Determinant factors of risk-taking in Georgian Banking Institutions with Machine Learning

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Abstract

Economical development in perspective is unthinkable without the successful functioning of the commercial banking system, as it has a direct impact on practically all areas of the market economy by determining the vector of its development. The paper aims to discuss and analyze banking risk and its factors. It involves analysis of factors affecting the profitability of banks and correlations between different variables that are crucial for identifying relationships between key aspects. An analysis is performed on the example of Georgian Banks. To respond to this question, 14 active commercial banks of Georgia operating in the years 2013 – 2020 were analyzed using Machining learning and ordinary least squares (OLS) . This research also applies the fixed effect model by evaluating Hausman. Results showed specific correlations between a variety of factors affecting the risks of commercial banks. Research emphasizes the importance of performing proper risk management strategies and their influence on the overall profitability of the bank.

Keywords: risks, banking sector, Basel Accord, risk management.

1.Introduction

Banks are the main intermediaries between society and sustainability. Economic growth is highly dependent on the financial operations performed between stakeholders and the bank. With this in mind, risk management in banks is one of the most crucial aspects that needs attention from both society and the banks themselves. The development of a country's banking industry is critical to the successful and healthy growth of its economy. As the main source of income of banks are loans (Saunders & Cornett, Financial Markets and Institutions, 2015) it increases the risk of bank liquidity. A huge part of the population is involved in loan-taking causing banks to lend their resources not only to financially stable customers but also to less creditworthy ones. Thus, increasing the risk of financial ruin. Effective supervision of the banking system, therefore, plays a major role in the functioning banking industry. The primary purpose of the aforementioned supervision is to guarantee that banks have enough capital while taking into consideration the risks associated with the banking sector's operation. "The correlations between different types of risk, both within an individual bank and throughout the banking system, have therefore increased and become more complex" (Greuning & Bratanovic, Analyzing Banking Risk, 2020), consequently, the need for a thorough understanding of factors influencing bank risk has increased.

Banks must offer dependable conditions and competent supervision, which are critical in banking to maintain the stability of all countries' financial systems. It offers advantages in free market circumstances and sound macroeconomic policy. Risk management is a critical component of the bank's policy. Particularly, it is "the logical development and execution of a plan to deal with potential losses" (Tursoy, 2018). The prospect of lower economic gains due to monetary loss or expenditure linked with banking transactions or operations is referred to as risk. To monitor and control risks, the banking sector must establish and operate an adequate and effective internal audit, internal control, and risk management system that is compatible with their activities and structure in changing conditions, and that includes all branches and departments operating within the framework of the principles established for them and reporting to the board of directors.

To create a cycle, it is necessary to define, measure, analyze, systematically and effectively monitor, audit, report, and regularly review risk management functions following the legal requirements subject to the consolidation of the bank and its subsidiaries, as well as to ensure the emerging risks within the framework of the established procedures and principles.

As we know, many studies have explored factors influencing bank risk and performance – e.g. Mirzaei et al., 2013; Molyneux & Thornton, 1992; etc. For instance, factors affecting bank risk and consequently banks' performance are size, capital ratios, profitability, efficiency, market power, diversification of activities, and economic and country indicators. With this in mind, Goddard has suggested that banks' profitability and capital-to-asset ratio have a positive correlation (Goddard et al., 2004), whereas Pasiouras and Kosmidou (2007) state that there is a negative correlation between the cost-to-income ratio and bank's performance. Thus, it is crucial to identify particular risks and conditions that have an impact on banks' position in the market and therefore overall image. It is important to identify how the risk influencing the bank may be created and managed. Negligence may cause disrupting outcomes leading to bankruptcy and unbearable result both for the business and for the bank's stakeholders. This research describes and explains significant correlations between major factors affecting banks' risks. The importance of understanding financial variables influencing banks has always been in priority and is mentioned in many studies specifically proposed in this research for a thorough understanding of the topic discussed.

The significance of the study is based on the fact that bank is vulnerable to the financial crisis. The system's flaws demonstrated that the accomplishment of the country's goals is impossible without the stable operation of banks. "The Asian financial crisis of 1997 illustrates that ignoring basic risk management can also contribute to economy-wide difficulties" (Meyer, 2000), it has covered many weaknesses that raised the risk of default. The financial crisis exposed the primary factors for the emergence of commercial banks' financial soundness. In this regard, Basel Committee for Banking Supervision (BCBS) was established to regulate banking standards: "The Committee sets international standards and guidelines for national regulators to assess and supervise their banking system. Its landmark publication—the Basel Accord—largely affects the way banks manage their capital and risk as well as the way they are monitored and supervised by the regulators" (Quang & Gan, 2019). Society must understand the peculiarities of bank risk operations to be able to correctly assess a bank's performance. As future stakeholders, we may be involved in financial operations with banks and should exquisitely understand their creditworthiness, together with the bank's financial background concerning risks. Banks are financial intermediaries that also influence overall sustainability. Nowadays, most people are involved in the banking system and therefore should have a clear vision and understanding of the basis on which banks operate. The importance of the study issue is determined by the necessity to construct relevant analyzed data of the local Georgian commercial banks concerning risks, taking into consideration the specific nation and recent trends in the banking industry.

The purpose of the study is to define different categories of risks faced by the banking sector and to illustrate them, as well as to reveal such basic features as demonstrating the need for proper risk management and risk. The purpose of the research is to show correlations between major financial variables affecting banks' risk and analyze their significance on the local market.

2.Literature review

Commercial banks are confronted with a huge variety of risks in emerging and progressing financial markets. According to Turgut Türsoy (Risk Management Process in Banking Industry, 2018), risk management in the Banking sector is defined as "the logical development and execution of a plan to deal with potential losses" (Tursoy, 2018). Indeed, risk management is a complex topic to be addressed by all banks around the world. Planning for the future is the best strategy that the bank may rely on to become successful in the market. It can be said that Risk Management Plan is related to the standard Business Plan for the whole operations the company plans to fulfill for the sake of profitability. The best strategy to achieve any set objective is to plan for it. Therefore the better bank plans the process of all operations, the better outcome one can get. Nowadays, the world never forgives mistakes made by the company. Planned actions are best for further development and avoiding any risks that may occur in the process.

Moreover, the better the process is planned the better the management team can cope with forthcoming obstacles on the way. A good risk management scheme can push each department toward new possibilities arising from good management strategies. According to John C. Hull (2018) "The risk management function's primary responsibility is to understand the portfolio of risks that the company is currently taking and the risks it plans to take in the future" – The most important subject a bank should be concentrated on is analyzing all possible risks that may be incurred during its operations.

To assess the banks' performance, special credit ratings were created to show the current position of the bank regarding risk exposure and creditworthiness. For instance, such platforms are Fitch ratings (https://www.fitchratings.com/) and Moody's (https://www.moodys.com/). This rating may be assigned to any entity willing to borrow money. Accordingly, with their assistance, the system of lending/borrowing money became more reliable and stable. With this in mind, a detailed analysis of financial data should be provided by the bank, which is crucial not only for its internal usage and control but also for external evaluation. With the help of financial statements, banks may alter their risk management strategies and improve the overall position of the business.

Many incidents proved the importance and the need for proper Risk management in banks. One of which was "The Asian financial crisis of 1997" which illustrated that "ignoring basic risk management can also contribute to economy-wide difficulties" (Meyer, 2000). This was caused by negligent deeds from the financial institutions toward customers. Banks have extended loans based on their relationships, rather than on the factual and thorough cash flow analysis information which led them to default (Meyer, 2000). Another example of poor risk management was UBS in Switzerland that "rapidly, over just two years, accumulated a large portfolio of credit default swaps (CDS), lost over $50 billion in 2008, and had to be rescued" (Martyanova et al., 2019). According to Persson and Marcusson (2019) default of one bank does not affect the overall economy, but the default of several banks due to poor risk management does.

Most banks tend to have similar economic activities and hence, acquire similar risks (Persson & Marcusson, 2019). Disruption of the economy due to the collapse of the banking industry is directly correlated with the government. To avoid the likewise cases, Basel Committee for Banking Supervision (BCBS) was established to regulate banking standards: "The Committee sets international standards and guidelines for national regulators to assess and supervise their banking system. Its landmark publication—the Basel Accord—largely affects the way banks manage their capital and risk as well as the way they are monitored and supervised by the regulators" (Quang & Gan, 2019). After observations on the current situation, Basel Committee has created three important Accords that relate to the main idea of the research: Basel Accord I – the purpose was to outline how much capital should banks reserve to be able to cover their obligations. Accordingly, banks all over the world had to reassess their budgets and recalculate the minimum capital vital for meeting their obligations and regulations. This research intends to evaluate banks' performance regarding capital; Basel Accord II - obliged Banks to have enough cash reserves to be able to meet obligations from operations, which directly influences my research variables while evaluating Georgian Banks' performance; Basel Accord III - According to Persson and Marcusson (2019) Basel III was the most effective regulation in terms of risk reduction, which was due to "increased capital adequacy ratio and the implementation". At the same time, they underline that banks' efficiency is not halted by capital requirements, but for example, supervision can negatively affect it. The crucial point is to have a balanced capital ratio and the ability to give out loans. As we know, when capital is increased in the company, it becomes more illiquid and undoubtedly, affects profitability. In this research, I will examine all financial risk factors influencing banks' performance and their correlation and draw a hypothesis based on this relationship.

3.Bank Risk Analysis

The bank's risk profile is typically evaluated with the help of the risk-weighted assets (RWA) ratio, the non-performing loans (NPL) ratio, and the standard deviation of ROA or ROE (Z-score) which is supported by several researchers (Li et al., 2021; Mirzaei et al., 2013; Molyneux & Thornton, 1992). As we have already discussed, it is crucial to identify the major factors affecting bank risks in detail and define each of them separately to have a thorough basis for analyzing them in further research parts. As mentioned before in the text, these major factors are profitability, size, capital ratio, efficiency, market power, diversification of activities, and economic and country indicators.

3.1. Profitability

There is a broad agreement that a negative correlation between risk and bank performance exists. Poghosyan and Cihak (2011) demonstrate how European banks with strong profitability profiles are less likely to encounter trouble in the future year. Low-quality skills in loan operations may be reflected in poorer performance, according to Louzis, Vouldis, and Metaxas (2012). Recent studies indicate that several bank-specific characteristics, including interest rate spread, non-interest revenue, diversity, loan provisions, and capital, play major roles in defining the profitability and risk profile of the bank. For instance, Goddard et al. (2004) found a strong negative correlation between a bank's profitability and its bank risk taken, but Pasiouras and Kosmidou (2007) found a negative correlation between a bank's performance and its cost-to-income ratio.

The profit-before-tax ratio is used as a measure of profitability. According to Delis and Kouretas (2011), profitability has a mixed effect on bank risk-taking and vice versa. Higher levels of risk assets can, in good times, lead to greater earnings, which can then be used to fund further loans. In contrast, the excessive risk may result in problematic loans and decreased profitability, which will eventually mean fewer risk assets in the next quarter. Profitability is therefore likewise endogenous and only appears once in the calculated equations.

In the opinion of the majority of analysts, bank risk and performance are negatively correlated. A study by Poghosyan and Cihak (2011) indicated that profitable European banks are less likely to engage in troubled lending. Risk and profitability were shown to be negatively linked in Demsetz, Saidenberg, and Strahan's (1996) investigation of bank risk. They hold that a bank's profits are inversely related to the risk it takes on.

Chinese joint-stock and local commercial banks were examined by Shih et al. (2007) to assess how profitable they were. Local commercial and state-owned banks are outperformed by joint-stock commercial banks, according to the available statistics. They believe that the size of the bank has a limited impact on performance

when it comes to risk-taking traits. Sufian and Habibullah (2009) focus on four state-owned and twelve joint-stock commercial banks in China between 2000 and 2007. Therefore, my hypothesis is:

H1: The returns of a bank and its risk are inversely correlated.

Considering these results, we anticipate discovering a negative/positive correlation between bank profitability and risk.

3.2. Size

The size of the bank has a large negative influence on changes in capital ratio and a considerable positive impact on changes in bank risk. Aggarwal and Jacques (1998) discovered that the size of the bank had a substantially detrimental effect on capital, indicating that larger banks maintain less capital. On the other side, they concluded that bank size negatively affects risk, larger banks take less risk. They also discovered a negative correlation between changes in risk and changes in the capital when risk is assessed by the ratio of non-performing loans to total assets, but a positive correlation when risk is evaluated by the ratio of risk-weighted assets to total assets.

On the other hand, Afzal and Mirza (2012) discovered that risk and the size of the bank are positively correlated based on the data of Pakistan Commercial Banks of 2004 – 2009. They also found that bank size and diversification are positively related, the bigger the bank, the more diversified portfolio they have. This idea is also supported by Laeven, Ratnovski, and Tong (2014) who state that large banks have more systematic risks due to their variety of activities. As mentioned before, another study supporting this idea has Martyanova (2019) who once again underlined the importance of size in relation to portfolio diversification.

The other research by De Jonghe (2010) and Uhde and Heimeshoff (2009) found larger tend to take on more risk due to the moral hazard problems. They define that larger companies may be more likely to be tempted to increase risk-taking, lower market discipline, and produce competitive distortions since they are aware that they would be bailed out in the event of a problem. Another paper found larger banks have a lower risk profile, because of the increased capacity and effectiveness of their management (Salas & Saurina, 2002).

So, I investigate the following hypotheses regarding how size affects bank risk:

H2: The size of banks positively affects the risk taken by banks.

3.3. Capital Ratio

In their research, Calem and Rob (1999) looked at how regulatory capital requirements affect banks' risk-taking behavior. A U-shaped association between bank capital and risk-taking was discovered by the researchers, which means that when bank capital grows, banks first take less risk, before increasing their exposure to greater risk. Undercapitalized banks are taking on greater risk because of the deposit insurance fee extra. A link was identified between a bank's capital and its willingness to take risks, showing that as the capital requirement increased, so did the willingness of well-capitalized institutions to take risks. Only in markets with low concentration can capital regulation be successful in reducing risk-taking, according to Behr, Schmidt, and Xie (2010).

Rime (2001) used data from Swiss banks to analyze the influence of regulatory capital requirements on bank risk-taking behavior. Their findings revealed that banks have boosted their capital because of regulatory pressure. In addition, they found no correlation between regulatory pressure and risk.

Using data from 181 institutions in 15 European nations, the authors Iannotta, Nocera, and Sironi (2007) were able to determine both performance and risk in the financial sector. According to the statistics, state-owned banks have poor loan quality and significant bankruptcy risk, whereas mutual banks have superior loan quality.

So, I investigate the following hypotheses regarding how capital affects bank risk:

H3: A negative/positive relation exists between bank capitalization and risk

Information regarding capitalization and risk will provide us with valuable outcomes concerning the efficiency of general regulations in Georgia.

3.4. Efficiency

Numerous studies demonstrate that inefficiency is a factor in bank risk. Recent research by Poghosyan and Cihak (2011) and Louzis and Metaxas (2012) has used the cost-to-income ratio as a proximate for management effectiveness. Louzis, Vouldis, and Metaxas (2012) claim that low-cost efficiency is positively correlated with increases in future non-performing loans (NPLs), so long as bad management results in subpar credit scoring, pledged collateral appraisal, and borrower monitoring abilities. Similar conclusions are reported by other writers who have focused on cost efficiency (Williams, 2004).

Consequently, the following is our fourth theory:

H4: The link between bank efficiency and risk is inverse.

As mentioned before, exploring efficiency may outline one of the key aspects to look at while performing risk management analysis.

3.5. Market Power

Mirzaei et al. (2013) note that in developed economies measures intended to foster competition may cause individual banks to become unstable. Another study supporting this idea belongs to Saunders and Schumacher (2000). Additionally, they claim that when banks employ these greater margins to cover possible credit losses, expanding markets with higher interest-margin revenues produce banks that are more stable and lucrative. Berger et al. (2009) indicate the existence of a negative link between market power and total risk exposure in a worldwide survey encompassing 23 industrialized nations. Additionally, they discover data showing that larger capital ratios tend to counter the increased risk even while loan portfolio risk rises with market dominance.

Park and Peristiani (2007) found in their research that monopolistic banks in concentrated banking systems may improve earnings and hence minimize financial fragility by providing bigger capital and lower incentives for bank owners and management to take excessive risks. Boyd and Nicolo (2005) go against this and defend that large companies with monopolistic strength may charge their customers higher interest rates, which forces them to make riskier investments to cover their financing expenses.

In the current thesis, I suggest testing the following hypotheses:

H5: The more market the banks, the more likely it is to reduce the risk.

Considering that market power has a huge influence on the risk of a bank.

3.6. Diversification of Activities

The balance sheets of banks have become increasingly diverse as their operations have expanded over the last few decades. In addition to interest, there are fees, commissions, and trading activities that provide non-interest revenue. The portfolio of a bank is considered to be more varied when it has a higher share of various types of activity. Numerous studies have examined how diversity affects bank risk, with results that occasionally diverge from those of conventional portfolio and banking theories (Deng, Elyasiani, & Mao, 2007).

Due to growing competition and diminishing interest rate margins, Valverde and Fernández (2007) found that product diversity increases profitability and enhances market power. On the other hand, Angbazo (1997) found that off-balance sheet (OBS) hedging operations explain the cross-sectional disparities in interest rate risk and

liquidity risk. Angbazo believes that OBS operations help diversify the company's revenue sources, which lowers the company's total risk.

Pakistani banks were studied by Afzal and Mirza (2012), who explored the link between bank size, risk, and diversification. To be more specific, they looked at the question of whether large banks have superior diversification. Larger financial institutions have more diverse credit portfolios, according to the researchers. The research included both accounting-based and market-based risk metrics.

Demirgüc-Kunt and Huizinga (2010) examined a sample of worldwide banks between 1995 and 2007. They concluded that, despite the potential benefits of risk diversification offered by expanding into non-interest income-generating activities like trading, banking strategies that heavily rely on generating non-interest income are extremely risky.

So, my hypotheses are:

H6a: The more the bank's revenue diversity, the greater the bank's risk.

H6b: The more the bank's revenue diversity, the lesser the bank's risk.

It is crucial to test two completely opposed hypotheses to identify a detailed outcome.

3.7. Economic and Country Indicators

The banking industry has clearly displayed cyclical characteristics. According to the majority of the literature, faster growth rates are connected with a more stable macroeconomic environment and a lower chance of bank crisis (Marcucci & Quagliariello, 2008; Festic, Kavkler, & Repina, 2011; Poghosyan & Cihak, 2011). For example, Pasiouras and Kosmidou (2007) find that the rise in GDP and inflation have a major impact on the profitability of European banks and that this effect varies depending on whether the banks in question are domestic or international and if they operate in the region (Bolt et al., 2012; Dietrich & Wanzenried, 2014). According to the findings of Saunders and Schumacher (2000), a crucial factor in determining the interest margin of a bank is the combination of regulatory regulations and the volatility of macro interest rates. In addition to this, they provide evidence that there is a trade-off between reducing the cost of banking services to customers and guaranteeing the financial viability of banks by enforcing greater capital requirements (lower interest margins). In a similar vein, Bolt et al. (2012) demonstrate that the level of long-term interest rates has a substantial impact on determining the profitability of banks during periods of rapid economic expansion. In addition, Mirzaei et al. (2013) report that there is a negative relationship between domestic credit as a percentage of GDP and bank profitability in emerging markets, whereas there is a positive relationship in

advanced markets. This is in contrast to the positive relationship that exists in advanced markets. Additionally, Mirzaei et al. provides evidence that larger domestic credit leads to considerably increased bank risk in developing economies. This might be attributable to the higher default likelihood and the worse capacity for recovery in these markets (Demirguc-Kunt & Huizinga, 1999).

As a result, I anticipate that there will be an inverse relationship between economic growth and bank risk.

H7: There is an inverse correlation between the expansion of the economy and the level of risk that banks face.

According to the findings of Arpa, Giulini, Ittner, and Pauer (2001), the proportion of risk provisions in the total loans made by the banking industry changes directly with the rate of inflation (including both consumer price index (CPI) and real estate price inflation). In a similar vein, Baboucek and Jancar (2005) demonstrate that the deterioration of the NPLr may be attributed to rising inflation ratios. According to Uhde and Heimeshoff (2009), the effect of changes in inflation rates depends on whether or not inflation is anticipated by banks and whether or not it coincides with general economic fragility. In addition, the effect also depends on whether or not inflation coincides with general economic fragility.

So, I expend that there is a positive association between inflation and risk.

H8: There is a positive relationship between inflation and bank risk.

H9: Regulatory quality effects positively banks' risk.

Indeed, regulations may have a huge impact on the financial stability of commercial banks.

4.Methodology

The bank's risk profile is typically evaluated with the help of the risk-weighted assets (RWA) ratio, the non-performing loans (NPL) ratio, and the standard deviation of ROA or ROE (Z-score) (Li et al., 2021; Mirzaei et al., 2013; Molyneux & Thornton, 1992). But in this research, I applied two variables, Z-score and Non-performing loans (NPL) as a bank-risk measure.

4.1. Sample Data

The BankScope Fitch IBCA, which gives details on financial statements and ownership structure for financial institutions globally, is where we get the annual data for this report. This database includes in-depth profiles as well as financial information on banks from all around the world. I collected the year-end financial

data for every bank that was still operating from 2013 to 2020. Our sample is made up of 14 commercial banks that were active in Georgia during the study period.

During the time under consideration, we expect sample banks to contain information for all of the variables that have been studied for a minimum of five years. Banking subsidiaries and international branches are regarded as distinct credit institutions.

After performing this filtering, I acquired a final dataset that includes a panel with 123 observations that is unbalanced. Annual macroeconomic data has been collected from the World Development Indicators database (http://data.worldbank.org) and the IMF (http://www.imf.org).

Table 1 lists the explanatory variables that were discovered in the study publications, together with their associated calculations and predicted bank risk indicators. A bank's capital structure is evaluated as part of the regulatory framework for developing and assessing the bank's level of capital at risk (Laeven & Levine, 2009). Retained profits and money raised through the issuance of new shares make up the majority of a bank's capital. "Actual capital" and "regulation capital" are often used in the literature to characterize bank capital. According to Shrieves and Dahl (1992) and Altunbas et al. (2007), this capital is defined by the risk-based capital ratio. Equity makes up a certain percentage of a company's total assets.

Return on assets (ROA) is used to show how profitability influences bank risk. Utilize the operating expenses-to-total assets ratio to assess the impact of the efficiency factor. I employed non-interest income to total assets to assess how risk-taking affected the diversification of bank revenue. The Lerner index, which assesses market power based on the banks' capacity to set prices beyond their marginal costs, is used to evaluate each bank's market power.

Research has shown that the rate of national GDP growth affects bank capital and credit risk choices, which in turn may affect loan demand in the economy (Ayuso et al., 2004; Jimenez & Saurina, 2006). To assess whether there was a correlation between risk and economic growth, I evaluated the real gross domestic product (GDP) growth rate across time. To demonstrate how a change in the country's macroeconomic environment has an impact on the risk-capital relationship, I incorporated inflation in both the capital and risk equations. I used the consumer price index (INF) to demonstrate how inflation affects bank risk-taking behavior over time. I also applied regulatory quality, which measures the perception of local government policies and regulations concerning protecting and promoting private sector development (REG). The financial development index is employed as well to calculate the efficiency of their banking sector and capital markets. Finally, I replaced bank interest rate risk with loan interest rate risk (POL).

Table 1. Variables and Explanations

Variable	Code	Definition
Dependent Variables		
Z-score	Zscore	ROA + Capital/Total assets)/ROA standard deviation last 3 years
Non – performing loan	NPL	Total non – performing loans/ Total loans
Independent Variables		
Return on Asset	ROA	Net profit before tax/Total assets
Non – interest margin	NIM	Interest revenue – Interest expense)/ Total assets
Bank size	SIZ	Log of Total assets
Capital ratio	CAP	Capital/Total assets
Lerner index	LR	(Total income – Operating expenditures)/Total income
Interest rate spread	INTR	(Interest income/ Total loans)— (Interest expense/ Total deposits)
Loans ratio	LONR	Total loans/Total assets
Non-interest income	NIC	Non-interest income/Total assets
Operating expenditure	OPEX	Operating expenditures/Total assets
Loan growth	LNG	Average inflation adjusted growth in loans
Liquidity	LIQ	
Inflation	INF	Annual percentage change in the consumer price index
Gross domestic product	GDP	Real annual growth in GDP
Regulatory quality	REG	Perception of local government regulations and quality
Financial development indicator	FDI	Development of capital and financial market

Policy interest rate	POL	Policy rate average of fiscal year

In this study, the equations are estimated using an ordinary least squares (OLS) regression. due to an unbalanced data set. To determine whether fixed-effect or random-effect models are acceptable for my panel data, this research also applies fixed or random effects models by evaluating Hausman. The outcome of the Hausman test supports the Random-effect. For each dependent variable, as well as for fixed-effect, random-effect, and ordinary least square (OLS), I used the following regression equation:

This study employs two proxies to gauge the level of risk-taking by Georgian banks. Boyd and Graham (1986) created the Z-score, which they computed as pre-tax income divided by total assets plus the capital-to-total-assets ratio divided by the standard deviation of asset returns (ROA). The Z-score is used to determine how many standard deviations a bank is below its predicted ROA. The natural logarithm of the Z-score is utilized because of the Z-significant score's skewness (Laeven & Levine, 2009). Numerous studies employ the Z-score to assess bank risk (Baselga-Pascual, Trujillo-Ponce, & Cardone-Riportella, 2015; Demirguc-Kunt & Huizinga, 2013). To get the Z-score, use the following formula:

$$Z\text{-score}_t = (ROA_t + Eq / TA_t) / \sigma\,(ROA)_t \qquad (1)$$

Based on past studies, such as those by Baselga-Pascal, Trujillo-Pence, and Cardone-Riportella (2015) and Tressel, Detragiache, and Demirguc-Kunt (2006), my second risk-taking indicator is the non-performing loan ratio (NPL). It determines the asset quality of a bank by calculating the ratio of non-performing loans to total loans.

We used ordinary least squares (OLS) to estimate my equation. due to the unbalanced data in my data panel. We may, therefore, re-estimate the model with either fixed or random effects. To determine whether fixed-effect or random-effect models are acceptable for my panel data, Hausman tests are performed. The assumption of fixed effects is supported by the Hausman test. We used the following regression equation in fixed-effect, random-effect, and ordinary least square (OLS) regression models for each dependent variable:

$$Z\text{-score}_{it} = \beta_0+\beta_1 ROA+\beta_2 NIM+\beta_3 SIZ+\beta_4 CAP+\beta_5 LR+\beta_6 INTR+\beta_7 LONR+ \beta_8 NIC+\beta_9 OPEX+ \beta_{10} LNG+$$

$$\beta_{11} LIQ+\beta_{12} INF+\beta_{13} GDP+\beta_{14} REG+\beta_{15} FDI +\beta_{16} POL \qquad (2)$$

Following earlier research (Tressel, Detragiache, & Demirgüç-Kunt, 2006; Baselga-Pascual, Trujillo-Ponce, & Cardone-Riportella, 2015), my second risk-taking metric is the non-performing loan ratio. The ratio of non-

performing loans to total loans is used to compute it, and it represents the asset quality of a bank. A larger percentage of non-performing loans increases the credit risk and costs banks money.

$$NPL_{it} = \beta_0+\beta_1 ROA+\beta_2 NIM+\beta_3 SIZ+\beta_4 CAP+\beta_5 LR+\beta_6 INTR+\beta_7 LONR+ \beta_8 NIC+\beta_9 OPEX+ \beta_{10} LNG+$$

$$\beta_{11} LIQ+\beta_{12} INF+\beta_{13} GDP+\beta_{14} REG+\beta_{15} FDI +\beta_{16} POL \quad (3)$$

The Georgian banking system maintained a comparable regulatory and supervisory framework over the period studied. For the study, I use both dependent and independent variables. I employ capital structure, revenue diversification, capitalization, efficiency, non-deposit funding, profitability, size, concentration of industries, GDP, and interest rate as independent variables to model my portfolio.

4.2. Random Forest and Relative Value Importance

In addition to the OLS regression that was utilized for the model, We also implemented Breiman's relative value important indicator that was derived using random forest (Breiman, 2001). In the random forest (RF) model, We calculated the relative value importance (RVI) using the same equations as in the previous model, equation number 2 and number 3.

RANDOM FOREST evaluates the impact of the different relevant elements on the risk and profitability of a bank. Several random algorithms or decision trees are combined in the RF ensemble learning approach to produce the outcome. The average weighted squared improvement to the model as a result of choosing the specific variable at each split is used to compute the RVI (Friedman & Meulman, 2003). As noted by Biau and Scornet (2016), Hastie et al. (2009), and others, the success of RF was largely due to the fact that it required little involvement from researchers and could be used for a variety of classification and prediction tasks. Moreover, RF models were found to be substantially less impacted by issues such as outliers and missing values (Biau & Scornet, 2016; Hastie et al., 2009). RF is resistant to numerous statistical problems, such as multicollinearity or heteroskedasticity, which affect the effectiveness of parametric models (such as regression analysis). In addition, RF is capable of processing a high number of input variables even in small samples and is mostly unaffected by insignificant input variables, like many other machine learning techniques (Hastie et al., 2009).

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	111	.019	.028	-.073	.142
NIM	111	.057	.035	.027	.234
NPL	111	.063	.081	.004	.555
Z-score	108	5.438	3.564	1.007	19.54
SIZ	111	5.458	.666	4.25	6.835
CAP	111	.235	.152	.079	.817
LR	105	2.531	17.672	-55.025	161.231
INTR	105	.094	.159	-.685	.51
LOAN	111	.572	.174	.102	.833
NIC	111	.005	.004	-.006	.017
OPEX	105	.054	.062	.008	.386
LNG	111	.21	.97	-.968	8.44
LIQ	111	.188	.107	.051	.613
INF	111	.05	.022	.013	.085
GDP	111	.027	.037	-.068	.05
REG	111	1.007	.118	.76	1.13
FDI	111	.271	.024	.235	.3
POL	111	.067	.028	.028	.121

5. Results and Findings

Summative statistics for the variables used in the thesis are shown in Table 2. According to prior research, the Z-score average was 19.54, which is greater than many of those (Dong, Meng, Firth, & Hou, 2014). The Z-score was 14 (Zhang, Wang, & Qu, 2012). The average NLP ratio is 6.3 percent, however, there is wide fluctuation amongst banks in this ratio. There is a range of -10.2% to 49.2% in the mean efficiency value (OPEX). During the research period, the majority of banks predict a loss and the average is 5 percent (Revenue diversification). Lerner index denotes a value of 5.22 as average.

Table 3. Spearman's Correlation

Variables	(NPL)	(Z-score)
ROA	-0.100	0.134
NIM	-0.049	-0.031
SIZ	-0.293***	0.259***
CAP	0.335***	0.183*
Lerner	-0.042	0.003
INTR	0.240**	0.191*
LONR	-0.530***	-0.081
NIC	0.238**	-0.108
OPEX	0.133	0.037
LNG	-0.079	0.022
LIQ	0.550***	-0.176*
INF	0.085	-0.096
GDP	0.041	0.176*
REG	-0.008	-0.134
FDI	-0.014	-0.097
POL	-0.070	0.099

The table displays the Spearman's rank correlation coefficients between all other variables and each dependent variable (column) (rows). Significant at the following levels: *Significant at the 10% level, **Significant at the 5% level, and ***Significant at the 1% level.

The correlation coefficients in Table 3 show the connection between each dependent and independent variable. Correlation coefficients appear to be insignificant at all significance levels except for a few independent variables, in the first place as a dependent variable, non-performing loans (NPL) are significant at the 1% significance level. At a 5% significance level, the interest rate spread is important in relation to non-performing loans (NPL). Only size (SIZ) and capital (CAP), interest rate spread (INTR), loan ratio (LONR), and GDP growth (GDP) are significant at a 10% significant level when Z-score is employed as a dependent. Dependant and dependent variables do not appear to have a statistically significant link, according to Table 3. Some of these findings appear to agree with previous research when non-performing loans are used as risk-taking. Table 3 does not provide any evidence that local financial markets as well as the regulatory environment have significant correlations to the riskiness of a bank as other several studies have shown (Saunders & Schumacher, 2000; Mirzaei et al., 2013; Berger et al., 2009). Though risk indicators are included, many of the correlation coefficients are low, even when the correlations are extremely significant (NPL, Z-score). Correlation relations (table 3) reveal none of the profitability indicators (ROA and NIM) have significant relation with the riskiness of the banks, as opposed to many previous findings.

Table 4 presents empirical estimation results for both bank risk indicators (Z-score and non-performing loans (NPL)), for firm-specific years from 2013 to 2020. In the table 4, the OLS results are displayed first (model 1 and model 2).

Tables 5 and 6 present fixed-effect and random-effect regressions for non-performing loans (NPLr) and Z-score, respectively.The relative percentage of loans in a bank's assets does not support my premise that there is a substantial positive link between a bank's risk and that percentage. Surprisingly, every regression analysis shows a bad correlation between bank risk and every regression result. Festic, Kavkler, and Repina (2011) state that this result deviates from earlier research.

Based on the literature,we don’t confirm the H hypothesis, which expected a positive association between the percentage of loans in a bank's assets (LONR) and its risk (Männasoo & Mayes, 2009; Festic, Kavkler, & Repina, 2011). Nonetheless, when the Z-score is employed as a risk proxy, this variable becomes negative significant at 5 percent, which might be attributed to the fact that liquidity risk is not completely reflected in the loan-to-asset ratio.

Table 4. OLS Results

Dependent variable: NPL				**Dependent variable: Z-score**		
	Coef.	**t-value**	**p-value**	**Coef.**	**t-value**	**p-value**
ROA	.309	1.14	.257	10.846	0.73	.468
NIM	.231	0.94	.352	12.369	0.91	.365
SIZ	.024	-1.56	.121	3.524***	4.53	0
CAP	.089	1.12	.268	9.692**	2.12	.037
Lerner	0	-0.12	.903	-.003	-0.17	.866
INTR	-.141*****	-1.69	.094	-.206	-0.07	.941
LONR	4.115*****	1.89	.061	-10.446**	-2.32	.023
NIC	.223	-1.44	.154	260.803**	-2.31	.023
OPEX	.216******	2.24	.028	1.126	0.11	.912
LNG	-1.809	-0.48	.631	-	-	-
LIQ	-.246	-0.61	.547	-10.699**	-2.09	.04
INF	-.023	-0.07	.947	130.161	0.72	.475
GDP	-.209	-0.28	.782	27.015	1.35	.181
REG	-1.989	-0.56	.579	10.923	0.65	.515
FDI				-30.04	-0.83	.409
Constant	.5	0.79	.431	-26.059	-0.85	.395

Mean dependent var	0.064
R-squared	0.476
F-test	5.834
Prob > F	0.000

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

There is a strong positive relation between bank capitalization (CAP) and risk, when a Z-score proxy is used, because of the potential hazard of leverage. Hypothesis (H3): The smaller the capitalization, the smaller the bank risk. Our findings don't support these findings in other papers (Poghosyan & Cihak, 2011; Berger & DeYoung, 1997; Mehran & Thakor, 2011). By increasing the riskiness of their loan portfolios as a response to moral hazard incentives, low-capital banks tend to have more non-performing loans in the future, according to Berger and DeYoung (1997).

According to my findings, profitability (ROA, NIM) and risk at banks are positively related in both scales used, as opposed to my hypotheses (H1) it is clear that our first hypothesis, which states that more profitable banks tend to be more stable, is not supported correctly. Additionally, as measured by the Z-score, inefficiency (OPEX) raises bank risk (H4). As previously stated, bank risk is adversely connected with operating cost efficiency, which connects "bad" management with inadequate skills in credit assessment, the evaluation of pledged collateral, and the monitoring of borrowers (Louzis, Vouldis, & Metaxas, 2012).

When non-performing loan (NPL) is employed as a dependent variable, this study confirms the findings of Sawada (2013) and Louzis, Vouldis, and Metaxas (2012) that bank NIC is statistically insignificant. Several studies have demonstrated that income diversification reduces the likelihood of a bank failure. Banks that focus on retail customers profit the most from non-interest revenue (NIC), according to a study published by Köhler (2014). Thus, H6a is supported.

According to some scholars, large banks appear to be less dangerous than smaller banks (Hypothesis 2). This conclusion might be explained by the fact that larger banks have a more diverse product mix (Salas & Saurina, 2002). With more access to the capital markets, larger banks may be able to handle unanticipated liquidity deficits more effectively (Konishi & Yasuda, 2004).

Hypothesis 5, which asserts that the more market power (Lerner index) the banking sector is, the more likely it is to have reduced risk, is not supported by the observation that the market power of industry has no significant relation with bank risk (table 5). In our equations, GDP, REG, FDI, and inflation are two of the most important macroeconomic variables, with negative and positive correlations to risk, respectively. Results from this study don't support Hypotheses 7 and 8.

Tables 5 and 6 determine the fixed effect results. The Hausman test was used to choose an appropriate model for our investigation of the relationship between bank-specific risks and the riskiness of Georgian banks. We adopted the fixed-effect model because of the results of the Hausman test. Multicollinearity analysis and heteroscedasticity tests were used in the study prior to the Hausman test. The study employed correlation

analysis and a variance inflation factor to examine the issue of multicollinearity (VIF). To determine if there was an issue with heteroscedasticity, the white test was utilized. Results of the white test, which is used to assess for probable heteroscedasticity. White test results confirm that heteroscedasticity is not a concern because the significance value is more than 0.05. (White, 1980). To choose a good model for our research, We applied the Hausman test. For our investigation, we employed a fixed-effect model based on the Hausman test result.

Table 5. Fixed Effect (Dependent Variable: NLP)

NPL	Coef.	St.Err.	t-value	p-value	Sig
ROA	.267	.212	1.26	.212	
NIM	-.078	.37	-0.21	.834	
SIZ	-.127	.056	-2.29	.025	**
CAP	-.211	.079	-2.68	.009	***
Lerner	0	0	-0.15	.88	
LONR	-.261	.1	-2.62	.011	**
NIC	1.29	2.095	0.62	.54	
OPEX	-.236	.125	-1.89	.063	*
LIQ	.187	.08	2.34	.022	**
INF	.218	.251	0.87	.388	
GDP	.016	.137	0.12	.906	
REG	.216	.085	2.53	.013	**
FDI	-.526	.318	-1.65	.103	
Constant	.846	.309	2.73	.008	***
Mean dependent var	0.064				
R-squared	0.438				
F-test	4.609				
Prob > F	0.000				

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

According to the table 5, loan ratio (LONR), bank size (SIZ), and capital (CAP) have a significant and negative influence on bank risk, however, liquidity (LIQ) has a positive and significant impact on bank risk. In addition to this, bank efficiency (OPEX) has a negative effect on bank risk, but bank diversification (NIC) showed no significant effect. The literature (Ghenimi et al., 2017; Adusei, 2015) supports these findings.

According to Adusei (2015), effective and efficient deposit mobilization improves the financial stability of banks. Additional research (Köhler, 2015; Shleifer & Vishny, 2010; Chai et al., 2022) supports these findings. The finding reveals that customers' deposits are being adequately utilized by Georgian banks, resulting in stability on the financial stability of banks in Georgia. In our calculations, GDP and inflation have a significant effect on bank risk, but regulatory quality has significant relations at a 5 percent level. The impact on risk, results from this study don't support Hypotheses 7 and 8, but support H9.

Table 6 illustrates the results when Z-score is employed as a risk proxy, banks' liquidity (LIQ), bank size (SIZ), and finally capital (CAP) are influencing significantly banks risk as supported by findings in table 5. All other variables show no significant influence on banks' risk.

Table 6. Fixed Effect (Dependent Variable: Z-score)

Z-score	**Coef.**	**St.Err.**	**t-value**	**p-value**	**Sig**
ROA	-3.884	10.894	-0.36	.723	
NIM	4.529	18.631	0.24	.809	
OPEX	-13.833	9.417	-1.47	.146	
LNG	-.034	.236	-0.14	.887	
LIQ	-10.158	4.053	-2.51	.014	**
INF	103.517	123.986	0.83	.407	
GDP	22.487	13.88	1.62	.11	
REG	12.11	10.862	1.11	.269	
FDI	-26.726	23.641	-1.13	.262	
POL	102.099	117.45	0.87	.388	
SIZ	-6.963	2.884	-2.41	.018	**
CAP	11.367	4.742	2.40	.019	**
Lerner	-.004	.012	-0.37	.715	
INTR	.427	2.826	0.15	.88	

LONR	-2.567	5.621	-0.46	.649
NIC	-104.987	100.379	-1.05	.299
Constant	28.292	29.038	0.97	.333

Mean dependent var	5.521
R-squared	0.499
F-test	4.413
Prob > F	0.000

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

5.1.Robustness Checks

We run a variety of robustness testing to verify the above conclusions (Tables 7 and 8). Results are confirming the findings in tables 6 and 7.

Table 7. Robustness Check (Dependent Variable: Non-performing Loans)

NPL	Coef.	Robust St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ROA	.31	.27	1.15	.252	-.22	.84	
NIM	.208	.243	0.86	.391	-.268	.685	
SIZ	-.024	.016	-1.55	.121	-.055	.006	
CAP	.092	.08	1.16	.248	-.064	.248	
Lerner	0	0	-0.11	.915	-.001	.001	
LONR	-.134	.082	-1.63	.103	-.295	.027	
NIC	4.164	2.162	1.93	.054	-.074	8.403	*
OPEX	-.205	.151	-1.35	.176	-.501	.092	
LIQ	.218	.096	2.26	.024	.029	.406	**
INF	.273	.378	0.72	.469	-.467	1.013	
GDP	-.05	.203	-0.25	.806	-.448	.348	

REG	.159	.116	1.37	.17	-.068	.386
FDI	-.535	.475	-1.13	.26	-1.465	.395
Constant	.156	.136	1.15	.252	-.111	.422

Mean dependent var	0.064	SD dependent var	0.083
Overall r-squared	0.474	Number of obs	105
Chi-square	81.983	Prob > chi2	0.000
R-squared within	0.265	R-squared between	0.374

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

Table 8. Robustness Check (Dependent Variable: Z-score)

Z-score	Coef.	Robust St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ROA	6.415	13.057	0.49	.623	-19.176	32.005	
NIM	13.857	13.657	1.01	.31	-12.911	40.624	
OPEX	-.647	5.507	-0.12	.906	-11.441	10.147	
LNG	-.332	.261	-1.27	.204	-.844	.18	
LIQ	-11.993	7.51	-1.60	.11	-26.712	2.726	
INF	131.851	164.498	0.80	.423	-190.561	454.262	
GDP	29.124	24.454	1.19	.234	-18.806	77.053	
REG	11.984	12.649	0.95	.343	-12.808	36.776	
FDI	-35.752	32.108	-1.11	.265	-98.682	27.178	
POL	129.257	158.019	0.82	.413	-180.454	438.967	
SIZ	3.528	.953	3.70	0	1.66	5.396	***
CAP	10.314	5.222	1.97	.048	.078	20.55	**
Lerner	-.003	.008	-0.37	.709	-.018	.013	
INTR	-.501	2.738	-0.18	.855	-5.868	4.865	
LONR	-10.991	8.795	-1.25	.211	-28.228	6.246	
NIC	-257.941	167.555	-1.54	.124	-586.343	70.462	
Constant	-25.31	20.669	-1.22	.221	-65.82	15.2	

Mean dependent var	5.521	SD dependent var	3.631
Overall r-squared	0.414	Number of obs	102
Chi-square	.	Prob > chi2	.
R-squared within	0.300	R-squared between	0.521

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

5.2. RVIs Results of Determinant Indicators of Bank Risk

Figures 2 and 3 show the findings of the RVI values from the various RF models, from most important to least significant. It is important to note that model 1 (NPL) and model 2 (Z-score) account for 69 percent of variance before considering the RVI values. The dependent variable's value is shown in parentheses. The values of the percentage of variance explained are 67.47 percent (NPL), and 69.60 percent (Z-score).

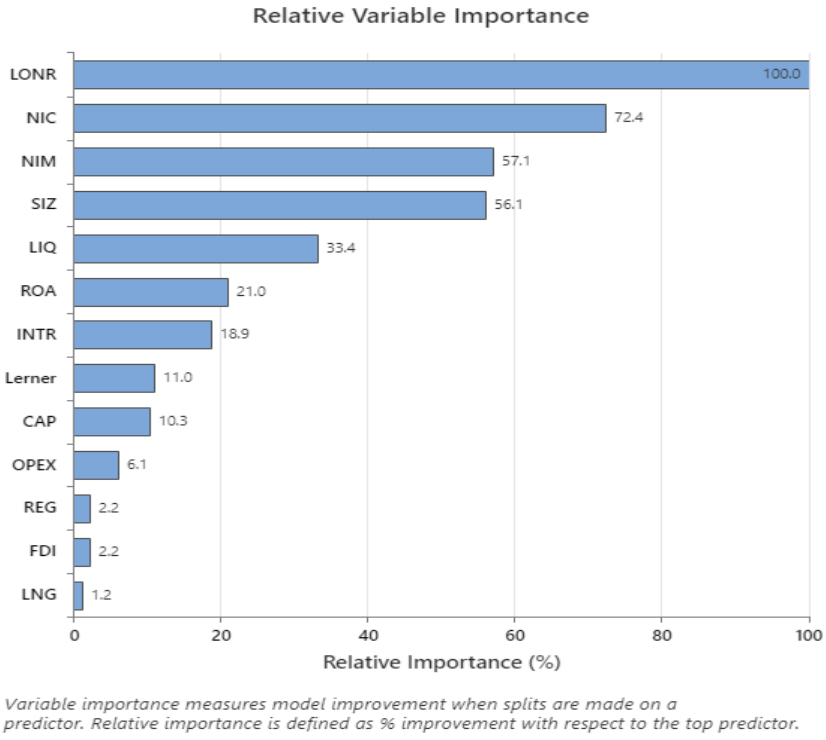

Figure 1. Relative Variable Importance (NPL)

Figure 2 demonstrates that at least four of the top five determinants are bank-specific factors, which are dominating in terms of their relative relevance in influencing the different risk indicators. These factors are

NIC (72.4), NIM (57.1), SIZ (56.1), and LIQ (33.4). None of the macro-variables are predominating the riskiness of banks in Georgia. Findings in RVI from the random forest are supporting the result of parametric regressions in tables 7-8 above. This demonstrates that microeconomic variables, as opposed to macroeconomic ones, significantly affect the riskiness of the banks in Georgia. Variables of macroeconomic factors such as those relating to the growth of domestic products (GDP), inflation (INF), the development of local financial markets (FDI), and the regulatory environment (REG) have no little effect on bank risk-taking activities.

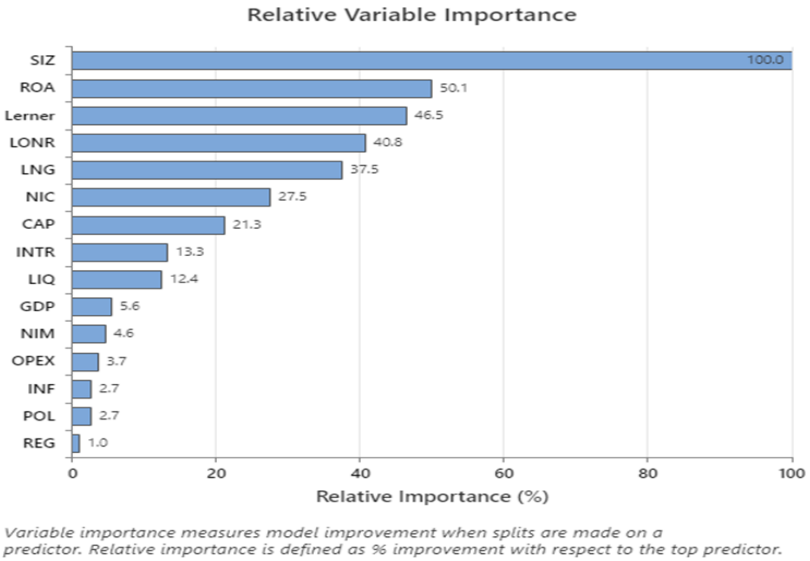

Figure 2. Relative Variable Importance (Z-score)

On the other result as figure 3 shows, again microeconomic characteristics of banks are predominating their riskiness and stability of banks. Size of banks (SIZ), profitability (ROA), market power (LERNER) and loan ratio (LONR) are the first four dominant factors, which are influencing the riskiness of banks.

According to the findings of this study, a bank's risk is significantly influenced by factors such as its size (SIZ), profitability (ROA), and market power (LERNER). This means that smaller banks may have riskier assets, which emphasizes the necessity for particular policies and regulations to ensure their soundness and stability.

6. CONCLUSION

This research has specifically shown that risk management is critical for a bank's profitability and health. As discussed, regulators are also concerned about the financial system's safety and soundness. Indeed, banking has evolved over the last several decades with the emergence of new trading tools and complex financial products. While these improvements strengthen banks' intermediation roles, increase profitability, and diversify bank risk, they pose substantial problems to bank risk management. Georgian banks have also encountered such difficulties but still manage to be present in the local market. Bank risk management has been deemed inadequate in light of the fast developments in financial markets. Following the recent global financial crisis, bank risk management has become a top priority for banking regulators and policymakers.

Research aimed to identify the factors affecting bank risk management in Georgia and productive results were achieved. It mainly covered profitability, size, capital ratio, efficiency, market power, diversification of bank portfolio, and economic conditions. There were both expected and unexpected results drawn from the statistical data set of the banks of Georgia. Particularly, one of the unexpected outcomes provided was the evidence that local financial markets as well as the regulatory environment do not have significant correlations to the riskiness of a bank as several studies have mentioned. Thus, the local market seems to differ from the other ones analyzed by previous authors. Another point was that none of the profitability indicators have a significant relation to the riskiness of the banks.

It can be said that different countries' market conditions have different effect on the risk of the bank. What may be true for one location, may be different for another. Moreover, the stability of the bank is not always dependent on profitability. Banks with less profit may be more stable and financially solid, compared to profitable and risky banks. This condition may be challenged by improper management and inadequate skill sets of those in charge. With this in mind, banks holding market power may be vulnerable in the face of risks. At the same time, economic expansion may be another factor that could help banks to become more stable and even decrease their risk exposure.

This research has also explored the portfolio diversification of banks which as we expected has a huge impact on the stability of a bank. We can conclude that banks with a variety of activities indeed rarely face failures. They have adequate capital to face any liquidity problems and appear more effective on the market. Georgian banks utilize customers' deposits adequately which leads them to stability and profitability in the long term.

As a result of the research, it becomes clear that there is a strong relationship between bank capitalization and risk. Banks' capital reduces risk by absorbing losses in the accounting framework so that the bank remains technically solvent, also provides access to the financial market when liquidity is needed and reduces banking risks by limiting asset growth. Banks are operationally solvent as long as cash inflows exceed mandatory cash outflows. There is a positive correlation between the rate of profitability and the risk of banks. Diversification of income reduces the probability of bank failure. Banks that focus on retail customers benefit the most from non-interest income. Investment banks are particularly exposed to the risks of changes in financial markets. This is because they have more financial assets such as stocks and bonds for both themselves and their customers. For example, market risk can be caused by changes in interest rates, commodity prices, or currency exchange rates. To counter all kinds of risks, banks hold capital to cushion the blow of losses.

Foreign direct investment and inflation are two of the most important macroeconomic variables affecting the economy. As appeared, GDP and inflation have a significant impact on banks' risk. Also, it is clear that microeconomic variables, unlike macroeconomic ones, significantly affect the riskiness of banks in Georgia. Macroeconomic factor variables such as Gross Domestic Product (GDP), inflation, development of local financial markets, and regulatory environment have little impact on banks' risk-taking activities. Microeconomic characteristics dominate the riskiness and stability of banks. Bank risks are significantly influenced by factors such as size, profitability, and market power, which emphasizes the need for specific policies and regulations to ensure their strength and stability.

Further research is needed to determine the causes of the outcome difference between Georgian and European banks. Studies of those who previously explored bank risk factors have drawn many different conclusions that appeared to apply to those countries. Although, the same correlations applied to Georgian banks were concluded to be false for the local market. This leads us to the idea of further exploration of differences between Georgian and European banks' environment in which they operate. It is crucial to understand, why so many conflicts appeared during the research process.

This research explored factors affecting the risks of Georgian banks and has shown the importance of analyzing banks in different locations as the outcome may be radically different. It challenged the controversial ideas of previous studies and has given new possibilities to research this topic in a different manner. The subject of bank risk management can now be overviewed from additional angles that may help society to find specific reasons for the aforementioned correlations and outcomes. Once we have a clear understanding of these outcomes, it can be used for further improvement of bank risk management in the Georgian market.

The banking and credit system is one of the most difficult and at the same time, interesting areas of modern highly developed countries. It is characterized by many peculiarities of development in the conditions of a transforming economy. Indeed, the efficiency of the entire economic system depends greatly on its smooth operation and therefore, needs a thorough understanding and analysis. Thus, risk management in the banking industry is a viable concept for thinking and an inseparable part of banks' operations.

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