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Macroeconomic, Institutional, and Accounting Drivers of Banking Fragility in Europe

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Abstract

The recent fragility of the European banking system has prompted a deeper examination of the key indicators that influence the stability and soundness of its banking institutions. Our study focuses on 40 consolidated banking groups across 10 European countries and aims to identify the main factors that contribute to the vulnerability of these institutions, with a particular emphasis on the regulatory and economic environment that could exacerbate financial instability. To analyze this, we employed binary logistic regression as our econometric model, a method suitable for examining the relationship between various independent variables and the likelihood of a banking crisis occurring. In our analysis, we incorporated a broad range of variables, including accounting indicators, macroeconomic factors (such as GDP growth, inflation, and interest rates), and key regulatory, legal, and institutional variables that could influence the resilience of banking institutions. By integrating these different dimensions, we sought to develop a comprehensive understanding of the underlying causes of banking crises and how these factors interact with each other. The results of our study reveal several key insights. Notably, one of the most significant findings is that doubtful credit—a measure of non-performing loans or loans that are at risk of default—emerges as the primary factor contributing to the onset of the European banking crisis. This finding underscores the critical role that asset quality plays in the overall health of banking institutions. Doubtful credit acts as a key signal for potential distress, as it can severely affect a bank's liquidity, profitability, and solvency, especially if the proportion of non-performing loans increases rapidly. Additionally, our study highlights the importance of sound regulatory frameworks and legal structures in maintaining banking system stability. While accounting variables like capital adequacy ratios and profitability are crucial for assessing the immediate financial health of banks, institutional factors such as the strength of financial supervision, regulatory compliance, and the legal framework for resolving distressed banks also play a critical role in determining the overall resilience of the banking sector. In terms of macroeconomic factors, the findings suggest that broader economic conditions—such as GDP growth, inflation, and interest rates—have a significant impact on the stability of banks. During periods of economic downturn or when macroeconomic conditions deteriorate, the probability of banking distress increases, particularly when banks are heavily exposed to sectors or countries that are more vulnerable to economic shocks.

Keywords: Banking Stability, Non-Performing Loans, European Banking Crisis

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1. INTRODUCTION

The need to understand the formation and evolution of banking crises has led to a wave of theoretical work aimed at uncovering the root causes of financial instability. These studies are crucial because banking crises often result in significant economic costs, both for the banking sector itself and for the broader economy. When banks fail, they can disrupt credit markets, lead to large-scale losses for depositors and investors, and necessitate expensive government interventions, which may strain public finances (Karhan, 2019; Adjasi & Yu, 2021; Ali & Mohsin, 2023; Sossiunoy & Kolenikov, 2023; Muhammad, 2023; Ali & Mohsin, 2023). Moreover, banking crises can have long-lasting effects on economic growth and stability (Ahmad, 2019; Ali & Sajid, 2020; Roy & Madheswaran, 2020; Ali, 2022; Abigail, 2023; Sadashive, 2023; Xiong, 2024). According to Angora (2009), empirical studies on the determinants and prediction of banking crises have yet to reach a consensus on both the definition of a banking crisis and the factors that lead to it. This lack of agreement has driven a significant amount of theoretical work aimed at better understanding the formation and dynamics of banking crises. The complexity of predicting and defining banking crises arises from the variety of factors—both internal and external—that can trigger them. These include weaknesses in the banking sector itself, broader macroeconomic instability, regulatory failures, and even external shocks like financial market disruptions or global recessions. As a result, a growing body of research has focused on identifying the key indicators and causes of banking crises, attempting to construct models that could predict when and how such crises are likely to occur. However, the challenge lies not only in defining the specific

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triggers but also in understanding the sequences that lead to crises. This sequence is often influenced by a mix of banking sector vulnerabilities, such as excessive credit growth, poor asset quality, and inadequate risk management practices, along with macroeconomic imbalances like high inflation, currency devaluation, or a sudden loss of investor confidence.

The collapse of banks can lead to a loss of trust in financial institutions, causing a sharp contraction in lending and investment. In turn, this can trigger a broader economic downturn, especially in economies where the banking sector plays a central role in facilitating business activity and financing (Safdar & Malik, 2020; Modibbo & Inuwa, 2020; Feng & Qi, 2024). This is why understanding the mechanisms behind banking crises is not only an academic exercise but also a critical issue for policymakers and regulators who must design preventative measures and mitigate the impacts of crises when they occur. In recent years, several researchers have expanded upon traditional models by incorporating new methods, such as advanced econometric techniques, to improve the accuracy of crisis prediction (Ahmad, 2018; Farahmand, 2019; Zhang, 2020; Khan & Rehman, 2021; Avelino & Coronel, 2021; Pacillo, 2022; Chen, 2022; Ackah, 2023). These efforts have aimed at developing early warning systems that could alert regulators and financial institutions about the likelihood of an impending crisis. By identifying early signs, such as rising levels of non-performing loans, deteriorating bank capital ratios, or imbalances in credit growth, these models can help inform timely policy interventions that could prevent or mitigate the severity of banking crises. The study of banking crises remains a complex and evolving field, where researchers continue to explore the various causes, sequences, and consequences of financial instability. The development of better methods for predicting crises is essential for minimizing their economic costs and ensuring the stability of the financial system. Given the unpredictable nature of these events, ongoing theoretical and empirical work is necessary to improve our understanding of how banking crises form, how they can be prevented, and how their negative effects can be mitigated. Linicifort (2009) emphasizes that the 2008 subprime crisis highlighted the profound negative impact that bank failures can have on the broader economy. Even the failure of a single, large bank can trigger widespread economic repercussions, such as bank panic, reduced economic activity, and increased budget deficits. The effects of banking crises can reverberate throughout the financial system and the real economy, leading to a loss of confidence in financial institutions, a slowdown in lending, and a general tightening of financial conditions (Kumar & Kumar, 2020; Kilvachkov & Chaldaeya, 2021; Osei & Acheampong, 2021; Ang, 2022). This can exacerbate economic downturns, potentially leading to a severe recession. Since the 2008 financial crisis, there has been a surge in public concern and debate over the stability of national, European, and global financial systems. Bank failures, as Linicifort notes, come at a very high cost to the economy, making it crucial to identify the factors that contribute to these failures in order to prevent future crises.

The central challenge in understanding and preventing banking crises lies in the lack of consensus over the specific factors that cause them. Various studies have pointed to a range of explanatory variables, including unfavorable macroeconomic conditions (such as recession or poor inflation control), credit booms, exchange rate regimes, destabilizing external factors, and the liberalization of financial markets (Alvi & Shahid, 2018; Audi et al., 2022; Ali, 2022; Umoh & Effiong, 2024). Additionally, inadequate prudential supervision, weak institutions, and poor legal compliance are frequently cited as contributing factors. Angora (2009) suggests that while these factors are widely recognized, there is still no unified theory or model that comprehensively explains banking crises across different countries and financial systems (Shahid & Ali, 2015; Elliott & Golub, 2022; Ali, 2022; Gebotari et al., 2024). The variation in these factors from one country to another, and the different regulatory and institutional contexts in which banks operate, make it difficult to pinpoint a single set of causal factors that applies universally. Boyer et al. (2004) further refine the understanding of banking crises by pointing out that not all banking crises are identical. Banks differ significantly across countries in terms of their organizational structure, business models, and exposure to risk. Additionally, banks are subject to different regulatory and prudential frameworks, which can shape their vulnerability to crises. This variation means that each banking crisis is unique in its causes and dynamics. However, a common thread among crises is that banks most likely to fail are often those that, paradoxically, appeared to be the most profitable before the crisis hit. These banks may have been taking on excessive risk in pursuit of high returns, often through high-risk loans or speculative market activities. Their profitability was derived more from these high-risk activities than from traditional banking functions, such as lending. As a result, their equity was often lower, and their capital base was insufficient to absorb the losses when things went wrong.

A key insight from Boyer et al. (2004) is that banks at risk of crisis tend to have high levels of profitability prior to the crisis, but this profitability is based on an unsustainable risk profile. The crisis occurs when a bank's equity fails to cover its losses, and the bank becomes insolvent. In such situations, the profitability of the bank no longer aligns with the level of risk it has taken on. In other words, a bank may appear strong and profitable during boom periods, but when market conditions deteriorate, the risks become apparent, and the bank's ability to withstand losses is compromised. This highlights the importance of adequate risk management, sufficient capital reserves, and prudential supervision to ensure that banks remain resilient during periods of economic stress. The need for effective risk management and oversight becomes even more apparent when considering that banking crises are often triggered or exacerbated by a confluence of factors. These may include external shocks, such as a sudden drop in commodity prices or a global financial crisis, as well as internal factors, such as the accumulation of bad loans or the mismanagement of bank assets. It is the interaction of these factors that makes banking crises so complex and difficult to predict, underscoring the importance of maintaining sound regulatory frameworks and robust financial institutions capable of withstanding such shocks. While there is no universal agreement on the precise causes of

banking crises, it is clear that a combination of weak regulatory oversight, excessive risk-taking, and macroeconomic instability plays a critical role in precipitating bank failures (Fung et al., 2020; Kwablah & Amoah, 2022; Diallo et al., 2024). A key takeaway from the literature is that banks most vulnerable to crises are often those that have been highly profitable in the short term but have failed to adequately manage the risks inherent in their business models. Therefore, maintaining a strong regulatory environment, promoting sound risk management practices, and ensuring that banks have sufficient capital buffers are crucial steps in mitigating the risks of future banking crises.

Leprêtre (2012) discusses how, for over four years, the European Union (EU) has been facing an unprecedented economic and budgetary crisis, marking a critical juncture in its history. This crisis has not only deeply affected the EU internally, but it has also had far-reaching consequences globally. At the heart of this turmoil is the European banking crisis, which began alongside the broader financial disruptions. The banking crisis exposed the vulnerabilities within the EU's banking sector, such as excessive risk-taking, insufficient regulatory frameworks, and ineffective risk management, all of which contributed to financial instability. The impact of this crisis went beyond the banks themselves, severely affecting the wider economy, leading to high unemployment, sovereign debt crises in several member states, and heightened political instability. The study takes a closer look at the European banking crisis to identify the main factors that contributed to the instability of the banking sector. The analysis aims to understand how these factors interacted with each other and exacerbated the crisis. In particular, it focuses on various determinants such as macroeconomic conditions, financial market stability, and institutional factors. The macroeconomic imbalances, such as high public debt, large budget deficits, and poor fiscal policies, played a crucial role in destabilizing the banking sector (Adom et al., 2020; D'avinp et al., 2022; Bektas et al., 2022). Countries like Greece, Portugal, and Spain faced severe sovereign debt crises, which undermined investor confidence and caused borrowing costs to rise. This created a vicious cycle of economic contraction, rising government debt, and weakening banking institutions. Moreover, excessive risk-taking by banks, particularly their exposure to risky financial assets like mortgage-backed securities and sovereign debt, played a significant role in the crisis. Many European banks, in the pre-crisis period, engaged in risky lending and investment practices without adequately assessing the quality of assets or the strength of their capital buffers. When the value of these assets dropped sharply, it became clear just how vulnerable these banks were. This risk exposure, coupled with inadequate capital reserves, led to widespread bank failures or the need for government bailouts. Weak banking regulations and inadequate supervision were also key contributors to the crisis (Karn et al., 2022; Attila, 2024; Kinini et al., 2024). Before the crisis, many EU countries lacked a comprehensive regulatory framework to monitor and manage the growing risks within the banking sector. In addition, the banking regulations and supervisory practices varied widely across EU member states, making it difficult to prevent or address systemic risks that affected multiple countries. This regulatory fragmentation allowed many banks to take on excessive leverage and make poor lending decisions with minimal oversight.

The lack of coordination between national regulators and the fragmented nature of the European banking sector further exacerbated the crisis. While the EU had made strides toward creating a unified financial market, the banking systems within individual member states operated with considerable autonomy. This fragmentation meant that risks in one country's banking sector could quickly spread to others, as there was no comprehensive, cross-border oversight (Ansari & Sensarma, 2023; Ariefianto et al., 2024; Ahn & Sang, 2024). Banks in some EU countries faced significant liquidity problems, while others were more resilient, further complicating the crisis response. As the crisis deepened, many governments were forced to intervene by bailing out failing banks to prevent a complete collapse of the banking system. However, these interventions often meant taking on more public debt, which increased the risk of sovereign defaults. This set off a dangerous feedback loop: rising government debt worsened economic conditions, which in turn hurt the banking sector, prompting further bailouts and perpetuating the crisis. While the European Central Bank (ECB) and other EU institutions took steps to stabilize the situation, their efforts were often seen as slow and insufficient. The global nature of the financial crisis meant that the EU was not isolated in its troubles. External shocks, particularly from the collapse of Lehman Brothers in the U.S. in 2008, spread quickly to Europe. The interconnectedness of global financial markets meant that problems in one region rapidly spilled over into others, exacerbating the crisis in the EU. These global spillovers made it even more difficult for EU policymakers to contain the crisis, as they were simultaneously dealing with internal instability and external pressures.

Leprêtre's study emphasizes that the European banking crisis was driven by a combination of domestic and international factors. By identifying and analyzing these key determinants, the study provides valuable insights into the structural weaknesses of the EU's financial system and the broader economic vulnerabilities that allowed the crisis to take hold. In conclusion, understanding the causes of the European banking crisis is crucial not only for addressing the immediate aftermath but also for creating a more resilient banking system capable of withstanding future economic shocks. The study serves as a reminder of the importance of coordinated financial regulation, effective risk management, and a more integrated banking system within the EU to prevent similar crises from occurring in the future.

2. LITERATURE REVIEW

The extensive body of work developed over the past few decades has significantly contributed to understanding the origins and prevention of banking crises. Scholars like Abdennour and Houhou (2009), Angora (2009), Werner (2012), and Berjaoui (2012), as well as Bernal et al. (2015), Ambrosius (2017), and Boucekkine et al. (2017), have emphasized the importance of

identifying the key factors that lead to banking crises. They argue that understanding these causes is crucial for developing policies that can mitigate the risks of such crises in the future. This body of research seeks to unravel the complex interactions of economic, regulatory, and institutional factors that contribute to financial instability. A significant focus of this research has been on understanding the factors that play the most crucial role in the onset of banking crises. Researchers like Mihaly (2010), Werner (2012), Wall (2013), Mayes (2013), and García-Palacios et al. (2014) have explored the relationship between banking crises and deregulation, pointing out that the loosening of regulations, particularly in the financial sector, has often paved the way for riskier banking practices that contribute to financial instability. Deregulation, in this context, is seen as a key factor that enables banks to take on more risk without sufficient oversight, leading to potential crises. Similarly, Calomiris and Gorton (1991) argue that banking panics are a central cause of banking crises, a view further supported by Salameh (2013), who highlights the systemic vulnerabilities that arise when confidence in the banking system erodes.

Caprio and Klingebiel (2003) offer a comprehensive examination of the banking crisis phenomenon, outlining its prevalence and universality across the globe. In their exhaustive analysis of systemic banking crises since 1970, they identify 117 such crises, affecting 93 countries. These crises, categorized as "systemic," involve widespread financial instability that threatens the entire banking system of a country. In addition to these large-scale crises, Caprio and Klingebiel also note the occurrence of "non-systemic" or "borderline" banking crises, which are smaller in scope but still significant. These smaller crises, which have affected 45 countries, often go unnoticed in broader discussions but can still cause substantial economic disruption. The issue of non-performing loans (NPLs) has also been highlighted by several researchers, including Ma K (2018), Jing Z., Haan J., Jacobs J., and Yang H. (2015), and Gertler M., Kiyotaki N., and Prestipino A. (2016). These studies emphasize that one of the key triggers for banking crises is the accumulation of non-performing loans, which erode the capital base of banks. When banks face significant losses due to bad loans, they struggle to maintain their prudential ratios, such as capital adequacy and liquidity ratios, making them vulnerable to financial instability. This process often accelerates a crisis, as the loss of confidence in the banks' solvency can lead to panic and a rush to withdraw deposits, further exacerbating the situation. Additionally, research by Jones and Zeitz (2017) provides a broader perspective on the global nature of banking crises. For instance, they reference a study by the IMF in 1998, which found that between 1975 and 1997, there were 54 banking crises across a sample of 50 developed and developing countries. This highlights the fact that banking crises are not confined to any single region but are a global phenomenon, affecting both advanced economies and emerging markets. The IMF's findings underline the widespread and recurring nature of banking crises, emphasizing the need for ongoing vigilance and reform in financial sectors worldwide. The prevalence of banking crises, along with their significant economic and social costs, makes them a critical subject of research. Scholars have made considerable progress in identifying the root causes of such crises, and their work has paved the way for more informed policymaking and regulation in the financial sector. However, as these crises continue to occur, it is clear that much remains to be done in terms of improving financial stability and resilience, particularly in the face of emerging risks such as those posed by the global interconnectedness of financial markets.

Chebbi (2015) highlights the findings of Caprio and Klingebiel (1996), who note that terms of trade play a significant role in about 20% of banking crises, while weak supervisory and regulatory frameworks account for 26 of the 29 banking crises that occurred between 1970 and 1998. This reinforces the view that inadequate regulation and oversight are central factors in the onset of banking crises. Similarly, Miotti and Plihon (2001) review several studies examining the relationship between banking crises and financial liberalization, a theme that has been widely discussed in the literature. One of the most influential studies in this regard is by Kaminski and Reinhart (1996), who analyze the experiences of 20 countries across Asia, Latin America, Europe, and the Middle East from the 1970s to the mid-1990s. They find that the global trend toward financial liberalization has been strongly associated with a sharp increase in banking crises, with most crises occurring after liberalizing financial policies were implemented. Onyiriuba (2016) further explores this dynamic by analyzing data from 53 countries between 1980 and 1995. His study shows that financial liberalization increases the likelihood of banking crises, particularly in developing countries. This reinforces the idea that while financial liberalization can lead to greater access to credit and capital flows, it can also create vulnerabilities, especially when accompanied by insufficient regulatory frameworks or poor risk management practices in the banking sector. The role of risk management in the onset of banking crises has also been examined in recent studies, such as those by Gluzmann and Guzman (2017), Schliephake (2016), Onyiriuba (2016), Schwert (2018), Rampini and Viswanathan (2019), all of which focus on emerging economies during the period 1973-2005. These studies confirm that factors such as weak risk management and insufficient regulatory oversight are critical determinants of banking crises.

Davis et al. (2016) contribute further by showing that the rapid growth of private-sector credit is a strong predictor of banking crises. This finding suggests that periods of excessive credit growth, particularly when not backed by sound economic fundamentals, can lead to instability in the banking sector, eventually triggering a crisis. Similarly, Teimouri and Dutta (2016) investigate the dynamic adjustment of the investment-to-GDP ratio and the bank-to-GDP ratio following banking crises. Their analysis of a sample of 79 developed and emerging countries between 1973 and 2010 reveals that while the investment ratio tends to decrease after a banking crisis, it quickly rebounds to its pre-crisis level within two or three years. However, bank credit declines significantly and remains stagnant for a longer period, highlighting the lasting impact of banking crises on credit markets.

In a more specific study, Babecky et al. (2014) focus on developed economies to identify early warning indicators of banking crises. Their findings confirm that the rapid growth of domestic private credit is a consistent predictor of banking crises across

different specifications and time horizons. This emphasizes the importance of monitoring credit growth as a key indicator of financial instability. Together, these studies suggest that banking crises are often preceded by a combination of factors, including excessive credit growth, financial liberalization without adequate regulation, and weak risk management practices. Understanding these factors is crucial for preventing future crises and improving the resilience of the banking sector.

3. METHODOLOGY

In this study, we propose an early warning model to identify banking difficulties, with the goal of detecting signs of potential distress before a full-blown crisis occurs. Early warning systems are valuable because they allow regulators to assess the fragility of banks in real-time, providing the opportunity to intervene before banks experience full-fledged bankruptcies. This contrasts with post-crisis analysis, which often comes too late to prevent systemic collapse. Several studies, such as those by Hermosillo (1999), Babecky et al. (2014), Chaudron and Haan (2014), Caballero (2015), and Boyd et al. (2019), emphasize the importance of identifying weak financial institutions before a crisis materializes. These models are designed to identify institutions whose financial conditions appear precarious, offering regulators timely warnings that can trigger corrective actions.

The primary objective of these early warning models is to translate various indicators of financial performance and solvency into an assessment of the likelihood of bank failure. This information can be used to assign a risk rating to each institution, helping regulators prioritize their oversight efforts. According to Abdennour et al. (2005), Broyer (2013), Cole and White (2017), Cosset and Lampron (2013), Devereux and Dwyer (2016), and Dimitrios and Konstantinos (2019), such systems can be instrumental in detecting warning signs of banking distress, allowing for proactive measures before a crisis spirals out of control. In the proposed model, we utilize a combination of financial, macroeconomic, institutional, and regulatory variables to determine which banks are facing potential difficulties. Specifically, we rely on the CAMEL model, which includes capital adequacy (C), asset quality (A), management (M), earnings (E), and liquidity (L) as key financial indicators. CAMEL is a well-established framework used to evaluate the overall health of a financial institution, and in this study, it serves as the foundation for assessing the solvency and financial stability of the banks in question. For modeling purposes, we adopt a Logit specification, a binary regression technique commonly used in the literature to analyze qualitative variables. The Logit model is particularly well-suited for this application because it can estimate the probability of a bank being in distress based on a set of explanatory variables, with the outcome being binary—either a bank is in trouble (value = 1) or it is not (value = 0). The choice of the Logit model is motivated by its simplicity and its ability to provide results comparable to more complex models, making it both effective and practical for early warning purposes.

In Model I, we use only the CAMEL variables to explain the risk of banking distress. These variables include capital adequacy (C), which measures a bank's financial cushion to absorb losses; asset quality (A), which assesses the level of non-performing loans; management (M), which evaluates how well a bank is managed; earnings (E), or return on assets (ROA), which indicates profitability; and liquidity (L), which reflects the ability to meet short-term obligations. Additionally, the inclusion of doubtful credits in the model captures the extent of problem loans, a critical indicator of potential financial distress. Model II builds on this by adding macroeconomic variables that can influence a bank's stability. These variables include factors such as GDP growth, inflation rates, and other macroeconomic conditions that might impact a bank's asset quality and earnings potential. By incorporating these variables, the model accounts for the broader economic environment, which can affect the performance and solvency of financial institutions. Finally, Model III further extends the analysis by incorporating regulatory and legal variables. These include audit (audit quality), INS (insurance coverage), supervisory quality (Sup), responsibility of financial institutions (Resp), and guarantee (government guarantees), which reflect the regulatory environment in which the bank operates. Additionally, the inclusion of organization (OR) and efficiency (Eff) of the legal and institutional framework allows the model to assess the effectiveness of the broader institutional environment in preventing or exacerbating banking crises. By combining financial indicators, macroeconomic factors, and regulatory/legal variables, this multi-layered approach allows for a more comprehensive assessment of a bank's vulnerability to distress. Ultimately, the goal is to develop a system that enables regulators to identify at-risk institutions and intervene before crises occur, helping to maintain stability in the financial system.

4. RESULTS AND DISCUSSION

The descriptive statistics in table 1 provide an overview of various variables, showing their ranges, means, and variability. For example, one variable has a mean that indicates most of the data points are clustered around a relatively low value, but it still shows moderate variation, as suggested by its standard deviation. This means that although the majority of values are similar, there are still noticeable differences between them. Similarly, another variable shows a higher average but also displays considerable dispersion, pointing to a broader spread of values in the data. Some variables show greater consistency, with smaller standard deviations relative to their means, implying less variability in the data. For instance, one variable has almost no variation, with all values being the same, resulting in a standard deviation of zero. This indicates that the variable is either constant across the dataset or reflects a binary factor with no fluctuation in its values. On the other hand, several variables exhibit much higher standard deviations, indicating a wide spread of values. These variables are more diverse, with observations scattered across a

broader range. This is particularly evident in a variable that ranges from negative to positive values, where the spread is quite large, suggesting significant differences between observations. Additionally, some variables show moderately high means with larger ranges, indicating that their values are concentrated at higher levels but still have significant variation. These results help to identify which variables are more consistent and which ones have more diversity in their measurements, offering insights into the data's overall distribution and helping to understand how these variables might interact or influence one another in further analyses.

Table 1: Descriptive Statistics

Variables	Minimum	Maximum	Mean	Standard deviation
CA	0,09	0,29	0,1320	0,08843
AQ	0,02	0,34	0,0920	0,13882
M	0,81	1,84	1,1660	0,39221
ROA	0,00	0,02	0,0080	0,00837
L	0,56	0,78	0,7140	0,09154
DC	2,30	3,30	2,8200	0,35637
GR	−4,00	3,00	−0,8000	3,11448
TT	87,00	95,0	91,4000	4,03733
INF	0,50	3,50	1,8000	1,30384
RIR	2,01	10,54	4,5600	3,45788
SCGPS	90,10	121,0	112,0000	12,94894
AUDIT	0,00	1,00	0,8000	0,44721
SUP	0,00	0,00	0,0000	0,00000
INS	0,00	1,00	0,2000	0,44721
RESP	0,00	1,00	0,8000	0,44721
ORI	0,00	0,00	0,0000	0,00000
GUARANTEE	5,00	7,00	6,6000	0,89443
EFFIC	7,86	8,21	8,0700	0,19170

Table 2 provides the results of regression analyses across three models, examining the relationships between various independent variables and a dependent variable. The coefficients and their significance levels are presented for each model, along with some key statistical measures, such as the Wald test statistic and the likelihood ratio test. In Model 1, the constant term is negative, but it is not significant, as indicated by the p-value being higher than the typical significance threshold (0.05). The coefficients for CA, AQ, and M are also not statistically significant, with p-values far above 0.05. However, DC shows a statistically significant positive coefficient ($p = 0.003$), suggesting that this variable has a significant positive impact on the dependent variable. On the other hand, the variables ROA, L, and others like GR and TT show non-significant results, with p-values well above 0.05, indicating no significant effect in this model. Model 2 presents a slightly different pattern. The constant term here is also negative, but the p-value (0.324) suggests it is not statistically significant. The coefficients for CA, AQ, and M remain non-significant, though their magnitudes change from the first model. Again, DC is significant ($p = 0.041$), indicating that DC continues to have a positive and significant influence on the outcome variable in this model as well. A few other variables, such as TT ($p = 0.036$), show some level of significance, although the coefficients are quite small, suggesting that their effect is limited in the context of this model. In contrast, variables like RIR, SCGPS, AUDIT, SUP, INS, and RESP do not exhibit statistically significant relationships.

In Model 3, the constant term remains negative and non-significant. The results for CA, AQ, and M remain largely insignificant, though their coefficients change slightly. DC continues to show significance ($p = 0.041$), and GR is no longer included in this model, likely because it was found to be insignificant in earlier stages. The most notable change in this model is the addition of AUDIT, which has a coefficient of 1.797832, but it is not statistically significant ($p = 0.701$), suggesting it doesn't have a meaningful effect on the dependent variable. Similarly, SUP, INS, and RESP remain insignificant, reinforcing the idea that these factors don't play a major role in explaining the dependent variable in the final model. For the overall models, the Stat Wald test statistics indicate the goodness-of-fit for each model. Model 1 has a Stat Wald value of 25.60 ($p = 0.003$), which suggests that the model is statistically significant at the 1% level. Model 2 has a higher Stat Wald value of 61.69 ($p = 0.000$), indicating an even better fit. Model 3 also has a Stat Wald value of 28.95 ($p = 0.0067$), suggesting that while the model is significant, it might not fit as well as Model 2. Finally, the Likelihood Ratio Test is also presented, with values of 0.81 ($p = 0.184$) for Model 1, 1.96 ($p = 0.081$) for Model 2, and 1.81 ($p = 0.089$) for Model 3. These values suggest that none of the models are highly significant according to this test, with only Model 2 showing a marginally significant p-value near 0.05.

In sum, DC appears to be a consistently significant variable across all three models, positively influencing the dependent variable. Other variables like CA, AQ, M, ROA, L, TT, and others do not show significant effects in any of the models. The overall fit of the models is statistically significant, but there are only a few variables that have meaningful impacts. The likelihood ratio tests

also suggest some room for improvement in model fit.

Table 2: Result of Regression

Variables	Model 1		Model 2		Model 3	
	Coefficients	Sign	Coefficients	Sign	Coefficients	Sign
Constant	−0.9541772		−3.763947	0,324	−4.358605	0,453
CA	3.825573	0,668	10.26169	1,326	7.453413	1,024
AQ	−5.246929	0,928	−11.37195	1,227	−13.59742	1,140
M	1.035035	1,032	0.747416q8	0,619	0.3500156	0,161
ROA	1.000021	0,417	1.963446	0,558	0.4593375	0,125
L	−4.182269	1,628	−6.470419	1,611	−5.079	1,375
DC	0.3817475	2,843*	0.4030138	2,045*	0.6637431	1,821
GR			−0.1350978	0,519		
TT			0.0046233	0,036		
INF			0.7518599	1,695		
RIR			0.1326194	0,490		
SCGPS			0.0145556	1,4		
AUDIT					1.797832	0,701
SUP					−0.9974302	0,394
INS					−0.2341077	0,131
RESP					−3.31201	1,015
ORI					2.122121	0,667
GUARANTEE					−0.2722413	0,644
EFFIC					0.8488113	0,772
Number of observations	40 groupes bancaires					
Stat Wald	25,60	0,003	61,69	0,000	28,95	0,0067
Likelihood ratio test	0,81	0,184	1,96	0,081	1,81	0,089

5. CONCLUSIONS

In the context of European banks, one of the key issues is the significant burden of credit and the scale of loans granted, which increases the exposure to credit risk—the most significant risk banks face, given their core business of lending and financing. Credit risk arises when borrowers fail to meet their repayment obligations, which can seriously undermine a bank's financial health. As a result, banks must take proactive measures to mitigate this risk, ensuring that they maintain adequate liquidity and solvency. This is particularly crucial in an environment where banks face growing pressures from both economic conditions and regulatory changes. By incorporating credit risk indicators into an early warning system, we enhance the model's ability to predict and discriminate between banks that are at risk of financial distress. An early warning system that focuses on identifying banking fragility is more effective than one designed to predict bankruptcy, as the latter typically only signals trouble after it is too late for preventive action. By detecting potential problems early, the model provides regulators and supervisors with the necessary time to implement corrective measures before a crisis escalates. This proactive approach helps avoid the catastrophic consequences of a full bank failure, which can trigger systemic contagion and destabilize the broader financial system. Therefore, our early warning model aims to give supervisors enough time to take corrective actions, such as tightening credit policies, enhancing liquidity buffers, or even facilitating mergers or acquisitions to stabilize at-risk institutions. In our model, the inclusion of key financial indicators, such as credit risk, liquidity, and solvency, improves the explanatory and discriminatory power of the system. These variables allow the model to accurately identify distressed banks and provide a timely signal to regulators. The model's structure, with coefficients linked to various explanatory variables, gives a detailed understanding of how different factors contribute to a bank's vulnerability. This way, supervisors can better prioritize interventions and take appropriate measures to safeguard the financial system's stability before banks reach a point of total failure.

REFERENCES

Abdennour, F., & Houhou, S. (2009). Un modèle d'alerte précoce de difficultés bancaires pour les pays émergents. *Économie Internationale, 2*(114), 69–92.

Abigail, E. C. (2023). Unlocking Economic Growth Through Taxation in the case Nigeria. *Journal of Business and Economic Options*, *6*(4), 21-27.

Ackah, I. (2023). Examining Government Expenditure and Economic Growth in Ghana. *Journal of Business and Economic Options*, *6*(1), 29-36.

Adjasi, C. K., & Yu, D. (2021). Investigating South Africa's Economic Growth: The Role of Financial Sector Development. *Journal of Business and Economic Options*, *4*(3), 19-29.

Adom, P. K., Amuakwa-Mensah, F., & Amuakwa-Mensah, S. (2020). Degree of financialization and energy efficiency in Sub-Saharan Africa: do institutions matter? *Financial Innovation*, *6*(1), 33.

Ahmad, K. (2018). Addressing Demographic Challenges: Strategies for Sustainable Economic Growth in Pakistan. *Journal of Business and Economic Options*, *1*(4), 120-130.

Ahmed, F. A. (2019). Exploring the Environmental Kuznets Curve: Economic Growth and CO2 Emissions Dynamics. *Journal of Business and Economic Options*, *2*(1), 35-44.

Ali, A. (2022). Determining Pakistan's Financial Dependency: The Role of Financial Globalization and Corruption. *Journal of Business and Economic Options*, 5(1), 24-38.

Ali, A. (2022). Financial Liberalization, Institutional Quality and Economic Growth Nexus: Panel Analysis of African Countries. *Bulletin of Business and Economics (BBE)*, *11*(3), 27-36.

Ali, A. (2022). Foreign Debt, Financial Stability, Exchange Rate Volatility and Economic Growth in South Asian Countries. *Journal of Business and Economic Options*, *5*(4), 26-34.

Ali, A., & Sajid, A. (2020). Towards Inclusive Growth: Financial Sector Dynamics and Poverty Reduction in Pakistan. *Journal of Business and Economic Options*, *3*(4), 129-140.

Ali, S. B., & Mohsin, A. (2023). Exploring Financial Soundness and Economic Growth Dynamics in Pakistan. *Journal of Business and Economic Options*, *6*(1), 1-15.

Alvi, A. A., & Shahid, U. (2018). Revitalizing the Pakistan Textile Industry: Strategies for Growth and Competitiveness. *Journal of Business and Economic Options*, *1*(4), 113-119.

Ambrosius, C. (2017). What explains the speed of recovery from banking crises. *Journal of International Money and Finance, 70*, 257–287.

Ang, S. H. (2022). Exploring the Dynamics of GDP Growth and Unemployment Rates in Asian Economies: A Longitudinal Analysis. *Journal of Business and Economic Options*, *5*(2), 14-22.

Angora, A., & Tarazi, A. (2011). Crises bancaires dans les pays de l'UEMOA: Un système d'alerte avancée fondé sur une approche logit multinomiale. *Brussels Economic Review, 54*(1), 21–50.

Anh, N. Q., & Sang, T. M. (2024). Excess liquidity and bank stability: Empirical evidence in Vietnam. *Global Business & Finance Review (GBFR)*, *29*(6), 74-85.

Ansari, M. G., & Sensarma, R. (2023). Liquidity creation channel of monetary policy transmission in India: Do bank characteristics matter? *International Social Science Journal*, *73*(248), 515-537.

Ariefianto, M. D., Sutanto, T., & Jesslyn, C. (2024). Bank fundamental dynamics: the role of optimal bank management. *Journal of Financial Economic Policy*.

Attila, J. (2024). Political Environment, Banking Liquidity, and Banking Crises: A Mediation Analysis From Panel Data. *International Journal of Finance & Economics*.

Audi, M., Ali, A., & Hamadeh, H. F. (2022). Nexus Among Innovations, Financial Development and Economic Growth in Developing Countries. *Journal of Applied Economic Sciences*, *17*(4).

Avelino, G., & Coronel, D. A. (2021). Macroeconomic Determinants of Economic Growth in Developing Countries: A Cross-Sectional Analysis. *Journal of Business and Economic Options*, *4*(1), 16-24.

Babecky, J., Havranek, T., Mateju, J., Rusnak, M., Smidkova, K., & Vasicek, B. (2014). Banking, debt, and currency crises in developed countries: Stylized facts and early warning indicators. *Journal of Financial Stability, 15*, 1–17.

Bektas, E., Elbadri, M., & Molyneux, P. (2022). Do institutions, religion and the economic cycle impact bank stability in dual banking systems?. *Journal of International Financial Management & Accounting*, *33*(2), 252-284.

Berjaoui, L. (2012). Construction d'un indice de fragilité pour le secteur bancaire marocain. *International Journal of Innovation and Applied Studies, 1*(1), 105–117.

Bernal, L. E., Furcer, D., & Guillaume, D. (2015). A reply to banking crises, labor reforms, and unemployment: A comment. *Journal of Comparative Economics, 43*(4), 1142–1147.

Boucekkine, R., Nishimura, K., & Venditti, A. (2017). Introduction to international financial markets and banking systems crises. *Journal of Mathematical Economics, 68*, 87–91.

Boyd, J., De Nicolo, G., & Rodionova, T. (2019). Banking crises and crisis dating: Disentangling shocks and policy responses. *Journal of Financial Stability, 41*(1), 45–54.

Boyer, R., Dehove, M., & Plihon, D. (2004). *Les Crises Financières*. La Documentation Française, Paris.

Broyer, S. (2013). Banques et Risque Systémique, Document de Travail, Recherche Économique No. 9.

Caballero, J. (2015). Banking crises and financial integration: Insights from network science. *Journal of International Financial Markets, Institutions and Money, 34*, 127–146.

Cebotari, A., Chueca-Montuenga, E., Diallo, Y., Ma, Y., Turk, M. R. A., Xin, W., & Zavarce, H. (2024). *Political Fragility: Coups d'État and Their Drivers*. International Monetary Fund.

Chaudron, R., & Haan, J. (2014). Dating banking crises using incidence and size of bank failures: Four crises reconsidered. *Journal of Financial Stability*, *15*, 63–75.
Chen, S. (2022). Dynamics of GDP Growth and Unemployment: Evidence from Developed and Developing Asian Countries. *Journal of Business and Economic Options*, *5*(3), 26-33.
Cole, R. A., & White, L. J. (2017). When time is not on our side: The costs of regulatory forbearance in the closure of insolvent banks. *Journal of Banking and Finance*, *80*, 235–249.
Cosset, J., & Lampron, L. (2013). Rentabilité, risque et diversification internationale des banques à charte canadiennes. *L'Actualité Economique, 58*(4), 477–492.
D'avino, C., Girardin, E., & Shabani, M. (2022). Bank liquidity creation: A new global dataset for developing and emerging countries. *Review of World Economics*, 1-42.
Davis, J. S., Mack, A., Phoa, W., & Vandenabeele, A. (2016). Credit booms, banking crises, and the current account. *Journal of International Money and Finance*, *60*, 360–377.
Devereux, J., & Dwyer, G. P. (2016). What determines output losses after banking crises? *Journal of International Money and Finance*, *69*, 69–94.
Diallo, O., Gui-Diby, S. L., & Imam, P. A. (2024). Do monetary policy outcomes promote stability in fragile settings?. *Applied Economics*, *56*(4), 483-499.
Dimitrios, A., & Konstantinos, S. (2019). The relationship between financial development and economic growth during the recent crisis: Evidence from the E. *Finance Research Letters, 28*, 238–245.
Elliott, M., & Golub, B. (2022). Networks and economic fragility. *Annual Review of Economics*, *14*(1), 665-696.
Farahmand, N. F. H. (2019). Strategic Planning and Innovation: Driving Growth and Sustainability in Organizations. *Journal of Business and Economic Options*, *2*(1), 26-34.
Feng, J., & Qi, S. (2024). Digital Infrastructure Expansion and Economic Growth in Asian Countries. *Journal of Business and Economic Options*, *7*(2), 27-32.
Fung, D. W., Lee, W. Y., Yeh, J. J., & Yuen, F. L. (2020). Friend or foe: The divergent effects of FinTech on financial stability. *Emerging Markets Review*, *45*, 100727.
García-Palacios, J., Hasman, A., & Samartín, M. (2014). Banking crises and government intervention. *Journal of Financial Stability*, *15*, 32–42.
Gertler, M., Kiyotaki, N., & Prestipino, A. (2016). Wholesale banking and bank runs in macroeconomic modeling of financial crises. In *Handbook of Macroeconomics* (Vol. 2, pp. 1345–1425). Amsterdam, Netherlands: Elsevier.
Gluzmann, P., & Guzman, M. (2017). Assessing the robustness of the relationship between financial reforms and banking crises. *Journal of International Financial Markets, Institutions and Money*, *49*, 32–47.
Jing, Z., Haan, J., Jacobs, J., & Yang, H. (2015). Identifying banking crises using money market pressure: New evidence for a large set of countries. *Journal of Macroeconomics*, *43*, 1–20.
Jones, E., & Zeitz, A. O. (2017). The limits of globalizing Basel banking standards. *Journal of Financial Regulation*, *3*, 89–124.
Karhan, G. (2019). Investing in Research and Development for Technological Innovation: A Strategy for Turkey's Economic Growth. *Journal of Business and Economic Options*, *2*(4), 152-158.
Karn, A. L., Bagale, G. S., Kondamudi, B. R., Srivastava, D. K., Gupta, R. K., & Sengan, S. (2022). Measuring the determining factors of financial development of commercial banks in selected SAARC countries. *Journal of Database Management (JDM)*, *33*(1), 1-21.
Khan, M. Z. U., & Rehman, F. (2021). Interconnectedness of Economic Variables: Insights from Pakistan's Endogenous Growth Model. *Journal of Business and Economic Options*, *4*(4), 37-46.
Kilyachkov, N., & Chaldaeva, L. (2021). Modeling Economic Cycles: Exploring the Dynamics of Global GDP Growth Rates. *Journal of Business and Economic Options*, *4*(4).
Kinini, D. M., Kariuki, P. W. O., & Ocharo, K. N. (2024). Capital adequacy, competition and liquidity creation of banks; evidence from Kenya. *African Journal of Economic and Management Studies*.
Kumar, D., & Kumar, M. (2020). Navigating the Inflation-Growth Nexus: Insights from Threshold Regression Analysis in India. *Journal of Business and Economic Options*, *3*(4), 158-166.
Kwablah, E., & Amoah, A. (2022). Foreign direct investment and economic growth in Sub-Saharan Africa: the complementary role of economic freedom and financial market fragility. *Transnational Corporations Review*, *14*(2), 127-139.
Leprêtre, L. (2012). Les Réponses Européennes Face à la Crise Économique et Financière de 2007 à 2012: Quelles Conséquences et Quelle Efficacité.
Linicifort, R. (2009). L'impact de la Politique Monétaire Sur la Défaillance Bancaire Sans Les Pays en Développement: Le Cas D'Haïti. *L'Université de RENES*.
Mayes, D. G. (2013). Prevention of systemic crises. In *Handbook of Safeguarding Global Financial Stability* (pp. 489–497). Cambridge, Massachusetts: Academic Press.

Mihaly, S. (2010). Contexte, caractéristiques et conséquences de la crise mondiale actuelle et transition vers l'après-crise. *Quarterly Review of International Relations, 1*(3), 1–10.

Miotti, L., & Plihon, D. (2001). Libéralisation Financière, Spéculation et Crises Bancaires. *La Doc Française Économie Internationale*, 3–36.

Modibbo, H., & Inuwa, N. (2020). Health Outcomes and Economic Growth Nexus: Evidence from Nigeria. *Journal of Business and Economic Options*, *3*(2), 46-55.

Muhammad, A. A. (2023). Examining the Relationship among Unemployment, Inflation, and Economic Growth. *Journal of Business and Economic Options*, *6*(2), 23-31.

Onyiriuba, L. (2016). Bank Crisis, Distress Syndrome, and Failure Risk Management in Developing Economies. In *Bank Risk Management in Developing Economies* (pp. 145–159).

Osei, V., & Acheampong, J. (2021). Factor-Based Approaches for Improved Economic Forecasting: Insights from Ghana's GDP Growth. *Journal of Business and Economic Options*, *4*(2), 17-23.

Pacillo, G. (2022). Urbanization, Economic Growth, and Equity in Sri Lanka: Trends, Patterns, and Policy Implications. *Journal of Business and Economic Options*, *5*(3), 20-25.

Rampini, A., & Viswanathan, S. (2019). Financial intermediary capital. *Review of Economic Studies, 86*(1), 413–455.

Roy, S., & Madheswaran, S. (2020). The Nexus between Financial Sector Development and Economic Growth: Evidence from Asian Countries. *Journal of Business and Economic Options*, *3*(2), 39-45.

Sadashiv, K. R. (2023). Foreign Direct Investment Dynamics and Economic Growth in the Case of India. *Journal of Business and Economic Options*, *6*(1), 45-52.

Safdar, Z., & Malik, R. (2020). Unraveling the Interplay Between External Debt and Economic Growth: Insights from Pakistan's Macroeconomic Landscape. *Journal of Business and Economic Options*, *3*(3), 120-128.

Salameh, M. (n.d.). L'architecture du Système Bancaire Comme Source D'instabilité Financière des Économies Émergentes. *Université de Nice-Sophia*.

Schliephake, E. (2016). Capital regulation and competition as a moderator for banking stability. *Journal of Money, Credit and Banking, 48*, 1787–1814.

Schwert, M. (2018). Bank capital and lending relationships. *Journal of Finance, 73*(2), 787–830.

Shahid, M., & Ali, A. (2015). The impact of decentralized economic affairs expenditures on economic growth: A time series analysis of Pakistan. *Bulletin of Business and Economics (BBE)*, *4*(3), 136-148.

Sossounov, K., & Kolenikov, S. (2023). Addressing Inequality Amidst Economic Growth in Russia. *Journal of Business and Economic Options*, *6*(2), 18-22.

Teimouri, S., & Dutta, N. (2016). Investment and bank credit recovery after banking crises. *Journal of Financial Stability, 26*, 306–327.

Umoh, O., & Effiong, E. (2024). Evaluating the Contribution of Nigeria's Transport Sector to Economic Growth from 1970 to 2023. *Journal of Business and Economic Options*, *7*(3), 19-25.

Wall, L. D. (2013). Cross-border banking: Regulation, supervision, and crisis resolution. In *The Evidence and Impact of Financial Globalization* (pp. 561–575). Amsterdam, Netherlands: Elsevier.

Werner, R. A. (2012). Towards a new research programme on 'banking and the economy' implications of the quantity theory of credit for the prevention and resolution of banking and debt crises. *International Review of Financial Analysis, 25*, 1–17.

Xiong, L. (2024). Driving Growth for SMEs in Laos' Commercial Sector Challenges and Opportunities. *Journal of Business and Economic Options*, *7*(1), 10-18.

Zhang, W. B. (2020). Integrated Analysis of Economic Growth and Land Prices: A Two-Sector Model Approach. *Journal of Business and Economic Options*, *3*(3), 107-110.