DETERMINANT FACTORS INFLUENCE BANK RISK-TAKING: EVIDENCE FROM COMMERCIAL BANK OF GEORGIA

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Abstract. This article investigates the link between commercial bank risk-taking and various factors. I use a panel data model to look at bank-specific and macroeconomic factors in order to evaluate bank risk-taking using sample evidence from Georgian commercial banks. The time span chosen, 2006-2014, considers the impact of the country's persistent financial and economic difficulties. I look at capitalization, efficiency, capital structure, size, profitability, non-deposit financing, economic growth, revenue diversification, industry concentration, interest rates, inflation, and as variables that influence bank risk.

INTRODUCTION

In comparison to other firms, commercial banks have a unique risk-taking difficulty. The public's interest in financial stability, as well as the potential for systemic consequences of bank excessive risk-taking, are the driving forces for the introduction of particular bank risk-taking regulations. As a result, banks in distress are subject to various regulations. The security of creditors' interests is also a significant issue. As a result, the special regulatory evaluates banks in order to reduce risk taking and ownership structure.

Georgia's most recent reform package outlines such goals as encouraging a wide range of financial instruments, increasing market transparency, promoting the expansion of brokerage firms, and forming municipal and project-backed securities. However, today's financial system is the most powerful.

In June 2014, Georgia and the European Union signed an association agreement. A Deep and Comprehensive Free Trade Area is included in the agreement. It marked the integration of several years of Eastern Partnership collaboration between Tbilisi and Brussels. It is the first stage in Georgia's path to full membership in the EU. It explains how Georgia would gradually improve in several sectors, including the financial sector, in order to meet Euro criteria.

Georgia adopted a governmental plan for regional development in order to provide a favorable environment for regional development and to improve the population's living conditions. As a result, the government has designated resolving regional inequalities, unemployment, and poverty as a high priority for engagement in its socioeconomic development strategy – 2020. Banks play a crucial role in Georgia's economy, and the public is engaged in the soundness and safety of the banking system. Establishing prudential rules for commercial banks is critical, as is identifying the variables that characterize risk-taking concerns in Georgian commercial banks.

LITERATURE REVIEW

The capital structure of a firm, which consists of a proportion of debt and equity, has some risks and benefits. The capital structure choice is essential for banks since it influences the shareholders' profits per share and wealth.

Asarkaya and Ozcan (2007) assessed the structure of the Turkish banking industry from 2002 to 2006 and found a relationship between, economic growth, portfolio risk, capital adequacy, the sector's average capital level, and return on equity. They also observed a negative relationship between share deposits and capital adequacy.

According to Demirgüç Kunt, Detragiache, and Merrouche (2013), bank capital records are largely intended to decrease bank risk. The primary goal of capital requirements is to discourage risk-taking by bank shareholders who may be limited in their liability options (Behr, Schmidt and Xie, 2010).

According to theoretical models, regulators force banks to reduce leverage by imposing flat capital requirements, pushing them to fund losses with a riskier portfolio. Deposit insurance schemes induce moral hazard because higher capital requirements reduce bank risk-taking (Koehn and Santomero, 1980; Kim and Santomero, 1988; Furlong and Keeley, 1989).

Most analysts believe there is a negative link between bank risk and performance. Poghosyan and Cihak (2011) studied European banks and found that those with a strong track record of profitability are less likely to engage in distressed lending. In their study, Demsetz, Saidenberg, and Strahan (1996) observed a negative relationship between bank risk and profitability. They believe that a bank's returns are inversely proportional to its risk.

Shin et al., (2007) evaluated the profitability of Chinese joint-stock and city commercial banks to see how they fared. According to the data, joint-stock commercial banks outperform local commercial and state-owned banks. When it comes to risk-taking characteristics, they consider that bank size has a modest influence on performance. Between 2000 and 2007, Sufian and Habibullah (2009) focus on four state-owned and twelve joint-stock commercial banks in China.

To measure performance and risk, Iannotta, Nocera, and Sironi (2007) analyzed data from 181 banks in 15 European countries. The data show that state-owned banks have low loan quality and a high insolvency risk, whereas mutual banks have better loan quality.

The legal environment and bank regulation, among other factors, can influence bank risk-taking behaviors, according to Laeven & Levine (2009). For example, deposit insurance, according to Keeley (1990), enables consumers to expand their risk-taking possibilities and incentives. Strong investor security, according to John, Litov, and Yeung (2008), is connected to risk taking. Capital requirements, which force owners to put more of their personal wealth at risk in a bank, limit owners' risk-taking drive (Laeven & Levine, 2009: Kim & Santomero, 1994).

From 2002 to 2008, Klomp & Haan (2012) investigated the impact of bank supervision and legislation on risk-taking in 200 banks throughout the world. They discovered that increased bank supervision and regulation appeared to have a significant influence on banks' risk-taking choices. Furthermore, their findings show that the effect of a bank has a favorable impact on capital and risk evaluations. Afzal and Mirza (2012) used a sample of Pakistani banks to investigate the relationship between the bank size and risk taking. They discovered that large banks are more diversified, and that bank size and risk are related in a favorable way.

Finally, the characteristics of country economic indicators have had an influence on risk-taking incentives (Laeven and Levine, 2007; La Porta, Florencio, Andrei & Robert, 2002).

DATA AND VARIABLES

To find out how a bank's unique characteristics affect risk-taking. Data about bank accounting was gathered from annual reports on the National Bank of Georgia's website. The sample consists of 158 annual samples collected between 2006 and 2014. Certain banks' yearly accounting data was not accessible because many banks did not declare or because the institutions were very new. These values were not removed. My data is unbalanced panel data format. Table 1 contains a list of the variables utilized in the theses.

Table 1 summarizes the explanatory factors found in the research papers, as well as their related computations and anticipated bank risk indicators. I use the loan-to-total-assets ratio (Loan/TA) to investigate the impact of a bank's asset structure on its risk (H1).

The regulatory framework for developing and measuring the degree of capital at risk in a bank is evaluated by capital structure (Laeven & Levine, 2009). The bulk of a bank's capital is made up of cash from issuing shares and retained earnings. The terms "actual capital" and "regulatory capital" are commonly used in the literature to describe bank capital. The risk-based capital ratio, which Shrieves and Dahl (1992) and Altunbas et al. (1992) used in earlier research, is used to define this capital (2007). The capital ratio is the percentage of total assets that is made up of equity. I utilize the Eq/TA to examine if capitalization levels are a deciding factor in bank risk (H2a, H2b).

The return on assets (ROA) is used to show the impact of profitability on bank risk (H3). The cost-to-income ratio (CIR) is used to assess the efficiency factor's impact (H4). To assess the influence of banks revenue diversification of risk-taking (H5), I used an adjusted Herfindhl-Hirchman index (HHIRD) developed by Baselga-Pascal, Trujillo-Pence, and Cardone-Riportella (2015). Where COM means gross commission and fee revenue, INT defines gross interest income, OTH refers other gross operational income, and TOR indicates total operating revenue, which is calculated by adding INT, COM, and OTH. To evaluate the impact of a bank's size on risk, I used the natural logarithm of its assets (H6). Industry concentration (H7) is computed as the sum of the squares of all banks' loan share in the sector, using the Herfindahl-Hirchman Index (HHIIC). When the index surpasses 1800(0.18), it is said to be extremely concentrated, and when it falls below 1000, it is said to be unconcentrated (or 0.1).

Ayuso et al., 2004; Jiménez and Saurina, 2006) found that the amount of national GDP growth influences bank capital and credit risk choices, which in turn can influence loan demand in the economy. As a result, I investigated the rate of increase of real gross domestic product (GDP) across time to see if there was any correlation between risk and economic growth (H8). In both the capital and risk equations, I add inflation to demonstrate how changes in the country's macroeconomic environment impact the risk-capital relationship. As a result, I used the consumer price index (CPI) to demonstrate how inflation affects bank risk-taking behavior over time (H9). Finally, I use loan interest rate risk as a proxy for bank interest rate risk (H10).

Below the table 1.3 summarizes the explanatory variables measured in the current study and their expected signs for bank risk.

Table 1. Explanatory Variables

Classification	Explanatory variable	H	Data sourse	References
Capital structure	Loan/total assets (%)	H1	NBG	Männasoo and Mayes, 2009
Capitalization	Equity/total assets (%)	H2	NBG	Poghosyan and Cihak, 2011;
Non-deposit funding	Non-deposit funds/total liabilities (%)	H3	NBG	Köhler, 2015
Profitability	Return on assets (%)	H4	NBG	Poghosyan and Cihak, 2011
Efficiency	Cost-to-income ratio (%)	H5	NBG	Metaxas and Mayes, 2009
Revenue diversification	Herfindahl–Hirschman Index	H6	NBG	Stiroh and Rumble, 2006
Size	Natural log of total assets	H7	NBG	Männasoo and Mayes, 2009, Poghosyan and Cihak, 2011;
Industry concentration	Herfindahl–Hirschman index	H8	NBG	Männasoo and Mayes, 2009; Uhde and Heimeshoff, 2009;
Economic growth	Annual real GDP growth rate (%)	H9	Geostat	Uhde and Heimeshoff, 2009
Inflation	Annual average rate change in CPI (%)	H10	Geostat	Männasoo and Mayes, 2009
Interest rates	Interest rate on the loan	H11	Geostat	Uhde and Heimeshoff, 2009

METHODOLOGY

To measure the risk-taking of Georgian banks, this study uses two proxies. The Z-score was developed by Boyd and Graham (1986), and it is calculated 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 amount of standard deviations below a bank's projected ROA is calculated using the Z-score. Because Z-score is considerably skewed, the natural logarithm of Z-score is used (Laeven and Levine, 2009). The Z-score is also used to measure bank risk in a number of other research (e.g., Baselga-Pascal,Trujillo-Pence and Cardone-Riportella, 2015; Demirgunc-Kunt & Huizinga, 2013). The following formula is used to compute the Z-score:

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

My second risk-taking metric is the non-performing loan ratio (NPL), which is based on earlier research (e.g., Demirguc-Kunt, Detragiache, and Tressel (2006); Baselga-Pascal,

Trujillo-Pence, and Cardone-Riportella, 2006). (2015). It is calculated as the ratio of non-performing loans to total loans and indicates the asset quality of a bank.

I adopt an ordinary least square (OLS) regression to estimate my equation. Because of my data panel's unbalanced data. As a conclusion, I may re-estimate the model using either fixed or random effects. Hausman tests are used to assess if fixed-effect or random-effect models are appropriate for my panel data. The Hausman test supports the Random-effect hypothesis. For each dependent variable, as well as fixed-effect, random-effect, and ordinary least square (OLS) regression models, I use the following regression equation:

$$\text{Z-score} = \beta0 + \beta1 \ \text{Eq/TA} + \beta2 \ \text{ROA} + \beta3 \ \text{loan/TA} + \beta4 \ \text{CIR} + \beta5 \ \text{HHIRD} + \beta6 \ \text{SIZE} + \beta7 \ \text{HHIIC} + \beta8 \ \text{GDP growth} + \beta9 \text{inflation} + \beta10 \text{interest} \qquad (2)$$

$$\text{NPLr} = \beta0 + \beta1 \ \text{Eq/TA} + \beta2 \ \text{ROA} + \beta3 \ \text{loan/TA} + \beta4 \ \text{CIR} + \beta5 \ \text{HHIRD} + \beta6 \ \text{SIZE} + \beta7 \ \text{HHIIC} + \beta8 \ \text{GDP growth} + \beta9 \text{inflation} + \beta10 \text{ interest.} \qquad (3)$$

Table 2. Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.
ROA	158	.0214612	.3241223
Eq/TA	158	0.32204	.116454
Z score	121	23.9428	48.45985
NPL	151	0.07108	.0940686
Size	158	5.200324	1.874743
HHIRD	158	.2203762	1.484825
HHIIC	158	433.8814	134.6388
CIR	156	0.64969	0.1458
Loan/TA	158	0.4924	.2283519

Table 3. Pearson Correlations

	Z score	NPL	ROA	Eq / TA	Size	HHIRD	HHIC	CIR	Loan/TA
Z score	1.000								
NPL	0.0320	1.000							
	0.7312								
ROA	-0.9768	-0.1603	1.000						
	0.0000	0.0492							
Eq/TA	0.9936	0.3690	-0.9828	1.000					
	0.000	0.000	0.000						
Size	-0.4783	-0.3013	0.4268	-0.4203	1.000				
	0.000	0.05618	0.07265	0.6585					
HHIRD	-0.6287	0.0111	-0.0075	0.0029	0.0941	1.000			
	0.9566	0.8921	0.9253	0.9716	0.2396				
HHIC	-0.1353	-0.0796	0.1136	-0.1364	0.4040	0.0205	1.000		
	0.1389	0.3310	0.1553	0.0876	0.000	0.7980			
CIR	-0.1143	0.0302	0.0093	0.0265	-0.1203	-0.0071	0.0316	1.000	
	0.2139	0.7138	0.9081	0.7427	0.1346	0.9300	0.6952		
Loan/TA	0.0344	-0.2164	-0.0568	0.0459	0.1676	0.1485	0.1279	0.7082	1.000
	0.0574	0.5483	0.01687	0.6728	0.0946	0.0719	0.5183	0.5186	

ANALYZING AND FINDINGS

Table 2 summarizes the factors addressed in the theses. The average Z-score is 23.94, which is higher than the average of numerous previous studies (e.g., and Dong, Meng, Firth and Hou, 2014) The Z-score was 14. The average NLPr ratio is 7.1 percent, although there is a wide range of NLPr ratios among firms. With a range of -10 to 49 percent, the average efficiency rating (CIR) is -5.2 percent. The majority of banks determined a negative profit over the research period. HHIRD (revenue diversification) is 0.22 on average. In the case of loans, the Herfindahl index (HHIIC) has a mean value of 433 and a broad range of values.

Pearson correlation analysis is used to assess the presence of multicollinearity and study the correlation among explanatory independent variables, as shown in Table 3. Z-score has a strong and positive association with capital adequacy and loan proportion of assets, a negative and significant correlation with ROA and size, and no significant relationship with HHIIC, HHIRD, and efficiency, according to the correlation results (CIR). According to the research, non-performing ratio has the same relationship to factors such as loan to asset ratio (loan/TA) and operating efficiency.

Tables 4, 5, and 6 exhibit empirical estimation findings for both bank risk indicators (Z-score and non-performing loans) from 2014 to 2006 firm specific years. The OLS findings are shown first in the table above (model 1 and model 2). For non-performing loans (NPLr) and Z-score, respectively, Tables 5 and 6 show random-effect and fixed-effect regressions.

My hypothesis that a significant positive relationship exists between a bank's risk and the relative percentage of loans in its assets is not supported by evidence. Surprisingly, all regression analyses reveal a negative connection between bank risk and all regression outcomes. This finding, according to Festic, Kavkler, and Repina (2011), contradicts previous studies.

Table 4. Determinant of bank risk: OLS

	Model 1	Model 2
	Z-score Pool OLS	NLPr Pool OLS
ROA	10.79	-0.225
	(1.39)	(-1.93)
Eq/TA	5.560	0.114*
	(1.66)	(2.51)
SIZE	-0.368*	-0.0229*
	(-2.13)	(-2.19)
HHIRD	0.0403	0.0379
	(0.13)	(0.83)
HHIIC	0.00887*	0.0892
	(2.29)	(0.15)
CIR	-0.00613	0.0560
	(-1.14)	(0.68)
Loan/TA	-2.627*	-0.0438*
	(-2.09)	(-2.29)
GDP	0.0966	-0.0341
	(0.05)	(-1.31)
INF	0.346	0.0998
	(1.35)	(0.26)
INTRATE	0.353	-0.00244
	(0.40)	(-0.19)
_cons	0.0412	0.0870
	(0.00)	(0.51)
N	120	150
R²	0.1937	0.2103

Notes: *Using ordinary least square (OLS) regression, this table shows the drivers of bank risk in Georgia from 2006 to 2014. The Zscore is utilized as a dependent variable in Model 1 to assess the bank risk factor. As a dependent variable in Model 2, the non-pergorming loan is determined by calculating the bank risk factor. The independent variables are described in the table.*

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5. Alternative models for risk-taking characteristic (Non-performing loan)

	Model 1 NLPr fixed-effect	Model 2 NLPr-random effect
ROA	-0.227*	-0.245*
	(-2.03)	(-2.23)
EqTA	0.0803	0.0999*
	(1.30)	(1.98)
SIZE	-0.0203	-0.0339
	(-1.36)	(-0.46)
Loan/TA	-0.109	-0.0561
	(-1.89)	(-1.42)
HHIRD	0.0388	0.0411
	(0.95)	(0.98)
HHIIC	0.0560	0.0360
	(0.08)	(0.59)
CIR	0.0871	0.0276
	(0.12)	(0.37)
GDP	-0.0516*	-0.0399
	(-2.26)	(-1.72)
INF	-0.0112	0.0590
	(-0.34)	(0.18)
INTRATE	0.0253	-0.0449
	(0.23)	(-0.04)
_cons	0.273	0.0858
	(1.54)	(0.56)
N	150	150
R^2	0.4703	0.5238
Sigma_u	0.7461	0.03108
Sigma_e	0.6828	0.06828
Wald chi(11)	-	34.69
Hausman test(p-value)		0.5235

Notes: *Using a fixed effect and random effect model, this table depicts the drivers of bank risk in Georgia from 2006 to 2014. As a dependent variable, non-performing loans (NLPr) are used to compute the bank risk factor. The independent variables are shown in table 1. The proportion of variance in the dependent variable that the model can explain is known as R2. Hausman test is a test to compare random or fixed method in the model. t statistics in parentheses* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6. Alternative models for risk-taking characteristic (Zscore)

	Model1 Zscore-fixed-effect	Model2 Zscore-random effect
ROA	4.632	7.334
	(0.60)	(0.97)
Eq/TA	2.244	4.879
	(0.50)	(1.36)
SIZE	-1.379	-0.280
	(-1.14)	(-0.56)
loanTA	-3.074	-2.370
	(-0.65)	(-0.87)
HHIRD	0.398	0.185
	(1.47)	(0.66)
HHIIC	0.00425	0.0790
	(0.84)	(1.93)
CIR	-0.0490	-0.0543
	(-1.03)	(-1.09)
GDP	0.0441	-0.0917
	(0.25)	(-0.05)
INF	0.439	0.363
	(1.93)	(1.54)
INTRATE	0.318	0.411
	(0.41)	(0.50)
_cons	-9.764	-0.301
	(-0.71)	(-0.03)
R^2	0.1822	0.3076
Sigma_u	4.78	1.69
Sigma_e	4.49	4.49
Wald chi(11)	-	16.26
Hausman test(p-value)		0.9522
N	120	120

Notes: *a fixed effect and random effect model is used , this table depicts the drivers of bank risk in Georgia from 2006 to 2014. As a dependent variable, the Zscore is used to compute the bank risk factor. The independent variables are described in table 1. R2 is the percentage of variance in the dependent variable that the model can explain.. Hausman test is a test to compare random or fixed method in the model. t statistics in parentheses* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Previous study (e.g., Lehar, 2005) has found a positive relationship between bank capitalization and risk. As a result, to compensate for the downturn, banks are diversifying their holdings. Higher capital requirements by regulators do limit bank risk-taking, according to the moral hazard hypothesis. Banks do not take risks since deposit insurance is not available in Georgia. H2 2b is a valid hypothesis.

I wanted to investigate if profitability had an impact on bank risk-taking. The variable of ROA has positive and insignificant levels in model 1 of OLS regression, but it has negative and unimportant values in model 2. In all other models 1 and 2 in Tables 5 and 6, ROA has a negative and significant association with risk-taking dependent variables.

The findings of this study demonstrate that, as assessed

by the Z-score in table 6, cost efficiency is negatively connected to bank risk. The results do not match those of previous research when a nonperforming loan is used as a dependent variable. However, the findings are consistent with earlier studies, such as (e.g., Louzis, Vouldis &Metaxas, 2012).

In the financial literature, the effects of income diversification (HHIIC) on bank risk are contradictory. The outcomes of this study show that non-interest revenue proportions in retail-oriented banks increase income diversity, as expected by the literature. In banks, however, I couldn't discover any evidence of a link between revenue diversity and risk. As a result, Hypothesis H6 is declared.

Table 4 displays the size variable in models 1 and 2, indicating a negative and significant relationship between bank size and

risk. The results validate hypothesis 7. Large banks have better access to international financial markets, as seen below: They seem to be well to deal with unexpected financial shortages.

Risk and industry concentration have a positive but not significant connection. A larger concentration may have a positive influence on financial system stability through strengthening bank oversight. As a result, H8 is also denied.

Finally, GDP, unemployment, interest rate, inflation exhibit no significant associations with risk. In Table 5, only GDP shows a negative and significant relationship in model 1. These factors show a negative and positive relationship with risk, respectively.

CONCLUSION

Georgia's financial system is still in the early stages of development and is experiencing significant changes. This study looked at the factors that affected bank risk-taking in Georgia from 2014 to 2016. The research uses OLS regression, as well as Random-effect and Fixed-effect methods. There were no significant differences in the findings of any of these regressions. Because of the industry's scale and data availability, the majority of conclusions are contradictory with literature and assumptions. This study, however, might be the first of its type in the banking business.

Capitalization, income diversification, industry concentration and profitability all exhibit positive and insignificant correlations in most regressions, according to my findings. The amount, percentage, and cost effectiveness of a loan are all negatively connected to bank risk. Risk and macro factors have contradictory connections.

In my research, I discovered a link between bank capitalisation and risk. The findings might indicate that market dynamics are faulty, and that Georgian banks are being driven to raise their debt as a result of flat capital requirements.

The cost efficiency of a bank is inversely related to its risk. The results are inconsistent when a nonperforming loan is included as a dependent variable. According to earlier studies, non-interest earnings helps commerce banks diversify their revenues. However, I found no evidence of a connection between revenue diversification and risk in banks. My findings have major policy consequences, and supervisors interested in banking stress tests may be more interested in them.

The majority of my findings in this study contradict existing literature. Overall, it may have considerable managerial and practical consequences for decision-makers.

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