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Determinants of Stability of the Banking Sector in Bulgaria Against the Backdrop of Covid

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Abstract

The aim of the paper is to investigate the determinants of stability of the bank system in Bulgaria and examine their relevance during the pre-Covid, Covid and post-Covid period. The key determinants for stability are identified. The relevant data used in the study is sourced from the publicly available releases of bank indicators by the supervision authority and regulator.

The published data is aggregate for the whole banking sector and applies for both the independent and dependent variables in the specified regression model.

Relevant research texts for stability determinants and COVID impact are studied and their findings applied to the banking sector in Bulgaria. A multiple regression model was devised and applied with the capital adequacy ratio selected as the dependent variable, whilst the independent variables being the major internal financial ratios.

While the study finds significant effects of COVID-19 on key bank performance indicators, used as either independent or dependent variables in the model, the overall impact on the bank sector stability is assessed as neutral due to the interplay of strong capital buffers, the conservatism of Bulgarian banking sector due to the lack of lender of last resort and the implementation of macroprudential measures in the years before the pandemic.

Keywords: banking system, capital adequacy, stability, profit, bank stability determinants, COVID

JEL: G2, G21

Introduction

The Covid 19 pandemic is a type of event that is rare for the economy in general. Contrary to the global financial crisis of 2008-2009, the emergence of the Covid 19 pandemic could not be forecasted.

Despite its severity, the COVID event represents a unique opportunity to study the resilience of a banking system in times of non-human-inflicted negative shock. Furthermore, the banking sector in Bulgaria entered the pandemic with higher stability and liquidity in terms of higher coefficients of capital adequacy, liquidity ratios and sufficient levels of profitability and capital buffers.

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The study is built around the idea of event studies. However, the event, i.e. the COVID pandemic is not an announcement or emergence of new information in a single moment of time but rather a protracted process with its initiation, rapid development, saturation and fading out phases. Our focus is on the bank sector stability. Hence, we work with aggregate sectoral variables that represent or indicate stability but also sectoral factors that we and other authors identify as significant determinants of stability for banks. The objective of the study requires to study the effect of COVID on both the independent factors and the dependent measures of stability and use the exogeneous shock of the event to study whether the relationship between the determinants and indicators of stability are still significant during the event and how both stability and its determinants are influenced by the event.

We attempt to find distinctions in the main characteristics of the economy and the banking sector in Bulgaria between the periods of pre, during and post-COVID and assess the performance of banks and their stability against this background. The depth and breadth of the analysis is carefully chosen to focus on significant key indicators and characterizations.

The studied period in the paper is divided into three sub periods – the pre-Covid 19 period that includes Q1 2017-Q4 2019, the Covid 19 period where the pandemic has the severest effect due to the active government measures of lock downs (from Q1 2020 to Q1 2022) and the post-Covid 19 period (from Q2 2022 to Q1 2024) during which the Bulgarian economy started to recover. The analysis includes key indicators measuring the stability, efficiency, and operations of the Bulgarian banking system on the aggregate level.

The sample period was carefully selected to include several years before the pandemic but after the introduction of the prudential measures of the ECB and BNB following the financial crisis of 2008 and the subsequent sovereign debt pressures of some EU member states. The COVID pandemic event period was a priori defined as the year of the lock-down but extended to include the global supply chain and economic disruptions caused by it.

We have chosen to study the impact of COVID only through its manifestation on significant key banking sector variables, based on extant research and our own intuition. We found it virtually impossible to identify or define a direct measure, variable or index of the severity of the pandemic. We also recognize that not only the pandemic but government measures to contain it impacted economy and hence decided to study the effects and not to attempt to identify a causality relationship between the pandemic development and the economy or the banking sector. Last but least our scientific interest is in finance and banking sector resilience and not on the shocks that test its stability.

The paper is structured into four sections: the first section presents the literature review and outlines the theoretical framework of the model; the second section makes an overview of the situation in the banking system in Bulgaria during the pre-Covid, Covid and post-Covid period; the third section examines key bank indicators affecting the bank stability; the last section investigates through a regression model the effect of the Covid 19 pandemic on the key bank indicators. We examine the three periods using the same key banking indicators and investigating their effect on the banks' capital which we accept as a measure of the banks' stability.

We prove in the paper that the Covid 19 pandemic did not have a significant effect on the Bulgarian banking system in terms of banks' stability despite the temporary deterioration in the profitability indicators. We explain these results with the implemented conservative bank policy, high levels of capital and liquidity before the pandemic, and measures during the pandemic as more allowances for loan losses (provisions), precautionary lending policy as well as the effect of the bank moratorium announced by the Central bank of Bulgaria.

Section 1. Literature Review

The topic is approached in a two-stage study of the extant scientific literature. First, a review is performed on the general problem of determinants of bank stability. Lee and Lee (2021) analyze global banking systems using a system Generalized Method of Moments model, identifying internal factors like equity-to-asset ratio, bank size, loans-to-assets ratio, and revenue diversification as critical determinants of bank stability. Mesfin (2022) identifies the main internal factors of bank stability in Ethiopia, including asset tangibility and the lending rate, while external factors are GDP growth, control of corruption, and the rule of law. Zaid and Amara (2022) focus on Jordanian banks, highlighting liquidity and credit risks as the primary internal determinants of bank stability, exacerbated by illiquidity in bank assets. Jahn (2012) classifies determinants of banking stability into macroeconomic, financial, and structural factors, demonstrating how these variables interact at a national level to influence stability. Ben Jemaa (2021) investigates Tunisian banks, emphasizing that internal measures such as the Z-score and capitalization ratio are significant indicators of their stability. Silva and Pereira (2023) explore Portugal's banking sector, finding that GDP growth, inflation, money supply increases, and asset prices are external factors significantly affecting banking stability. Rai (2023) examines Nepalese banks, showing that internal factors like bank size, funding risk, and liquidity risk, along with GDP growth as an external factor, strongly influence their stability. This first stage leads to appropriate identification of determinants and their relative importance for stability in banking. It also points to possible indicators of bank stability, such as ROE and CAR and their respective drivers as identified in the extant research.

Second, we have studied research on the effect of COVID on the determinants and also on the overall bank stability as affected by the COVID economic "stress test". Anani and Owusu (2023) show that for about 450 US banks for 22 quarters (Q1 2017 to Q2 2022) before the Covid 19 shock there is no statistical significance in the Z-score (associated with the insolvency risk) for the sampled banks. During the Covid 19 pandemic they demonstrate that the banks with higher levels of Tier 1 capital proved to be more resilient, with lower degree of insolvency risk compared to banks with lower levels of Tier 1 capital. Demiguc-Kunt et al. (2021) proved that some measures as liquidity support, borrower assistance and monetary easing moderated the adverse impact of the Covid 19 pandemic for some banks but this is not true for all banks or in all circumstances. Marcu (2021) states that the big banks were better prepared when the pandemic started because they had constantly consolidated their capital and are much more resistant to shocks. Using a large sample of listed banks over a period from Q1 2020 to Q12021, Viet Tran et. al (2022) observe that during the Covid 19 pandemic

the banks experienced reduced loan growth and asset quality, and lower earnings ratios. Ikeda et. al (2021) conclude that the global banking system proved to be resilient during the Covid-19 crisis as the banks entered it with higher levels of capital contrary to the global financial crisis in 2008. M. Sabir et. al (2023) investigate the impact of the Covid 19 pandemic on the banking sector by making a research on 2073 listed and unlisted banks in 106 countries during the period Q1 2016 – Q2 2021 and find that the Covid 19 pandemic has decreased significantly the banks' performance measured through ROA, ROE and NIM as the banks' profits have declined by 0,38% for ROA and 0,58% for NIM during the pandemic. Danisman et al. (2021) prove that the banks with stronger pre-Covid financial conditions experienced less negative shock responses to the pandemic. Dadoukis et al. (2021) investigate that the banks with higher pre-Covid IT investments had higher market performance, credit supply and lower rates of loan renegotiations in the early stage of the pandemic which corresponds with the view that the pandemic had not only negative effects on the financial sector but it also boosted the technology development. El-Charaani et al. (2023) prove that in the MENA countries the banks' profitability during the Covid-19 pandemic was influenced by the liquidity creation, bank size, asset quality and efficient management. Kozac (2021) proves that banks' capital is more resilient to the increase of non-performing loans in the EU Central Eastern South European Countries - CESE countries - than in the non-EU CESE countries. El-Chaarani et al. (2023) in their regression analysis show that the factors of managerial efficiency, bank size and GDP have had a significant positive impact on the banks' financial performance while in contrast the credit risk is found to have a negative and significant impact on the financial performance of the banks during and before the pandemic. Todorova (2021) shows that in Bulgaria the amount of NPLs did not grow significantly because of the Covid-19 pandemic. She also proves that the GDP growth and unemployment have a significant effect on NPLs while the effect of government deficit is statistically insignificant. Kolev (2020) shows that the banking sector in Bulgaria stood the initial shock of the Covid-19 pandemic. These researches show that despite the negative effects of the Covid 19 pandemic on the banks' profitability the banking systems that enter the pandemic with strong capital and liquidity buffers remain stable during the pandemic as they kept their high capital adequacy ratios and the levels of NPLs.

Section 2. Development of the Bulgarian banking system before, during and in the post the COVID period

We determine the pre Covid period from Q1 2017 to Q4 2019. In that period the economic growth in Bulgaria was above the EU average, the level of unemployment was below the EU average and the level of inflation was above the EU average since 2019. During the pre-Covid period the banking system in Bulgaria experienced increasing levels of bank assets due the increasing lending portfolios. The reason for the increased lending activities were the low interest rates on the loans and increased loan demand in the three main segments – consumer loans, loans for house purchases and refinancing of non-performing loans. In 2016 the Bulgarian banking system went through asset quality review and a stress test procedure which was a prerequisite for

the banks to clean up their lending portfolios and to enter the pandemic with decreasing levels of NPLs. Despite the low-interest rate levels deposit dynamic was high showing the higher level of confidence in the system and the leading role of the banks in Bulgaria in financial intermediation as well as the high level of the households' propensity to save (holding approximately 66% of all deposits in the banking system in the period).

The levels of CET1 and CAR (capital adequacy ratio) showed a tendency for increasing being far above the regulatory minimums and above the average levels of the European banks. The coefficient of the liquid assets was increasing and was above the Central bank requirement of 20% (as of the end of 2017 it is 39%). The level of non-performing loans was decreasing as the highest levels were recoded for non-performing loans to non-financial corporations and consumer loans, while the loans for house purchases had comparatively low levels of NPLs. The Bulgarian banking system has a higher level of coverage compared with the European counterparts. The level of loans to total assets varied between 61% and 65% during the pre-Covid period. The sources for lending were predominantly provided by deposits which were negotiated at low interest rates. Most of the loans were placed to sectors such as commerce, industrial processing, and construction. The liquidity coverage ratio of the Bulgarian banks was almost double compared to the level of the banks falling under the direct supervision of the ECB (it varied between 270% and 294%). In the pre-Covid period in terms of ROA and ROE the Bulgarian banking system was ranking within the top 10% compared to the EU countries being far above the EU average. The Central bank of Bulgaria applied systemic risk buffer at 3%, anti-cyclical buffer of 0% in 2017 and a buffer for the domestically systemic important banks (varying between 0,5% and 0,125% for 2018). In 2019 the level of anti-cyclical buffer was increased to 0,5% due to the increased lending activity). During the period there were 25 banks operating in Bulgaria and consolidation in the sector was ongoing. The level of concentration in the sector is high as two prominent consolidations happened increasing the share of the five biggest banks in the country.

During the pre-Covid period Bulgarian banks have high levels of ROA and ROE, decreasing values of NPLs and high levels of capital adequacy ratios and adequate capital buffers. We can conclude that the Bulgarian banking system entered the Covid 19 pandemic stable and profitable, thus being less susceptible to external shocks.

The Covid 19 pandemic is a type of black swan event contrary to GFC which was somewhat predictable. In our research we refer the pandemic period from Q1 2020 to Q1 2022.

When Bulgarian economy entered the Covid 19 pandemic the GDP growth in Bulgaria was above the EU average but in Q3 2020 the country experienced negative growth which was typical for all EU countries. During the pandemic the banking sector was affected by the low economic activity, implementation of restrictive measures, low and negative interest rates, increase in the allowances for loan losses, lower revenues from bank fees and commissions, decrease in lending activity and decreasing profits, higher administrative costs due to the intensive technological solutions that were implemented by the banks.

In 2020 there was a strong decrease in loans (they accounted for 58,9% of the total assets compared with the pre-Covid year

when they constituted 67,5%). Deposits in the banking system continued to grow because of the households' precautionary motive. CET1 and CAR had levels above the regulatory requirements as well as the LCR providing that during the pandemic the Bulgarian banking system stayed well capitalized and liquid. In 2020 the levels of CET1 and CAR were respectively 21,69% and 22,74% compared with the European banks which had CET1 and CAR of 15,21% and 19,5%. The levels of LCR were even higher than in the pre-Covid year – 279% compared to 270% and significantly higher compared to the banks falling under the European Supervisory Mechanism – 171%. Despite being above the EU average NPLs continued their tendency to fall and the level of their coverage increased being above the EU levels – 62,6% vs. 43,8%. This is an indicator that the banks in Bulgaria succeeded to manage properly the credit risk during the pandemic and that the Bulgarian banks were rather conservative in terms of lending and in accessing their risk exposures. Due to the suppressed lending activity and the conservative policy for provisions for loan losses there was a significant drop in the levels of ROA and ROE – from 1,47% and 11,6% in 2019 to 0,66% and 5,3% in 2020. The main sectors subject to lending during the Covid 19 pandemic were commerce and industrial processing. The consolidation processes in the Bulgarian banking system continued as the merger of one bank falling in the top 5 with a bank from the second group was closed in 2020 and another merger of a bank in the top 5 started in 2021. Consolidation processes in the system were rather managerial decisions, not a response to the harsh economic circumstances in the country, i.e. the Covid 19 pandemic did not have an effect on the consolidation processes in the banking system in Bulgaria.

The Bulgarian National Bank (the supervisory authority for the banking sector in Bulgaria) initiated several measures at the start of the pandemic at the amount of 9,3 billion BGN. These measures referred to compulsory capitalization of the banks' profits for 2019 at the amount of 1,6 billion BGN, cancellation of the anti-cyclical buffer for 2020 and 2021, and an increase in the banking system liquidity by 7 billion BGN through a decrease in the banks' foreign exposures. The Central bank also adopted a procedure for deferral and settlement of banks' payable liabilities which provided three standardized mechanisms for deferral of both interest and principal of up to six months, for deferral only of interest of up to six months and a procedure applicable for revolving loans. Later, a deferral of 18 months was permitted because of amendments in the ECB Guidelines. Additionally, the Central bank agreed a swap with the ECB of 2 billion EUR for liquidity support which necessarily was used during the Covid period. All these measures undertaken by the Bulgarian National Bank are in line with the ECB measures implemented to support the economy during the pandemic.

Under the Moratorium as of the end 2020, 13 506 requests for deferral were submitted by non-financial corporations of which 12 354 were approved at the total amount of 6.4 billion BGN. Regarding households 94 705 requests for deferral were submitted of which 77 124 were approved at the amount of 1.7 billion BGN. In the first year of the Covid 19 pandemic the majority debtors used the possibilities for deferral provided by the moratorium as in the next year the figures slightly rose reaching respective amounts of approved requests for the households at 1.8 billion BGN and 6.5 billion BGN for non-

financial corporations. Approximately 10% of loans in bank portfolios in Bulgaria were subject to deferrals under the moratorium procedure as this level was comparatively lower than that in other EU countries, e.g. Cyprus, Hungary, Portugal, where the banks reposted the highest shares of loans subject to moratoria.

Some additional measures for stabilization were undertaken through the Bulgarian Development Bank (owned by the Ministry of the Economy), where as a first step a capital increase of the bank's capital was initiated – by 350 million EUR. Individual interest free loans at the amount of 2.3 million EUR were provided through the bank to unemployed due to the Covid 19 pandemic as well as guarantees for loans to non-financial corporations whose activities were negatively affected by the pandemic. As Bulgaria is under Currency Board regime the Central bank could not intervene with monetary policy measures; that's why the measures that were undertaken by the Bulgarian National Bank have a very high impact in mitigating the negative effects of the pandemic on the banking sector.

The profitability indicators ROA and ROE worsened during the Covid 19 pandemic which was in line with the observed trends for the banks in the EU. However, the Bulgarian banking system kept high levels of capital adequacy ratios and liquidity indicators and continued to be stable and liquid during the Covid 19 pandemic. The higher liquidity in the banking system was a prerequisite for creating buffers to absorb the negative effects of the shock during the Covid 19 pandemic. The conservative lending policy and shrinking yield generating activities contributed to the decrease of the profitability indicators. The conservative policy and the undertaken measures at policy level led to the decreasing levels of NPLs – contrary to the fact that high levels of NPLs are common for bank crises. Regarding the financial sector Bulgaria as an EU member Bulgaria applies the EU legislation (direct application of EU regulations and transposition of EU directive) without significant discretion in terms of the legislative provisions. During the Covid 19 pandemic the measures undertaken by the regulatory authorities affecting the banking system were in line with the measures undertaken by the ECB and the EU regulatory authorities for temporary easing of the regulatory pressure. We cannot identify specific regulatory measures undertaken at local level regarding the banking sector.

We refer as post pandemic period the one between Q2 2022 and Q1 2024. In 2022 and 2023 the Bulgarian economy was hit by the high levels of inflation and the uncertainties in the international environment as all EU countries. In 2022 the GDP growth in Bulgaria was below the EU average but this tendency reversed in 2023. The unemployment in the country continued being below the EU average levels. Post Covid periods were characterized with lower levels of provisions for loan losses, increased levels of lending, increasing interest rates and increasing bank profitability. The levels of lending reached the pre-Covid levels. The amounts of deposits in the banks also continued rising despite the lower pace of increase in the interest rates on deposits in Bulgaria. CET1 and CAR kept their levels above the regulatory requirements as well as the liquidity coverage ratio. During this period the banking system realized unprecedented levels of profits due the favorable macroeconomic conditions, increased lending as well as the increased levels of net interest income and net income

from fees and commission in the banking sector. The increased lending activity led to tightening the regulatory capital requirement on the local level - increased anti-cyclical buffer to 1% (2022), 1,5% (2023) and 2% (2023). In the post Covid period the levels of ROA and ROE doubled compared with the Covid period reaching levels of 2,1% and 18,5% respectively. At the end of the period the Bulgarian banking system ranked first in terms of ROA within the entire EU. In the post-Covid period the minimum required reserves were increased from 10% to 12% by the Central bank as a measure against the high rate of loan increase.

Section 3. Dynamics of key banking indicators during the Covid 19 pandemic

In this section we analyze the dynamics of key bank indicators that affect the stability of the banking system. Riadi et. al. (2022) show that banks with high capitalization are more stable compared with banks with a lower one, thus concluding that bank capitalization plays a crucial role for mitigating the negative effects of the Covid 19 pandemic. Well-capitalized banks can absorb loan losses and speed up recovery after economic shocks as the Covid 19 pandemic. Cao. Y and Chou (2022) prove that the reforms on bank regulatory capital after the GFC have been effective in building up bank strength which helped the banking system to continue lending to the real economy during the COVID-19 crisis. Restoy (2021) shows that at the beginning of the pandemic there was a smooth increase in NPLs in the banking systems in Europe and in the USA, which explained the moderate increase in the loan loss provisions. Plikas et al. (2024) conclude through empirical testing that due to the accumulation of capital after the GFC and government and Central bank support during the Covid 19 pandemic there was a substantial reduction in the NPLs. They also add that the peripheral economies withstood the negative spill overs of Covid 19 due to the combination of accumulation of capital and government support. Kryzanowski et al. (2022) prove that banks with high-quality capital were more resilient to the crisis and were able to effectively control their NPL ratios. H. Gholipour and A. Arjomandi (2021) show that the implementation and duration of prudential measures as the number of months that the policy was in place throughout 2020 had an adverse and significant relationship with the aggregate NPLs' growth.

In this section we discuss the dynamics of key banking indicators that affect the bank capital during the pre-Covid, Covid and post-Covid period. We present those dynamics in figures to visualize their dynamics in the three periods. We also present calculations of descriptive statistics of standard deviation, mean, minimum and maximum levels, which are presented in the table below.

The dynamics of the key banking indicators having effect on the bank capital in the three periods is analyzed below. Those bank variables are ROA, ROE and NIM (indicators for bank profitability), Cost-to-Income ratio (operational efficiency), Loans-to-Deposits (liquidity risk), NPLs and Provisions-to- Loans (credit risk).

Capital Adequacy: The main function of the bank capital is to absorb losses. In our research we associate the banks' capital with the bank stability. The importance of capital for bank stability is incorporated in the regulations related to the bank's capital adequacy, minimum requirements for CET1 and CAR as well as the implementation of capital buffers. Breaching the minimum requirements

Table 1. Descriptive statistics for the three periods – pre-Covid, Covid and Post-Covid

	Mean (pre Covid 19 Period)	St.Dev.	Min	Max	Mean (Covid 19)	St.Dev.	Min	Max	Mean (post Covid 19 perio)	St.Dev.	Min	Max
Capital Adequacy	21.04%	0.0110	19.17%	22.66%	22.40%	0.0082	20.45%	23.14%	20.89%	0.0082	19.56%	21.84%
ROA	1.43%	0.0021	1.12%	1.74%	1.03%	0.0016	0.70%	1.16%	1.88%	0.0036	1.43%	2.28%
ROE	11.27%	0.0187	8.76%	13.84%	8.10%	0.0133	5.48%	9.26%	16.38%	0.0348	12.09%	20.27%
Loans-to-Deposits ratio	0.708	0.012	0.687	0.733	0.659	0.018	0.641	0.694	0.651	0.010	0.637	0.664
Deposits /in bln./	75.629	5.3508	68.540	85.160	94.950	6.908	85.250	105.060	118.839	7.615	106.050	128.755
Loans /in bln/	53.485	3.0032	49.540	58.520	62.521	3.227	59.020	68.360	77.375	5.004	70.420	85.110
Loans-to-Assets ratio	0.523	0.0095	0.511	0.540	0.495	0.012	0.485	0.514	0.483	0.007	0.472	0.496
Assets /in bln./	102.325	7.2986	92.900	114.200	126.448	8.901	115.100	140.540	160.200	11.367	142.100	176.300
NIM	2.97%	0.0055	2.40%	3.99%	2.15%	0.0012	2.04%	2.40%	2.55%	0.0043	2.04%	3.08%
Net interest income /in bln BGN/	3.015	0.4153	2.680	3.992	2.757	0.000	2.757	2.757	4.128	0.944	2.924	5.432
Cost-to-Income ratio	46.997	2.9338	44.479	53.621	45.760	2.656	41.330	51.300	37.979	4.118	33.840	43.137
Credit Impairments-to-Loan	0.009	0.0031	0.006	0.016	0.010	0.003	0.006	0.014	0.006	0.001	0.004	0.008
Impairments /in mln BGN/	501.669	147.3156	342.400	805.100	641.756	154.344	400.000	879.000	430.429	90.936	344.400	585.700
Leverage ratio	11.52%	0.0089	10.38%	13.03%	12.42%	0.0028	11.89%	12.79%	11.38%	0.003	0.109	11.72%
NPL	9.14%	0.0232	5.94%	13.17%	4.81%	0.0075	3.73%	5.92%	2.89%	0.004	0.023	3.42%
Capital /in bln BGN/	12.424	1.2745	11.396	14.397	15.679	0.7817	14.606	16.710	18.253	1.606	16.318	20.661

for CET1 and CAR is a prerequisite for the supervisory authority for withdrawing the bank license. The higher levels of CAR limit the disposable income-bearing assets of the banks but also provide conditions for higher credit ratings and better price of the deposit resources is thus achieved. Comparing the three periods the average level of CAR was the highest during the Covid 19 period (22,4%) including its minimum and maximum levels. Somehow, this was a result of the undertaken measures for bans of dividend distribution but also because of the banks' attempts to operate cautiously during the uncertain Covid 19 times.

ROA and ROE: ROA and ROE are profitability indicators for the banks. ROA (Net Profit/Assets) reflects the bank's possibility to generate profit through its main activities and the level of this indicator shows how successful the assets' operations are. ROE (Profit/Own Capital) is a popular measure for estimation of the profits to the shareholders and it directly measures the return to the shareholders. Both indicators are monitored by the supervisory authorities due to the importance of the banks' profits which are considered as being the first buffer against credit losses. Retained profits are an important source of capital allowing banks to strengthen their buffers and to be more resilient to credit losses. Generally, banks with low profitability may have problems with attracting resources (usually at higher costs), take more risks and have more difficulties to attract capital in hard times. Banks with low profitability indicators make for a riskier banking sector, worse financial stability, and worse business strategies. Operational efficiency (Cost-to-Income ratio), credit risk (Provisions-to-Loans) and liquidity risk (Loans-to-Deposits) as well as the level of NPLs all affect the profitability indicators. During the Covid 19 period the average lowest levels of ROA (1,03%) and ROE

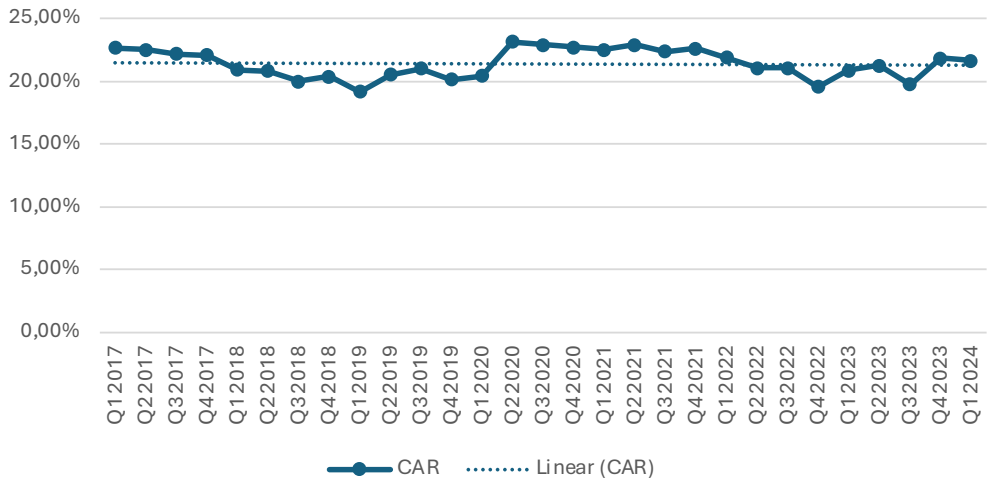

Figure 1. Capital adequacy ratio of Bulgarian banking system
Source: BNB

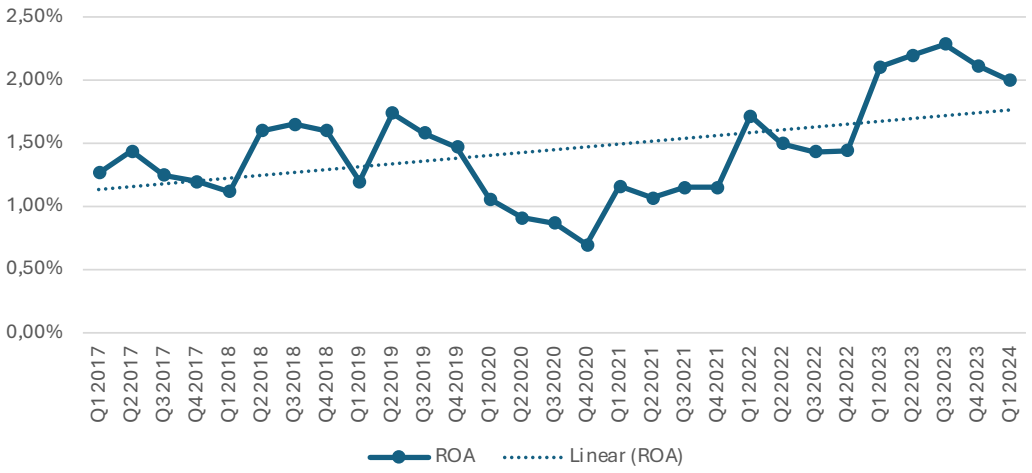

Figure 2. Return on Assets of the Bulgarian banking system
Source: BNB, own calculations

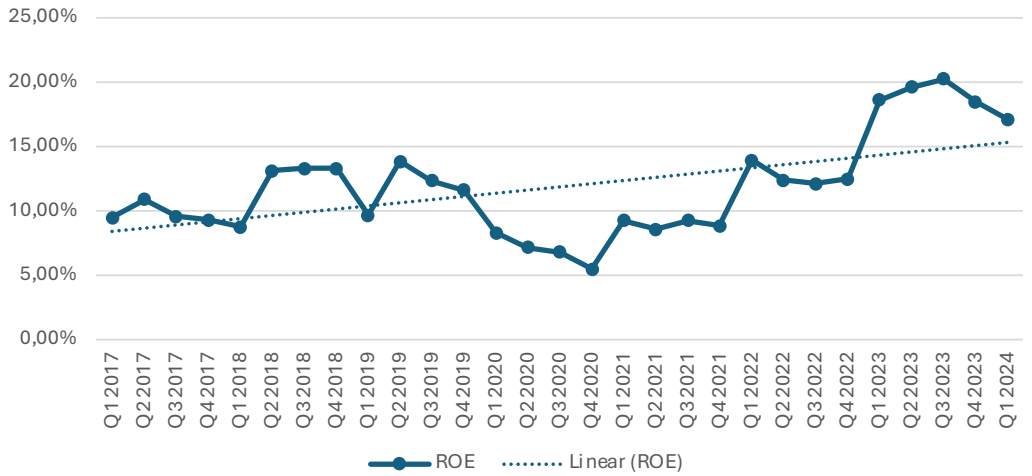

Figure 3. Return on equity of Bulgarian banking system
Source: BNB, own calculations

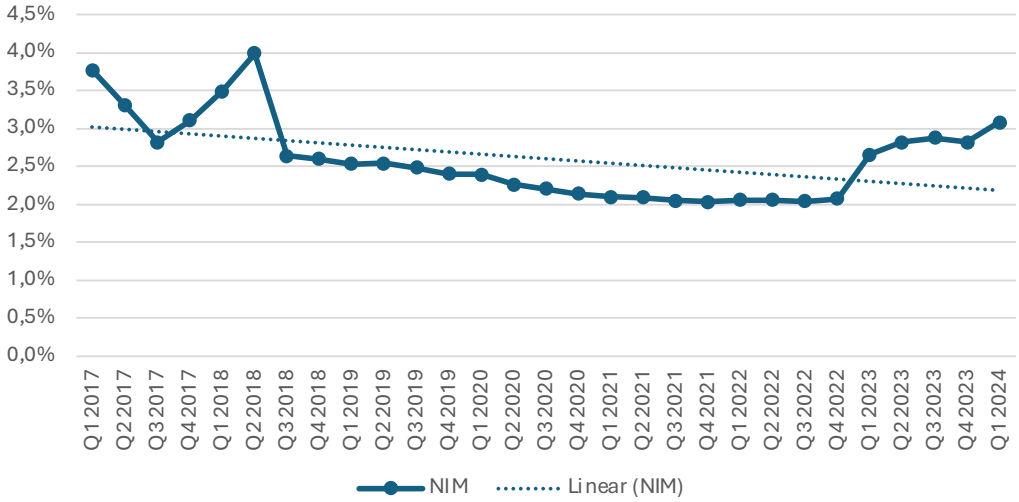

Figure 4. Net interest margin of Bulgarian banking system
Source: BNB, own calculations

(8,1%) were reported. Despite the worsening levels of banks' profitability, the Bulgarian banking system did not have negative profitability indicators which several banking systems in Europe experienced during the Covid 19 pandemic, examples being Greece, Spain, Malta and Cyprus.

There is a strong positive relation between the profitability indicators and net interest margin (NIM) as the Bulgarian banking system is commercially oriented – the banks in Bulgaria are commercially performing all the services and providing all the products included in their license such as depositing and lending as their main function as well as payments, investment intermediation, custodianship, depositary services, etc. In average terms NIM has the lowest value during the Covid 19 pandemic – 2,15% compared to 2,97% and 2,55% in the pre-Covid and post-Covid period. In the Covid period the NIM varied less compared to the pre-Covid and the post-Covid period – the difference between the minimum and maximum values in the Covid period is the lowest. The net interest income increases mostly in the post Covid period.

Loans-to-Assets ratio and Loans-to-deposits ratio: The Bulgarian banking system is oriented to attracting deposits as the main source of funding and granting loans that constitute the main part of the banks' assets. During the pandemic the financial state of non-bank financial corporations deteriorated due to the imposed restrictions in the activities and the drastic drop in consumption and services in several sectors, which led to decrease in income cash flows and delays in local and foreign payments. The stagnation in the economic activity and the existing uncertainty led to a decrease in lending as in the Q2 2020 a negative change in loans to non-financial corporations was reported (-1,04%). In terms of non-financial corporations' deposits there was a negative change in Q1 2020. The financial situation of the households also worsened as some of them lost their income due to temporary unemployment which affected

their creditworthiness. In average terms there was a growth in deposits during the Covid 19 period compared with the pre-Covid period of 25,5% due to the precautionary motive for savings in the period.

The growth in the post-Covid period compared with the Covid period was similar (25,15%). Regarding loans the increase in average terms in the Covid 19 period to pre-Covid period was 16,89% and for the post-Covid period compared to the Covid 19 period it was 23,76% which can indicate stagnation in lending due to the slowdown in the economic activity and the higher levels of inflation in the post-Covid period.

In terms of the types of loans – loans to non-financial corporations, consumer loans and loans for house purchases – during the pre-Covid period all segments had an increase in terms of volumes. In the Covid period there was a decline in lending in all segments and the decrease happened in different sub-periods. The drop in the loans to non-financial corporations appeared in April 2020, directly after the announcement of the lockdown in Bulgaria and in the other countries bringing disruption in companies' business activities and leading to uncertainty and disruptions in many sectors. Regarding consumer loans the significant decline in lending was registered in May 2020 with a lag after the announcement of the lockdowns. The drop in consumers loans reflects the uncertainty for the future incomes, decline in consumption due to the limited economic activity, temporary job losses. The decline in loans for house purchases was smooth compared to loans to non-financial corporations and consumer loans as no evident sub-period with significant drop could be identified. A recovery could be observed in January 2021 for loans to non-financial corporations and in March 2021 for consumer loans and loans for house purchases.

The Loans-to-Deposits ratio is significant for the liquidity risk, and it shows what part of loans is financed by deposits and to what extent worsened economic conditions and bank panic would influence bank performance. The Loans-to-Assets ratio shows the system's profile, e.g. which components of assets contribute mostly to the profitability indicators. The figures for the Loans-to-Deposits ratio are similar in the Covid-19 and in the post-Covid period indicating a drop in comparison with the pre-Covid period, which proves our assumption of moderate growth of loans during the Covid 19 and post-Covid period and increase in deposits due to precautionary reasons.

Operational costs, credit impairments and NPLs: The Cost-to-Income ratio is an indicator for the banks' operational efficiency. Normally, this indicator should be negatively related with the profitability indicators – the higher the value of the ratio is, the lower the bank profitability is as the indicator measures the operational expenses not only the financial ones. During the pandemic period the indicator slightly decreases. However, the decrease of this indicator is much more prominent in the post-Covid period. The Covid period pushed the banks to invest much in providing digital products and services to their clients due to the lockdown and that started to bring optimization in terms of branch offices and staff. The clients needed some time to get used to the massive usage of digital products and services as well as the banks which needed time for technical, legal, and educational support.

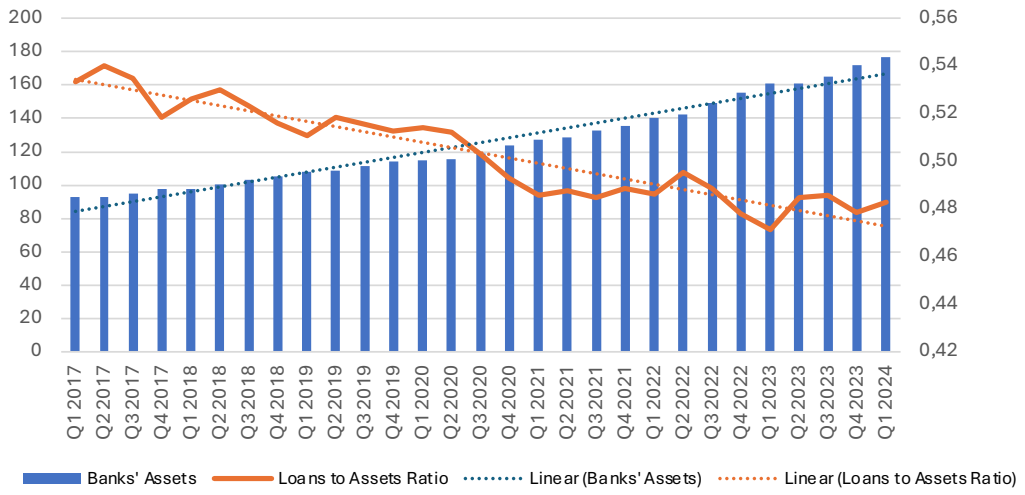

Figure 5. Banks' assets and Loans-to-assets ratio
Source: BNB, own calculations

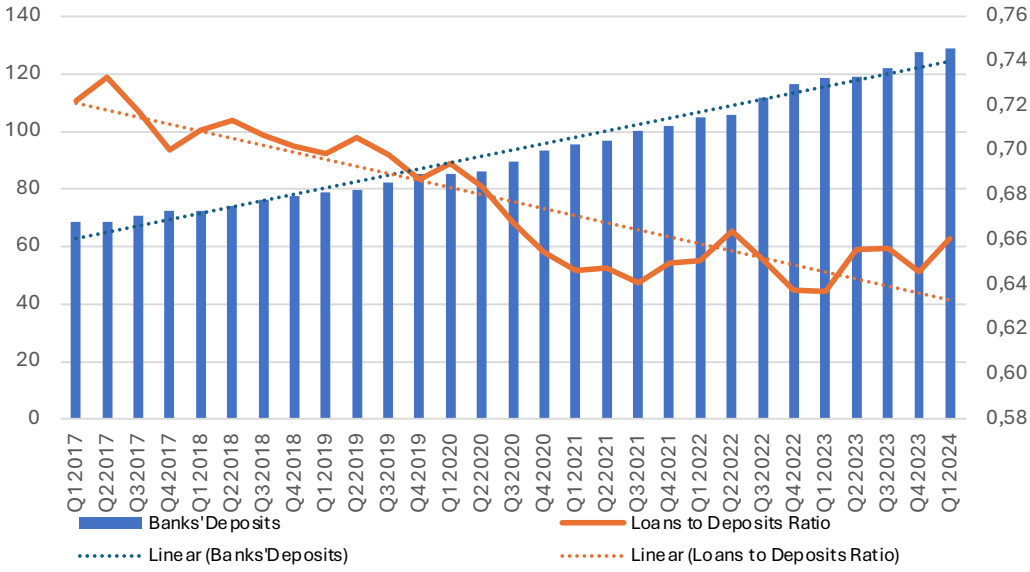

Figure 6. Deposits and Loans-to-deposits ratio
Source: BNB, own calculations

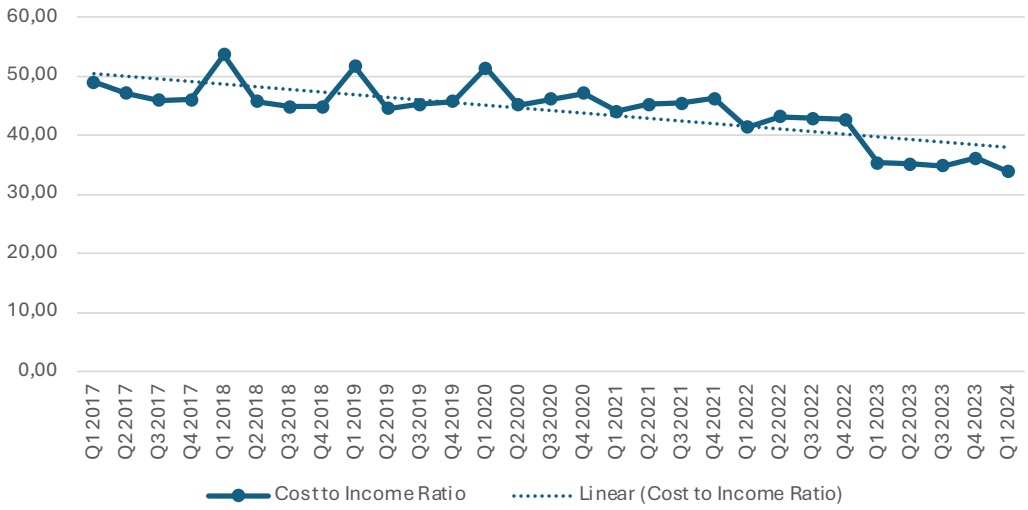

Figure 7. Cost to Income ratio
Source: BNB, own calculations

Credit impairment is an indicator that supplements the analyses of NPLs as both indicators are expected to have a negative influence on the profitability indicators. In average terms the Credit Impairments-to-Loans ratio increased despite the decrease in the NPLs, which was evidence for a more conservative policy applied by the banks by setting aside more provisions due to the uncertainty in lending, worsened economic conditions for some sectors and expectations for delays in payments and worse credibility for some clients. The NPLs continued their tendency to decrease during the Covid and the post-Covid period due to the effect of the moratorium which mitigated the effect on the Covid 19 pandemic on the NPLs. The Credit impairments-to-Loan ratio smoothly decreased during the three periods contrary to the NPLs where the tendency for decrease was more abrupt showing the improvement in banks' policy for credibility assessment and the attempt to reach the lower levels reported by the EU banks.

The leverage ratio is the ratio between the bank's capital and its assets. The requirement for the calculation of this ratio as well as for certain levels that should be maintained by the banks was implemented by the Basel 3 requirements. The higher levels of that ratio are an indicator for better bank stability but also the higher values suppose higher profitability as when the banks easily fulfill the requirements for capital adequacy, they are better regarded by the public and can easily negotiate funding on the capital markets. During the Covid pandemic that ratio had the highest value (12,42%) in average terms compared to the pre-Covid and the post-Covid period (11,52% and 11,38% respectively). This was again evidence for more conservative policy undertaken by the banks during the Covid 19 pandemic period but also it reflected the stagnation in lending and the measures by the supervisory authority (namely, ban on the dividends' distribution) which cumulatively led to higher values of the indicator.

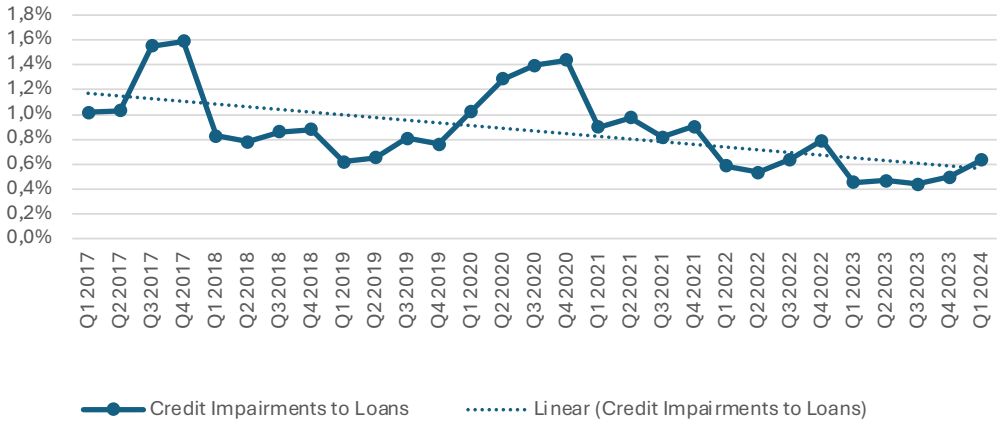

Figure 8. Credit impairments to Loans

Source: BNB, own calculations

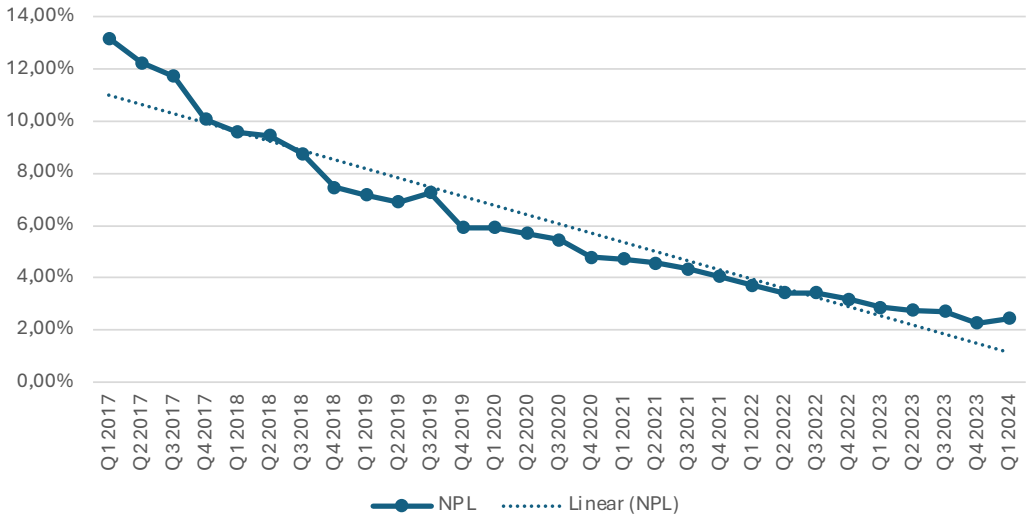

Figure 9. Non-performing loans

Source: BNB, own calculations

Section. 4. Econometric multiple regression model

In order to assess the importance of the discussed factors and determine the main ones leading to bank stability we propose a very simple linear regression model that includes relevant independent variables but also attempts to avoid multicollinearity.

The discussed determinants above are included in the linear multivariate regression model in the following way:

$$CAR=\alpha+\beta1*ROA+\beta2*ROE+\beta3*NIM+\beta4*Loans\_Deposits+\beta5*Loans\_Assets+\beta6*Cost\_Income+\beta7*Impairments\_Loans+\beta8*NPLs+\varepsilon, \quad (1)$$

Where:

CAR is the dependent variable;

α – constant;

βs are the coefficients showing the effect of the respective independent variable on the dependent variable;

ε –error term;

First, we must question whether the multivariate regression model is appropriate. As an initial attempt its results are informative in some way or another. Second, the choice of dependent and independent variables is also to be scrutinised. CAR is a metric that banks can manage directly through bank capital injections and allocations. Therefore, it does not depend only on our choice of independent variables. Third, the independent variables are not truly independent both in a statistical and qualitative way. They are interlinked and actively managed by the banks. Hence, the whole approach is questionable, but nevertheless informative. Fourth, the choice of dependent variable – CAR. We could as well have chosen ROE, which is less susceptible to direct management by the banks and is an all-inclusive metric that shows in the long-run the appropriateness of the bank's management.

A regression model run on ROE as the dependent variable with all other variables selected as independent produces far better results as visible from the following tables, but our goal was to study the bank stability as indicated by CAR. The results of ROE being the dependent variable are presented in the following three tables with R^2=0.997 and p<0.001 at F=775.7 as shown.

As visible from Table 2 all the estimated parameters of a multivariate regression where ROE is the dependent variable are logical and can be easily justified from a bank economics point of view.

Returning to our originally proposed model, we must note that the sample is very small, consisting of only 29 observations. Both the dependent variable and the independent ones represent the averages for the whole banking sector in Bulgaria. An alternative panel approach with cross-sections studied simultaneously would probably produce far better results, but ours is just a first attempt to identify significant factors. The F-statistic is 8.10 meaning independent predictor variables explain a significant portion of the variation in the dependent variable. The p-value of F-test

Table 2. Summary of alternative models explanatory power

Model Summary - ROE

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.000	0.000	0.000	0.039
M_1	0.998	0.997	0.996	0.003

Note. M_1 includes CAR, ROA, NIM, Loan_Deposits, Loans_Assets, Cost_Income, Loans_Impairment, NPL

Table 3. Estimated Coefficients of independent variables of alternative model

Coefficients ▼

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	0.119	0.007		16.298	< .001
M_1	(Intercept)	0.113	0.052		2.163	0.043
	CAR	−0.209	0.077	−0.061	−2.715	0.013
	ROA	8.370	0.680	0.879	12.310	< .001
	NIM	0.547	0.162	0.076	3.377	0.003
	Loan_Deposits	−0.086	0.130	−0.065	−0.665	0.514
	Loans_Assets	−0.004	0.205	−0.002	−0.018	0.986
	Cost_Income	−0.050	0.051	−0.063	−0.980	0.339
	Loans_Impairment	0.343	0.442	0.028	0.776	0.447
	NPL	−0.091	0.062	−0.072	−1.462	0.159

Table 4. ANOVA of main model

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	0.003	8	3.450×10^{-4}	8.100	< .001
	Residual	8.518×10^{-4}	20	4.259×10^{-5}		
	Total	0.004	28			

Note. M_1 includes ROA, ROE, NIM, Loan_Deposits, Loans_Assets, Cost_Income, Loans_Impairment, NPL
Note. The intercept model is omitted, as no meaningful information can be shown.

is 0.0001 making the overall model statistically highly significant. The R-squared is 0.7642. It is sufficiently high given the small sample. Thus the proposed model explains 76.42% of the variation in the dependent variable, Capital Adequacy ratio (CAR). The Adjusted R-squared 0.6698 taking into account the number of predictor variables remains high, indicating a good fit. The root MSE: 0.00653 is relatively low and suggests good predictive accuracy.

Despite the small size of the sample, its predictive power represented by R^2 = 0.764 is not to be ignored. This means that we have selected relevant factors that do really affect the capital adequacy ratio. However, it should be noted that CAR depends not only on capital but also on the component of risk adjusted assets and weighed risk positions as defined in the Basel III standard, included in the denominator of that ratio. Capital injections, distribution of dividends and of course the lending policy of the banks both in terms of volume but also type and structure of the loan portfolios also affect the capital adequacy ratio. These variables are omitted from the regression equation.

Overall the model is statistically significant (p = 0.0001), meaning that at least one predictor significantly explains variations in CAR. ROE has a strong negative effect on CAR (-1.289, p = 0.013). Higher return on equity is associated with a lower capital adequacy ratio. Although counterintuitive, this is logical

given that ROE = (Net Income after Corporate Tax) / (Equity Capital). The CIR (Cost-to-Income Ratio) is highly significant (-0.3495, p = 0.003). As costs increase relative to income, capital adequacy decreases as a lesser proportion of the operating income is available for capitalization and thus strengthening of the banking capital. NIM (Net Interest Margin) is marginally significant (0.9244, p = 0.058) which is to be expected. A higher NIM improves capital adequacy, but the effect is slightly weak. This is due to a relatively low-interest rate environment and thin margins characteristic of the sample period. It has to be further investigated, whether the higher share of the Net Non-Interest Income in the Operating Income of the bank has to account for this effect. ROA, LDR, LAR, IMPL, and NPL are not statistically significant. Their empirically observed impact on CAR is unclear, although theoretically their influence is known. However, regarding the β parameters of the independent variables presented in Table №5, the highest impact although not statistically significant factor influencing the CAR is ROA (the return on assets). This is to be expected from a theoretical point of view. At first glance an odd observation is that the β coefficient of the ROE is negative, but this is due to the rule that a higher CAR means more bank capital, i.e. higher denominator and therefore possibly lower ROE.

The distributions of the independent variables are far from normal and stationary. We have attempted to work with stationary first differences, but this reduces the explanatory power of the multivariate model to about R^2=0.45. Therefore, the final choice of this first attempt to quantify the factors is done with the actual time series as they are.

The collinearity diagnostics in Table 6 shows correlation between some of the independent variables. We do not consider this as a major problem given the small size of the population and that all our independent variables are tightly linked to the economies of real operating banks.

Despite the small size of the sample the residuals are randomly scattered around the CAR line as shown in Fig. 10. In addition, the Q-Q plot of the standardized residuals shows a strong correspondence of theoretical versus observed values.

Table №8 shows valid both positive and negative correlations between the independent variables. This is in line with the collinearity test. It is to be noted that ROA and Loans Impairment are strongly and significantly correlated with CAR.

Overall, this initial multivariate regression analysis offers and points to further directions of quantitative research with high probability for deriving valid relationships and results.

We have also examined Omitted Variable bias examination given that many factors that influence CAR have been left out of the equation, the most salient being the risk component of assets as a percentage of total assets. This parameter is not directly available publicly and deriving it implicitly from CAR and bank capital will introduce a circular reference in the regression analysis.

In order to control for Omitted Variable Bias (OVB) we have performed Impact Threshold for a Confounding Variable (ITCV) analysis as specified by Frank et al. (2013) and further developed and exemplified by Bendig, D., & Hoke, J. (2024). This analysis helps us determine how strong an omitted variable would need to be to invalidate the observed relationship between ROA (Return on Assets) and CAR (Capital Adequacy Ratio). The analysis involves computing both unconditional and conditional impact thresholds.

Table 5. Estimated Coefficients of independent variables of the main model

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	0.214	0.002		101.571	< .001
M_1	(Intercept)	0.473	0.097		4.872	< .001
	ROA	7.189	4.678	2.605	1.537	0.140
	ROE	−1.289	0.475	−4.446	−2.715	0.013
	NIM	0.924	0.460	0.440	2.010	0.058
	Loan_Deposits	−0.395	0.313	−1.031	−1.260	0.222
	Loans_Assets	0.369	0.503	0.646	0.734	0.472
	Cost_Income	−0.349	0.103	−1.533	−3.400	0.003
	Loans_Impairment	−0.563	1.106	−0.161	−0.509	0.616
	NPL	0.099	0.161	0.273	0.617	0.544

Table 6. Descriptive statistics of the main model

Descriptives

	N	Mean	SD	SE
CAR	29	0.214	0.011	0.002
ROA	29	0.014	0.004	7.642×10^{-4}
ROE	29	0.119	0.039	0.007
NIM	29	0.026	0.005	0.001
Loan_Deposits	29	0.677	0.030	0.006
Loans_Assets	29	0.503	0.020	0.004
Cost_Income	29	0.441	0.050	0.009
Loans_Impairment	29	0.009	0.003	6.016×10^{-4}
NPL	29	0.061	0.031	0.006

Table 7. Collinearity diagnostics

Collinearity Diagnostics

				Variance Proportions								
Model	Dimension	Eigenvalue	Condition Index	(Intercept)	ROA	ROE	NIM	Loan_Deposits	Loans_Assets	Cost_Income	Loans_Impairment	NPL
M_1	1	8.522	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2	0.337	5.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.011
	3	0.101	9.175	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.034	0.059
	4	0.027	17.750	0.000	0.001	0.001	0.003	0.000	0.000	0.008	0.218	0.000
	5	0.011	27.876	0.000	0.002	0.001	0.707	0.000	0.000	0.000	0.001	0.128
	6	4.647×10^{-4}	135.431	0.035	0.013	0.143	0.002	0.007	0.006	0.712	0.387	0.002
	7	1.868×10^{-4}	213.570	0.343	0.459	0.389	0.138	0.012	0.000	0.142	0.261	0.735
	8	1.368×10^{-4}	249.630	0.262	0.524	0.461	0.120	0.062	0.015	0.120	0.090	0.008
	9	1.363×10^{-5}	790.676	0.359	0.001	0.004	0.021	0.919	0.978	0.018	0.001	0.057

Note. The intercept model is omitted, as no meaningful information can be shown.

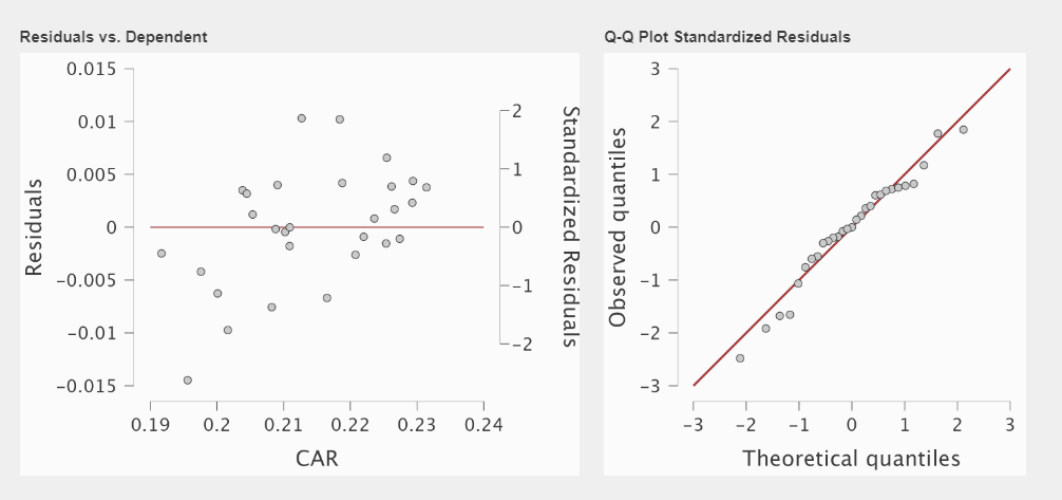

Figure 10 (a). Residuals versus dependent variables, (b) Q-Q plot.

Table 8. Pearsons correlation coefficients

Pearson's Correlations

Variable		CAR	ROA	ROE	NIM	Loan_Deposits	Loans_Assets	Cost_Income	Loans_Impairment	NPL
1. CAR	Pearson's r	—								
	p-value	—								
2. ROA	Pearson's r	−0.456*	—							
	p-value	0.013	—							
3. ROE	Pearson's r	−0.456*	0.993***	—						
	p-value	0.013	< .001	—						
4. NIM	Pearson's r	−0.083	0.273	0.230	—					
	p-value	0.669	0.151	0.231	—					
5. Loan_Deposits	Pearson's r	−0.121	−0.166	−0.249	0.644***	—				
	p-value	0.531	0.388	0.192	< .001	—				
6. Loans_Assets	Pearson's r	−0.014	−0.309	−0.389*	0.574**	0.980***	—			
	p-value	0.942	0.103	0.037	0.001	< .001	—			
7. Cost_Income	Pearson's r	0.062	−0.804***	−0.840***	0.057	0.569**	0.658***	—		
	p-value	0.748	< .001	< .001	0.769	0.001	< .001	—		
8. Loans_Impairment	Pearson's r	0.549**	−0.752***	−0.761***	0.016	0.359	0.472**	0.523**	—	
	p-value	0.002	< .001	< .001	0.935	0.056	0.010	0.004	—	
9. NPL	Pearson's r	0.107	−0.337	−0.415*	0.621***	0.911***	0.938***	0.644***	0.534**	—
	p-value	0.579	0.074	0.025	< .001	< .001	< .001	< .001	0.003	—

* p < .05, ** p < .01, *** p < .001

The omitted variable would need a correlation of -0.135 with CAR and 0.017 with ROA to explain sufficiently ROA's effect on CAR. This results in an impact of -0.002 (which is extremely small). Since this impact is small, it suggests that an omitted variable is unlikely to completely undermine the observed relationship between ROA and CAR.

The omitted variable would need a stronger correlation of -0.262 with CAR and 0.262 with ROA to explain tsufficiently he effect of ROA. This results in an impact of -0.069, which is larger than the unconditional impact but still relatively small. Even when controlling for other variables, an omitted factor would need a fairly strong effect to fully invalidate the relationship between ROA and CAR.

Table 9. Unconditional impact thresholds

Variable	Correlation with ROA (Cor(vX))	Correlation with CAR (Cor(vY))	Impact
ROE (Return on Equity)	0.993	-0.4557	-0.4525
IMPL (Impairment Losses)	-0.752	0.549	-0.4128
CIR (Cost-to-Income Ratio)	-0.8043	0.0623	-0.0501
NPL (Non-Performing Loans)	-0.3372	0.1074	-0.0362
NIM (Net Interest Margin)	0.2733	-0.0830	-0.0227
LAR (Loan-to-Asset Ratio)	-0.3087	-0.0142	0.0044
LDR (Loan-to-Deposit Ratio)	-0.1664	-0.1212	0.0202

Table 10. Partial (Conditional) Impact (After Controlling for Other Covariates):

Variable	Correlation with ROA (Cor(vX))	Correlation with CAR (Cor(vY))	Impact
ROE (Return on Equity)	0.954	-0.6611	-0.6308
CIR (Cost-to-Income Ratio)	-0.410	-0.6827	0.2799
NPL (Non-Performing Loans)	0.5007	0.3208	0.1606
IMPL (Impairment Losses)	-0.5008	-0.2982	0.1494
NIM (Net Interest Margin)	-0.4787	0.2935	-0.1405
LDR (Loan-to-Deposit Ratio)	0.1225	-0.2226	-0.0273
LAR (Loan-to-Asset Ratio)	0.0403	0.1661	0.0067

The following Tables 9 and 10 show how much influence different observed covariates already have on the ROA-CAR relationship. We can compare these observed effects to the ITCV thresholds to determine whether any existing covariates already approach the level of impact needed to challenge ROA's effect on CAR.

ROE (-0.4525) and IMPL (-0.4128) already have much larger impacts than the ITCV threshold of -0.069. This suggests that ROE and impairment losses significantly influence the ROA-CAR relationship and could potentially be important omitted variables in other models. CIR, NPL, and NIM also have non-negligible effects, but their impacts are smaller.

ROE (-0.6308) has the highest impact and exceeds the ITCV threshold of -0.069, making it the strongest observed confounder. CIR (0.2799) also has a major impact on the ROA-CAR relationship. NPL (0.1606) and IMPL (0.1494) still have moderate influence but are not as strong as ROE or CIR. NIM (-0.1405) also plays a significant role. LDR and LAR have much weaker effects.

The ITCV analysis suggests that ROA's effect on CAR is relatively robust unless a missing variable is as influential as ROE or CIR. ROE is the strongest confounder (-0.6308 impact after controlling for other covariates). CIR (-0.2799) also has a significant influence.

If omitted variables had similar effects to ROE or CIR, they could significantly alter the interpretation of ROA's impact on CAR.

Any further analysis should carefully account for ROE and CIR, as they are major influencers of capital adequacy. If omitted variables are as strong as ROE, they could change the conclusion about ROA's importance. The ITCV approach suggests that while omitted variables could change the inference, it would require strong confounding effects, especially from variables similar to ROE, CIR, or impairment losses (IMPL).

Discussion and concluding remarks

The Bulgarian case is relatively uncommon in that the country is characterized by low debt to GDP ratio, a conservative banking sector with a cautious approach to its leverage and capitalization. Nearly all banks operate a classical universal banking model with a very well diversified retail deposit funding base and a well-diversified earning asset portfolio. Within the framework of the Bank Business Model Activity-Funding definition (BBM-AF), as proposed by Ayadi et al (2019), nearly all Bulgarian banks are diversified retail (type 1) banks that combine lending to retail with a moderate percentage of trading activities and primarily funded by retail deposits. According to Freixas et al (2015), this observation alone points to prevailing conditions of low systemic risk. In addition, the Bulgarian banks do not rely on the local inter-bank market for long or even short-term funding, but merely for resolving temporal daily or weekly excess liquidity or shortfall tasks with all such trading being collaterally-backed with Bulgarian or other EU-member states' collateral bonds. Another salient feature is that more than three quarters of the Bulgarian banking sector (balance sheet basis) is owned by large international banking groups and this feature further reduces systemic risk as local banks can access funding and liquidity both locally on the interbank market and through their holding parent groups.

Against the backdrop of other EU members Bulgaria is somewhat an extraordinary case. During the whole period of study, the country has maintained sound macro-economic indicators, with low budget deficits, a low debt to GDP ratio of less than 40%. One very important specific is that the country's monetary system is under a currency board. The Central bank, consequently, has only a few ways to conduct monetary policy and offer support for the banks. These are the capital adequacy requirements and the minimal required central money and cash reserves. The Bulgarian National Bank cannot conduct open market operations, cannot act as a lender of last resort and cannot perform any quantitative easing or other alternative monetary operations. This makes all the banks in Bulgaria very conservative in managing their credit risk and liquidity. As seen from the average CAR, its level of 21% is three times the level of the EU average. Moreover, during all the pre-Covid, Covid and post-Covid periods the banks held excess central money reserves.

Although the profitability of the banking sector was affected negatively the decrease was not significant. Lending also slowed but not dramatically.

One must have in mind that Bulgaria is not a densely populated country. It is in the periphery of the EU and hence the COVID pandemic emergence lagged its outspread in the rest of Europe. This gave time for the government to prepare and to be able to manage the COVID cases development as to avoid panic and hospital capacity overflow. At

the same time the actions of the monetary authority – BNB were timely, adequate and appropriate. Therefore, we do not observe dramatic deterioration of banks' performance even for the least capitalised banks in the country.

This study reviewed the performance of the banking sector in Bulgaria during the pre-Covid, Covid and post-Covid periods as defined earlier in the paper. Bulgaria represents an interesting case as it is extraordinary in its excess safety buffers both in the banking sector and macroeconomics. However, it is also under a currency board with no lender of last resort. One way to expand and delve deeper into the effects of COVID as a stress event is to study how the different banks in Bulgaria coped through a panel study. Another venue could be to make a comparative analysis with countries of similar size particularly within the EU if the country risk has to be taken into account.

In order to qualify and quantify the impact of Covid we have studied the relevant variables of interest before the COVID, during the COVID and after the COVID pandemic in an attempt to identify material and significant shifts and changes that may lead us to important patterns identification and observations.

The key conclusions, at least in the case of Bulgaria, are that: (1) the key determinants of bank stability remain the legacy ones with no new characteristics identified with significant impact; (2) the net ROA after costs arising from quality of assets remain the single most important factor when liquidity shocks are taken out of the equation; (3) exogeneous shocks such as COVID work differently from shocks arising from internal banking or financial system issues which lead us to (4) that the morale and ethics associated with a shock play a very important role in the reaction and proactive response of both banks and their regulator.

The current financial stability models that also include the development of the financial stability and macro-prudential framework after the global financial crisis (2008) but prior to the COVID pandemic (2020) continue to explain and more importantly predict financial stability observations and issues. However, following the collapse of the Silicon Valley Bank in the US the concept of first-class risk-free assets was severely challenged as T-Bills and T-Bonds were demonstrated to be a source of significant risk under certain conditions, namely concentration and thin capitalization of banks.

The Bulgarian context represents an environment with low bank interdependencies and low dependency on financial markets. The sector is well capitalized and with low structural imbalances. Hence, conclusions can be drawn for macroprudential and micro-prudential stability in low systemic risk environments with well-capitalized sector participants operating a classical diversified retail type 1 model. The effects of subsequent macroeconomic shocks are outside the scope of the present study and have not been explored. Further studies designed to explore such development will represent an interesting venue for expanding our understanding of the resilience of the banking systems with regards to its liquidity and solvency.

References

Anani, E., & Owusu, I. (2023). Regulatory capital and bank risk resilience amid the COVID-19 pandemic: How are the Basel reforms faring? Finance Research Letters, 52, 103591. https://doi.org/10.1016/j.frl.2023.103591

Bendig, D., & Hoke, J. (2024). Probing for omitted variable bias: The role of the impact threshold of a confounding variable in complementing instrumental variable estimations. Industrial Marketing Management, 122(3), 145–159. https://doi.org/10.1016/j.indmarman.2024.08.009

Ben Jemaa, B. (2021). The determinants of banking stability: The example of Tunisia. ResearchGate. Retrieved from [URL]

Cao, Y., & Chou, J.-Y. (2022). Bank resilience over the COVID-19 crisis: The role of regulatory capital. Finance Research Letters, 48, 102891. https://doi.org/10.1016/j.frl.2022.102891

Dadoukis, A., Fiaschetti, M., & Fusi, G. (n.d.). IT adoption and bank performance during the COVID-19 pandemic. Economics Letters (in press).

Demir, E., & Danışman, G. O. (2021). Banking sector reactions to COVID-19: The role of bank-specific factors and government policy responses. Research in International Business and Finance (in press).

Demirgüç-Kunt, A., Pedraza, A., & Ruiz-Ortega, C. (2021). Banking sector performance during the COVID-19 crisis. Journal of Banking and Finance, 133, 106305. https://doi.org/10.1016/j.jbankfin.2021.106305

El-Chaarani, H., Abraham, R., & Azzi, G. (2023). The role of liquidity creation in managing the COVID-19 banking crisis in selected MENA countries. International Journal of Financial Studies (in press).

El-Chaarani, H., Skaf, Y., Roberto, F., Hamdan, A., & Binsaddig, R. O. (2023). Assessing the direct and moderating effect of COVID-19 on the performance of the banking sector in the MENA region. FIIB Business Review (in press).

Frank, K. A., Maroulis, S. J., Duong, M. Q., & Kelcey, B. M. (2013). What would it take to change an inference? Using Rubin's causal model to interpret the robustness of causal inferences. Educational Evaluation and Policy Analysis, 35(4), 437–460.

Freixas, X., Laeven, L., & Peydró, J.-L. (2015). Systemic risk, crises, and macroprudential regulation. The MIT Press.

Gholipour, H., & Arjomandi, A. (2021). Economic policy responses to the COVID-19 pandemic and growth of nonperforming loans. International Review of Finance (in press). https://doi.org/10.1111/irfi.12362

Ikeda, Y., Kelly, W., Lewrick, U., & Schmieder, C. (2021). Covid-19 and bank resilience: Where do we stand? Bank for International Settlement, No. 44. Retrieved from [URL]

Jahn, N. (2012). Determinants of banking system stability: A macro-prudential analysis. Bank for International Settlements Working Papers, Basel: BIS. Retrieved from [URL]

Kolev, S. (2020). The Covid-19 challenge and the sustainability of the Bulgarian banking sector. In ERAZ 2021 Conference Proceedings. Retrieved from [URL]

Kozak, S. (2021). The impact of COVID-19 on bank equity and performance: The case of Central Eastern South European countries. MDPI (in press).

Kryzanowski, L., Liu, J., & Zhang, J. (2023). Effect of COVID-19 on non-performing loans in China. Finance Research Letters, 52, 103372. https://doi.org/10.1016/j.frl.2023.103372

Lee, C., & Lee, H. (2021). The determinants of bank's stability: A system GMM panel analysis. Cogent Economics & Finance, 9(1), 1-18. https://doi.org/10.1080/23322039.2021.1940680

Marcu, M. R. (2021). The impact of the COVID-19 pandemic on the banking sector. Management Dynamics in the Knowledge Economy, 9(2), 205-223. https://doi.org/10.2478/mdke-2021-0015

Mesfin, A. (2022). Determinants of bank stability in Ethiopia: A two-step system GMM approach. Cogent Business & Management, 9(1), 1-18. https://doi.org/10.1080/23311975.2022.2067737

Plikas, J. H., Kenourgios, D., & Savvakis, G. A. (2024). COVID-19 and non-performing loans in Europe. Journal of Risk and Financial Management, 17(7), 271. https://doi.org/10.3390/jrfm17070271

Rai, B. (2023). An analysis of the determinants of bank stability in the banking sector of Nepal. Nepalese Journal of Economics, 7(1), 67-88. Retrieved from [URL]

Restoy, F. (2021). Prudential policy after the pandemic. In 33rd Annual Conference of the Group of Banking Supervisors from Central and Eastern Europe, Astana, Kazakhstan. Retrieved from [URL]

Riadi, S., Hadjaat, M., & Yudaruddin, R. (2022). Bank concentration and bank stability during the COVID-19 pandemic. Emerging Science Journal (in press).

Shabir, M., Jiang, P., Wang, W., & Isık, O. (2023). COVID-19 pandemic impact on banking sector: A cross-country analysis. Journal of Multinational Financial Management, 67, 100784. https://doi.org/10.1016/j.jmoneyfin.2022.100784

Silva, J., & Pereira, R. (2023). Banking stability determinants: Evidence from Portugal. Journal of Banking Regulation, 24(1), 50-65. https://doi.org/10.1007/s10292-022-00412-x

Todorova, V. (2021). Non-performing loans in Bulgaria and alleviations for debtors in times of Covid-19 pandemic. Volume 3, Issue 2. Retrieved from [URL]

Tran, D. V., Hassan, M. K., Alam, A. W., & Dau, N. (2022). Banks' financial soundness during the COVID-19 pandemic. Journal of Economics and Finance, 46(3), 713–735. https://doi.org/10.1007/s12197-022-09546-z

Zaid, M., & Amara, T. (2022). Determinants of banks' stability in Jordan. Economies, 10(12), 1-18. https://doi.org/10.3390/economies10120295