is to find out whether liquidity management influences significantly profitability of commercial banks in Armenia. The study was implemented on 15 out of all 17 commercial banks operating at this point, for different periods depending on availability of the data. In order to analyze the variables and the relationship between them, descriptive statistics and multiple regression analysis were exploited. With one dependent variable (ROA) and 5 independent variables S1\_1, S2\_2 (liquidity ratios established by the Central Bank of Armenia), LDR, DAR, LLP/A results suggest that profitability is increased with the increase of high liquid assets, but diminished with increase of loan-loss provision amount kept by the banks.

Although it is generally accepted, that liquidity was undervalued before the crisis, a tradeoff between liquidity and the opportunity cost of holding liquid but low-yielding assets should be considered as well. Thus, the way of efficient liquidity management and increasing profits is to be found by financial managers.

## Introduction

One of the main goals of any economic organization irrespective of its size or activity is to boost its profits. Hence, organizations make their main purpose to maximize it. In the business world almost all decisions concerning investments, financing or dividends are highly linked to the problem of profit optimization. Thus, a strong relationship between company's profitability and its key decisions exists. The two main concepts of this research and key determinants for all the commercial enterprises are profitability and liquidity.

Banks have their own unique and important role in the business and financial world. Changes in banking sector can with a high possibility lead to consequences in other sectors of the economy. According to Allen and Carletti (2007) banks tend to make very risky investments, knowing that deposit insurance funds will bear the loss in case of failure and shareholders can get the rewards if it succeeds. On the other hand, the incentives of taking risks are restrained by the existence of capital adequacy.

According to Lamberg et al (2009) besides the daily operations, liquidity management also affects firm's profitability. A crucial point of liquidity management appears to be reaching an optimal proportion between liquidity and profitability (Nahum et al, 2007).

Raykov (2017) indicated, that higher profitability rates and significant growth in invested working capital can easily provide liquidity. The author also mentions that a common problem that financial managers encounter while choosing the optimal degree of liquidity is the necessity to compensate the funds withdrawn from the operating cycle and the high probability of turnover and profitability decrease.

Profitability is considered one of the principal objectives of financial management, as it seeks to maximize the shareholders' wealth. Therefore, profitability is a crucial factor for an organizations' performance. Shareholders, investors and managers are interested in increase of stocks' market price and assessing the level of operational performance in the framework of profitability (Macharia, 2013). In Armenian banking sector, where shares of banks are not publicly traded, it is especially hard to assess banks' performance based on shareholder's wealth, thus profitability can be considered a proxy for shareholders' wealth.

Hoskin et al (2009) defines liquidity as “the ability of a firm to meet its financial obligations as they fall due and to finance growth in its business”. Hoskin et al (2009) highlights the significance of liquidity profile for all companies, at the same time mentioning that especially banks need to keep liquidity profile which will provide steadiness of financial system to funding shocks. Hoskin mentions that” banks are particularly vulnerable to liquidity risk as a results of the maturity transformation role that they play in the financial system”.

According to Bordeleau and Graham (2010) after the 2007 crisis it was accepted generally that importance of liquidity management and the consequences of that kind of risks for the banks themselves was not taken into account seriously enough. Only aftermath it was proposed by the policymakers that banks should keep more liquid assets and hedge against funding or liquidity problems that may be encountered. Boredeleau and Graham (2010) also notice that liquid assets usually provide lower return and that “holding them imposes opportunity costs on a bank”.

2008 financial crisis has indicated the importance of liquidity management in banks’ operations. The crisis in financial system affected the rest of business sectors which depended on them, once more highlighting the significance of financial and banking system for the whole economy. The tumult of financial sphere was a result of credit crisis caused by subprime mortgage lending. After housing prices dropped down delinquencies in mortgage lending led to a liquidity crisis. The crisis which started in the US, further caused problems in the global financial system. That was an illustration of how illiquidity can reserve profits and capital because of companies trying to raise funds to cover their obligations. This revealed the importance of liquidity and the fact that one may have assets which surpass liabilities and still encounter a problem when it cannot liquidate that assets to meet obligations. Necessity of creating prudential liquidity measures in banking regulatory system became evident, as the significance of liquidity was not acknowledged. Despite the fact that illiquidity or lack of it was an essential factor in banks’ failure, keeping liquid assets in excess may also influence negatively opportunity cost. Therefore, the trade-off between sound liquidity and the costs of keeping low-yielding assets that reduce profitability of banks was evident.

To sum up, this study aims to contribute to empirical findings about relationship between liquidity level and profitability. The first part of the work is dedicated to literature research which includes theoretical description of liquidity, profitability and their relationship. The second part of literature review examines studies implemented before to find the impact of

liquidity on profitability in banks. Further there is the description of variables which are exploited in the empirical section, main source of the data and research methodology. After that, empirical results are presented and discussed. Finally, conclusions and the limitations for the research are given.

## Literature review

### **Liquidity**

The purpose of the research is the estimation of impact of liquidity on profitability. There are many definitions given to liquidity in different researches done before.

Basel Committee on Banking Supervision defines liquidity as the ability of a bank to have available cash or to be able meet its obligations if they come due without any unexpected costs incurring (BSBS, 2008). Banks can pay for their liabilities when they come due by selling their assets. The question is whether a certain bank has high enough liquidity not to come across insolvency in case of selling its assets and not to have unexpected losses. Keeping cash or accounts in central bank are the most popular sources of liquidity. Securities which have short-term maturity are considered to be safer in comparison with the others and can be easily sold in large volumes at liquid markets without any losses because of price changes.

Aldo (2015) defines liquidity for bank industry as “the capability to secure necessary funding through attracting deposits, cash or pledging encumbered assets.

Maness and Zietlow (2005) point out three important elements of liquidity, which include:

- Amount of resources that are needed in order to cover the obligations,
- Time that will be needed to convert assets into cash,
- Cost that will incur while transferring the assets into cash.

The liquidity risk is the plausibility for a bank that it will not be able to finance its transactions, secure its obligations. In case of not having the appropriate level of liquidity banks may need to engage supplementary sources of funding with relatively higher costs, the consequence of which may be insolvency. At the same time, excessive liquidity can result in declining of return on assets or return on equity, which indicates poor performance.

Greuning et al (2004) notes the significance of keeping adequate liquidity, as the liquidity crisis in one bank may have negative consequences for the whole banking sector. Of course liquidity management and risk level depends on the size of a particular company and the range of its activities.

## **Liquidity risk**

Liquidity is noted by many researchers to be one of the key determinants of a bank's financial performance. There was an evidence, in the form of 2008 global financial crisis, of how inadequate liquidity management caused banks to go bankrupt, which as a consequence led to negative effects in the whole financial system.

Muranaga and Ohsawa (2002) mention two important parts of liquidity risk, which are execution and opportunity costs. Thus, liquidity risk includes the risk of being unable to fund assets properly in terms of maturity and price, as well as risk of failing to liquidate an asset at a price near to its fair one and in time.

A similar point is discussed by Hoskin et al (2009) according to whom there are many different forms of liquidity risk: "from the funding perspective it is the risk that an entity cannot meet its obligations as they fall due, and as a secondary matter, the risk to an entity's profitability of being able to meet its obligations only at an elevated cost". The authors of the same article highlight the fact of the banks being especially exposed to the liquidity risk because of taking short-term deposits meanwhile keeping the major part of their lending in the form of long-term mortgages.

It is worth mentioning that there is a certain level of liquidity risk for banks exposed by the securities markets. As the opportunity cost of keeping all liquid assets in the form of cash is too high, the banks tend to keep them in the form of various marketable securities (government bonds for example). But when it is time to transfer those securities in order to meet the obligations banks are greatly dependent on how liquid is that market for the mentioned assets.

Aldo (2015) addresses liquidity risk in the framework of many other risk factors, such as credit risk, reputation and market risks, as they have some influence on liquidity risk.



## **Liquidity regulation**

Financial performance can differ from bank to bank depending on the specifics of its activity and management decisions. Among some internal factors that can influence a bank's performance, the size, regulatory goals and expense management are mentioned. External factors can be the market condition and industry characteristics in a specific area.

2008 financial crisis showed the significance of appropriate regulation and supervision by the government in the banking sphere.

In fact, misconduct in liquidity management may affect not only revenues and capital, but may also lead to bankruptcy of a solvent bank in specific cases. In case of facing liquidity problems and in order to meet their obligations banks can be forced into borrowing funds from capital markets with very high rates, which may result in reduction of their earnings. Another problem may come up, when there is a discrepancy between maturities of deposits and the respective assets, which again can make banks raise the additional funds at an extremely high cost, thus affecting negatively its performance.

After the abovementioned crisis financial regulatory authorities imposed stricter rules not only for liquidity but for capital requirements as well. In particular, BCBS (Basel Committee on Banking Supervision) in Basel Accord III put great attention on liquidity regulation to make banks more resilient against financial crisis and shocks.

Basel III presented LCR (liquidity coverage ratio) and NSFR (net stable funding ratio).

LCR is meant to make banks to keep more HQLA (high quality liquidity assets).

$LCR = \frac{HQLA}{(30 \text{ days net cash outflows})}$

This ratio should exceed 100%, otherwise the banks are considered to be highly risky in terms of liquidity.

NSFR is to assess whether the bank has available stable funding within a year.

$NSFR = \frac{\text{Available stable funding}}{\text{required stable funding}}$

This ratio normally must be higher than 1.

## **Profitability**

Profit is the surplus of revenue over the costs, expenses and taxes for sustaining the respective activity in a given span of time (Sivathaasan et al, 2013). Profitability, according to Harvard and Upton is “the ability of a given investment to earn a return from its use”. Hermanson (1989) gives quite a simple definition for profitability as the ability to generate income.

Corporate profit planning still remains “a very difficult and time-consuming” task for financial managers because of the existence of many other factors included in managers’ decisions that are not controllable by the company (Ibe, 2013).

According to Tsomocos (2003) while thinking of profit maximization financial management should at the same time consider the sustainability of the organization. In this framework, it is again noticeable that profitability and liquidity are connected. Liquidity management is important for both, not missing good investment opportunities, using the available capital in the most optimal way possible and not allowing additional costs to incur because of the lack of profits.

The most popular measurements of profitability are ROE and ROA.

ROA (return on assets) shows how efficiently the company uses its assets to generate profit and is calculated by the following formula.

$$\text{ROA} = \text{Net Income} / \text{Total Assets}$$

ROE (return on equity) is quite similar to the previous one and indicates how efficiently shareholders’ capital is used in making profits. Shareholder usually consider high ROE while making decisions about the company.

$$\text{ROE} = \text{Net Income} / \text{Shareholders' Equity}$$

While depositors are more concerned with the financial stability indicators, shareholders put more attention to profitability. Debt holders consider payments of obligations in a timely manner more important (Bwacha, Xi, 2018).

## **Profitability-Liquidity tradeoff**

Profitability-liquidity tradeoff is a widely spread and accepted concept among researchers. It is widely known that any particular financial instrument with higher risk suggests higher profitability. Initially it can be presumed that liquidity and profitability are correlated negatively, as keeping highly liquid assets supposes some additional costs, which negatively influence profitability. But it was proposed by many researchers that there can be a positive relationship between the two above mentioned terms, as efficient liquidity management can enhance a company's profitability.

Despite the fact that current assets are not as profitable as the fixed ones according to Eljelly (2004), keeping them and providing adequate level of liquidity can keep banks away from extra costs. As an example of this Bwacha and Xi (2018) mention good investment opportunities which require quick funding that will not be missed by the banks in case of holding appropriate liquidity, or a situation when unexpected mismatch between cash inflows and outflows can be financed from the liquidity reserves, thus preventing banks from additional costs and default risk.

The restrictions defined by BSBC as well as regulations of Central Banks define minimum liquidity reserves against financial crisis or economic shocks. Bordeleau and Graham find keeping too much liquidity, while trying to follow the rules, dangerous as well. From all of this another dilemma of financial managers is observed, which is finding the optimal point of liquidity after which holding too much liquid assets can have the reverse effect on financial performance.

## **Other determinants of profitability**

As mentioned before, profitability is the ultimate purpose of commercial banks. Some external and internal factors influencing profitability exist according to studies implemented before. External factors may include GDP, inflation rate, tax rates and others. Taking into account that this research examines only commercial banks located in Armenia, the focus will be the internal factors of banks that may affect profitability.

Among the most popular internal determinants of banks' profitability are banks' size, credit risk, cost to income ratio, capital risk and so on. According to Kosmidou et al (2017) a positive relationship exists between bank's profitability and its size (measured by assets) explained by the economy of scale, although some other studies found a negative impact of banks being large on its

profitability because it is harder and more expensive to manage.

Credit risk which is usually computed by dividing loan loss costs to total loans is believed to be another important determinant of a bank's profitability. Studies implemented before found negative relationship between credit risk and profitability.

Cost to income ratio, which indicates the efficiency of banks' operations, is also among the main factors affecting profitability and is considered by some researchers to affect banks' profitability negatively in case of being high.

### **Empirical researches**

There is a limited amount researches that examined the particular relationship between liquidity risk and bank performance, but rather are focused on studying determinants of banks' profitability including liquidity as one of them.

Lartey et al (2013) describes profitability as a "function of internal and external factors". The internal or bank specific factors are divided by him into two groups into financial statement and non-financial statement variables. As financial statement variables the author mentions "expense management, loan composition, composition of deposits, market interest rates, bank earning and operating efficiency". Among non-financial statement-variables the author notes "bank branches, bank size and bank location". External factors according to him include financial regulation, competitive condition, market share, market growth and others.

Demirguk-Kunt and Huizinga (1999) implemented a study on banks' profitability determinants in 80 countries. The results indicated that liquidity when measured by loans to total assets ratio negatively impacted profitability represented by ROA, meanwhile having positive impact on net interest margin.

Bordeleau and Graham (2010) analyzed the impact of keeping liquid assets on banks' profitability using samples of large U.S. and Canadian banks for the period 1997-2009 in the working paper for Bank of Canada. The paper was aimed to find out empirically whether holding of liquid assets have significant effect on profitability. ROE and ROA were regressed against liquid asset holdings with some other control variables in non-linear expressions. Based on the result of modeling the relationship between the given variables (profitability and liquidity) there

was a nonlinear relationship discovered by the authors, which implied that profitability is going up for those banks which hold a certain amount of liquid assets against default and bankruptcy, however up to a certain point after which keeping liquid assets tends to decrease profitability of a bank. It is supported, that banks are funded if they keep a certain amount of liquid assets, thus its liquidity risk is reduced. According to the authors the costs of discrepancy between assets and liabilities can be decreased by holding liquid assets, so that the losses induced by maintaining more of them can be counterbalanced. It is also possible though, that opportunity costs of maintaining liquid assets exceed the advantages. Generally, the relationship between above mentioned variables should not be viewed without taking into account the banks' business model, whether it is traditional, for example loan based, or not. The authors suggest that although keeping liquid assets is important for resisting liquidity shocks, keeping too much of that assets can cause a lot of costs, hence reduce profitability.

Arnold (2008) points out positive relationship between liquidity and profitability, emphasizes some positive effects of keeping highly liquid assets, particularly that liquid assets can cover daily operational costs and prevent from missing promising investment opportunities requiring quick payments or keeping sustainability in unexpected emergency situations.

Selvanathan et al (2016) analyzed the same relationship for 10 Licensed Commercial Banks of Sri Lanka for the period of 2006-2014 and found positive impact of liquidity on profitability in the short run, but not a direct effect in the long term. Valverde and Fernandez (2007) while looking for the determinants of European banks' profitability, found that loan to deposit ratio affects profitability positively.

Lartey & Antwi (2013) studies were implemented to find relationship between liquidity management and profitability of the banks which were listed on Ghana Stock Exchange (for the period 2005-2010) and seven of them were included in their study with exploitation of time series. According to the results, for the given period both of the variables went down. The relationship between them, though positive, but was mentioned to be very weak. Anyway, from the authors' point of view banks need to manage liquidity very efficiently, as the appropriate amount of liquid assets can not only increase profitability, but also minimize banks liquidity risk, help the bank take the unpredicted shocks, which might be caused for example, by the sudden need to change the assets or liabilities side of balance sheet. However, the authors address the issue of holding too much liquid assets and the latter's negative impact on profitability.

Alshatti (2014) examined the impact of liquidity management on profitability in Jordan banks for the span of 2005-2012. Thirteen banks were chosen by the author as representative. As dependent variables ROA and ROE were picked (as estimation for profitability) and liquidity ratio as independent variable along with some others. The results of the regression run in the article showed that a statistically significant correlation existed between liquidity of assets and profitability of banks. The researchers suggest that when expressed by ROE the impact of investment and quick ratios are positive on profitability. Also impact of capital ratio on profitability (measured by ROA) was positive. It was concluded by the researchers that banks have to keep sufficient liquidity in order to increase profitability. At the same time, Alshatti recommends to invest the excess of liquidity in other aspects of investment to increase the profitability by getting the benefits of time value of free money.

Another part of researchers noticed the negative effects of liquidity on profitability mentioning disadvantages of holding current assets in comparison with fixed assets, known as less profitable as keeping liquidity can result in accumulation of idle assets and inefficiency of financial management.

Molyneux and Thornton (1992) implemented their study on 18 European banks to investigate the determinants of their profitability. The results indicated negative relationship between the ratio of liquid assets to total assets and return on assets.

According to Lyroudi et al. (1999) who did his studies on companies listed on London Stock Exchange from 1993 to 1997 chose as liquidity indicator liquidity ratio, cash conversion cycle, current ratio and ROE, ROA, NIM as profitability ratios. As a result, the authors found inverse relationship between liquidity and profitability. Same results were achieved by Eljelly (2004), who examined the same relationship by picking Saudia Arabia companies for 1996-2000.

Another research was carried by Demirguk-Kunt et al (2003) on 1400 banks from 72 countries The study aimed to examine the impact of bank regulation, concentration and institutional development on bank margins across a broad cross section countries. At the same time banks specific factors and systematic differences were controlled in the terms of banking sector. The primary dependent variable was net interest margin (interest income minus interest expense divided by interest bearing assets). As the model used included country specific variables, authors used generalized least squares estimator with random effects. According to

their results highly liquid assets are connected with lower net interest margins. The authors explain a significant part of banks net margin variations by their individual characteristics, that is to say that high interest margins are related with small banks and those which hold small fraction of liquid assets, relatively low amount of capital and with large market share. The authors emphasize its consistence with the opinion that relatively large banks can exploit power to increase rents.

The greatest part of researches on this topic were mainly focused on large countries with developed financial sector, influential ones, such as the USA or other geographical regions. This study seeks to contribute to existing literature in terms of finding the same relationship for a small country with developing financial system, which did not encounter serious shocks during the 2008 recession and is regulated by the Central Bank strictly in terms of financial performance including liquidity.

### The conceptual model

As it was mentioned before the main concepts of this research are liquidity and profitability. Profit is what shareholders are most concerned about to attain wealth maximization. Liquidity is the factor that government aims to increase in order to keep banks' stable development and supervise the sustainability of financial institutions. Before 2008 financial crisis the importance of liquidity management was not considered fully by financial managers. Liquidity was not usually included as a common determinant of profitability, hence not many studies there were which investigated relationship between liquidity and profitability.

Researches investigating the abovementioned relationship differ depending on the industry, location of the industry and sample size. For the purpose of this research four liquidity ratios were chosen which are general and current ratios, LDR (Loans to deposit ratio), DAR (Deposits to assets ratio) were chosen as independent variables along with two other variables to account for firm-specific risk which are LA (loan to assets), LLS/TA (loan loss provisioning to total assets) to get an explanatory model. Profitability was examined through the use of the (return on assets) ROA ratio. The result is similar in case of choosing ROE (return on equity ratio) as a measure of profitability. Resulting from the thoughts mentioned above in the framework of this research question the following hypotheses were proposed:

H1.1: The general liquidity ratio significantly impacts the return on assets

H1.2: The current liquidity ratio significantly impacts the return on assets

H1.3: The loan to deposit significantly impacts the return on assets

H1.4: The deposit to assets significantly impacts the return on assets

H1.5: The loan to assets ratio significantly impacts the return on assets

H1.6: The loan loss provisions to assets ratio significantly impacts the return on assets

## Data

### **Data collection**

For the purpose of this research secondary data collection was selected. In contrast to primary data which is collected via questionnaires, surveys and observations, secondary data much less expensive, easier to access and is free of bias of respondents and the researcher.

As the research design of this study is quantitative the variables used as proxies for liquidity and profitability were taken from audited financial statements of commercial banks in Armenia for different time periods in the range of 2003-2018. This secondary data can be considered reliable and of high quality, as is collected from the financial statements published on the official web pages of each commercial bank chosen for the study. Thus, the information used from the reports meets international accounting standards.

### **Sampling**

This research is focused on banking sector hence the sample is comprised of 15 out of 17 commercial banks operating in Armenia. Due to unavailability of data for some of the banks, 2 were excluded among which were the ones with large asset size. However, the sample captures the significant part of assets overall in Armenian banking sector. According to the data taken from the banks' financial reports of 2018, sum of total assets of all commercial banks in Armenia comprised almost 10.3 million USD and total assets for the selected banks was nearly 8.2 billion USD making up almost 80% total assets in all Armenian commercial banks. Thus, by the criteria of assets' size the selected sample for this research can be considered representative of the banking sector in Armenia.

### **Measures**



In order to choose reliable measures or proxies for the two main concepts of this research that are liquidity and profitability, it can be useful to go over similar studies done before to see which measures are the most popular for both dependent and independent variables and which ones could be related to this research.

Bordeleau and Graham (2010) selected ROA and ROE as proxies for profitability and the liquidity measured using cash and cash equivalents to total assets ratio. In the research implemented by Alshatti (2014) while examining liquidity-profitability tradeoff, capital, quick and liquid ratios and ROA, ROE were picked as proxies for liquidity and profitability respectively.

For the purpose of this study ROA ratio was selected as profitability measurement, while the independent variables of liquidity were measured by four liquidity ratios. Two credit risk measuring ratios were added to the independent variables as well.

Therefore, for the analysis of how liquidity impacts profitability in Armenian banking sector the following variable proxies were used. The variables were computed for different time periods depending on bank and the formulas for calculating them are as follows:

Variables of interest	Formula
<b>General liquidity (S2<sup>1</sup>)</b>	High liquid assets/ Total assets
<b>Current liquidity (S2<sup>2</sup>)</b>	High liquid assets/ Demand liabilities
<b>LDR</b>	Loans / Total deposits
<b>DAR</b>	Total deposits/ Total assets
<b>LA</b>	Loans /Total assets
<b>LLP/A</b>	Loan loss provisioning/ Total assets
<b>ROA (return on assets)</b>	Net income/ Total Assets

Table 1: Dependent and independent variables

General and current liquidity are defined by the Central Bank of Armenia for commercial banks in Armenia in Regulation 2 on “Regulation of banking, prudential standards of banking”.

The minimum ratio of banks highly liquid assets expressed in all currencies divided to total assets in all currencies is defined to be 15 % by the CBA. Current liquidity ( $S2^2$ ) standard is defined 60 % minimum. The components of highly liquid assets and demand liabilities are defined by point 34, 36 of Regulation 2 correspondingly. Demand liabilities include demand resources or resources which have no fixed amount of maturity (including the interests on that demand) such as overdue liabilities accounted in the category “Liabilities” in balance sheet. Total assets are to include “the total of the accounts category “Assets” of the “Account chart of banks, credit organizations, investment funds and investment fund managers operating in the territory of the Republic of Armenia” according to Regulation 2.

LDR measures the capability of a bank to fulfill its obligations through deposits. This ratio is calculated as total loans divided total assets. It indicates a bank’s ability to cover loan losses and withdrawals by its clients. Investors put attention on LDR of banks to be sure that banks have adequate liquidity to cover loans in case of economic downturn. It also shows how good is a bank in attracting and retaining customers. Banks that have lower loan to deposit ratio usually have higher liquidity, but may not be earning as much as they could (D. Rengasamy, 2014). Those which have too high loan to deposit ratio tend to encounter problems over assets growth and may not have enough liquidity to cover any unforeseen fund requirement.

DAR how much of assets are funded by deposits. Normally banks with more deposits have potential to offer their clients more loan opportunities. High deposit to assets ratio may indicate accessibility of cheaper funds for generating revenue through loans. Although from the first sight banks are supposed to generate more profits in case of having more deposits, if the funds are drawn through loans they may meet profitability decrease because of interest payable to depositors. (Menicucci et al., 2016).

LA is a measure of credit default risk of bank loan portfolio (Bouvatier and Lepetit, 2008). Loans are riskier than other bank assets, so loans are supposed to have greater return. So initially it is expected that there is a positive relationship between LA ratio and profitability. On the other side banks that are expanding their loans fast pay higher cost for their funding requirements, which can lower the positive impact of these variables (K. Staikouras, E.Wood, 2004).

LLP/A is a measure for capital risk, but also indicates differences in credit quality across different banks. Loan loss provision is the amount of money allocated as an allowance for loans and loan payments that are not collected. They are exploited to cover such expenses as bad loans, customer defaults. If banks operate in an environment with higher risk and lack of efficiency in controlling its lending operations, it will possibly have a high loan-loss provision ratio to cover the risk. Thus, it is initially expected to be in a negative relationship with profitability. In order to have explanatory model without including a control variable (banks' assets size) loan loss provisions are examined as a share of total assets.

### Descriptive statistics

The variables in the model are mostly examined in regard to total assets. This eliminates the necessity of including a control variable, total assets. Thus it would be useful to analyze the selected banks by their asset size and to see which range of assets size is the most popular among them.

The graph represented below shows a classification of the chosen 15 commercial banks by their assets' size. The given graph represents number of banks per assets' size group for the year 2018.

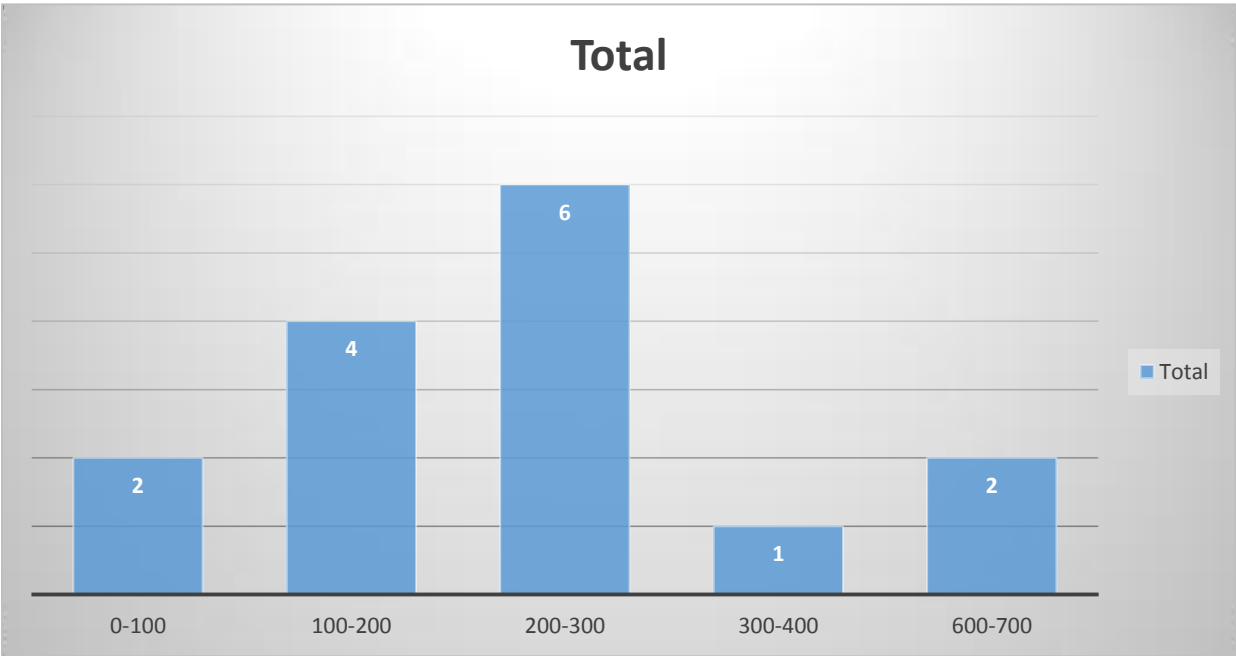


Figure 1: Banks' distribution by assets (in millions)

As it is seen in the graph assets' size of the selected banks is in the range of 95 billion AMD to 700 billion AMD. 6 banks from the chosen banks had total assets between 200 billion and 300 billion comprising almost 39% of the sample. 4 banks representing nearly 15 % of the target banks had assets' size from 100 billion to 200 billion AMD. Only 2 banks (33% of the sample) had assets' size in the range of 600 billion to 700 billion AMD.

For the purpose of testing hypotheses in this research statistical methods were exploited. Before the analysis of main multiple regressions, descriptive statistics and correlations will be presented. For analyzing the data by certain values, such as central tendency, range, dispersion around the mean descriptive statistics of the chosen variables are presented and discussed.

Table 2 provides summary statistics for the variables used in the analysis.

	ROA	S2_1	S2_2	LDR(Loan to Deposit ratio)	DAR(Deposit to Assets ratio)	Loans to total assets	Loan loss/total assets
<b>Mean</b>	0.02	0.33	2.07	1.22	0.48	0.52	0.01
<b>Median</b>	0.01	0.30	1.66	1.11	0.49	0.56	0.01
<b>Standard Deviation</b>	0.02	0.14	1.49	0.54	0.17	0.16	0.02
<b>Range</b>	0.12	0.66	6.93	3.77	0.76	0.77	0.11
<b>Minimum</b>	-0.05	0.13	0.76	0.01	0.05	0.00	-0.02
<b>Maximum</b>	0.07	0.79	7.69	3.78	0.81	0.77	0.08

Table 2: Descriptive statistics summary

The mentioned values were calculated for each bank in the given period of time. Return on assets has a mean of 0.02 and standard deviation of 0.02 as well. The mean value of LDR was 1.22 with standard deviation of 0.54. The mean of DAR was 0.48 which shows that on average almost 48% of assets were financed with deposits, which can be ascribed to the fact that there are lower cost funds for banks, so deposits are a popular way of raising funds to finance their assets. It is also observed that on average banks had more net loans in comparison with deposits for the same period. High mean of S2\_2 (2.07) points out that on average banks kept more high liquid assets than demand liabilities, but less than total assets (with S2\_1 comprising 0.33).

Median value for ROA was 0.01, which is twice lower than its mean. Medians of LDR and DAR comprised 1.11 and 0.49 respectively. Medians of LDR and DAR differed just slightly from its mean value, by 0.01 points. The same can be said about S2\_1, with slight difference of 0.03 points. Median of LLP/A was the same as its mean.

Standard deviation of LLP/A 0.02, which is twice as high as its mean value indicates that banks differ significantly with their loan loss provisioning amount. Standard deviations of S2\_2 (1.49), which is almost equal to its mean and LDR (0.54) almost half of its mean can also be considered high for this data. Median of ROA (0.02) is also the same as its mean. High variations and essential differences could be expected, taking into consideration that banks are unique to each other and may operate in different conditions, have different market share and strategies.

	ROA	S2_1	S2_2	LDR(Loan to Deposit ratio)	DAR(Deposit to Assets ratio)	Loans to total assets	Loan loss/total assets
ROA	1.000						
S2_1	0.223	1.000					
S2_2	0.054	0.357	1.000				
LDR(Loan to Deposit ratio)	0.122	-0.115	0.010	1.000			
DAR(Deposit to Assets ratio)	-0.286	-0.322	-0.377	-0.653	1.000		
Loans to total assets	-0.167	-0.750	-0.405	0.115	0.506	1.000	
Loan loss provisioning/total assets	-0.652	-0.054	-0.045	-0.093	0.195	0.105	1.000

Table 3: Pearson's correlation

Table 3 provides summary of correlations between the selected variables.

The main thing to put attention on here is whether independent variables are highly correlated with each other. In case it is true it will be more difficult to understand how they affect the dependent variable separately because of multicollinearity (C.R. Bwacha, X. Jing). It is obvious

from the table that there is a weak positive relationship between two liquidity ratios  $S2^1$  and  $S2^2$ , which is 0.35, thus when general ratio increases, current ratio goes up as well. This is would be expected as high liquid assets are included in the computation of both ratios as a numerator.

As it can be observed from the table, the correlation coefficient of LDR and DAR imposes quite high negative correlation (-0.65), which is explained by the fact that deposits are used in computation of both variables as a numerator in one and as a denominator in other.

LA ratio exposed very high correlations with other independent variables  $S2_1$ ,  $S2_2$  and DAR ratios, 0.75, 0.40 and 0.50 respectively. From this a need of assessing multicollinearity between the independent variables of the regression arises. It was checked with variance inflation factor (VIF). As it can be seen in table 6, collinearity statistics was in a normal range of below 10 (commonly accepted threshold for VIF), only after dropping LA (loans to assets) variable.

The correlations between ROA and independent variables  $S1_2$ ,  $S2_2$  and LDR were weak 0.22, 0.05 and 0.12 respectively. Correlation coefficient of DAR with ROA was -0.28. The highest correlation with the dependent variable was exposed by LLP/A ratio (-0.65).

## Methodology

To examine the relationship between liquidity and profitability of commercial banks in Armenia multiple regression analysis will be utilized to determine relationship of independent ( $S2_1$ ,  $S_2$ , LDR, DAR, LLP/A) and dependent (ROA) variables. Multiple regression coefficients are facilitated for the process of rejecting or accepting null hypotheses.

The regression model used for this study is as follows:

$$Y = \beta_0 + \beta_1 * S2^1 + \beta_2 * S2^2 + \beta_3 * LDR + \beta_4 * DAR + \beta_5 * LLP + \varepsilon$$

where,

$\beta_0$  is the constant,

$\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$  are regression coefficients,

$\varepsilon$  represents random error term.

## Results

### Regression analysis: ROA, independent variables

Multiple regression analysis was implemented in order to find impact of liquidity on profitability of banks, with ROA as dependent variable and S2<sup>1</sup>, S2<sup>2</sup>, LDR, DAR and LLP/A ratios as predictors. The number of observations overall comprised 134. Table 4 represents the model summary of the regression analysis.

<b>Dep. Variable:</b>	ROA	<b>R-squared:</b>	0.479
<b>Model:</b>	OLS	<b>Adj. R-squared:</b>	0.458
<b>Method:</b>	Least Squares	<b>F-statistic:</b>	23.52

Table 4: Regression

R<sup>2</sup> is 47.9 % and R<sup>2</sup> adjusted of the model is 45.8 %, suggesting that the independent variables explain 45.8% of variation in the dependent variable ROA.

<b>ANOVA</b>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	5	0.0237	0.0047	23.5203	1.04E-16
Residual	128	0.0258	0.0002		
Total	133	0.0495			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
<b>Intercept</b>	0.0271	0.0121	2.2406	0.0268	0.0032	0.0511
<b>S2_1</b>	<b>0.0243</b>	0.0109	2.2322	<b>0.0273</b>	0.0028	0.0459
<b>S2_2</b>	<b>-0.0012</b>	0.0010	-1.2672	<b>0.2074</b>	-0.0031	0.0007
<b>LDR</b>	<b>-0.0006</b>	0.0035	-0.1784	<b>0.8587</b>	-0.0075	0.0062
<b>DAR</b>	<b>-0.0174</b>	0.0121	-1.4394	<b>0.1525</b>	-0.0413	0.0065
<b>LLP/A</b>	<b>-0.7867</b>	0.0830	-9.4769	<b>0.0000</b>	-0.9509	-0.6224

Table 5: ANOVA table

It can be observed from the table that with confidence level 95% (significance level of 0.5) model is significant. It can also be seen from the table 5 beta coefficients, every unit change in standard deviation in S2\_1, S2\_2, LDR, DAR and LLP/A causes 2.4%, 0.1 %, 0.06%,1.7% and -78% variation respectively. As for the significance of predictor variables, according to ANOVA table, at confidence level of 95% (criterion for significance is p-value less than 0.05) only two variables S2\_1 (liquidity proxy) and LLP/A (credit risk proxy) impact the independent variable ROA. S2\_1, LDR and DAR were found statistically insignificant as regards to ROA.

From the table below it can also be seen that collinearity statistics which was checked by VIF is within an acceptable range of below 10. Thus, from the model impact of independent variables can be valued separately. Results are presented in table 6.

<b>VIF for each independent variable</b>	
S2_1	6.263
S2_2	3.358
LDR	3.551
DAR	3.902
LLP/A	1.557

Table 6: VIF of independent variables

The analysis conducted was used to test hypotheses that relate of the variables, hence based on its results the summary of hypotheses proposed are presented below in table 7.

	<b>Hypothesis</b>	<b>P-Value</b>	<b>Supported/Rejected</b>
<b>H1.1</b>	General liquidity ratio significantly impacts the return on assets	0.027 < 0.05	Supported
<b>H1.2</b>	Current liquidity ratio significantly impacts the return on assets	0.207 > 0.05	Rejected
<b>H1.3</b>	Loans to deposits ratio significantly impacts the return on assets	0.858 > 0.05	Rejected
<b>H1.4</b>	Deposits to assets ratio significantly impacts the return on assets	0.152 > 0.05	Rejected
<b>H1.5</b>	LLP to assets ratio significantly impacts the return on assets	1.8E-16 < 0.05	Supported

Table 7: Hypotheses



H1.1: General liquidity ratio was found to have significant impact on profitability when measured by ROA. The relationship was found to be positive, meaning that according to the results, the higher amount of high liquid assets results in higher profitability for commercial banks in Armenia. This result is opposed to thoughts about relationship of liquidity and profitability, that were described above as it was initially supposed that with high probability the relationship is rather negative. However, it is consistent with results of previous researchers such as Ariyadas and Selvanathan (2016) who found positive relationship between liquidity and profitability for 10 Licensed commercial banks of Shri Lanka, but only in a short run. At the same time, it could refer to Berger's (1995) analysis according to which a positive relationship might exist between liquidity and profitability. This in turn applies the concept of 'expected bankruptcy cost hypothesis' which if applied to the impact of liquid assets on profitability can be interpreted in the following way: Banks holding more liquid assets benefit from superior perception in funding markets, reducing financing costs and increasing profitability. Specifically, this result suggests, that banks holding more liquid assets diminish their funding costs to such extent that it offsets the opportunity costs. In other words, banks with high amount of liquid assets are perceived as more safe and having such an advantage results in higher profitability.

H1.2: Second hypothesis, according to which Current liquidity ratio impacts ROA significantly, was rejected according to the results of regression. However, the relationship between two variables was inverse, implying that the higher amount of high liquid assets banks keep (in proportion to demand liabilities), the less profitable they are.

H1.3: The dependent variable LDR was regressed against ROA and was found not to be statistically significant. Hence, the hypothesis that loans to deposit ratio significantly impacts the return on assets is rejected. So, changing this ratio by banks will not affect profits when measured by ROA. Worth mentioning that LDR and ROA exposed a negative linear relationship, meaning the two variables tend to move in opposite directions. But the relationship may be considered to be caused by other factors since the impact was found not to be statistically significant. One explanation for that according to B X Jing (2016) is that although loans have higher interest rate in comparison to other investments such as Treasury Bills, decrease in deposits make banks encounter the problem of

finding cheap funds in order to keep liquidity. They usually need to borrow from other banks or central bank, to meet liquidity needs or reserve requirements and the rates for such short term loans are set by central banks through their monetary policy. These regulations have become stricter for the banks, especially after the crisis. This fact is related to Armenian commercial banks, as well. These rates have gone up essentially after the financial crisis, so it has become more expensive for banks to meet liquidity needs.

H1.4: The hypothesis that DAR ratio significantly affects ROA, was rejected as well. Hence the proportion of deposits to assets do not essentially affect profitability according to the results of the regression. The relationship between these two variables was found to be inverse as well. This can be ascribed to the fact that during the post-crisis period (taking into account that the data for this research mainly includes data for the period after 2008, with exception of two banks) banks were obliged to have more liquid assets hence marginal interest income earned from loans and interest payable to depositors could be offset by the cost of maintaining low earning liquid assets.

H1.5: Results indicate that LLP/A affects ROA significantly. It shows that loan loss provisioning impacts profitability negatively. Particularly, unit increase in of LLP leads to decrease of profitability (proxy ROA) by 0.78 all other things held constant. This result is consistent with previous research implemented by Vong et al (2005). According to the authors a large amount of loans does not necessarily result in high amount of profits. Interest spread is mentioned by them as an important determinant of profitability, which may be lessened because of decrease in interest rate in a competitive credit market. The major part of operations in Armenian banks is based on borrowing and lending activities, thus they may encounter high credit risk, so there is a need to keep loan loss provisions to tackle risk problems. But a high loan-loss provision with smaller interest spread may lead to lower profitability. Thus, it may be supposed that banks largely depend on loan portfolio quality and the ones among them that are risk adverse prone to decreasing their profitability.

## Conclusion

The study investigated effect of liquidity on profitability of 15 Armenian banks out of 17 by using balance sheet measures RAO as a proxy for profitability, loans to deposit, deposit to assets, as well as general and current liquidity ratios set by CBA Regulation 2 document as proxies for liquidity and loan loss provision as a proxy for capital risk over the period 2003-2018. In general, according to the results there is a linear relationship, whereby profitability is increased for Armenian banks, which hold high liquid assets, but deteriorates as they keep more loan loss provisioning in relation to assets. This results are in line with the concept, that banks which hold more liquid assets are rewarded by the funding markets with reducing its liquidity risk. On the other hand, the fact that this advantage can be counteracted by the opportunity cost of holding too much high liquid and low yielding assets should be considered as well.

Researches, studying effects of liquidity on profitability implemented before show different results depending on banks' business model, strategy, geographical location and so on.

The results gained from this research are relevant, as appropriate level liquidity of commercial banks in Armenia is regulated by two liquidity measures used in this paper. Additionally, as there were a limited number of studies of this type done in countries with small economy and developing financial sector, which did not encounter much shocks during the recession of 2008, it aimed to contribute to the relevant literature

Although the results suggest that relationship between one of the liquidity ratios and profitability measure is positive, it is proposed that financial policymakers should always keep in mind the tradeoff between liquidity and profitability while defining acceptable levels of liquid assets kept by the banks. While high liquid assets can make banks less prone to liquidity shocks, holding too much may start to have the opposite effect on profitability.

To sum up, this research demonstrated, that the liquidity affected profitability positively, on the other hand lower credit risk implies lower profitability. In spite of being a very important factor in banking sector, liquidity does not explain a great part of variation in profitability of commercial banks according to the chosen model for the paper.

## Limitations

Several limitations during the implementation of the research decreased the effectiveness of the study. Because of unavailability of financial statement for some banks, the sample was

selected based on convenience factor, rather than on the assets' size, which would help to choose a more representative sample for the commercial banks of Armenia.

The study was implemented in small country with developing financial and banking system, so the study will be applicable to countries with similar characteristics. Based on the availability of data in the form of financial reports, the proxies for our variables were chosen for different periods of time from bank to bank. Thus, variables representing some banks might have had greater impact on the regression model results than the others.

The current research can serve as a stepping stone for a further study applied to other countries or regions, with or without bank liquidity requirements, emphasizing a rudimentary relationship relevant to the regulation of the banks.

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