

Policy Uncertainty, Financial Stability and Economic Instability: Evidence from US Banks

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Abstract

This research examines financial stability within American banks taking into account unexpected economic shocks.

The sample used in this paper consists of 165 commercial banks operating in the United States during the 2000-2022 period. The authors utilize the fixed effects model, the two-step generalized method of moments estimator, and the quantile regression. On the one hand, the results evince that the profitability, liquidity and capital have a positive influence on bank stability across all levels of stability. On the other hand, the findings substantiate that the credit risk negatively affects bank stability. However, this impact varies across the distribution of bank stability. The outcomes simultaneously highlight the disastrous effects of unforeseen economic shocks on bank stability, revealing distinct effects across various quantiles of the stability distribution.

This paper contributes to the literature as a pioneering study that includes a wide

range of economic uncertainty factors in the U.S. banking system. Indeed, it allows distinguishing the different sources of economic turbulence affecting stability levels in banks. This is achieved by modelling data over an extended period that includes multiple overlapping crises. Moreover, this study adds to the scarce existing research by revealing the heterogeneous effects of uncertainty factors as well as bank variables on banking stability across different quantiles of the distribution.

Keywords: United States, Bank stability, Policy uncertainty, Economic recession, Crises.

JEL: G01, G21

1. Introduction

Bank is a key component of the financial system, playing a crucial role in its financial and economic development (Baum et al., 2021; Davies et al., 2010). Nevertheless, it can be vulnerable to unforeseen shocks during periods of economic uncertainty. This uncertainty deteriorates not only the overall macroeconomic environment, but also the banking system. In fact, crises are typically

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marked by rising loan defaults and deposit withdrawals, which in turn heighten risk and diminish liquidity (El-Chaarani and Abraham, 2022).

Previous studies have consistently shown that uncertainty surrounding government fiscal, monetary, regulatory, and economic policies have a negative impact on bank stability (Killins et al., 2019; Wu et al., 2020). Furthermore, El-Chaarani and Lombardi (2022) demonstrate that banks with political ties were more likely to engage in risky lending practices, contributing to the sector's vulnerability and the eventual financial collapse.

In the context of the American system, the U.S. banking sector remained stable over the period 1998–2006, with some notable disruptions, particularly during the 2001 dot-com bubble and the subsequent market reaction to the terrorist attacks. However, bank solvency has been weakened substantially during the 2007-2009 financial crisis, triggering a gradual recovery that began in 2010 (Djatche, 2019). More recently, the COVID-19 pandemic has had a negative impact on global economies. However, empirical research on the pandemic's effects on bank stability remains limited. In light of these idiosyncratic events, ensuring the financial stability of the banking sector became a primary focus for regulators.

Some policymakers consider banking stability as the absence of banking crises. In this case, factors influencing banking stability include not only the quality of institutions or the role and the nature of banking operations, but also macroeconomic conditions, such as unexpected fluctuations in business cycles (Goodhart and Segoviano, 2009).

Bank stability and risk taking have been the subject of academic research in the US

context (Imbierowicz and Rauch, 2014; Khan et al., 2017; Phan et al., 2022). However, the studies mentioned above have only dealt with one source of economic disruption, and have not included major crises and unforeseen shocks at the same time. As a result, we intend to bridge this gap. As a matter of fact, we identify, study and distinguish the impact of each economic turbulence on the stability of American banks. Therefore, we perform modelling on simultaneous widespread shocks.

On this account, our research question is 'How bank specific variables affect bank stability in the backdrop of changes in the economic activity situation?' Hence, we will try to determine the extent of the impact of the economic downturn on the functioning of the U.S. banking system, especially on bank stability.

We have chosen the United States owing to its particularity consisting in the presence of crises, and in the importance of the role played by banks in the American economy. In fact, the U.S economy stands as the global leader across several dimensions: economically, with one of the highest GDP growth; militarily, with a substantial defence budget and advanced armed forces; and technologically, with cutting-edge industries in fields such as artificial intelligence and telecommunications.

We pay particular attention to the period running from 2000 to 2022. This period began with the terrorist attacks, followed by the collapse of Lehman Brothers, which triggered political uncertainty, until the end of the period highlighted by the COVID-19 pandemic. Indeed, we can note the difference between crises in their disastrous impact on the American economy. This impact is shown particularly on the macroeconomic aggregates

(the growth rate and unemployment rate). The U.S. economy is severely affected by global crises and major shocks, with a low process recovery essentially after the terrorist attack and the subprime crisis (see appendix 1). Hence, we will try to bring to light the impact extent of these shocks on bank stability.

In the hope of meeting the objective of this research work, the remainder of our paper proceeds as follows. Section 2 reviews the related literature, and develops the research hypothesis. Section 3 sets forth the data and research methodology. Section 4 deals with the empirical results and interpretations. Section 5 presents the robustness test. Section 6 represents an empirical extension. Eventually, section 7 concludes the paper.

2. Literature review and hypothesis development

2.1. Internal factors of bank stability

In order to achieve better stability control, it is of great significance to examine internal factors. Some literature has investigated the impact of bank-specific factors on bank stability.

Concerning bank funding liquidity, bank deposit flows are obviously prominent since their fluctuations can disrupt both aggregate investment and consumption, leading to substantial negative effects on the macroeconomic environment (Demirguç-Kunt & Detragiache, 1998). In this context, Acharya and Naqvi's theoretical framework predicts that banks with large deposits run less funding liquidity risk, given that deposits protect banks against liquidity risk. Consequently, bank managers often have a reasonable incentive to assume greater risks. This is because they are covered against a reduction in the risks they assume. As a result, larger deposits imply greater risk-taking and lower stability.

Moreover, some studies confirm the negative impact of funding liquidity on banking stability in the USA and the GCC countries, respectively (Phan et al., 2022; Smaoui et al., 2020). Furthermore, Khan et al. (2017) show that banks with lower funding liquidity risk, as represented by higher deposit ratios, have an incentive to take on more risk.

Respecting the capital, several recent studies have found a positive impact of capital on bank stability. That is to say, more capital means that the bank encounters fewer problems and risky situations (Bermpei et al., 2018; Shabir et al., 2023; Tran et al., 2022; Alouane et al., 2022; Almaskati, 2022). Furthermore, Ghenimi et al. (2017) prove that the capital acts as a safety net for MENA banks in times of crisis, reducing the risk of bank insolvency. This confirms the results of Imbierowicz and Rauch (2014), stating that the capital ratio is negatively related to the probability of failure of U.S. banks. Similarly, Dahir et al. (2018) report that well-capitalized BRICS banks tend to take less risk. This result is also in line with previous literature (Bonner et al., 2015; Khan et al., 2017). Moreover, Riahi (2019) suggests that higher capital adequacy is an important indication of a bank's stability in GCC countries. In accordance with Yin (2019), a higher capital ratio is associated with a higher Z-SCORE, suggesting greater stability or a lower overall risk of bank failure. By contrast, well-capitalized banks may have stronger incentives to assume higher levels of risk (Djankov et al., 2007; Acharya et al., 2011).

Touching the bank credit risk, Li (2009) points out that toxic or bad loan quality are considered a precautionary indicator of a potential banking crisis. Indeed, bank risk failure is likely to increase when banks face increased non-performing loans or if

a myriad of troubled economic projects are financed by loans. In this case, a growing number of publications, particularly after the subprime crisis, have brought to light the positive relationship between credit risk and insolvency risk (Phan et al., 2022; Ghenimi et al., 2017; Bermpei et al., 2018). As a matter of fact, Imbierowicz and Rauch (2014) outline that the collapse of many U.S. banks was caused by the joint emergence of liquidity and credit risks.

Regarding the bank performance, several studies have corroborated that bank stability depends on bank profits. In fact, Ghenimi et al. (2017) highlight the positive effect of ROA on bank stability. In addition, Dahir et al. (2018) outline that an increase in bank profits reduces bank risk-taking. Moreover, Shabir et al. (2021) underline that bank with high profitability are more stable. In the same vein, Tran et al. (2022) report a positive relationship between net interest margin and the Z-SCORE in emerging and developing countries.

Eventually, the findings of previous studies on the impact of bank size on the bank stability are mixed. On the one hand, the theory of economies of scale shows that when a bank increases in size, it can achieve economies of scale through more efficient information systems, and better risk and resource management teams. Some authors account for the positive impact by the fact that large banks tend to be more stable, and customers feel more secure when dealing with large banks (Srairi, 2013; Alzoubi, 2017; Wu et al., 2021; Phan et al., 2022). On the other hand, large banks presume that they are 'too big to fail'. That being the case, banks have an incentive to hold riskier loans (Vadovà, 2011; Abdul-Rahman et al., 2018), which can undermine bank stability.

2.2. External factors of bank stability

With the aim of studying the impact of external factors, which are not under the control of bank management, it is essential to consider the main forms of uncertainty (see appendix 2).

First, referring to previous studies (Phan et al., 2022; Bilgin et al., 2021), we use terrorist attacks as a measure of geopolitical risk. In this case, Phan et al. (2022) reveal that terrorist attacks significantly explain geopolitical risk (GPR). They find a negative impact of this shock on bank stability by the fact that the GPR index shows spikes after the 9/11 terrorist attacks.

Second, the financial crisis is widely used as an indicator variable to measure the effects of the economic uncertainty on the risk-taking behaviour of banks. On the one hand, previous studies have found out a negative influence of subprime crisis on bank stability in the MENA region (Ben Saleh and Boujelbene, 2018; Ghenimi et al., 2017; Wu et al., 2021; Chen et al., 2017). In the same vein, Dahir et al. (2018) evince that BRICS banks were not stable during the global financial turmoil due to the liquidity crisis, indicating that the crisis triggered by developed economies affected them. On the other hand, Smaoui et al. (2020) show that banks were more stable during the crisis because regulations are imposed on banks during crises to improve their resilience. Hence, monetary authorities can improve banking sector stability during economic downturn by limiting banks' risk-taking behaviour.

Third, several studies have placed the focus on the disruptive effect of COVID-19 on bank stability. Indeed, banks face serious threats from the effects of this pandemic. This results from business closures, lock-ups, and reduced demands for goods and services

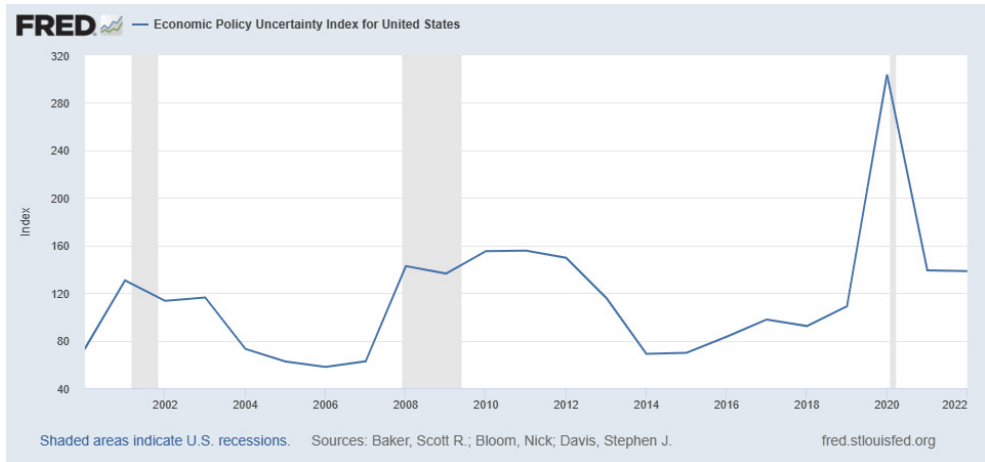


Figure 1. Annual economic policy uncertainty index in USA

Source: FRED

during and after the pandemic (Beck and Keil, 2022). Many researches indicate that banks faced higher default risks, indicating less banking stability under conditions of increased uncertainty (Maria et al., 2022; Ozsoy et al., 2020; Elnahass et al., 2021; Shabir et al., 2023).

By virtue of these significant events, figure 1 presents the EPU index, which effectively captures the global peaks in uncertainty associated with each occurrence (Ahir et al., 2018). On the one hand, several recent researches have reported a negative impact of policy uncertainty on bank stability (Phan et al., 2021; Wu et al., 2021; Wu et al., 2020; Shabir et al., 2021; Bilgin et al., 2021; Danisman and Tarazi, 2024; Olalere et al., 2024). In this context, institutional isomorphism arises from standard responses to uncertainty. Uncertainty is a powerful force that encourages imitation. In fact, when organizational technologies are poorly understood, when objectives are vague, or when the environment creates symbolic uncertainty, organizations may look to others for guidance (March & Olsen, 1976). This indicates that organizational isomorphism can

be triggered by discernible poor outcomes or by an emerging legal framework requiring compliance from all organizations, even if such compliance appears unfavourable to them.

Figure 1 shows three peaks of uncertainty. The first occurred in 2001 following the terrorist attack, with a value of 130. The second occurred in 2008 after the financial crisis with a value of 150. Eventually, a more significant peak of 300 appeared in 2020, due to the pandemic crisis.

On the other hand, the "real options" theory developed by McDonald and Siegel (1986) suggests that bank stability may be reinforced during periods of heightened uncertainty. Similar to producers, banks face issues related to irreversible investments (loans) and can adopt a wait-and-see strategy when uncertainty is high. As the "option value of waiting" increases, banks may find that their chances of making better-informed decisions improve until uncertainty decreases. This, in turn, reduces the likelihood of poor decisions arising from incomplete information. In relation to this theory, suggesting a greater

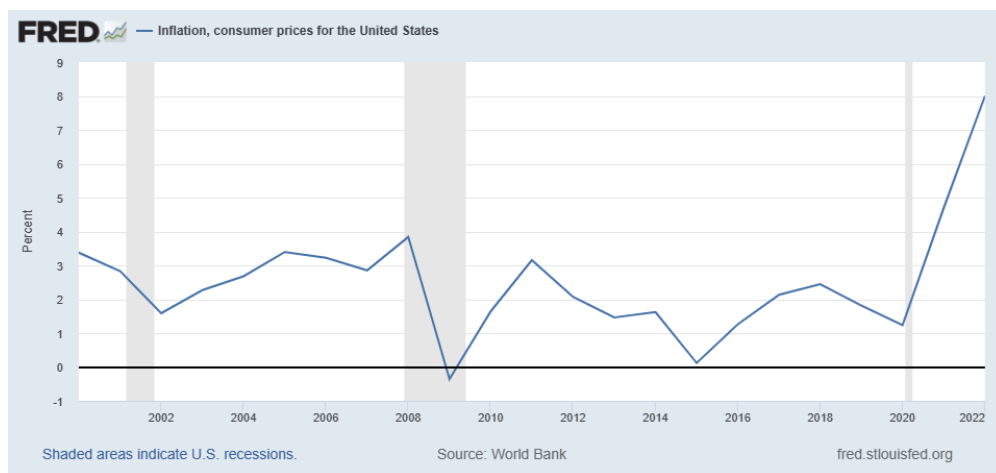


Figure 2. Annual inflation rate in USA

Source: FRED

financial stability in a context of heightened uncertainty, some research aligned with the "volatility paradox" proposed by Brunnermeier and Sannikov (2014) seeks to determine whether financial instability emerges in a low-uncertainty environment. Danielsson et al. (2018) warn that the prevailing excess optimism during periods of low volatility encourages banks to excessively increase their lending and leverage, leading to devastating outcomes.

Eventually, inflation rate can control business cycles' effects since higher inflation is associated with deteriorating economic conditions. Indeed, it is used as a proxy for monetary instability by many researches (Beck et al., 2004; Bermpei et al., 2018). Figure 2 shows that all forms of uncertainty aforementioned lead to inflation.

Figure 2 shows that inflation, which peaked at 3.8% between 2000 and 2019, experienced a significant rise globally in 2021, reaching 4.7%, and surged to 8% in 2022. After several decades of stability, inflation has made a strong comeback (IMF, 2023). This can be explained by high energy prices and supply

chain disruptions, consequences of the Russia-Ukraine war. Thus, the post-pandemic world is characterized by high inflation. Following the sharp inflation spike after the pandemic, central banks have recognized that the risk of deflation is no longer a major concern. The possibility of inflation exceeding central bank targets in the medium term has once again become a source of worry (IMF, 2023). In this context, in response to the 2007 global financial crisis and the COVID-19 crisis, the United States implemented various economic policies to mitigate their negative effects and ensure long-term economic growth. However, the continuous adjustments to economic policies have led to a higher level of economic uncertainty.

Several studies have found a negative impact of inflation on bank stability. In fact, a higher cost of financing resulting from unanticipated inflation lowers the banks' intermediation profits and adversely affects their solvency (Smaoui et al., 2020; Tran et al., 2022; Bilgin et al., 2021; Bermpei et al., 2018).

Based on the theoretical and empirical literature, we develop our main hypothesis as follows:

Bank stability tends to deteriorate in response to unforeseen shocks.

3.Data and research methodology

3.1. Data description

Most economic shocks have originated from the United States, notably the terrorist attacks of 2001 and the subprime mortgage crisis of 2007. These events prove the importance of focusing on this market and highlight the critical role of the U.S. financial system in global stability, as well as its vulnerability to systemic risks during periods of crisis. Hence, our study focuses on a sample of 165 commercial banks in the USA. The period considered for this study runs from 2000 to 2022.

3.2 Description of variables

In our research, we take the ratio of Z-SCORE as our dependent variable in order to measure bank stability. It is denoted as follows:

$$Z\text{-SCORE} = (\text{ROA} + \text{CAP}) / \sigma\text{ROA}$$

where σROA represents the standard deviation of ROA over the past three years as a proxy for the volatility of returns.

Several previous studies have used this measure as the inverse of bank risk taking (Phan et al., 2022; Elnahass et al., 2021; Bilgin et al., 2021; Wu et al., 2020; Bermpei et al., 2018; Shabir et al., 2023; Chen et al., 2018; Shabir et al., 2021). Indeed, a lower Z-SCORE value implies greater exposure of the bank to the risk of insolvency.

The literature suggests that bank stability is a function of both internal and external

factors. Internal factors include bank-specific determinants of stability. Yet, external factors are not under the control of bank management.

The inflation rate is measured through the consumer price index growth. The financial crisis is a dummy variable indicating 1 for the period ranging from 2006 to 2009. The pandemic crisis is captured by a dummy variable, which takes the value 1 during the 2020–2022 period. The terrorist attack is a dummy variable denoting 1 for the 2000–2001 period.

The Economic Policy Uncertainty Index (EPU), developed by Baker et al. (2016), is generated through an algorithm that analyses the frequency of newspaper coverage, with validation from human reviews of 12,000 articles. The News-based Political Uncertainty Index is derived from search results across 10 major newspapers, focusing on articles containing terms such as "uncertain," "economy," "deficit," and "regulation." Baker et al. (2016) demonstrate that the index indicates a decrease in investment and employment, as well as an increase in both during periods of major events. These events include the US presidential elections, the collapse of Lehman Brothers, the Gulf Wars, and other significant economic policy events in the USA, all of which are generally considered major exogenous shocks to the banking sector.

The ratio of deposits to total assets is used in order to measure the funding liquidity. Several previous studies have used this measure as the inverse of funding liquidity risk (Acharya & Naqvi, 2012; Khan et al., 2017; Dahir et al., 2018; Smaoui et al., 2020; Phan et al., 2022; O'Connell, 2022). Deposits protect banks against funding shortages and mass withdrawals of funds. Higher deposits imply a lower funding liquidity risk.

Performance is an important determinant of banking stability, since its measurement depends on profitability. Return on bank assets (ROA) is considered a measure of profitability, widely used in the literature to assess bank profitability (Borio et al., 2017; Alouane et al., 2022; Majumder & Uddin, 2017; Mamatzakis & Bermpe, 2016). It also shows how efficient banks are in using their assets to generate net income.

The capital ratio variable is essential to ensure that banks have a sufficient buffer to absorb a reasonable amount of loss, and compile with statutory capital requirements before they become insolvent. The capital ratio also measures the financial strength of

a bank. It is computed by dividing a bank's capital by its assets.

We measure the differences in loan quality through non-performing loans. Reinhart and Rogoff (2011) indicate that non-performing loans, which signal the onset of a banking crisis, have previously been used as a measure of credit risk.

The bank size is the natural logarithm of total bank assets in millions of constant US dollars. This variable is widely used as a determinant of bank stability.

Table 1 presents all of these variables.

3.3. Research methodology

We study the determinants of bank stability, using the static panel (fixed-effects).

Table 1. Definitions of variables

Variables	Definitions	Abbreviations	Data Source
Bank stability	Natural logarithm of the sum of ROA and equity-to-asset ratio divided by the standard deviation of ROA over the past three years.	Z-SCORE	Datastream + Authors' calculation
Funding liquidity	Ratio of total deposits to total assets	FL	Datastream
Profitability	Ratio of net income to total assets	ROA	Datastream
Capital	Ratio of equity to total assets	CAP	Datastream
Credit risk	Ratio of non-performant loan to total loans	NPL	Datastream
Bank size	Natural logarithm of the book value of the bank's total assets at the end of the accounting period.	SIZE	Datastream
Financial crisis	The binary variable taking the value 1 for the years 2006-2009.	SUB-CRISIS	
Pandemic crisis	The binary variable taking the value 1 for the years 2020-2022.	COV-CRISIS	
Terrorist attack	The binary variable taking the value 1 for the years 2000-2001.	ATT	
Economic policy uncertainty	Natural logarithm of the Baker et al. (2016) annual policy uncertainty index	EPU	Stlouisfed (FRED)
Inflation	Consumer price index	INF	World Bank Website

Source: The authors

The subsequent model is applied with a view to measuring the stability of our sample:

$$\begin{aligned} Z\text{-SCORE}_{i,t} = & C + \alpha_1 FL_{i,t} + \alpha_2 ROA_{i,t} + \alpha_3 CAP_{i,t} + \alpha_4 \\ & NPL_{i,t} + \alpha_5 SIZE_{i,t} + \beta_1 SUB_CRISIS_t + \beta_2 COV_ \\ & CRISIS_t + \beta_3 ATT_t + \beta_4 EPU_t + \beta_5 INF_t + \varepsilon_{i,t} \quad (1) \end{aligned}$$

where i represents the bank; t indicates the time (our time frame is 2000–2022), and $Z\text{-SCORE}_{i,t}$ sets forth the bank stability. $\varepsilon_{i,t}$ points out an idiosyncratic error term, and α and β are coefficients for estimation, using the fixed effects (FE). We use the static panel since it can control the individual and temporal variation in observable behaviour or aggregate cross-sectional time series. It can also monitor the observed or unobserved individual heterogeneity, and hierarchical structure.

4. Empirical results and interpretations

4.1. Descriptive statistics of the model variables

Descriptive statistics are compiled for both banking and macroeconomic factors. The mean, standard deviation, minimum and maximum of these different variables are presented in Table 2.

Over the 2000–2022 period, the Z-SCORE is distributed with a mean value of 4.337 and a standard deviation of 1.088. The Z-SCORE margin ranges from a minimum of -1.083 to a maximum of 7.973. The relatively high standard deviation and wide Z-SCORE margin imply considerable variation in risk levels between banks. This result is congruent with that of Khan et al. (2017) in the American context and for the same sample period, with a mean of 5.17. Similarly, Imbierowicz and Rauch (2014) have found an average Z-SCORE of 3.43 for U.S. banks.

Table 2. Descriptive statistics

Variables	Mean	Standard-deviation	Minimum	Maximum
Z-SCORE	4.337	1.088	-1.083	7.973
FL	76.75	9.12	33.32	95.41
ROA	1.231	0.665	-14.8	6.48
CAP	10.075	2.664	2.76	44.61
NPL	1.318	1.628	0	52.63
SIZE	15.147	1.768	10.572	22.043
SUB-CRISIS	0.174	0.379	0	1
COV-CRISIS	0.13	0.337	0	1
ATT	0.13	0.337	0	1
EPU	4.665	0.392	4.06	5.716
INF	2.493	1.628	-0.356	8.003

Notes: The mean corresponds to the average value of the variables; the standard deviation or variation corresponds to the distribution of data dispersed in relation to the mean value.

Source : Research findings

4.2. Correlation

Table 3 shows the correlation matrix of main explanatory variables and the dependent variable of bank risk-taking (stability) of the sample of U.S. banks.

On the one hand, the associations between most of explanatory variables and bank Z-SCORE are statistically significant.

On the other hand, the correlation **coefficients** between the independent variables do not exceed 0.8. Thus, the problem

of bivariate multicollinearity is completely absent.

4.3. Empirical results

Table 4 below reports the empirical results of estimating model (1), using the static panel fixed effects model.

The findings of Hausman test evince that the **P-value** is below 5%. The fixed-effects panel model is the most appropriate. The probabilities of the Modified-Wald test

Table 3. Matrix correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Z-SCORE	1.000										
(2) FL	0.054* (0.001)	1.000									
(3) ROA	0.299* (0.000)	-0.204* (0.000)	1.000								
(4) CAP	0.185* (0.000)	-0.060* (0.000)	0.127* (0.000)	1.000							
(5) NPL	-0.271* (0.000)	0.005 (0.777)	-0.264* (0.000)	-0.023 (0.154)	1.000						
(6) SIZE	-0.096* (0.000)	-0.326* (0.000)	-0.001 (0.950)	0.074* (0.000)	0.086* (0.000)	1.000					
(7) SUB-CRISIS	-0.271* (0.000)	-0.085* (0.000)	-0.274* (0.000)	-0.104* (0.000)	0.294* (0.000)	-0.028 (0.085)	1.000				
(8) COV-CRISIS	-0.088* (0.000)	0.251* (0.000)	0.001 (0.968)	0.028 (0.088)	-0.016 (0.336)	0.194* (0.000)	-0.178* (0.000)	1.000			
(9) ATT	0.012 (0.470)	-0.082* (0.000)	0.169* (0.000)	-0.109* (0.000)	-0.129* (0.000)	-0.189* (0.000)	-0.178* (0.000)	-0.150* (0.000)	1.000		
(10) EPU	-0.234* (0.000)	0.158* (0.000)	-0.180* (0.000)	0.017 (0.297)	0.225* (0.000)	0.107* (0.000)	0.384* (0.000)	0.525* (0.000)	-0.032* (0.046)	1.000	
(11) INF	-0.043* (0.008)	0.071* (0.000)	0.135* (0.000)	-0.101* (0.000)	-0.147* (0.000)	0.050* (0.002)	-0.119* (0.000)	0.512* (0.000)	0.025 (0.131)	0.022 (0.185)	1.000

Notes: The bivariate multi-colinearity occurs when two independent variables are closely correlated. Detecting this problem is based on the Pearson correlation matrix. According to Kennedy (2008), a correlation coefficient above 0.8 confirms the presence of this issue. These correlations relate to data extracted from 165 banks over the 2000-2022 period; * $p < 0.05$.

Source: Research findings

and the BP-LM (Breush Pagan-Lagrange multiplier) tests are below 5%. Hence, there is a heteroscedasticity problem between individuals, and autocorrelation between residuals. The outcomes of the FE panel model are reported in table 4, considering the Z-SCORE as a measure of bank stability.

With regard to the bank liquidity, the findings give proof of a non-significant coefficient. Funding liquidity measured by deposit has no impact on the bank stability in the USA. This outcome is congruent with some previous studies (e.g., Shabir et al., 2021).

The positive effect with a significant coefficient at the 1% level of ROA on banking stability is supported by a body of literature (Shabir et al., 2021; Dahir et al., 2018; Tran et al., 2022; Wang & Lin, 2021), showing that more profitable banks are more solvent. However, our result contradicts the result obtained by Srairi (2013). Hence, our finding indicates that an increase in bank profitability is associated with greater stability. Therefore, banking stability depends on their profits.

The bank capital shows a positive impact, with a significant coefficient at the 1% level. Whenever a bank's capital increases, it will have more resources to absorb the negative

Table 4. Fixed effect results

	Dependent variable : Z-SCORE	
	Coefficient	P-value
FL	0.003	0.51
ROA	0.326***	0
CAP	0.061***	0
NPL	-0.08***	0.005
SIZE	0.052	0.365
SUB_CRISIS	-0.447***	0
COV_CRISIS	-0.253***	0.006
ATT	-0.142**	0.024
EPU	-0.241***	0
INF	-0.036***	0.001
R ²	21%	
Fisher (p-value)	96.47***	
Hausman	0.0026	
Modified-Wald test	0.0000	
BP-LM test	0.0000	

Notes : Z-SCORE (Bank stability) is the dependent variable; P-values indicate probabilities that are robust to problems of heteroskedasticity and error autocorrelation; (*), (**) and (***) indicate significance at the 10%, 5% and 1% thresholds, respectively ; Both tests (for heteroscedasticity and autocorrelation) have been carried out; and the correction of our estimators (the fixed-effects estimator) has been made by adding the "Vce robust" option in order to obtain an estimate robust to these two problems.

Source: Research findings

shocks caused by loan losses, and therefore greater stability than their undercapitalized peers. Our result is in consonance with the study of Imbierowicz et al. (2014), implying that the capital-to-assets ratio is negatively related to the probability of bank failure. Similarly, our research is in the same line of thought with that of Bermpei et al. (2018), Shabir et al. (2023) and Shabir et al. (2021), corroborating that the capital and bank stability are positively related. Moreover, using the same econometric method, Twairesh and Bata (2025) show that the capital has a favourable effect on bank stability. This implies that high bank capital is perceived as an effective buffer to hedge against unexpected losses, which is closely linked to low banking risk.

The credit risk, measured by the ratio of non-performant loans, displays a negative and significant coefficient at the 1% level. This outcome corroborates that of Louzis et al. (2012) and Reinhart and Rogoff (2011), implying that non-performing loans can be used to signal the onset of such a crisis. This finding is consistent with that of Twairesh and Bata (2025), indicating that bad loans have a negative effect on the stability of Saudi Arabian banks.

Concerning the bank size, the results show a non-significant coefficient. Hence, the size has no impact on the U.S. bank stability.

Touching the financial crisis, the results show a negative link between the financial crisis and bank stability, with a significant coefficient at the 1% level. This finding proves that subprime crisis has led to a rise in toxic loan in banks, pushing a majority of depositors into withdrawing their funds. This leads to risk of insolvency. This outcome is in line with some previous studies (Wu et al., 2021; Ghenimi et al., 2017).

Respecting the pandemic crisis, the effect of the COVID-19 turbulence is similar to the global financial crisis. The negative sign of the coefficient attached to this crisis, has been proven by previous studies (Elnahass et al., 2021; Shabir et al., 2023). This result confirms the resource dependence theory, stating that firms cannot rely solely on their internal operational capabilities. Indeed, resources are essential for adding value to the firm (Pfeffer and Salancik, 1978). That being so, organizations require resources from the external environment in order to survive. Thus, companies survive or succeed by leveraging their dependence on other firms or the dependence of other firms on them to obtain the necessary resources (Ulrich & Barney, 1984). However, during the pandemic, which presents a significant source of uncertainty, it seems challenging to access to external market sources. While many central banks and public authorities responded proactively to this crisis in an effort to support the resilience of the banking sector by adjusting interest rates, the lockdown measures and their consequences heightened concerns regarding the stability of banks.

Regarding the terrorist attack, the findings show a negative and significant coefficient at a 5% level. These results confirm those of Phan et al. (2022), substantiating that the GPR index shows spikes after the 9/11 terrorist attacks, which give proof of a negative impact of this shock on bank stability.

We observe similar findings in relation to the impact of EPU on Z-SCORE. This finding is consistent with that of Phan et al. (2021), proving that bank stability has been significantly reduced when facing increased policy uncertainty. In fact, the increase in bank fragility is also highlighted by the decline in their relative stability position because of

the rapidly changing environment (Wu et al., 2021; Shabir et al., 2021; Wu et al., 2020).

Finally, our results show that inflation has a negative impact on bank stability. This outcome corroborates that of Tran et al. (2022), substantiating that an unexpected rise in inflation increases financing costs, which in turn reduces banks' intermediation profits and weakens their solvency.

5. Robustness check using GMM system method

In order to ensure the robustness of our results, we use the GMM system approach. In fact, fixed and random effects provides biased estimates owing to the lagged dependent variable, the endogeneity problem, and the omitted variable bias. Hence, system GMM estimator, proposed by Arellano and Bover (1995) and Blundell and Bond (1998), serves to solve these problems.

Then, our second model is the following:

$$\begin{aligned} Z_SCORE_{i,t} = & C + \delta_1 Z_SCORE_{i,t-1} + \alpha_1 FL_{i,t} + \\ & \alpha_2 ROA_{i,t} + \alpha_3 CAP_{i,t} + \alpha_4 NPL_{i,t} + \alpha_5 SIZE_{i,t} + \\ & \beta_1 SUB_CRISIS_t + \beta_2 COV_CRISIS_t + \beta_3 ATT_t + \\ & \beta_4 EPU_t + \beta_5 INF_t + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Where $Z_SCORE_{i,t-1}$ is the first lagged dependent variable capturing the persistence in bank stability over time, δ , α and β are coefficients for estimation, using the GMM-system.

It is worth noting that the difference-GMM estimator is less efficient than system-GMM estimation because it does not use a system that combines regressions of levels and first differences. In system-GMM estimation, the original equation in levels is instrumented with lagged first differences of the variables, allowing the use of more instruments, while the first-differenced equation is instrumented with the lagged levels of the variables.

Referring to table 5, Hansen's tests show that the p-value is not statistically significant, with a value higher than 0.1. This means that the null hypothesis H_0 of the validity of the identification restrictions (instrument validity) cannot be rejected. Thus, we come to the inference that the instruments used for these regressions are valid, implying the validity of the results. What is more, the p-value of AR (2) is not statistically significant. This connotes that we cannot reject the hypothesis stating that there is no second-order autocorrelation. That being the case, the empirical model has been properly identified. Consequently, we come to the conclusion that the model estimated satisfies the diagnostic tests. Moreover, the coefficient of the lagged dependent variable is significant, proving the dynamic nature of the model specification (Daher *et al.*, 2015).

Touching the explanatory variables, and regarding the bank-specific ones, the negative sign of the coefficient attached to credit risk in the dynamic panel model, with significance at the 5% level, confirms the findings of static panel and the results of Twaresh and Bata (2025). This finding is in accord with the study carried out by Diamond and Rajan (2005). These authors evince that U.S. banks could be less stable at a time when they face increased credit and default risk. This result confirms the moral hazard arising from asymmetric information between borrowers and lenders, leading to a reduction in credit availability and impacting the stability of the banking system.

Respecting the bank size, the dynamic panel model reveals a negative effect with a high significance of 1%. This finding is not highlighted by the FE model. This outcome confirms the 'too big to fail' assumption, suggesting that large banks are incentivized to take greater risks, hold more loans, and pay

Table 5. GMM results

	Dependent variable : Z-SCORE	
	Coefficient	P-value
Lag Z-SCORE	0.422***	0.000
FL	-0.006	0.283
ROA	-0.455	0.112
CAP	0.047	0.13
NPL	-0.046**	0.041
SIZE	-0.053***	0.001
SUB_CRISIS	-0.947***	0.000
COV_CRISIS	-0.291***	0.003
ATT	-0.052	0.602
EPU	-0.164*	0.079
INF	0.025	0.128
AR (1)	0.000	
AR (2)	0.208	
Hansen test	0.17	

Notes: Z-SCORE_{it-1} is the lagged dependent variable; P-values represent probabilities; (*), (**) and (***) indicate significance at the 10%, 5% and 1% thresholds, respectively. AR (1) and AR (2) are (Arellano and Bond 1991) tests for first-order and second-order autocorrelation in the first differenced errors. The Hansen test is a test for over identifying restrictions.

Source: Research findings

less attention to the negative consequences of that risk. Indeed, they can easily access government bailouts or benefit from the safety net in times of distress. In fact, smaller banks are required to hold less liquidity risk due to limited external funding sources, while larger banks hold more liquidity risk due to their increased leverage, and are able to raise funds on the interbank market and from other sources under the “too big to fail” presumption.

Using various econometric methods, we find that global shocks, especially the financial crisis of 2007–2009 and the COVID-19 outbreak, have significantly weakened bank financial stability. What is more, we note a negative influence of the EPU. Our results are

explained by herding behaviour and mimetic isomorphism.

DiMaggio and Powell's (1983b) perspective on isomorphism is employed to examine the relationship between mimetic isomorphism arising from standardized responses to uncertainty and organizational survival within a complex economic environment. In fact, in such a situation of uncertainty, information problems are exacerbated. Then, bank managers who are concerned about their reputation may be inclined to mimic the lending decisions of other banks. This is because shareholders and financiers are more likely to attribute collective failures to external factors rather than to the individual bank's managerial abilities (Scharfstein & Stein, 1990; Acharya & Yorulmazer, 2008). At the same time, banks,

uncertain about the profitability of the projects they are considering, may look to the lending choices of other banks. The initial decisions made by the first movers may offer valuable insights for the others. As Banerjee (1992) and Avery and Zemsky (1998) suggest, in this situation, bank decisions are likely to exhibit herd behaviour, where banks follow the actions of others instead of gathering their own information. In this case, lending decisions driven by herd behaviour can lead to increased risk, especially if these decisions deviate from the bank's core principles. Therefore, the need for a strategic response to manage isomorphic change has become critical.

Through these various results, we have highlighted the significance of the majority of internal and external factors in enhancing (reducing) stability and mitigating (improving) banking risk. However, the relationship between these factors may differ across various points of the stability (risk) distribution. Furthermore, the Z-SCORE variable can exhibit extreme values, making the mean value less informative. To address these issues, our proposed methodology relies on quantile regression (QReg), which is better suited to the distribution of banking risk. By using quantile regression, we can overcome this limitation and gain more accurate insights into the relationship between banking stability, macroeconomic variables, bank factors, and the conditional quantiles of risk and/or stability.

6. An empirical extension using the quantile regression method

The previous analyses suggest the average effects of the sample under the assumption of homogeneous impacts of EPU on banking stability. Concerns may arise regarding the

heterogeneity of the sample, which introduces bias into the traditional inference approach. We examine how the impact of some bank and macroeconomic factors varies according to the distribution of banking stability using quantile regression.

To effectively analyse the total impact of the explanatory variables on the dependent variable, we select five representative quantile points: the 10th, 25th, 50th, 75th, and 90th percentiles (Nguyen et al., 2023). This approach is also consistent with the standard practice of most researchers when using quantile regression to study relationships between economic variables with asymmetric distributions. Therefore, we apply the quantile regression method to investigate the factors affecting banking stability at high, medium, and low-risk levels. Compared to panel regressions, quantile regression offers the following advantages:

First, quantile regression describes the entire conditional distribution of the dependent variable, rather than just the conditional expectations (mean values) of the dependent variable. Second, it does not require random error terms to strictly satisfy classic econometric assumptions, such as zero mean, homoscedasticity, and normal distribution. For variables that are not normally distributed, the estimated parameter values in quantile regression are more robust. Finally, it reveals the heterogeneous influence of explanatory variables on the different quantiles of the dependent variable.

To assess the validity and applicability of the quantile model used in this study, we conduct a normality test of the variable distribution. Several commonly used methods for testing normality are employed. We examine skewness and kurtosis, reflecting the shape of the distribution's tails and the

direction and degree of asymmetry in the distribution of the data, respectively (see, for example, Lin & Xu, 2018). In this case, the skewness of all variables deviates from 0, suggesting that these variables do not follow a normal distribution. Additionally, the kurtosis of all variables differs from 3, further confirming that these variables are not normally distributed (see appendix 3).

Then, we use the quantile regression method for more extended results. Our model is the following:

$$\begin{aligned} Z\text{-SCORE}_{i,tq} = & C + \alpha_1 FL_{i,tq} + \alpha_2 ROA_{i,tq} + \alpha_3 CAP_{i,tq} \\ & + \alpha_4 NPL_{i,tq} + \alpha_5 SIZE_{i,tq} + \beta_1 SUB_CRISIS_{i,tq} \\ & + \beta_2 COV_CRISIS_{i,tq} + \beta_3 ATT_{i,tq} + \beta_4 EPU_{i,tq} \\ & + \beta_5 INF_{i,tq} + \epsilon_{i,tq} \end{aligned} \quad (3)$$

Where q represents a quantile of the bank stability distribution.

Table 6 shows that some stability factors differ between the different quantile points. We delve deeper into more detailed and substantial results:

With regard to bank specific variables, the principal result that emerges from our study is the positivity of the impact of liquidity. Unlike static and dynamic panel methods, the quantile regression reveals a positive effect with a high significance of 1% at all quantiles. This indicates that higher stability (lower insolvency risk) is associated with higher liquidity level. Indeed, the abundance of liquidity in banks shields them from adverse shocks to their stability, in line with Cornett et al. (2011). The implication is that a bank that demonstrates consistency in its deposit mobilization strategy (e.g., competitive and attractive rates, a security option, a clear marketing and communication strategy) is more likely to be stable than its peers. This aligns with the empirical literature suggesting that the use of larger customer deposits

enhances stability (Shleifer & Vishny, 2010). We argue that banks with higher deposits face a lower funding liquidity risk because these banks will have sufficient funds to meet obligations, and there is less potential for a "run" risk when deposit insurance is in place. Hence, results from QR prove that liquidity is a pivotal constituent in corroborating a greater financial stability of banks.

Moreover, quantile regression proves that the bank capital is a valuable source of funding and acts as a safety net for banks in times of crisis, with positive coefficients across all levels of the Z-SCORE.

Furthermore, quantile regression confirms the negativity of the impact of credit risk on Z-SCORE. What is more, the absolute coefficients decrease slightly up to the 75th quantile, reaching their lowest point at the 90th quantile (0.148 at the lowest quantile level and 0.097 at the highest quantile level). That is to say, banks in the highest quantiles (i.e. a higher level of banking stability) generally maintain adequate capital levels relative to their assets. In this case, a sufficient capital buffer enables these banks to absorb potential losses without bringing about insolvency. In fact, more stable (less risky) banks tend to have less non-performing loans compared to others. This finding is statistically proven (see Appendix 4). Indeed, the mean value of NPL decreases from 2.2 to 0.94 (from the 10th to the 90th quantile).

With regard to economic instability, we find that the coefficients of different forms of instability are negative and statistically significant across the Z-SCORE distribution. Our findings are in consonance with those of Nguyen et al. (2023). These authors come to the inference that economic shocks intensify banking risk at all Z-SCORE levels. What is more, the negative effect of EPU is stronger

Table 6. Quantile regression results

Variable \ Quantile	Q1	Q2	Q3	Q4	Q5
FL	0.013*** (0.000)	0.013*** (0.000)	0.016*** (0.000)	0.016*** (0.000)	0.019*** (0.000)
ROA	0.427*** (0.000)	0.448*** (0.000)	0.479*** (0.000)	0.479*** (0.002)	0.366*** (0.007)
CAP	0.04*** (0.001)	0.047*** (0.000)	0.057*** (0.000)	0.057*** (0.000)	0.065*** (0.000)
NPL	-0.148*** (0.000)	-0.135*** (0.000)	-0.122*** (0.000)	-0.122*** (0.002)	-0.097** (0.033)
SIZE	-0.012 (0.487)	-0.036*** (0.001)	-0.038*** (0.001)	-0.038*** (0.01)	-0.026 (0.173)
SUB_CRISIS	-0.443*** (0.008)	-0.365*** (0.000)	-0.338*** (0.000)	-0.338*** (0.000)	-0.406*** (0.001)
COV_CRISIS	0.16 (0.278)	0.061 (0.431)	-0.348*** (0.000)	-0.348*** (0.000)	-0.528*** (0.006)
ATT	-0.263** (0.046)	-0.184*** (0.001)	-0.261*** (0.000)	-0.261** (0.012)	-0.239** (0.041)
EPU	-0.326** (0.015)	-0.348*** (0.000)	-0.159** (0.017)	-0.159* (0.79)	-0.042 (0.772)
INF	-0.062*** (0.007)	-0.065*** (0.000)	-0.048*** (0.000)	-0.048*** (0.001)	-0.059*** (0.006)
Pseudo R-squared	0.2	0.15	0.11	0.09	0.06

Notes: This table presents regression estimates of the relationship between bank characteristics and Z-SCORE under the effects of EPU global shocks using quantile regressions. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively. Numbers in parentheses are p-value. Pseudo R-squared represents R squared at various quantiles.

Source: Research findings

for poorly and moderately stable banks. In fact, the coefficients of $\ln$ EPU slightly decrease until the 75th quantile (0.326 to 0.159). For highly stable banks, times of high political uncertainty (e.g., at the 90th quantile) do not affect bank stability. This result confirms our hypothesis and our results from the panel regression and previous studies (Shabir et al., 2021; Wu et al., 2020; Bilgin et al., 2021).

Eventually, we prove the disruptive effect of uncertainty at different distribution quantiles of bank stability. In summary, our empirical results are robust to alternative econometric

specifications, confirming the validity of our initial hypothesis.

7. Conclusion

This research work aims to empirically test the impact of internal factors, on the one hand, and external factors, on the other hand, on the stability of American banks. Our sample comprises 165 commercial banks operating in the USA, for the period running from 2000 to 2022. What is more, we elaborate panel and quantile regression models providing evidence that bank stability is represented through a

myriad of banking factors. This analysis also highlights the severe impact of unexpected economic shocks on the stability of banks.

The results of the quantile regression evince heterogeneity in the relationship between the bank stability and some bank factors. For instance, we found out that the negative effect of credit risk is stronger for poorly and moderately stable banks. We also endeavour to discern the disruptive effect of economic instability at different distribution quantiles of banking stability. However, the impact of policy uncertainty is insignificant for highly stable banks.

7.1. Practical implications

Our results remain unchanged in a battery of robustness tests using different econometric approaches. Other methods reveal that the effects hold across the distribution of bank stability. We believe our study offers considerable value to both regulators and investors.

Our findings provide guidelines for academic researchers on stability in U.S. banks. Moreover, they offer practical guidance for practitioners after the recent pandemic crisis. Indeed, they allow distinguishing the different sources of economic disruption affecting stability levels in banks. They also show the difference between crises in terms of bank stability measured by Z-SCORE. This occurs through modelling over a long period and simultaneous crises.

7.2. Research Limitations

Like any other research, our study has some shortcomings. Firstly, it is difficult to make a generalization from our results because of our limited sample size. It deals only with some American banks. Secondly, it examines only three crises. Eventually, it includes only some bank factors.

7.3. Practical recommendations

Future researchers can verify the results by considering the recovery period from COVID-19 or look into other crises such as energetic, inflation, and Russia-Ukraine crises. Moreover, they can add other bank-specific variables, including leverage, portfolio diversification, and efficiency, as well as macroeconomic factors such as GDP growth and unemployment rate.

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Appendix 1. Overview of the economic activity situation

Economic Situation and Recovery process \ Events	Terrorist attack 2000-2001	Subprime 2007-2008	COVID-19 2020-2021
Annual growth rate	• Year of crisis (2001) 1% • One year later (2002) 1.7%	• Year of crisis (2008) 0% • One year later (2009) -3%	• Year of crisis (2020) -3% • One year later (2021) 6%
Annual unemployment rate	• Year of crisis (2001) 4.5% • Two years later (2003) 6%	• Year of crisis (2008) 6% • Two years later (2010) 10%	• Year of crisis (2020) 8% • Two years later (2022) 4%
EPU index	• Year of crisis (2001) 130 • Two years later (2003) 120	• Year of crisis (2008) 150 • Two years later (2003) 160	• Year of crisis (2020) 300 • Two years later (2021) 150
Recovery process	Slow recovery process	Slow recovery process	Rapid recovery process

Source: The authors

Appendix 2. Different forms of uncertainty

Uncertainty form	Policy uncertainty	Economic uncertainty	Pandemic uncertainty	Monetary uncertainty	Geopolitical uncertainty
Proxy	Economic policy uncertainty index	Financial crisis dummy	Pandemic crisis dummy	Annual inflation rate	Terrorist attack dummy

Source: The authors

Appendix 3. Normality tests

Variable \ Test	Skewness	Kurtosis
Z-SCORE	-0.2971212	4.199613
FL	-1.124802	4.569981
ROA	-5.143937	103.8902
CAP	2.411517	23.74447
NPL	10.20736	270.5915
SIZE	1.273555	5.013786
SUB_CRISIS	1.720618	3.960526
COV_CRISIS	2.194691	5.816667
ATT	2.194691	5.816667
EPU	0.4435089	3.144538
INF	1.398411	6.542865

Source: Stata17 output

Appendix 4. Mean Z-SCORE and NPL values per quantile

Quantile \ Value per quantile	Q1	Q2	Q3	Q4	Q5
Z-SCORE	2.80381	3.879136	4.34346	4.856523	5.800129
NPL	2.203768	1.236245	1.133399	1.072437	0.9419763

Source: Stata17 output