Determinants of bank profitability in Georgian banking sector

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Abstract

This study examines the impact of bank-specific and macroeconomic determinants on the profitability of commercial banks in Georgia, where banks tend to be the largest part of the financial system, with free market systems and liberalization policies similar to those in other transition economies, using panel data analysis and random forest method (RVI) is implemented as a robustness check. The profitability indicators return on asset (ROA), return on equity (ROE), and net interest margin (NIM), all of which have been extensively utilized as indicators of profitability in previous research, were employed. The research indicates that the three most significant bank-specific factors are net loans, nonperforming loans, and capital adequacy ratios. Other bank-specific factors such as asset size and liquidity ratio have statistically minor effects on bank profitability. The other macroeconomic determinant, inflation rate, has no effect on the profitability performance levels of the banks studied.

Keywords: Georgia, bank profitability, panel data analysis, ROA, ROE, Net-interest margin.

JEL Classifications: C23, C38, G21, G31

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1.Introduction

The development of any nation's economy has unquestionably been greatly influenced by the expansion of the financial sector for a long time. Accidents in the financial sector ultimately had an impact on the whole economic system in addition to their own position. As a consequence of globalization, capitalism and the free-market system have attracted new participants to the financial sector, but they have also brought about severe crises in banking, The basis of the financial industry, especially in developing countries when the necessary infrastructure and political climate are lacking. As a consequence, many countries are required to put aside a significant amount of their efforts and state budgets to pay off the crisis debt, which has significantly hindered their growth rates. Georgia, a country that became independent when the Soviet Union collapsed, and has accelerated the creation of all free-market institutions during the past fifteen years. In developing countries like Georgia, banks are necessary for the expansion of the financial industry and economic growth. Since banks are the backbone of most economies in transition and sometimes the only financial institution available for many companies like SMEs (small-medium enterprises), banking issues have taken center stage in discussions about financial reform.

In the developed economies, research on the banking industry's profitability is quite important. Unfortunately, there are not a lot of studies that concentrate on the profitability of commercial banks in developing nations like Georgia. For policymakers and finance academics, the analysis of the profitability of commercial banks in Georgia will be more essential in this situation. Because the health of the banking sector is so critical to the health of the economy as a whole, it follows that knowing the factors that affect bank profitability is vital and essential to the stability of the economy.

In the late 1980s, when Georgia was still a member of the Soviet Union, financial reform was initiated. Significant changes did not, however, take place before the country gained its independence. The five state-owned specialist banks (Eximbank, Sberbank, Agroprombank, Promstroibank, and Zhilsotsbank), which were formerly owned by the Georgian Gosbank branch, were privatized in 1991, resulting in the establishment of a two-tier banking system (Amaghlobeli et al., 2010). There was no stability in Georgia's financial industry. Bad loans made up the majority of bank assets, which led to asset depletion, and the erosion of public confidence. Banks were routinely mismanaged and corrupted.

It was clear that Georgia's banking system needed a quick reform in 1990s. The International Monetary Fund, the World Bank, the European Bank for Reconstruction and Development, and other international financial institutions helped to initiate this process. With its efforts, the National bank of Georgia (NBG) aimed

to speed up the privatization of ex-state banks, restore overall macroeconomic stability, and tighten regulations on the banking industry. The Georgian Parliament strengthened the National Bank of Georgia's independence and gave it more power to suspend banking licenses for organizations that did not conform to prudential standards by passing the Organic Law on the National Bank of Georgia on June 23, 1995, and the Law on Commercial Bank Activities in February 1996. The Basel Committee on Banking Supervisor's 25 Key Principles of Efficient Banking Supervision, which are widely acknowledged, served as the foundation for the NBG's bank supervision policy. As part of the implementation of new laws and procedures to regulate banking operations, a new asset categorization system was created in order to more precisely identify credit risks, enhance internal and external audits, and separate conflicts of interest in banking activities.

The Georgian financial system now conforms with modern banking regulations and operates in a free market environment. In addition, severe competition exists for a share of the expanding financial market, and the admission of new banks into Georgia's banking sector encourages the creation of competitive new bank products.

This paper aims to reveal how micro and macroeconomic factors affect the profitability of Georgia's commercial banks. Accordingly, this investigation will highlight the factors that guarantee the banking system's profitability and efficiency.

2. Literature review

The literature on bank profitability reveals that although some researchers have analyzed the profitability of banks across numerous countries, others have narrowed down on banks in a single nation to analyze profitability and performance metrics using a variety of techniques. According to Demirgüc-Kunt and Huizinga (1999), who analyzed 80 nations between 1988 and 1995, banks in countries with a high intensity of capital typically also have high return margins, while banks in countries with a high sector intensity often have low return margins. Tan and Floros (2015) used data from 101 institutions between 2003 and 2009 to examine the factors that affect bank profitability in China using two-step generalized methods of moments (GMM) estimators. According to empirical data, in China, the expansion of the banking industry, stock market, cost-effectiveness, and inflation are all positively correlated. The authors also stated that the Chinese banking sector is competitive and that low profitability might be attributed to a greater amount of non-traditional activity and more taxation.

Safarli and Gumush (2012) investigated the relationship between the performance of the Azerbaijan banking industry and macroeconomic circumstances from 2003 to 2008 using the CAMELS performance rating system and panel data analysis. Their empirical results showed that between 2005 and 2008, banks' performance declined and that the performance of the banking sector was negatively correlated with both inflation and GDP. To examine the connection between bank profitability and macroeconomic indicators, Baltaci (2014) studied data from 31 Turkish banks between 2001 and 2011 and found that inflation, crisis indicators, and bank profitability all have positive relationships. Helhel and Varshalomidze (2014) examined the efficiency and performance of the Georgian banking industry using the CAMELS grading system. For the years 2007 to 2013, six domestic private commercial banks were examined using 18 financial ratios. After the war with Russia and the financial crisis of 2008–2009, it was discovered that none of the banks under investigation have seen an improvement in their performance across the board.

Bank management, the financial markets, regulators, and academics have all given considerable attention to the factors that impact the banking industry's performance. Numerous studies, based on both empirical data and theoretical frameworks, have concluded that several factors, both internal and external, have an effect on commercial banks. Therefore, in recent research, the influence of both internal and external factors on a bank's profitability has been examined. According to research, internal variables (also known as bank-specific factors) have the biggest influence on bank profitability, whilst external factors (also known as macro or macroeconomic factors) play a lesser significance.

Many researchers, including Dietrich & Wanzenried (2011) and Athanasoglou et al. (2006) discovered that bank-specific variables, such as capital ratio, board size, revenue diversification, bank age, bank size, and financing cost were the most significant determinants of the financial profitability of businesses. In a similar vein, further studies, including Kosmidou et al. (2007), and Rachdi (2013) have examined how the performance of banks was affected by macroeconomic issues and industry-specific factors. Their findings show that the common variables affecting commercial banks' financial performance vary over time and across samples. However, there is disagreement over the precise characteristics that are indicative of a company's financial performance, and the strength of the correlation differs across datasets. Some of the recent research (Dietrich & Wanzenried, 2011; Perera & Wickramanayake, 2016; Robin et al., 2018) are concentrating on figuring out the profitability of banks in various countries.

2. 1. Bank-specific determinants

2.1.1. Size

The question of whether larger banks make more money is a widely accepted one in the academic literature. Earlier studies that examined the connection between bank size and profitability found that size did matter in terms of profitability. A study of the recent research on the link between bank size and profitability has led to various results. According to this efficiency argument, with increased operational efficiency brought about by economies of scale, larger banks are more profitable than smaller ones. Large banks may be able to take advantage of scope economies since they have access to markets that smaller banks cannot (product diversification and risk reduction).

Although some investigations have discovered that economies of scale only occur in small banks, large banks have shown the existence of economies of scale (Altunbas et al., 2001). According to Vennet (2002), economies of scale help Europe's smaller banks while causing problems for its bigger banks. According to Pasiouras and Kosmidou (2007), the size of large banks may demonstrate a detrimental association between size and profitability, due to the expenses involved with managing extremely large enterprises, bureaucratic overhead, and agency fees. In addition, research indicates that smaller banks are more profitable than their bigger counterparts. Bashir (2003) and Sufian and Chong (2008) find same results about banks in the Middle East. Several studies in the existing empirical research show a favorable correlation between bank size and profitability (Saeed, 2014).

Economies of scale and diversification benefit large banks with a variety of borrowers, resulting in cheaper financing costs and larger profitability (Goddard et al., 2004a; Elsas et al., 2010). On the other hand, others argue that increasing bank size increases asymmetric information, marketing, and operational costs resulting in an inverse relationship between size and profitability (Djalilov & Piesse, 2016).

H1: The profitability of banks and their size are positively/negatively correlated.

2.1.2. Capital Adequacy

The equity to total asset ratio of a bank is employed to calculate the bank's capital adequacy. It has a significant impact on capital strength (Anbar and Alper,2011; Abel and Roux,2016; Antoun et al.,2018). Additionally, there is a lack of clarity on the relationship between profitability and equity capital. According to Berger (1995), raising the equity capital ratio lowers the need for additional financing from external sources, lowers the cost of capital, and lowers the costs of bankruptcy. Over time, banks' bottom lines benefit by

reducing financial risk and leverage; a rise in equity capital, however, is not a good thing. Empirical findings show that there is a lot of variation in the conclusions reached by research on the association between profitability and equity capital.

In several European nations, Abreu and Mendes (2002) revealed that capital and bank profitability were positively correlated, with well-capitalized banks demonstrating reduced bankruptcy risks, higher interest margins, and cheaper financing costs on profitable assets. Banks with greater capital ratios are assumed to be more profitable since they need less outside borrowing, hence increasing their earnings. Since a reduction in risk boosts a bank's reputation and reduces the cost of funding, banks with sufficient capital see increased profitability. However, a lower capital ratio increases the company's exposure to leverage risk, which leads to a higher cost of borrowing. According to several experts, banks with higher capital ratios are healthier than those with lower ones. Currently, a high capital ratio is seen as indicating minimal leverage and, thus, low risk.

Multiple studies have shown a favorable relationship between performance and the availability of equity capital (T.Yahya et al. 2017; Zampara et al. 2017; Mercan, 2021b; Athanasoglou et al., 2006). However, the equity capital ratio is inversely in connection with bank performance, as shown by the research of Chronopoulos et al. (2012), and Guru et al. (2002). Ebenezer, Omar, and Kamil (2017) illustrate that capital ratio positively impacts bank profitability. Hence, we hypnoses as follows:

H2: The capital ratio and bank profitability are positively/negatively correlated.

2.1.3. Efficiency

Efficiency, which is typically assessed by the cost to income ratio, is another factor that affects the profitability of the bank. It can be used to measure the bank's operating efficiency. The ratio of non-interest expenses to total income is a basic method for measuring it. This ratio determines how much the profitability of a bank is affected by its operational efficiency. The higher the management efficiency is, the lower the ratio of operational efficiency (Sastrosuwito & Suzuki, 2012; Cerci et al., 2012; Turgutlu, 2014; Mercan,2020a). According to empirical studies of Cerci et al., 2012; Rachdi, 2013 and Sastrosuwito & Suzuki, 2012, the cost-to-income ratio and profitability indicators are negatively correlated.

H3: The profitability of banks and efficiency are negatively correlated.

2.1.4. Diversification

Non-interest income as a proportion of total revenue is a metric used to measure diversification. The bank may raise its earnings via non-interest channels such as service charges, commissions, and the like. Jiang et al.

(2003) found that it is acceptable to assume that a bank's revenue would increase if the firm entered new business sectors. The idea of "economies of scope" may allow banks that handle a wide range of financial transactions to save expenses. Tan (2016) claims that the link between bank diversification and profitability is negative. Other earlier papers such as Jiang et al. 2003 and Chiorazzo et al. 2008 have identified a beneficial benefit of diversity, while others (Demirgüç-Kunt and Huizinga 1999; Tan and Floros 2012) have discovered a detrimental influence on profitability. We do not anticipate any clear association based on the mixed evidence.

There are conflicting empirical results about the link between revenue diversification and bank profitability. The profitability of 42 Indian banking institutions was examined by Sinha and Sharma (2016) using GMM regression. They discovered that deposit growth, capitalization, HHI, diversification, and GDP are all positively correlated with ROA, while poor asset quality and inflation rate are negatively correlated with the profitability of banks in India. Chiorazzo et al. (2008) discovered that revenue diversification enhances the risk/return trade-off in their 2008 study of Italian banks, with larger impacts for large banks. Similar to this, Demirguc-Kunt and Huizinga (2010) found that revenue diversification boosted banking performance, but that Its advantages were offset by a greater vulnerability to non-interest activities. Small banks are more vulnerable to failure than bigger banks, according to Lepetit et al. (2008), since they depend more on non-interest activities like fees and commissions. Fiordelisi et al. (2011) analyzed European data and found that income diversification increases banks' risk.

H4: there is a negative/positive relation between profitability and diversification.

2.1.5. Liquidity

The ratio of a bank's loans to its total assets is applied as a proxy for liquidity in the current paper. Miller and Noulas (1997) found a negative link between liquidity and profitability since banks are more exposed to loans when their loan-to-asset ratios are higher. A higher loan-to-deposit ratio may increase profitability for banks with sound risk management, but it may also indicate that the banks aren't fulfilling their overnight liquidity needs and are thus forced to borrow. Studies have indicated that banks with greater liquidity ratios are less profitable than those with lower liquidity ratios (Molyneux and Thornton 1992; Demirgüç-Kunt and Huizinga 1999; Mercan 2021a).

The liquidity risk is the probable incapacity of banks to maintain asset expansion or repay debt. A bank's earnings are thus more likely to be high if it has a low percentage of liquid assets. According to Tan and Floros

(2015) and Sufian and Habibullah (2009), the three risks of liquidity, bankruptcy, and Credit, in general, have a significant impact on commercial banks' profitability. The profitability of banks (ROE, ROA, and NIM) are particularly affected negatively and significantly by liquidity.

H6: Liquidity negatively/positively affects banks 'profitability.

2.2. Dependent variables

In this research, return on equity (ROE), net interest margin (NIM), return on assets (ROA), and profit margin (PM) are used to refer to profitability indicators (see variables used in table 1).

The earnings after taxes of banks to their total or average assets are known as return on assets (ROA). It is a widely known indicator of profitability because it reveals how well an organization is able to generate revenue from its assets and how efficiently its assets are utilized. Previous research on ROA may be found in Bougatef (2017), and Williams (2003)

The return on equity (ROE) is the profit after taxes divided by the total or average amount of equity. This ratio is often used as a measure of a bank's ability to turn the money invested by shareholders into a profit (see variables used in table 1).

The net interest margin (NIM) is calculated as the difference between interest revenue and interest expenditures in proportion to the average amount of interest-bearing assets. Both Ho and Saunders (1981), and Saona (2016) employed net interest margin (NIM) as a profitability variable, defining it as the percentage of a bank's total operating revenue that comes from interest income after subtracting the cost of capital (table 1).

PM determines the profit margin as the ratio of pre-tax profit to either average or total assets. Similar to ROA, except it reveals the real profit from operations by excluding the impact of corporate taxes. Few earlier studies have used PM as a profitability indicator (see Bourke 1989; Tarusa et all 2012)

2.3. Macroeconomic variables

2.3.1. Concentration

The ratio of the top three largest banks' assets to all commercial banks' assets is used as a proxy to measure concentration in the banking sector. Two banks control a large portion of Georgian's banking sector, giving them a monopolistic position to control the market and a negative impact on other banks' profits.

The structure-conduct-performance (SCP) hypothesis and the efficient-structure (ES) hypothesis are two conflicting theories that should be taken into consideration. According to the SCP hypothesis, monopolistic

power results from growing market power (Short, 1979; Molyneux et al., 1994). The ES hypothesis states that market concentration is not the source of a bank's increased profitability; rather, the higher efficiency of efficient banks enables them to grow their market share and profit margins. Peltzman, (1977), Samad (2005), Heggestad and Mingo (1974), Rhoades (1977), Bostvadze (2018) and Mercan (2012) all support the SCP theory. Other scholars (Smirlock, 1985; Evanoff and Fortier, 1988; Gillini et al., 1984;) support the ES theory in the banking industry.

In a highly concentrated banking market, there is less competition, customers have fewer options available to them, and the market strength of individual banks is larger. As a result, the profitability of individual banks may be raised by the making of monopolistic profits. A firm's profit may improve due to market concentration, but the higher profit may be offset by management's inability to capitalize on revenue-generating possibilities. Among the empirical findings that support the positive effects of market concentration are Karimzadeh et al. (2013), Dietrich and Wanzenried (2011) and Perera et al. (2013). The association between bank concentration and profits has been demonstrated to be negative in several research (Ramadan et al., 2011; Batten & Vo, 2019; Ameur & Mhiri, 2013)

H5: Concentration negatively/positively affects banks 'profitability.

*GDP-*This figure might be seen as an indication that the growth of the economy is continuing. Banks are likely to participate in a broader range of operational activities during times of economic boom. These operations include lending, borrowing, and the provision of services that do not earn interest revenue. Research that was carried out by Athanasoglou et al. (2008), Mercan et al.(2020b) Trujillo-Ponce (2013), and Dietrich and Wanzenried (2011) reveals that there is a positive association between a bank's profitability and GDP. In light of this, we also anticipate that economic growth will have a favorable effect on the bank's profitability.

H7: GDP growth positively affects banks' profitability.

Inflation -The variation in the consumer price index on a yearly basis is used as a proxy for inflation. At the same time, Lee et al. (2015) discovered a positive association between the profitability ratios of some banks (for example ROE and ROA) and a adverse association between ROE and the profitability ratios of other banks. Moualhi et al. (2016) found an inverse relationship between inflation and the profitability of banks.

 H8: There is a positive/negative relationship between inflation and the profitability of banks.

3. Data collections

The yearly data used in this study comes from the Orbis, Bureau Van Dijk , a resource that provides information on the ownership structure as well as the financial statements of various financial institutions throughout the world. This database contains in-depth biographies as well as information on the financial status of banks from all around the globe. I went around to all of the banks that were still in business from 2013 to 2020 and gathered their year-end financial data. Our sample is comprised of 14 commercial banks that were functioning in Georgia throughout the time period under consideration for this research.

During the time period that is being considered, we anticipate that sample banks will hold information for all of the factors that have been investigated for a period of at least five years. Different types of credit institutions may be distinguished by looking at banking subsidiaries and overseas branches.

Following the completion of these filtering steps, I am left with a final dataset that consists of an unevenly distributed panel containing 123 observations. The World Development Indicators database (http://data.worldbank.org) and the International Monetary Fund (http://www.imf.org) have both been used to compile the annual macroeconomic data that has been gathered.

The explanatory factors that were revealed in the research articles are outlined in Table 1, together with the accompanying computations and forecasted bank risk indicators for each of the variables.

Table 1 provides a listing of the explanatory factors that were found in the research articles, together with the accompanying computations and anticipated bank risk indicators for each variable. As part of the regulatory framework that is used to determine and evaluate a bank's amount of capital that is at risk, the capital structure of the bank is subjected to an evaluation. The bulk of a bank's capital is comprised of funds that have been retained as profits and funds that have been obtained via the issuing of new shares. The literature often refers to "actual capital" and "regulation capital" when attempting to describe bank capital. Table 2 displays the descriptive statistics for the variables considered in this investigation. Maximum and minimum values, means, standard deviations, and medians are reported for the dependent and independent variables.

The findings show how profitability metrics like ROA, ROE, and NIM have changed from 2013 to 2020. Descriptive data for both bank-specific and macroeconomic factors are also included in the findings. ROA, ROE, and NIM have a mean of 1.7, a standard deviation of 2.4, and a maximum range of -7.2, 12.00, and 9.9 with mean of -28.1, 31.1, and standard deviations of 9.8, and 8.9 with mean, 3.6, 28.9, standard deviation 4.7 respectively, according to the data. From 2013 to 2020, the distribution was skewed negatively. Table 2 shows

that the mean and standard deviation of bank-specific data and macroeconomic indicators differed substantially across the sample year of data. CAR, LIQ, CR, and DIVE ratios means are 23.5, 18.8,8.7, and 5.4 percent respectively, while the corresponding standard deviations are 15.2 percent, 10.7%, 11.1 percent, and 5.9 percent.

Table 1. Variables and expected results of hypothesis

Variables	Code	Expected results
Dependent		
Return on asset	ROA	
Return on equity	ROE	
Net-interest margin	NIM	
Profit before tax to asset	PBT	
Independent variables		
Size	SIZ	+/-
Liquidity	LIQ	+/-
Efficiency	EFF	-
Diversification	DIV	+/-
CAPITAL	CAR	+/-
Country indicators		
Concentration	CR	+/-
Inflation	INF	+/-
Growth rate	GDP	+
Interest rate	INT	+/-

The mean bank size is 5.45 in logarithm terms, corresponding standard deviations for size are 0.66 percent, a minimum of 4.25, and a maximum of 6.85. The mean value of the Gross Domestic Product (GDP) is 2.7, with a minimum value of -6.8 and a maximum value of 5.0. This is the case when considering the economy as a whole. The inflation rate varies from a low of 2.8 to a high of 12.1, with a median of 6.8. More specifically, and considering elements that are specific to the industry, the mean value of interest rate is 4.92, with a standard deviation of 2.39, and a possible range of values of (Min. = 1.35, Max. = 8.49). Tests for multicollinearity and correlation between bank-specific and macroeconomic variables are shown in Table 3. According to the results, CAR, LIQ, CR, and INF have a undesirable relationship with ROE and ROA, and they also have a negative relationship with NIM when it comes to bank-specific variables. Similarly, ROA and ROE are positively correlated with SIZE, but NIM is negatively correlated with SIZE. EFF and DIV are positively correlated with the profitability indicators ROA, ROE, and NIM.

SIZE is shown to positively correlate with ROA and ROE but negatively correlate with NIM. This implies that NIM is less significant than ROA and ROE. Results suggest that, with the exception of INF, all macroeconomic variables are positively linked with all four-profitability metrics. When INF is regarded as a macroeconomic variable. However, there is a positive association between INT and the three-profitability metrics: ROA, ROE, and NIM. The results also reveal that the highest value of correlation between the two variables was 0.62, negative, which was found between CAR and EFF, indicating that multicollinearity among the variables is not a concern.

Table 2. Descriptive Statistics

Statistic	Nbr. of observations	Minimum	Maximum	Mean	Standard deviation
ROA	111	1.29	3.50	2.69	0.686
ROE	111	9.74	24.43	17.21	4.27
NIM	111	4.68	9.18	7.14	1.46
PBT	111	**-7.3**	**14.2**	**1.9**	**2.8**
SIZE	111	4.250	6.835	5.458	0.666
EFF	111	40.80	54.07	45.49	4.49
CAR	111	9.93	17.39	13.57	2.46
LIQ	111	5.1	61.3	18.8	10.7
CR	111	0.0	48.4	8.7	11.1
DIVE	111	0.4	35.7	5.4	5.9
INF	111	1.35	8.49	4.92	2.39
GDP	111	-6.8	5.0	2.7	2.2
INT	111	2.8	12.1	6.8	3.7

Multicollinearity diagnostics using VIF and Tolerance tests were carried out in order to produce a more reliable study. In Table 4, the results for all of the independent variables are shown. Both the VIF and Tolerance

values are involved here. The highest value of the VIF is 2.9, and the lowest value of tolerance is 0.047. This shows that there are no problems with multicollinearity among independent variables.

4. **Methodology**

The linear model described by (1) is used to analyze the impact of firm-specific and macro variables on the banks' profitability performance. According to the model, internal and external variables both have an impact on bank profitability. Ordinary least square (OLS) fixed and random effects have been used in a significant number of earlier researches with the purpose of determining the profitability indicators of banks. An empirical researcher must always contend with the problem of endogeneity when attempting to calculate a bank's profitability. Another crucial issue for the researcher is unobserved heterogeneity, which may be difficult to assess. This is a problem that cannot be seen.

According to the test, least squares estimation techniques result in inaccurate and inconsistent results (see Baltagi, 2005). As a result, we used fixed effect and random effect estimating methods that can handle the biases and irregularities in our results.

Accordingly, in accordance with the findings of previous studies that used the linear regression model in addition to the OLS, this research makes use of the same tools in order to perform an analysis of the factors that determine the profitability of Georgian banks.

We utilized a model to empirically assess the role of both internal, bank-specific characteristics and external, non-banking factors, such as those of the sector and the economy at large, in determining bank performance.

$$\text{BANKPROFIT}_{it} = \beta_0 + \beta_1\,\text{SIZE}_{it} + \beta_2\,\text{EFF}_{it} + \beta_3\,\text{CAR}_{it} + \beta_4\,\text{LIQ}_{it} + \beta_5\,\text{CR}_{it} + \beta_6\,\text{DIVE}_{it} + \beta_7\,\text{INF}_t + \beta_8\,\text{GDP}_t + \beta_9\,\text{INT}_t + \varepsilon_{it} \tag{1}$$

where, ROA, ROE, NIM, and PPR are used to measure bank performance indicators (BANKPROFIT_{it}). ε_{it} refers to a disturbance, *t* to the values of the years 2013 through 2020, and *i* to a set of numbers from 1 to 14. The parameters capture the potential impact of these factors on the key performance indicators used by banks. CAR stands for "Equity to Asset Ratio, SIZE for "Log of Total Asset,", EFF for "Cost to Income Ratio, CR for "Bank Concentration," INF stands for inflation, GDP stands for the GDP growth rate, and INF "Country inflation".

In the beginning, the estimation of all of these equations 1 for profitability metrics was accomplished by the use of methodologies using static panel data. Since it is not possible to estimate models using pooled regression due to the presence of unobservable heterogeneity and endogeneity, we have turned to use panel

data approaches in order to do so. Random and Fixed effects methods are the most common kinds of models used with static panel data. Statistical tests, such as the Hausman test, have been performed to determine the most effective panel strategic approach for estimating the bank performance equation. The conclusion of each of these evaluations was that the random effect model is more effective than the fixed effect model.

Table 3. Correlation and Multicollinearity

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
ROA	**1**												
ROE	0.82	**1**											
NIM	0.13	0.15	**1**										
PBT	0.98	0.79	0.15	**1**									
SIZE	0.28	0.55	-0.06	0.26	**1**								
EFF	0.03	0.03	0.02	0.02	-0.02	**1**							
CAR	-0.18	-0.37	-0.23	-0.18	-0.62	-0.08	**1**						
LIQ	-0.09	-0.08	-0.03	-0.12	-0.32	0.03	0.31	**1**					
CR	-0.16	-0.19	0.01	-0.17	-0.32	0.02	0.41	0.54	**1**				
DIVE	0.00	0.05	0.30	-0.01	0.05	0.52	-0.19	0.00	0.01	**1**			
INF	-0.18	-0.11	-0.14	-0.17	0.02	-0.07	-0.01	-0.16	-0.02	-0.02	**1**		
GDP	0.19	0.27	0.12	0.20	-0.01	0.00	0.01	0.10	0.02	0.03	-0.32	**1**	
INT	0.19	0.11	0.16	0.19	-0.03	0.04	-0.01	0.16	0.03	-0.01	-0.42	0.23	**1**

Table 4. Multicollinearity statistics

Variables	SIZE	EF	CAR	LIQ	CR	DIVE	INF	GDP	INT
Tolerance	0.35	0.69	0.47	0.57	0.34	0.61	0.047	0.64	0.04
VIF	2.81	1.438	2.4	1.72	2.90	1.61	1.24	1.54	2.32

5. **Findings**

The findings from studying the whole sample are shown in Table 5. The results of the OLS regression analysis indicate that EFF, CR, and DIV have a significant and negative effect on ROA, ROE, and PBT. With corresponding weightings of 10%, 5%, and 1%, SIZE has a positive and significant influence on all components of the profitability matrix. Contrary to expectations, LIQ has a positive impact on ROE and PBT, but does not significantly affect ROA. In the context of the presentation of macroeconomic indicators, INF has a negative link but one that is not substantially significant with all profitability metrics. The expansion of GDP has large and favorable impacts on ROA, ROE, NIM, and PBT. These benefits have been seen.

The R-square findings of the regression suggest that all independent variables explain the variation in the profitability matrix. This accounts for 53% of the variance in ROA, 56% of the variance in ROE, 34% of the variance in NIM, and 65% of the variance in PBT. F-statistics are significant for all dependent variables, but not for NIM (table 5)

Tables 5, 6, and 7 provide the empirical estimated findings for the models given in Equations. The results present three unique predictions for each approach. The estimates are obtained from the pooled OLS, random, fixed effect models. The findings are divided into two groups, each of which includes estimates for each model: elements that affect profitability at individual banks and at the macroeconomic level. The findings demonstrate that the modified R square for ROA, ROE, NIM, and PBT is 0.54, 0.49, 0.41, and 0.68 for fixed effect models, while it is 0.57, 0.495,0.424, and 0.518 for the random effect model. This is the case when looking at the whole picture. This implies that the profitability as measured by ROA is mostly driven by bank-specific factors—roughly 50%—and macroeconomic factors—roughly 55%—respectively. Similar to this, the pooled model's R square adjusted for ROE is 0.56, the fixed effect model is 0.49, and the random effect model is 0.22. This indicates that bank-specific variables account for around 45 percent, whereas macroeconomic drivers account for approximately 46 percent, and correspondingly, 22 percent of the variance in banks' profitability.

Additionally, the results show that the modified R-squared values for the pooling, fixed, and random effect models, respectively, are 0.34, 0.41, and 0.42. Each of the three models has a p value of less than 1% when used with its respective sub-models (random, pooled, and fixed models), proving their significance and excellent data fit.

5.1. Bank specific results

ROA- According to a random effect model in Table 7, there is a statistically significant influence on ROA from the bank-specific components EFF, CAR, and DIVE (p-values are less than 0.01, 0.05, and 0.05 respectively). The EFF and DIVE correlation coefficients are negative, while CAR is positively, exhibiting a statistically significant influence on ROA. More capitalizes banks have better profits, according to a number

Table 5. OLS results(pooled)

	(1)	(2)	(3)	(4)
	ROA	ROE	NIM	PBT
VARIABLES	OLS	OLS	OLS	OLS
SIZE	0.238*	0.320**	-0.107	0.197*
	(0.126)	(0.130)	(0.0670)	(0.114)
EFF	-0.180***	-0.158***	0.00441	-0.176***
	(0.0369)	(0.0379)	(0.00741)	(0.0354)
CAR	1.806**	-2.077***	-0.948***	1.769**
	(0.754)	(0.774)	(0.292)	(0.693)
LIQ	0.897	1.360**	-0.363	1.617***
	(0.641)	(0.659)	(0.362)	(0.595)
CR	-0.0562	-0.0690*	-0.0546***	-0.120***
	(0.0374)	(0.0384)	(0.0179)	(0.0343)
DIVE	-0.160**	-0.161**	0.0956**	-0.269***
	(0.0681)	(0.0699)	(0.0401)	(0.0618)
INF	-2.008	-1.972	-2.691*	-2.317
	(2.653)	(2.724)	(1.575)	(2.382)
GDP	5.127***	5.072***	1.032	5.607***
	(1.626)	(1.669)	(0.948)	(1.450)
Constant	-5.407***	-3.517***	-1.524***	-5.138***
	(0.875)	(0.898)	(0.434)	(0.798)
Observations	97	97	111	96
R-squared	0.533	0.569	0.346	0.657
F-Stat	12.56	14.53	6.734	20.86
Prob > F	0	0	4.63e-07	0

*** p<.01, ** p<.05, * p<.1

of recent researches, including those by Menicucci and Paoletti (2016), Chowdhury and Rasid (2017). Even though the LIQ ratio has a positive coefficient, this indicates that the ratio of total current assets to total assets has a positive but not significant impact on ROA.

Table 6. Fixed effect results

VARIABLES	(1) ROA Fixed effect	(2) ROE Fixed effect	(3) NIM Fixed effect	(4) PBT Fixed effect
SIZE	0.444	0.561	-0.0784	-0.00137
	(0.676)	(0.690)	(0.170)	(0.586)
EFF	-0.253***	-0.233***	0.00356	-0.259***
	(0.0430)	(0.0439)	(0.00358)	(0.0400)
CAR	2.030*	-1.549	-0.571**	1.830*
	(1.126)	(1.149)	(0.220)	(0.975)
LIQ	-1.260	-1.179	-0.719***	0.0418
	(0.897)	(0.915)	(0.240)	(0.798)
CR	0.0185	0.0123	-0.0268**	-0.0430
	(0.0429)	(0.0438)	(0.0105)	(0.0377)
DIVE	-0.194***	-0.186***	-0.0102	-0.317***
	(0.0649)	(0.0662)	(0.0189)	(0.0567)
INF	-0.954	-0.929	-2.209***	-0.792
	(2.522)	(2.574)	(0.734)	(2.197)
GDP	4.612***	4.456***	1.289***	5.084***
	(1.507)	(1.538)	(0.426)	(1.305)
Constant	-6.099	-4.390	-1.724*	-3.658
	(3.902)	(3.983)	(0.967)	(3.386)
Observations	97	97	111	96
R-squared	0.546	0.499	0.418	0.684
F-test	11.14	9.21	7.91	19.76
Prob	0.00	0.00	0.00	0.00
Number of banks	15	15	15	15

*** $p<.01$, ** $p<.05$, * $p<.1$

In summary results of the hypothesis when the ROA profitability matrix is employed, bank-specific indicator results of equation 1 reveal that H2, H3 and H4 are supported by table 7. In contrast, all other hypotheses of bank specific indicators are rejected in table 7.

ROE- According to the results in table 7, EFF, CAR, and DIVE ratios have negative effects, whereas SIZE and LIQ have statistically significant positive effects on ROE. According to this, the total equity to total assets (CAR) and SIZE in Georgian banks are both high, which has an incremental impact on their profitability (ROE). A bank's profitability is heavily dependent on its size, and capital adequacy according to the findings of the current study. Findings reveal that total operating efficiency (cost to income ratio) and capital ratio has

a detrimental impact on their profitability of banks in Georgia. SIZE is found to be positive and significant impact on ROE. This result is consistent with (Masood et al., 2012 and Chowdhury & Rasid, 2017). The results

Table 7. Random effect results

VARIABLES	(1) ROA Random effect	(2) ROE Random effect	(3) NIM Random effect	(4) PBT Random effect
SIZE	0.238*	0.320**	-0.0585	0.197*
	(0.126)	(0.130)	(0.0842)	(0.114)
EFF	-0.180***	-0.158***	0.00363	-0.176***
	(0.0369)	(0.0379)	(0.00432)	(0.0354)
CAR	1.806**	-2.077***	-0.658***	1.769**
	(0.754)	(0.774)	(0.217)	(0.693)
LIQ	0.897	1.360**	-0.684**	1.617***
	(0.641)	(0.659)	(0.269)	(0.595)
CR	-0.0562	-0.0690*	-0.0317***	-0.120***
	(0.0374)	(0.0384)	(0.0118)	(0.0343)
DIVE	-0.160**	-0.161**	0.00606	-0.269***
	(0.0681)	(0.0699)	(0.0230)	(0.0618)
INF	-2.008	-1.972	-2.349***	-2.317
	(2.653)	(2.724)	(0.870)	(2.382)
GDP	5.127***	5.072***	1.251**	5.607***
	(1.626)	(1.669)	(0.521)	(1.450)
Constant	-5.407***	-3.517***	-1.822***	-5.138***
	(0.875)	(0.898)	(0.501)	(0.798)
Observations	97	97	111	96
Wald chi2	100(0.00)	116(0.00)	56.68(0.00)	166.9(0.00)
R-sq:	0.57	0.495	0.424	0.518
Number of banks	15	15	15	15

*** p<.01, ** p<.05, * p<.1

of the studies conducted by Petria et al. (2012) and Marijana et al. (2012) contradict our findings regarding efficiency (EFF), which claim that EFF has a positive impact on ROE. According to the authors of the research by Marijana et al. (2012) and Petria et al., 2015, the operating expenses of a bank have a significant negative impact on its profitability, which are consistent with our findings.

NIM- In terms of NIM, the findings indicate that all bank-specific parameters of CAR, LIQ, and CR have an influence on NIM that is statistically significant. CAR, and LIQ ratios exhibit negative coefficients, indicating that they have a strong negative statistical influence on NIM. All the rest variables such as EFF

SIZE, and DIVE have no significant relations. The fact that the CAR and LIQ ratios have a negative coefficient indicates that Georgian banks are underperforming, as measured by NIM. As a result of the matter, only H2, and H6, are supported. The rest of the hypotheses of bank specific characteristics are rejected when NIM is employed as a performance indicator of profitability.

PBT- All bank-specific factors have a substantial impact on PBT profitability. SIZE, CAR, and LIQ have a positive influence on PBT. Table 7 illustrates that EFF, and DIVE have a negative effect on PBT. As a result, all bank specific 'hypotheses are accepted.

Overall, it is evident from the findings that the SIZE ratio has a statistically significant positive influence on ROE and PBT, on the other hand it has no significant except on NIM and ROA. Moreover, it has been demonstrated that liquidity has no significant influence on ROA, but when ROE,NIM, and PBT are employed, it has a significant effect. This finding is consistent with results of Bougatef (2017) and Petria et al. (2015), the profitability and liquidity of a bank are positively associated.

5.2. Determinant of country specific variables

ROA- According to the results shown in Table 7, macroeconomic variables, GDP—aside from INF and CR—has a significant positive statistical influence on ROA. This refers to the question of whether or not macroeconomic indicators impact the profitability of Georgian banks. It was discovered that the inflation and bank concertation had no statistically significant effect on profitability indicators except NIM is used, which both at the same time demonstrate a negative significant effect.

ROE- When ROE is employed as a dependent variable, GDP exhibits a strong statistically significant influence on ROE as well. ROE is affected negatively by the INF rate, but ROE is positively affected by GDP growth. Concentration of banking system has a negative and significant effect on ROE at 10% significance. . As shown by the results of Louzis et al. (2015), economic growth (GDP) has an influence on bank profitability, and inflation (INF) has an inverse effect on return on equity (ROE). However, this result contradicts the findings of Rashid and Jabeen (2016), who found that the GDP had a negative effect on bank performance. In conclusion, H5 and H7 are supported (table 7).

NIM- Results are the same sign for INF and CR when NIM is used, but INF has negative significant influence on NIM. Economic growth (GDP %) has a positive and significant coefficient on NIM. Overall, the hypothesis of H5, H7 and H8 are supported. Table 8 indicates the robust test. Results in table 8 are confirming

mostly the results I found in table 7 when random effects are employed. As a result, findings in random factors are consistent.

Table 8. Robust test

VARIABLES	(1) ROA Robust	(2) ROE Robust	(3) NIM Robust	(4) PBT Robust
SIZE	0.238*	0.320**	-0.107	0.197*
	(0.121)	(0.123)	(0.0679)	(0.113)
EFF	-0.180***	-0.158***	0.00441	-0.176***
	(0.0568)	(0.0563)	(0.00946)	(0.0562)
CAR	1.806**	-2.077**	-0.948***	1.769**
	(0.707)	(0.846)	(0.261)	(0.757)
LIQ	0.897	1.360**	-0.363	1.617***
	(0.562)	(0.586)	(0.385)	(0.611)
CR	-0.0562**	-0.0690**	-0.0546***	-0.120**
	(0.0265)	(0.0280)	(0.0125)	(0.0481)
DIVE	-0.160*	-0.161*	0.0956***	-0.269***
	(0.0945)	(0.0917)	(0.0325)	(0.0716)
INF	-2.008	-1.972	-2.691*	-2.317
	(2.172)	(2.231)	(1.553)	(2.179)
GDP	5.127***	5.072***	1.032	5.607***
	(1.348)	(1.434)	(0.838)	(1.194)
Constant	-5.407***	-3.517***	-1.524***	-5.138***
	(0.901)	(0.921)	(0.482)	(0.846)
Observations	97	97	111	96
R-squared	0.533	0.569	0.346	0.657
F-Stat	12.76	24.66	18.06	28.37
Prob > F	0	0	0	0

*** $p<.01$, ** $p<.05$, * $p<.1$

6. Random Forest and relative value importance

In addition to OLS regression, we implemented Breiman's random forest-derived relative value important indicator (Breiman, 2001). In the random forest (RF), I estimated RVI using equation 1.RANDOM FOREST evaluates the risk and profitability of a bank. Random algorithms and decision trees are combined in RF ensemble learning. RVI is measured as the average weighted squared model improvement from each split (Friedman & Meulman, 2003). As Biau and Scornet (2016) and others illustrated that RF was effective because it required minimum involvement from the researcher and could be used for classification and prediction

problems. RF models are less vulnerable to missing data and outliers (Hastie et al., 2009; Biau and Scornet, 2016).

Multicollinearity and heteroskedasticity, which have an impact on parametric models' efficacy, are not a concern for RF (such as regression analysis). RF is an ideal option for predictive analytics because, like many other machine learning algorithms, it can deal with a huge number of input variables, and solve the problem of small sample size (Hastie et al., 2009).

6.1. RVIs (relevant variable indicators) results of determinant indicators

As shown in Figure 1, when ROA is used to calculate three of the top five profitability variables, efficiency (EFF), diversification of banks 'income (DIVE), and capital adequacy (CAR) and they have a significant influence on ROA. EFF (100), DIVE (53.9), and CAR (33.9) are influencing the ROA. No macro-variables influence the riskiness of Georgian banks. Parametric regression results in tables 7-8 are backed up by RVI findings from the random forest. This shows that bank characteristics, rather than macroeconomic ones, have a substantial role in determining the profitability of Georgian banks.

Table 9 Summary of the model of RVI (ROA)

Model Summary

Total predictors	9
Important predictors	8
Number of terminal nodes	4
Minimum terminal node size	4

Statistics	Training	Test
R-squared	78.03%	61.36%
Root mean squared error (RMSE)	0.0114	0.0151
Mean squared error (MSE)	0.0001	0.0002
Mean absolute deviation (MAD)	0.0086	0.0097
Mean absolute percent error (MAPE)	1.0509	1.0839

Figure 2 indicates that banks' profitability (ROE) is dominated by their microeconomic features. There are a number of elements that contribute to a bank's profitability, including the bank's efficiency (EFF), diversification (DIVE), size of banks (SIZE), and capital ratio (CAR) (figure 2).

Bank profits are heavily impacted by elements including efficiency (100), diversification (DIVE), and bank size. The bigger the assets, the larger profit of banks. Table 9 and 10 indicate that the variable explained by independent variables is 83 percent for ROE, and R-square is 78 percent for ROA. Results are indicated in figure 3 as NIM is used for dependent variables. Finding are supportive for previous results above for ROE and ROA (Figure 3)

Figure 1 Relative variable importance (ROA)
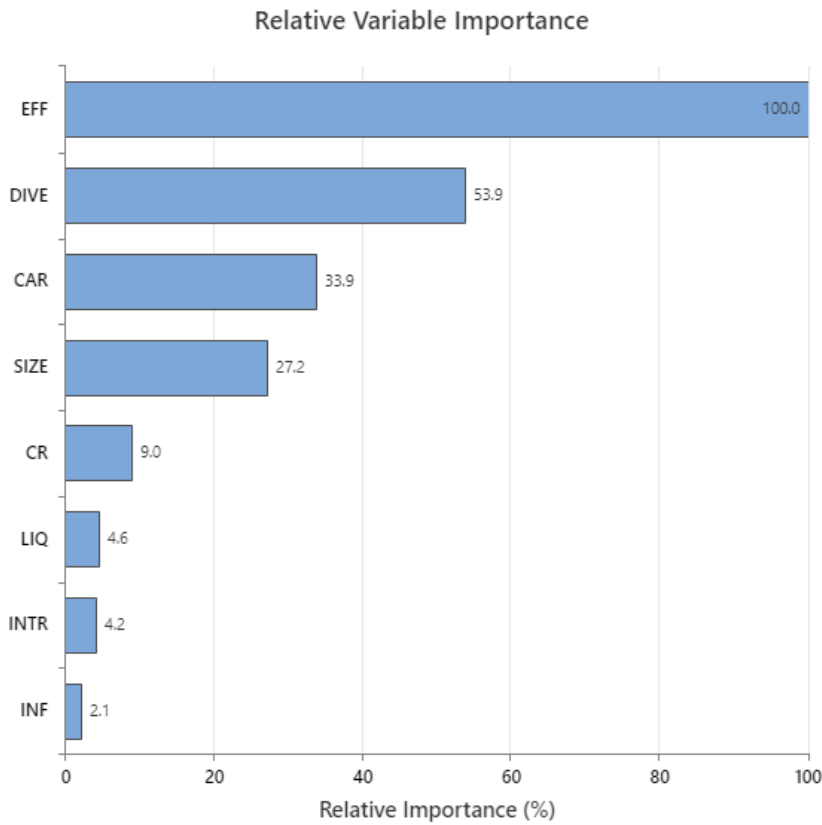
Variable importance measures model improvement when splits are made on a predictor. Relative importance is defined as % improvement with respect to the top predictor.
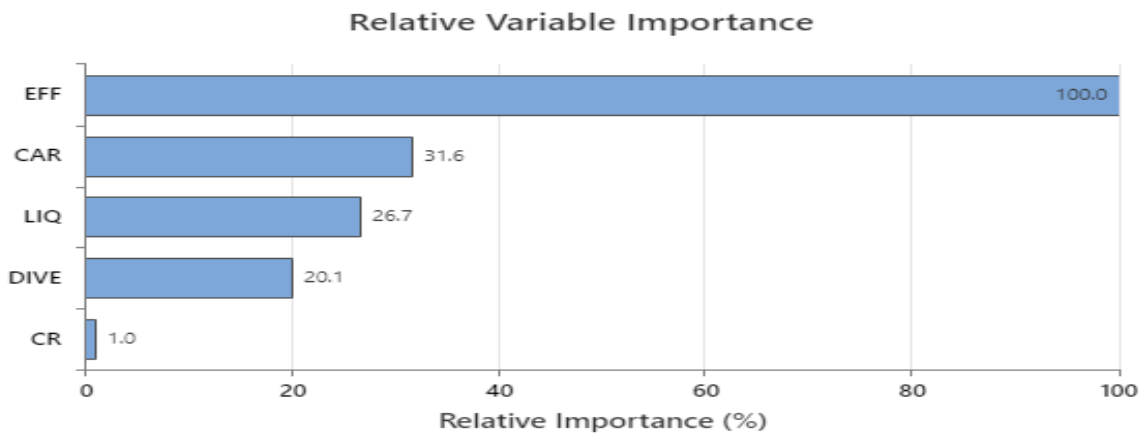
Figure 2 Relative variable importance (ROE)
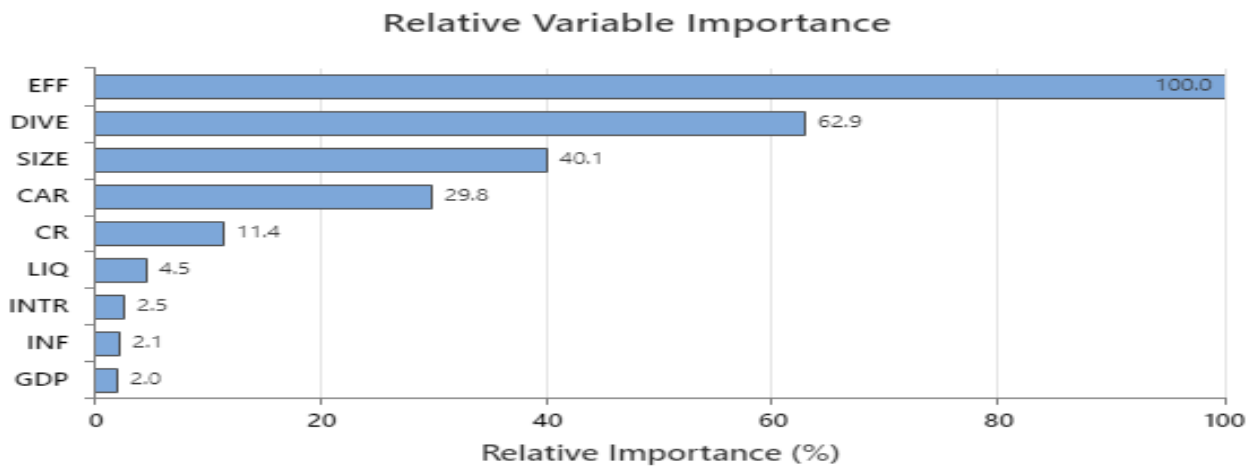
Variable importance measures model improvement when splits are made on a predictor. Relative importance is defined as % improvement with respect to the top predictor.

Table 10 Summary of model of RVI (ROE)

Model Summary

Total predictors	9
Important predictors	9
Number of terminal nodes	8
Minimum terminal node size	3

Statistics	Training	Test
R-squared	83.67%	66.86%
Root mean squared error (RMSE)	0.0394	0.0561
Mean squared error (MSE)	0.0015	0.0031
Mean absolute deviation (MAD)	0.0300	0.0401
Mean absolute percent error (MAPE)	0.4926	0.5694

Figure 3 Relative variable importance (ROE)

Relative Variable Importance

Variable importance measures model improvement when splits are made on a predictor. Relative importance is defined as % improvement with respect to the top predictor.

7. Conclusion and Discussion

In this research, we investigated the influences of both macroeconomic and bank-specific variables on the profitability of financial institutions. From 2013 to 2020, banks in Georgia were analyzed to see how bank-specific and macroeconomic factors affected their profitability as measured by return on assets, return on equity, and net interest margin. This was the case regardless of the kind of bank. As independent factors, bank-specific characteristics have been taken into consideration. These variables include asset size, capital sufficiency, liquidity, operational efficiency, liquidity, concentration, and diversification. In a similar vein, macroeconomic determinants make up the second group consisting of inflation and interest rates, and the gross domestic product (GDP) as independent variables.

In general, I find that the profitability of banks is based on features that are unique to individual banks as well as characteristics that are common to the banking sector. However, the direction of causation does not

always follow the same pattern across different metrics of profitability. The results have a variety of repercussions for public policy. The research is also important to a variety of players in the process of developing and preserving a financially stable and effectively functioning market and system, especially the banking system which dominates the financial system in Georgia.

In terms of the factors that are specific to individual banks, the results demonstrated that the profitability of Georgian commercial banks, as calculated ROA, has a positive association with factors such as capital ratio, and bank size, in contrast to an inverse relationship that exists with efficiency ratio. This indicates that bank size, capital, and efficiency ratios are the most significant bank-specific criteria determining the profitability of banks in Georgian measured when ROA is used as a profitability performance indicator. According to findings, the profitability of Georgian commercial banks as assessed by ROA, ROE, NIM, and PBT is positively correlated with GDP but negatively correlated with inflation on a macroeconomic level. When ROE is used as the dependent variable, the findings showed that bank size, capital, revenue diversification, efficiency, and liquidity ratio, as well as all macroeconomic parameters except inflation, had a considerable effect on the profitability of commercial banks in Georgia as calculated by ROE. According to the findings, there is also a correlation between ROE and efficiency, capital ratio, concentration and revenue diversification, but these are inversely related. On the other hand, there was found to be a positive association between ROE and bank size, liquidity ratio, and GDP.

The association between revenue diversification and bank profitability is only favorable with NIM, however, the relationship is positive but not significant with regard to NIM. It is a fact that banks focus to non-interest-earning activities that boosted their profits via commissions and fees. It will result in a reduction in their NIM, but an increase in their overall profitability.

The current research was to provide novel empirical data in order to fill a gap that had been identified within the existing banking literature about the particular macroeconomic factors that determine the profitability of commercial banks in Georgia. Because there are not many studies that explore banking in former-Soviet countries like Georgia. This research is one of the research that examine determinant factors that are influencing the profitability of banks. The conclusions of this research have important additions to the existing body of literature as a result of their capacity to completely define and critically analyze the current status of profitability among Georgian commercial banks. To be more explicit, this research presents evidence of the variables that may impact the profitability of Georgian banks throughout the time period extending from

2013 to 2020 and gives this evidence in the form of a study. As a result, the inquiry into this subject became highly significant and intriguing, in addition to providing bankers and policymakers with empirical facts.

To begin, our findings match the conclusions of earlier research on the profitability of banks. Second, we investigate a very recent collection of banks- and market-specific drivers of bank profitability, which refresh our understanding of bank profitability in relation to a number of significant characteristics. Because of these expansions, we have the ability to create some fresh and fascinating discoveries. Not only do we provide information for a very recent time period, but also these most recent years were marked by a number of significant shifts in the banking sector.

7.1. Practical Policy implementation

The results of current research are also providing advice and recommendations to decision-makers in the banking sector. It is recommended that regulators and decision-makers in the banking sector evaluate the macroeconomic factors, especially the bank-specific factors, so as to improve the profitability of commercial banks in Georgia. Additionally, bank managers, bankers, and other experts must concentrate more on bank-specific variables for the effective use of banks' resources in order to have a major, favorable impact on Georgian commercial banks' financial performance. This is something that is both needed and required. This subject may be investigated further in the future by integrating a wider range of investigations both micro- and macroeconomic aspects related to the bank in question. Both the private and public banking sectors need to be compared with regard to the elements that contribute to profitability, including both bank-specific and macroeconomic aspects. As a consequence of this, it is very obvious that the concentration in the industry is negatively impacting the profitability of the bank in general. The decision-makers must increase the amount of competition inside the banking industry. Because the banking sector in Georgia is very concentrated.

7.2. Limitations of research

It is not without certain restrictions. It would be helpful for me to understand the factors that determine bank profitability even better if I included more components in our assessments like mergers and foreign ownership. In addition, it may be useful to include detailed information on board and management members such as education level and skill levels, occupational status, gender of manager, experience, and independence of members, since these factors are becoming more significant in measuring bank profitability. In later work, we will examine some of these issues in further depth.

In addition to this, the scope of the thesis is confined to only the banking companies in Georgia; however, I recommend doing the same research in East Partner countries such as Ukraine, and Moldova that has not yet been explored. In this particular study, operational efficiency was determined by comparing total operating expenditures to gross revenue; however, future research may make use of additional efficiency indicators, such as technical efficiency, pure technical, and cost efficiency. In addition, we measured competition using the five-bank concentration ratio in the current paper. However, in future research, we may include The Lerner index to evaluate competitiveness and the standard z-score to analyze bank risk.

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