

Divergent Effects of Economic Policy Uncertainty on European Banks Profitability: Role of Capital Adequacy Ratio

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Abstract

This study aims to shed light on how economic policy uncertainty (EPU) affects the profitability of European banks across various banking groups and how capital adequacy ratio (CAR) moderates this relationship. Quantile regression analysis is used to analyze the relationship for 3941 yearly observations for the period from 2010 to 2020 for banks in 12 European countries. The findings indicate that the impact of EPU on profitability differs significantly depending on the kind of bank. For instance, while Investment and Saving Banks remain unaffected or even profit from greater EPU, Bank Holdings, Commercial Banks, Real Estate and Mortgage Banks, and Islamic Banks all see a decline in profitability due to EPU. CAR moderates the negative relationship between EPU and bank profitability, but the impact is asymmetrical among different types of banks. Overall, the paper's findings emphasize how crucial bank-specific traits like institutional framework, business focus, and risk attitude determine how banks respond to shifts in EPU. The diverse impacts of EPU on bank profit by category show that there is no one-size-fits-all approach to policy intervention in the banking industry.

Keywords: EPU; quantile regression; banks profitability; capital adequacy.

JEL Classification: G21, G32, D81

1. Introduction

Economic policy uncertainty (EPU) is caused by the incoherence of government fiscal, monetary and trade policies and is exacerbated by political events, geo-political tensions and legislative upheavals. EPU refers to the risks and uncertainties generated by the political and regulatory system (Nguyen, 2021). Uncertainties caused by economic policies have implications for various economic activities such as corporate investment, aggregate output,

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government deficit, employment, financial stress, financial institutions, volatility of equity returns, cash flows and exchange rates. EPU is derived from changes in the macroeconomic policies and whether these changes would impact the economic environment. Despite the implications of EPU for the real economy and financial institutions, there has been limited research on the impact of EPU on financial institutions, particularly banks. Previous studies on EPU in the banking sector have examined the impact of EPU on bank stability (Danisman & Tarazi, 2024; Nguyen, 2021), loan pricing (Ashraf et al., 2021), credit availability (Bordo et al., 2016), credit risk (Dang, 2025) and profitability (Ashraf & Shen, 2019; Athari, 2021; Chi & Li, 2017; Hamdi & Hassen, 2022; Dang et al., 2025).

Previous literature has demonstrated that EPU has a detrimental effect on bank performance (Ozili, 2022). The literature has provided evidence that banking sector profitability is impacted by uncertainty in monetary policy, interest rate environment, credit supply and changes in GDP. EPU reduces the demand for credit and increases the risk of non-performing loans, leading to volatile returns on capital and reducing the bank's profitability (Mendy et al., 2023). Banks are subject to additional regulatory capital requirements under BASE III. The high CAR shields banks from market risk and enables them to absorb losses due to loan impairments, investment losses or financial market shocks (Adelopo et al., 2022). Previous literature documents that CAR has a positive role in reducing the negative impact of EPU on bank stability (Danisman & Tarazi, 2024). CAR provide banks with capital buffers to absorb economic shocks and curb the excessive risk-taking behavior of bank managers, providing stability and creating room for growth (Al-Sharkas & Al-Sharkas, 2022). CAR provide resilience and confidence in uncertain times, allowing banks to attract deposits and provide loans to credit-worthy customers keeping profitability intact (Ruggah et al., 2024). Although EPU is a significant determinant of banking sector performance, but the literature on the relationship between EPU and bank profitability is scant. In this paper, we extend the literature by examining the impact of EPU on profitability of European banks. We also examine the role of capital adequacy (CAR) in moderating the relationship between EPU and banking sector profitability (Killins et al., 2019).

The choice of European banks for our study is interesting for several reasons. The UK's vote to leave the EU has raised concerns about economic policies in the Eurozone in the aftermath of Brexit, casting doubt on trade agreements and market prospects (Baker et al., 2016). These developments have created a strained global environment, distorting economic policy choices and creating uncertainty for businesses and financial institutions (Al-Thaqeb & Algharabali, 2019). Further, EPU has peaked due to the war in Ukraine and the resulting price volatility, supply chain disruption, investor uncertainty, inflation and interest rate hikes, credit risk and currency volatility (Van't Klooster & Fontan, 2020). These factors, therefore, increase the default rate on loans, reduce the profitability of European banks and increase the operating costs of European banks (Sum, 2012). In order to address this, European governments and central banks are scrambling to adjust interest rates and monetary policies,

increasing policy uncertainty (Athari, 2021). In fact, central banks in Europe are raising interest rates in the midst of persistent inflationary pressures from the geopolitical crisis, which is pushing up energy and commodity prices (Romelli, 2022). The hike in interest rate may increase the default risk for existing loan holders, specifically financial constraint firms in a high-interest environment (Karadima & Louri, 2021). It will lead to banks potentially having more non-performing loans leading to loan defaults and, thus, a negative impact on bank profitability (Wang et al., 2022). Therefore, it is interesting to examine the relationship between EPU and profitability in European banks and the mitigating mechanism of capital adequacy to absorb the effect of macroeconomic shocks (Desalegn et al., 2023).

The study contributes to the literature in the following ways. First, we contribute to the growing literature on the relationship between EPU and bank performance. Previous studies have documented a negative impact of EPU on bank profitability; however, these studies do not sufficiently examine the conditions under which the negative effect of EPU can be mitigated. Our study is the first one, to the best of our knowledge, to examine the role of capital adequacy (CAR) in mitigating the negative impact of EPU on bank profitability. We investigate whether CAR moderate the relationship between EPU and bank profitability, as capital adequacy is significant for banks in the wake of capital adequacy requirements under BASEL III. Second, we develop a comprehensive profitability index comprising different proxies of profitability, as this measure covers both accounting and market-based performance metrics. Third, we use a quantile regression approach to analyse the impact of EPU on bank profitability, as the quantile regression approach is robust to time-invariant, unobserved individual bank heterogeneity over time, resulting in more consistent coefficients (Chernozhukov et al., 2015; Wüthrich, 2020). Finally, the results of the study support the BASEL III regulations aimed at tightening the regulatory capital requirements as a tool to reduce the negative impact of EPU. This provides a more nuanced view of the CAR as a stabilising buffer against an expansionary or contractionary economic policy as the results demonstrate that the CAR can be not only a regulatory instrument for managing risk-taking behaviour but also protect against systemic instability or bank failures in the wake of the European prudential regulation. These findings are important for regulators who want to improve the framework for stress testing and capital requirements to increase the resilience of banking sector (Athari, 2021).

The remainder of the study continues as follows in various sections, such as Section 2, which explains the theoretical basis of the study. Section 3 deals with the review of the literature and the development of hypotheses. Section 4 presents empirical models and results, followed by a discussion in section 5 and a conclusion in section 6.

2. Theoretical Background

Banks and other financial institutions act as financial intermediaries that connect

the pool of savers with the pool of borrowers (Gorton & Winton, 2003). The interest margin mainly determines the profitability of a bank. Borrowing at low interest rates (for deposits) and lending at higher interest rates (for loans). In fact, this difference is reflected in the bank's net interest margin (Pines, 2018).

2.1 Theory of Financial Intermediation

The theory of financial intermediation addresses the existence of financial institutions which operate in the real economy by converting savings into investment and vice versa (Allen & Santomero, 1997). Financial intermediation also reduces the asymmetry of information, reduces transaction costs, and spreads the risk to depositors and borrowers (Molnár, 2018). Banks generate value through risk management and allocation of resources, which increases their profitability. Despite this, banks are making money by borrowing at low interest rates to obtain higher loan interest rates, known as interest margin (Konstantakopoulou, 2023). Similarly, the provision of financial intermediation services, such as payment processing and investment advice, also generates fees (Rampini & Viswanathan, 2018). Thus, sound financial intermediation contributes to the profits of banks by increasing lending opportunities, improving the capture of deposits and improving economic activity (Chan, 2021).

The theory of financial intermediation focuses on the role of banks as intermediaries in transferring funds from savers to borrowers, improving the allocation of resources and ultimately promoting economic stability (Grassi et al., 2022). The capital adequacy ratio (CAR) is an important regulatory tool to ensure that banks have sufficient capital to absorb losses and thus protect depositors (Ab Rahman et al., 2021). The higher CAR shows that the bank is in a good position to absorb the unforeseen risks it may face and is, therefore, better placed to withstand default (Hadjixenophontos & Christodoulou-Volos, 2018). Since a higher CAR means that a bank has more regulatory capital to cover its risk exposure, it has a direct impact on the bank's lending capacity and on the limits on the amount of leverage it is allowed to hold. Despite this, the theory of financial intermediation suggests that the CAR has a direct impact on the profitability of banks: a high CRR makes banks more resilient to financial stress, but at the same time, it reduces their profitability by reducing their lending (Adewole et al., 2019). The link between the CAR and financial intermediation is therefore crucial to balancing profitability and maintaining a stable financial system.

2.2 Bank Capital Channel Theory

In the context of economic policy uncertainty (EPU), bank capital channel theory focuses on how a bank's financing and capital structure affect its lending capabilities and risk-taking behaviour (Grosse-Rueschkamp et al., 2019). When EPU is high, banks may become more cautious, which may restrict banks' lending operations and thus reduce banks' profitability (Mohammad, 2022). However, regulatory requirements such as CAR

require banks to maintain sufficient regulatory capital to absorb unexpected losses (Schwert, 2018). Therefore, during periods of high uncertainty, banks tend to hold more capital than regulations require them to increase their resilience to economic shocks (Bordo et al., 2016). This change affects banks' profitability because, instead of lending capital, it is used to be held as a buffer to absorb possible losses (Danisman & Tarazi, 2024). While having more capital during the uncertain phases can help them mitigate risks, a higher than necessary unit of capital would necessarily bring about a lower return on equity (Si et al., 2022). Such conservativeness impacts banks' profitability, particularly when banks scale back on higher-risk and, thus, higher-yield investments (Danisman & Tarazi, 2024). As a result, the theory of the bank capital channel shows that high levels of EPU can actually disturb deposits and lending supply in general because banks have less credit to spread through the economy, and without access to funds, businesses and individuals cannot carry out their activities (Saha et al., 2024). Therefore, the bank capital channel of theory suggests that banks dynamically trade-off between risk management and profit-seeking behaviour during EPU times through the lens of their CAR strategies (Aiyar et al., 2015).

3. Literature Review and Hypotheses Development

A broader perspective has been adopted by previous studies (Alessandri & Bottero, 2020; Ashraf & Shen, 2019; Bordo et al., 2016; Chi & Li, 2017), arguing that banks usually transmit the EPU effect through their lending channels. EPU can have three significant effects on bank interest revenue; first, EPU affects the bank's client relationships because, in EPU, banks and depositors prefer to hold cash (Barrero & Bloom, 2020; Berger et al., 2020; Chi & Li, 2017). Second, EPU could influence the investment income of banks like interest on debt securities, short-term funds, and other investment securities. Due to the EPU, banks cannot hold securities owned by other banks, such as bond investments and other financial instruments. Therefore, bank revenue ultimately suffers due to banks' reluctance to invest in financial products (Gulen & Ion, 2016; Pástor & Veronesi, 2013). The last impact of EPU on banks' interest income is due to the transmission of tight monetary policy. Moreover, low and negative interest rates adversely affect the bank's profit and interest margin (Boungou & Mawusi, 2021; López-Penabad et al., 2022; Molyneux et al., 2019). Likewise, other researchers (Alessandri & Bottero, 2020; Ashraf & Shen, 2019; Bordo et al., 2016; Chi & Li, 2017) asserted that during high EPU, banks limit their credit growth and, consequently, their interest income is reduced.

3.1 EPU and Bank's Profitability

This view that EPU has a negative impact on bank profitability is supported by (Ampudia & Van den Heuvel, 2022), who conjectured that EPU negatively impacts banks' interest income. When a bank's interest revenue falls due to EPU, it ultimately affects its net interest income, and banks have fewer funds available to cover their operational expenses. A

broader perspective has been adopted by (Tran et al., 2021), exploring EPU's impact on banks' business models. Usually, banks have two types of income: interest-based and non-interest-based. Unlike earlier studies, it has been evident in this study that banks with non-interest income positively relate to EPU. In other ways, banks may adopt a revenue diversification model, switching to a non-interest income base model to avoid the EPU phase. However, the study conjectures that only small and medium-sized banks may diversify their income compared to large banks. Last, government spending-related EPU, followed by news, has the most significant impact on banks' business models. A broader perspective has been adopted by (Athari, 2021), who argues that banks' profitability is affected by different risks like domestic, political, and global risks; however, other factors like "bank-specific and industry-specific directly impact banks' profitability."

Uncertainty about macroeconomic policies, such as changes in monetary and fiscal policies, taxation and regulatory changes, can cause uncertainty about future business conditions. Firms can postpone investments during heightened EPU, resulting in output losses, reduction in employment and economic recession (Bernanke, 1983). Banks reduce credit supply in wake of heightened EPU due to reduced credit demand and delay in investment, which can negatively impact the profitability. EPU can result in negative financial shocks and an increase in non-performing loans, high interest rates and high operational costs which can result in lower profitability (Caglayan & Xu, 2019; Ozili, 2022). Thus, we hypothesize:

H_{1A} : EPU has a negative impact on bank profitability.

3.2 CAR Impact on Banks' Profitability

According to (Amadeo, 2018), the leading cause of the 2007-2008 financial crisis was the relaxing of bank lending laws, which allowed mortgage borrowers to borrow at a premium equal to or higher than the value of their homes. As a result, when house values started falling and showed no indication of rebounding again, banks hesitated to lend additional money by receiving more unpromising mortgages, resulting in a higher Libor rate and distrust. It is a weak risk management in which the role of capital adequacy cannot be ignored. CAR is considered equally important for banks and the economy, as credit growth in banks has a positive and significant impact on the capital adequacy ratio (HA, 2019).

As Dao and Nguyen (2020) state, CAR has a positive and significant impact on ROA but has a negative relationship with ROE. However, there is no association between net interest margin, capital risk, inflation rate, or bank size. In contrast, Fatima (2014) concluded that the importance of CAR for a strong and stable banking system cannot be denied. Banks with a strong CAR can absorb unexpected financial and economic shocks; thus, the cost of financing is reduced, ultimately improving the bank's profitability. Much of the available literature on capital adequacy ratio deals with the question of banks' profitability (Lotto,

2018); finding reveals “a positive relationship between CAR and banks’ operating efficiency.”; Besides, CAR also reduces the moral hazards between shareholders and loan holders. Lastly, banks develop financial stability only by adopting a sufficient CAR ratio, which leads to sound bank profitability. Similarly, (Irawati et al., 2019) conjectured that the CAR has a significant and positive impact on the financial performance of the banks; a higher CAR ratio indicates better bank financial strength in the phase of financial and economic distress.

A broader perspective was adopted by (Akinci & Olmstead-Rumsey, 2018; Allahrakha et al., 2018), who argue that CAR represents banks’ financed assets from banks’ capital. Usually, banks hold funds from other sources, such as funds from public loans and funds from government loans. In short, CAR is the core factor for banks to develop their robust revenue model and the strength to bear losses due to uncertainty. Together, these studies outline that CAR positively impacts a bank’s profitability; a higher CAR ratio leads to higher profitability (Agbeja et al., 2015a; Sitompul & Nasution, 2019b). Based on the above discussion, we propose the following hypotheses:

H_{1B} : Capital Adequacy ratio has a positive impact on bank profitability.

H_{1C} : Capital Adequacy ratio moderates the relationship between EPU and bank profitability.

4. Research Methodology

This study uses a panel quantile regression approach to evaluate the impact of EPU on banks’ profitability and the moderating role of CAR on the relationship between EPU and bank profitability. Specifically, we estimate the following equation to examine the impact of EPU on bank profitability.

$$Q_{\tau} \left(\frac{Y_{it}}{X_{it}}, \alpha_i \right) = \alpha_{\tau,i} + \beta_{\tau} EPU_{it} + \beta_{\tau} CAR_{it} + \epsilon_{it} \text{-----} (1)$$

Whereas, $Q_{\tau} \left(\frac{Y_{it}}{X_{it}}, \alpha_i \right)$ a quantile dependent variable as bank profitability; similarly, $\beta_{\tau} EPU_{it}$ Economic policy uncertainty quantile; β_{τ} ; it is the quantile coefficient; $\beta_{\tau} CAR_{it}$; it is the quantile capital adequacy ratio.

Panel quantile regression is simply an extension of classic panel data analysis, allowing relationships between different variables to be estimated along multiple partitioning points of the conditional distribution of the dependent variable. Moreover, Panel quantile regression has a significant advantage over standard panel models (fixed effect or random effect) because it can better control for endogeneity, especially when unobservable effects are stronger on some quantiles than others. Quantile panel data has a greater advantage when analysing banks with different levels of profitability by dividing it into three quantiles (higher, middle and lower). It may be evident that banks with low profitability are more affected

by EPU than banks with higher profitability. Likewise, commercial banks are less resilient during the EPU compared to other types of banks. In contrast to the assumptions about the homogeneity of responses typically used in the specification of traditional panel methods, quantile regression has the property of allowing the specification of instrumental variables at each quantile, thereby better-addressing endogeneity problems across these distributions. It allows flexibility in capturing how the independent variables affect heterogeneous parts of the outcome and may provide better information for situations where traditional approaches are deficient due to bias or inconsistency due to an endogenous effect.

4.1 Data

The sample for the study consists of banks from 12 countries in Eurozone for the period from 2010 to 2020. The sample period starts from year 2010, because in the post financial crisis period, significance of regulatory capital requirements has increased. The data for bank level variables is obtained from Bank focus database, while the data for macroeconomic variables is collected from World Bank world development indicators. EPU data is obtained from EPU database at www.policyuncertainty.com. EPU index is developed based on Baker et al. (2016) methodology. Our final sample consists of 3941 yearly observations. Table I provides the sample distribution across countries.

Table 1
Sample Countries

Sr no	Countries Name	Freq.	Per cent	Cum.
1	BELGIUM	183	4.64	4.64
2	CROATIA	65	1.65	6.29
3	DENMARK	236	5.99	12.28
4	FRANCE	957	24.28	36.56
5	GERMANY	418	10.61	47.17
6	GREECE	44	1.12	48.29
7	IRELAND	86	2.18	50.47
8	ITALY	453	11.49	61.96
9	NETHERLANDS	128	3.25	65.21
10	SPAIN	343	8.7	73.92
11	SWEDEN	166	4.21	78.13
12	UNITED KINGDOM	862	21.87	100
	Total	3941	100	

Source: Author owned Developed

Table 2 provide the sample distribution of different types of banks. The sample is dominated by commercial banks with 37% of the observations.

Table 2
Sample Banks

Sr No	Banks type	Freq.	Per cent	Cum.
1	Bank holdings and holding companies	480	12.18	12.18
2	Commercial banks	1461	37.07	49.25
3	Cooperative banks	780	19.79	69.04
4	Investment banks	295	7.49	76.53
5	Islamic banks	24	0.61	77.14
6	Private banking / Asset management companies	228	5.79	82.92
7	Real Estate and mortgage banks	346	8.78	91.7
8	Savings banks	327	8.3	100
	Total	3941	100	

Source: Author owned Developed

4.2 Measurement of Variables

The dependent variable for this study is banks' profitability measures, has been divided into two regimes as accounting measure and market measure.

Table 3
Measurement of variables

Variables	Descriptions	Measurement
Banks Profitability		
ROAE	Return on Average Equity	By dividing Net income by average shareholders' equity
OPAE	Operational Efficiency	By dividing operating by average shareholders' equity
ROAA	Return on Average Assets	By dividing Net income by average Total Assets
NIM	Net Interest Margin	Difference between interest income and interest expenses relative to the amount of interest-earning assets
INC-DIV	Income Diversification	Non-interest income / operating revenues
Cost-T-Inc-Ratio	Cost to Income Ratio	Total operating expenses by total operating income
AU_Ratio	Assets Utilization Ratio	Total Operating Income / Total assets
PE_Ratio	Price to Earnings Ratio	Market Capitalization/Profit Before Tax
EPS ratio	Earnings Per Share	Net Income After Taxes / Common Equity Shares Outstanding
P_To_B_Ratio	Price-to-book ratio	Market Capitalization/shareholders' equity
EY_Ratio	Earning Yield ratio	EPS / Share Price
PEG ratio	Price to earnings growth ratio	PE ratio / Expected EPS growth rate

Table to be continued...

P_CF_Ratio	Price to Cash Flow Ratio	Market Capitalization / Cash Flow from Operating Activities
	CAR for Banks	
CAR for Banks	“Capital Adequacy Ratio”	“Tier 1 Capital + Tier 2 Capital /Risk-weighted Assets”
	EPU measurement	
EPU	Economic Policy Uncertainty	EPU Index (Baker et al., 2016)
	Control Variables	
Bank Size	Bank Size	Natural logarithm of total assets of the bank.
CRG	Country Risk Governance	WDI_Indicators
C_GDP	Country GDP	WDI_Indicators
G_P_Savings	Gross Private Saving	WDI_Indicators
DOM_CR_%_GDP	Domestic credit provided by the financial sector (% of GDP)	WDI_Indicators

Source: Author owned Developed

Although, these measurements have been previously used in the literature (Ashraf & Shen, 2019; Chi & Li, 2017; Hamdi & Hassen, 2022; Killins et al., 2019). Besides, the capital adequacy ratio serves as a moderating variable and has been measured through “Tier 1 Capital + Tier 2 Capital /Risk-weighted Assets”. This measure has been used in previous research (Harahap, 2018; Kusumastuti & Alam, 2019; Sitompul & Nasution, 2019a). Table III provides the description and measurement of variables.

In addition, with the help of PCA, an index of a bank’s profitability is created by using the main dimensions of profitability measurement: ROAE, operating efficiency, ROAA, net interest margin, income diversification, cost-income ratio, asset utilization ratio, price-earnings ratio, EPS ratio, price-to-book ratio, earnings yield, PEG ratio and price-to-cash flow ratio. To this end, principal component analysis examines the most important factors or dimensions in a data set and involves transforming the original dimensions into a unique collection of orthogonal variables known as principal components (PCs) (Black et al., 2017;

$$\text{Individual Profitability Composite}^1 = \left(\frac{\lambda_{i,I}}{\sum_{j=1}^p \lambda_{i,I}^2} \right) (S_{i,I}) + \left(\frac{\lambda_{i,II}}{\sum_{j=1}^p \lambda_{i,II}^2} \right) (S_{i,II}) + \left(\frac{\lambda_{i,III}}{\sum_{j=1}^p \lambda_{i,III}^2} \right) (S_{i,III}) \text{-----}(2)$$

¹However, λ factor loading coefficient; j is representing total coefficient for factor j (for each banks profitability factor) by calculating the sum of the squares of the lambda coefficients for all p observable variables. The total coefficient serves as a metric to assess the overall significance of a particular factor in elucidating the variability found in the variables under consideration. Whereas Si is representing factor score of each individual bank’s profitability factor. However, factor loading score is the linear combination of observe variable x and the loading factor coefficient L: Si= LTx_i.; LT transpose value of the factor loading matrix L and Xi is representing the p x 1 vector of the observed variable for each individual bank’s profitability factor ith.

Krishnan, 2010; Taherdoost et al., 2022). To determine the bank's profitability index, we take the standardized score of each factor and multiply it by the corresponding factor loading of the factor ratios for the given profitability factor and then sum these products (Primpas et al., 2010; Vyas & Kumaranayake, 2006).

The independent variable is EPU, developed by (Baker et al., 2016). Economic policy uncertainty index (EPU) is the primary indicator of uncertainty and has been extensively used in previous literature (Al-Thaqeb & Algharabali, 2019; Altig et al., 2020; Wen et al., 2022). EPU is a comprehensive measure based on newspaper articles and the uncertainty related to government spending, inflation, interest rate and tax measures. Baker et al. (2016) use a text mining approach to measure policy uncertainty.

4.3 Moderation Model Estimation

To determine the moderating impact of CAR on the relationship between EPU and bank profitability, we estimate the following equation:

$$Q_{\tau} \left(\frac{Y_{it}}{X_{it}}, \alpha_i \right) = \alpha_{\tau,i} + \beta_{\tau} EPU_{it} + \beta_{\tau} CAR_{it} + \beta_{\tau} CAR_{it} * \beta_{\tau} EPU_{it} + \epsilon_{it} \quad \text{--- (3)}$$

Whereas, $Q_{\tau} \left(\frac{Y_{it}}{X_{it}}, \alpha_i \right)$ a quantile dependent variable as bank profitability; similarly, $\beta_{\tau} EPU_{it}$ Economic policy uncertainty quantile; β_{τ} ; it is the quantile coefficient; $\beta_{\tau} CAR_{it}$; it is the quantile capital adequacy ratio. In the last $\beta_{\tau} CAR_{it} * \beta_{\tau} EPU_{it}$ is Moderation or interaction term

5. Data Analysis

For this study, a moderated panel quantile regression analysis is run to test the hypothesis analysis empirically.

5.1 Measurement of Overall Banks Profitability Index

After the derivation of the component, the next task is to develop an index. To develop the index, the following equation will be observed and run this equation on STATA: Banks profitability factor index² = (factor explained coefficient score/Total factor coefficient score) (factor I score) + (factor explained coefficient score/Total factor coefficient score) (factor II score) + (factor explained coefficient score/Total factor coefficient score) (factor III score).

² Banks_Profitability_Index = BP1 *(1.9934/3.6644) + BP2*(1.4262/3.6644) + BP3 *(0.2448/3.6644)

Table 4
Principal Component Derivation

Principal components/correlation		Number of Obs	3,910	
		Number of comp.	3	
		Trace	11	
Rotation: orthogonal varimax	(Kaiser off)	Rho	0.7516	
Component	Variance	Difference	Proportion	Cumulative
Comp1	3.66423	0.535871	0.3331	0.3331
Comp2	3.12836	1.65383	0.2844	0.6175
Comp3	1.47453	.	0.134	0.7516

Source: Author owned Developed

In fact, a similar process is used to determine the bank's profitability index; taking the standardized score of each factor is multiplied by the corresponding factor loading of the factors ratios (ROAE, Operational efficiency, ROAA, net interest margin, income diversifications, cost to income ratio, assets utilization, price-earnings ratio, EPS ratio, price to book ratio, earning yield, PEG ratio and price to cash flow ratio) for the given profitability factor and then summed these products. Now, after running all commands in STATA, a composite index named Banks_Profitability_Index has been developed.

Table 4 represents orthogonal rotation; three components explain the variation of 75 percent. All three components have an Eigenvalue greater than one. Besides, component 1 explains the variation of 33 percent; simultaneously, component 2 is cumulative and explains the variation of 62 percent, and the last component, three, cumulatively explains 75 percent.

The Table 5 rotated components are based upon three distinguished components, and the name assigned to each component is based on individual factor load. Component-I assigns a name to a significant factor load score price to book ratio, which has assigned name market valuation, and this component explains individual variation (0.338 %). Moreover, Component-II assigned a name to the significant factor load score ROAA, which has an assigned name as operational efficiency, and this component explains individual variation (0.29 %). Similarly, Component-III assign names on significant factor load score NIM, which has an assigned name as banks Financial Management, and this component explains individual variation (0.124 %). In fact, according to Table-V rotation: orthogonal varimax (Kaiser off), the total variation explained by these three components is 75 %.

Table 5
Rotated Components

Rotated components (blanks are abs(loading)<.3)			
Variables name	Eigenvalu e	Description	
Component:1-Price to Book ratio-(0.338 %)	3.715	PE_Ratio	0.5046
"Market Valuation"		Price-to-book ratio	0.5179
		EY_Ratio	0.5045
		P_CF_Ratio	0.4664
		Factor Explained Coefficient Score	1.9934
Component:2-ROAA-(0.29 %)	3.194	ROAE	0.4445
"Operational Efficiency"		OPEA	0.4616
		ROAA	0.5201
		Factor Explained Coefficient Score	1.4262
Component:3-NIM-(0.124 %)	1.358	NIM	0.4644
"Banks Financial Management"		Cost to income Ratio	0.4527
		EPS_Ratio	-
		Factor Explained Coefficient Score	0.6723
			0.2448
Total Factors Coefficient Score			3.6644

Source: Author owned Developed

5.2 Descriptive analysis

The descriptive statistics in Table 6 (a) explain the bank's profitability, Capital Adequacy Ratio and Bank size with different types of banks.

Table 6 (a)
Descriptive Statistics Bank Types

Bank by Types	Banks Profitability Index		Capital Adequacy Ratio		Bank size	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Bank holdings and holding companies	2.45	1.08	18.98	4.63	7.20	0.87
Commercial banks	2.40	1.10	17.77	4.37	7.23	0.91
Cooperative banks	2.33	1.10	17.65	3.78	7.03	0.61
Investment banks	2.69	1.12	19.40	4.67	6.83	0.83
Islamic banks	2.06	0.64	22.25	3.42	6.00	0.18
Private banking / Asset management companies	2.33	1.11	18.21	4.53	6.57	0.59
Real Estate and mortgage banks	2.43	1.06	19.62	4.62	6.80	0.83
Savings banks	2.31	1.17	18.08	4.23	7.11	0.65

Banks' profitability for bank holding and holding companies on the mean is around 2.45 with a standard deviation of 1.08; capital adequacy ratio with mean value is 18.98 and standard deviation is 4.63, and the bank size on the mean is 7.20 with a standard deviation of 0.87. Similarly, for commercial banks, the Bank's profitability on the mean is around 2.40 with a standard deviation of 1.10; the capital adequacy ratio with a mean value of 17.77 and a standard deviation is 4.37, and the bank size on the mean is 7.23 with a standard deviation 0.91. Likewise, the profitability for cooperative banks on the mean is around 2.33 with a standard deviation of 1.08; the capital adequacy ratio has a mean value of 17.65 and a standard deviation of 3.78 and the bank size on the mean is 7.03, with a standard deviation 0.61. Additionally, the profitability for Investment banks on the mean is around 2.69, with a standard deviation of 1.12; the capital adequacy ratio has a mean value of 19.40, a standard deviation of 4.67; and the bank size on the mean is 6.83, with a standard deviation 0.83. Furthermore, the profitability for Islamic banks on the mean is around 2.06 with a standard deviation of 0.64; the capital adequacy ratio with a mean value is 22.25, and a standard deviation is 3.42, and the bank size on the mean is 6.00 with a standard deviation of 0.18. Moreover, the Bank profitability for Private banking / Asset management companies on the mean is around 2.33 with a standard deviation of 1.11; the capital adequacy ratio with mean value is 18.21 and standard deviation is 4.53, and the bank size on the mean is 6.57 with standard deviation 0.59. Besides this, the Bank's profitability for Real Estate and mortgage banks on the mean is around 2.43 with a standard deviation of 1.06; the capital adequacy ratio with mean value is 19.62 and standard deviation is 4.62, and the bank size on the mean is 6.80 with standard deviation 0.83. Lastly, Banks' profitability for saving banks on the mean is around 2.31 with a standard deviation of 1.17; the capital adequacy ratio has a mean value of 18.08 and a standard deviation of 4.23, and the bank size on the mean is 7.11 with a standard deviation 0.65.

Table 6(b)

Descriptive Statistics Countries wise

Countries	EPU OVERALL		Country Risk Governance		Country GDP		Gross Private Savings		Domestic Credit as % to GDP	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
BELGIUM	202.525	125.464	1.219	0.103	11.628	0.165	1.391	0.009	11.707	0.026
CROATIA	147.528	98.356	0.326	0.050	12.407	0.140	1.321	0.071	11.550	0.000
DENMARK	136.144	78.725	1.658	0.060	12.430	0.027	1.446	0.023	11.550	0.000
FRANCE	182.436	84.930	0.962	0.148	12.341	0.259	1.347	0.017	12.429	0.027
GERMANY	242.110	90.494	1.425	0.047	12.185	0.241	1.445	0.016	12.530	0.004
GREECE	180.009	106.445	0.249	0.061	12.448	0.024	1.108	0.054	11.572	0.148
IRELAND	239.051	125.187	1.401	0.054	12.453	0.021	1.366	0.113	11.559	0.018
ITALY	231.794	118.822	0.423	0.069	12.369	0.222	1.290	0.032	12.305	0.045
NETHERLANDS	140.529	69.537	1.625	0.038	11.992	0.398	1.435	0.022	11.933	0.043
SPAIN	208.600	113.483	0.711	0.103	12.096	0.405	1.324	0.034	12.123	0.027
SWEDEN	216.011	131.727	1.672	0.052	12.096	0.337	1.448	0.014	11.736	0.039
UNITED KINGDOM	183.458	106.236	1.252	0.115	12.191	0.325	1.130	0.036	12.449	0.033

Table 6(b) provides descriptive statistics for variables country wise for EPU overall, country risk governance, country GDP, gross private savings and domestic credit as % to GDP. The results of Belgium show the mean EPU overall is 202.525 with a standard deviation of 125.464; the country's risk governance is 1.219 with a standard deviation of 0.103; the country's GDP on the mean of 11.628 and a standard deviation of 0.165; Gross private savings on mean 1.391 and Standard deviation 0.009; Domestic Credit as % to GDP on the mean is 11.707 with standard deviation 0.026. Similarly, the results of CROATIA show the mean EPU overall is 147.528 with a standard deviation of 98.356; country risk governance a mean of 0.326 with a standard deviation of 0.050; country GDP on mean 12.407 and standard deviation 0.140; Gross private savings on mean 1.321 and Standard deviation 0.071; Domestic Credit as % to GDP on mean is 11.550 with standard deviation 0.000. Moreover, the results of DENMARK show the mean EPU overall is 136.144 with a standard deviation of 78.725; country risk governance a mean of 1.658 with a standard deviation of 0.060; country GDP a mean of 12.430 and standard deviation of 0.027; Gross private savings on mean 1.446 and Standard deviation 0.023; Domestic Credit as % to GDP on the mean is 11.550 with standard deviation 0.000. Furthermore, the results of FRANCE show the mean EPU overall is 182.436 with a standard deviation of 84.930; country risk governance a mean of 0.962 with a standard deviation of 0.148; country GDP a mean of 12.341 and standard deviation of 0.259; Gross private savings on mean 1.347 and Standard deviation 0.017; Domestic Credit as % to GDP on the mean is 12.429 with standard deviation 0.027. Additionally, the results of GERMANY show the mean EPU overall is 242.110 with a standard deviation of 90.494; the country risk governance a mean of 1.425 with a standard deviation of 0.047; the country's GDP has a mean of 12.185 and a standard deviation of 0.241; Gross private savings on mean 1.445 and Standard deviation 0.016; Domestic Credit as % to GDP on the mean is 12.530 with standard deviation 0.004. Besides this, the results of GREECE show the mean EPU overall is 180.009 with a standard deviation of 106.445; country risk governance on mean; 0.249 with a standard deviation of 0.061; country GDP on mean 12.448 and standard deviation 0.024; Gross private savings on mean 1.108 and Standard deviation 0.054; Domestic Credit as % to GDP on mean is 11.572 with standard deviation 0.148.

However, the results of Ireland show the mean EPU overall is 239.051 with a standard deviation of 125.187; the country risk governance a mean of 1.401 with a standard deviation of 0.054; the country's GDP has a mean of 12.453 and a standard deviation of 0.021; Gross private savings on mean 1.366 and Standard deviation 0.113; Domestic Credit as % to GDP on mean is 11.559 with standard deviation 0.018. Furthermore, the results of ITALY show the mean EPU overall is 231.794 with a standard deviation of 118.822; country risk governance on mean; 0.423 with a standard deviation of 0.069; country GDP on mean 12.369 and standard deviation 0.222; Gross private savings on mean 1.290 and Standard deviation 0.032; Domestic Credit as % to GDP on mean is 12.305 with standard deviation 0.045. Moreover, the results of NETHERLANDS show the mean EPU overall

is 140.529 with a standard deviation of 69.537; country risk governance on mean; 1.625 with a standard deviation of 0.038; country GDP on mean 11.992 and standard deviation 0.398; Gross private savings on mean 1.435 and Standard deviation 0.022; Domestic Credit as % to GDP on mean is 11.933 with standard deviation 0.043. Additionally, the results of SPAIN show the mean EPU overall is 208.600 with a standard deviation of 113.483; country risk governance a mean of 0.711 with a standard deviation of 0.103; country GDP on mean 12.096 and standard deviation 0.405; Gross private savings on mean 1.324 and Standard deviation 0.034; Domestic Credit as % to GDP on mean is 12.123 with standard deviation 0.027. Besides this, the results of SWEDEN show the mean EPU overall is 216.011 with a standard deviation of 131.727; country risk governance a mean of 1.672 with a standard deviation of 0.052; country GDP of a mean of 12.096 and standard deviation of 0.337; Gross private savings on mean 1.448 and Standard deviation 0.014; Domestic Credit as % to GDP on the mean is 11.736 with standard deviation 0.039. Besides this, the results of the UNITED KINGDOM show the mean EPU overall is 183.458 with a standard deviation of 106.236; the country risk governance a mean of 1.252 with a standard deviation of 0.115; the country's GDP a mean of 12.191 and standard deviation 0.325; Gross private savings on mean 1.130 and Standard deviation 0.036; Domestic Credit as % to GDP on the mean is 12.449 with standard deviation 0.033.

Table 6 (c)
Descriptive Statistics Variable wise

Variables	Obs	Mean	Std. Dev.	Min	Max
EPU OVERALL	3942	195.845	106.353	62.817	497.538
Banks Profitability Index	3389	2.401	1.103	1.000	6.000
Banks Enterprise Risk Management	3906	3.722	1.145	1.000	7.000
Capital Adequacy Ratio	3941	18.254	4.396	12.780	27.130
Banks Risk Governance Index	3942	19.366	11.935	-20.000	50.000
Banks size	3941	7.061	0.825	5.840	8.450
Country Risk Governance	3941	1.087	0.399	0.160	1.780
Country GDP	3941	12.229	0.329	11.550	12.530
Gross Private Savings	3941	1.314	0.117	1.100	1.460
Domestic Credit as % to GDP	3941	12.229	0.329	11.550	12.530

The results of descriptive statistics variable-wise show a different story; EPU overall in the sample on the mean is 195.845 with a standard deviation of 106.353; the minimum value is 62.817, and the maximum value is 497.538. Moreover, the results of descriptive statistics variables show that the Banks Profitability Index in the sample on a mean is 2.401 with a standard deviation of 1.103; the minimum value is 1.000, and the maximum value is 6.000. Furthermore, the results of descriptive statistics variables show that Banks Enterprise Risk Management on the mean is 3.722 with a standard deviation of 1.145; the minimum value is 1.000, and the maximum value is 7.000. Furthermore, the results of descriptive

statistics show that the Capital Adequacy Ratio on a mean is 18.254 with a standard deviation of 4.396; the minimum value is 12.780, and the maximum value is 27.130. Additionally, the results of descriptive statistics show that the Banks Risk Governance Index on the mean is 19.366 with a standard deviation of 11.935; the minimum value is 20.000, and the maximum value is 50.000. Besides this, the results of descriptive statistics show that the Bank's size on the mean is 7.061 with a standard deviation of 0.825; the minimum value is 5.840, and the maximum value is 8.450.

Additionally, Country Risk Governance on the mean is 1.087 with a standard deviation of 0.399, a minimum value of 0.160, and a maximum value of 1.780. However, Country Risk Governance on the mean is 1.087 with a minimum value of 0.160 and a maximum value of 1.780. Apart from that, the Country's GDP on the mean is 12.229, with a minimum value of 11.550 and a maximum value of 12.530. Besides, Gross Private Savings on the mean is 1.314 with a standard deviation of 0.117; the minimum value is 1.100, and the maximum value is 1.460. Lastly, Domestic Credit as % to GDP on the mean is 12.229 with a standard deviation of 0.329; the minimum value is 11.550, and the maximum value is 12.530.

5.3 Correlation analysis

The results of correlation analysis depict the relationship between variables and explain the strength and direction of the relationship.

Table 7
Pairwise Correlation Analysis

Variables	Banks Profitability	EPU	CAR	Bank Size	CRG	C_G DP	G_P_Savings	DOM_CR-Percentage to GDP
Banks Profitability	1							
EPU	-0.26*	1						
CAR	-0.27*	0.30*	1					
Bank Size	-0.154*	-0.105*	-0.58*	1				
CRG	0.133*	0.570*	0.186*	-0.023	1			
C_GDP	-0.047*	-0.140*	0.009	-0.033*	-	1		
G_P_Savings	0.110*	0.063*	-0.029	-0.005	0.153*	0.227*	1	
DOM_CR-Percentage to GDP	-0.361*	-0.153*	-0.046*	-0.019	-	0.086	-0.363*	1
					0.173*	*		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The results are expounding; bank profitability and EPU have a negative relationship, which means that as EPU increases, the bank's profitability will also decrease. The relationship between variables is significant, up by -0.26 units. Similarly, the relationship between the Capital Adequacy Ratio (CAR) and bank profitability is negative, indicating that an increase in CAR tends to reduce a bank's profitability. The relationship between variables is significant, up by -0.27 units. Besides, bank size and bank profitability also have a negative relationship; as bank size increases, the bank's profitability significantly decreases up to -0.154. Moreover, country risk governance (CRG) and banks' profitability have a positive relationship, which means CRG will increase the bank's profitability by significantly increasing it to 0.133 units. However, a country's GDP and bank profitability have a negative relationship, which means that as a country's GDP increases, the bank's profitability significantly decreases up to -0.0047 units. Alternatively, gross private savings have a positive and significant relationship with banks' profitability, which means that as gross private savings increase, the bank's profitability also significantly increases to 0.110 units. Conversely, domestic credit as a percentage of GDP has a negative and significant relationship with banks' profitability. As the domestic credit percentage to GDP increases, the bank's profitability will be reduced to -0.361 units.

Furthermore, the correlation coefficients between EPU and CAR have a positive and significant relationship up to 0.30 units. It means that as EPU units increase, the CAR units also need to increase. However, EPU and bank size have a significant negative relationship of -0.105 units. Similarly, country risk governance and EPU have a significant and positive relationship up to 0.570 units. Unlike this, the country's GDP and EPU have a significant and negative relationship of up to -0.140 units. However, gross private savings and EPU have a positive and significant relationship of up to 0.063 units. Lastly, domestic credit as a percentage of GDP has a negative but significant relationship with EPU -0.153 units.

Besides, CAR and bank size have a significant and negative relationship, which means that CAR will reduce to -0.58 units as bank size increases. Likewise, CAR and country risk governance have a significant and positive relationship of up to 0.86 units. It means that as the country's risk governance increases, so does the CAR. Furthermore, the country's GDP and CAR have a positive relationship up to 0.009 units. However, gross private savings and CAR have a significant and negative relationship, which means that as gross private savings increase, the level of CAR decreases to -0.029 units. Lastly, domestic credit as a percentage of GDP and CAR have a significant and negative relationship; in other words, credit as a percentage of GDP increases, it reduces the CAR level to -0.046 units.

Additionally, bank size and country risk governance have a negative relationship of up -0.023 units, with country GDP and bank size having a negative relationship of -0.033 units. Likewise, bank size has a negative relationship with gross private savings up to -0.005 units and domestic credit as a percentage of GDP -0.019 units. Similarly, country

risk governance has a negative relationship with country GDP up to -0.153 units, Gross private savings has a negative relationship with CRG up to 0.227, and domestic credit as a percentage of GDP has a negative relationship up to -0.173 units. Alternatively, the country's GDP has a negative relationship with gross private savings up to -0.028 units, but domestic credit as a percentage of GDP has a positive relationship with up to 0.086 units. Lastly, gross private savings negatively correlate with domestic credit as a percentage of GDP up to -0.363 units.

5.4 Regression analysis

Table 8 presents the results of the quantile regression for the impact of EPU on bank profitability and the moderating impact of CAR on the relationship between EPU and bank profitability.

Table 8

Regression results for the impact of EPU on bank profitability for bank holding companies and commercial banks

Bank holdings & Holding companies				Commercial Banks			
VARIABLES	25th Percentile	50th Percentile	75th Percentile	VARIABLES	25th Percentile	50th Percentile	75th Percentile
EPU	-0.168** (-2.130)	0.201*** (-2.697)	-0.255** (-2.213)	EPU	-0.101** (-2.073)	-0.109** (-2.387)	-0.113** (-2.411)
CAR	-0.0164* (-1.708)	0.0210** (-2.299)	0.0282** (-2.005)	CAR	0.0428* -1.648	0.0529** -2.167	0.0577** -2.306
Moderation (EPU X CAR)	-0.0504 (-0.0881)	0.285 -0.524	0.819 -0.979	Moderation (EPU X CAR)	0.00475* -2.08	0.00429* -2.005	0.00407* -1.856
Bank_SZ	-0.269 (-1.631)	-0.389** (-2.482)	-0.581** (-2.414)	Bank_SZ	1.184*** (-6.650)	1.222*** (-7.319)	1.241*** (-7.247)
CRG	0.905* -1.922	1.161*** -2.598	1.571** -2.282	CRG	0.0967 -0.593	0.0823 -0.538	0.0753 -0.481
C_GDP	0.103 -0.676	0.0784 -0.542	0.0387 -0.173	C_GDP	-0.134 (-1.291)	-0.157 (-1.617)	-0.168* (-1.690)
G_P_Savings	-1.706* (-1.733)	-1.467 (-1.575)	-1.086 (-0.753)	G_P_Savings	0.179 -0.346	0.185 -0.380	0.188 -0.376
DOM_CR_Perc tge_GDP	-0.81 (-0.670)	-1.14 (-0.995)	-1.666 (-0.941)	DOM_CR_Perc tge_GDP	0.778 -1.327	0.948* -1.723	1.030* -1.825
Observations	475	475	475	Observations	1,452	1,452	1,452
	Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Table 8 presents result from quantile regression for banks holding companies and commercial banks at the 25th, 50th, and 75th percentiles. The effect of Economic Policy Uncertainty (EPU) is negative and statistically significant for all three quantiles, with coefficients of -0.168 ($p < 0.05$; $t = -2.13$) at the 25th percentile, -0.201 ($p < 0.01$; $t = -2.70$) at the median and -0.255 ($p < 0.05$; $t = -2.21$) at the 75th percentile. The Capital Adequacy Ratio (CAR) reflects a negative influence as well: -0.0164 ($p < 0.10$; $t = -1.71$), -0.0210 ($p < 0.05$; $t = -2.30$), and -0.0282 ($p < 0.05$; $t = -2.01$) for the three quantiles. The interaction term between EPU and CAR is not significant at any quantile (-0.0504 , 0.285 , and 0.819 , respectively), suggesting CAR does not moderate the impact of policy uncertainty. Bank size is non-significant at the 25th percentile (-0.269 ; $t = -1.63$) but becomes significantly negative at the 50th (-0.389 ; $p < 0.05$; $t = -2.48$) and 75th (-0.581 ; $p < 0.05$; $t = -2.41$) percentiles. CRG has a positive and significant impact on profitability with the coefficients 0.905 ($p < 0.10$; $t = 1.92$), 1.161 ($p < 0.01$; $t = 2.60$) and 1.571 ($p < 0.05$; $t = 2.28$). In contrast, country GDP growth (C_GDP) and domestic credit as the percentage of GDP (DOM_CR_Perctge_GDP) do not reach significance at any quantile (coefficients between 0.0387 to 0.103 , and -0.81 to -1.666 , respectively). Gross private savings (G_P_Savings) shows a weak negative association at the 25th percentile (-1.706 ; $p < 0.10$; $t = -1.73$) and is non-significant at the median and upper quantiles.

For commercial banks, the quantile regression shows a consistently negative and statistically significant impact of Economic Policy Uncertainty (EPU) on bank performance, being -0.101 ($t = -2.07$, $p < 0.05$) at the 25th percentile, -0.109 ($t = -2.39$, $p < 0.05$) at the median, and -0.113 ($t = -2.41$, $p < 0.05$) at the 75th percentile. In contrast, Capital Adequacy Ratio (CAR) is positively related to bank performance— 0.0428 ($t = 1.65$, $p < 0.10$), 0.0529 ($t = 2.17$, $p < 0.05$) and 0.0577 ($t = 2.31$, $p < 0.05$) at the 25th, 50th and 75th percentiles respectively—hinting better-capitalized banks achieve higher returns. The EPU-CAR interaction is also positive and significant (0.00475 , $t = 2.08$, $p < 0.05$; 0.00429 , $t = 2.01$, $p < 0.05$; 0.00407 , $t = 1.86$, $p < 0.10$), suggesting that larger capital buffers attenuate the adverse effects of EPU on bank profitability. Bank size has a large and very significant negative impact in every quantile (-1.184 , $t = -6.65$, $p < 0.01$; -1.222 , $t = -7.32$, $p < 0.01$; -1.241 , $t = -7.25$, $p < 0.01$), implying that bigger commercial banks perform worse than their smaller counterparts. Country risk governance (CRG) is not significant in any quantile. Gross private savings (G_P_Savings) remain non-significant throughout, while country GDP growth (C_GDP) is marginally negative at the 75th percentile (-0.168 ; $t = -1.69$, $p < 0.10$). In addition, domestic credit over GDP (DOM_CR_Perctge_GDP) has a positive significant impact on banks' performance at the 50th (0.948 , $t = 1.72$, $p < 0.05$) and 75th (1.030 , $t = 1.83$, $p < 0.05$) percentiles, indicating that a deeper credit market favors better performance among high-performance banks.

Similarly, Table 9 presents quantile regression results for cooperative banks, showing that Economic Policy Uncertainty (EPU) and other financial indicators have nuanced effects

at the 25th, 50th, and 75th percentiles. The relationship between EPU and bank performance is negative, although only statistically significant at higher quantiles: -0.0111 ($t = -1.679$, $p < 0.10$) at the median and -0.00929 ($t = -1.658$, $p < 0.10$) at the 75th percentile, it suggests that the impact of uncertainty is more apparent when we look at the cooperative banks that perform the best. For the Capital Adequacy Ratio (CAR), positive and significant effects were consistently observed with 0.00148 ($t = 1.682$, $p < 0.10$), 0.00159 ($t = 2.605$, $p < 0.01$), and 0.00166 ($t = 3.262$, $p < 0.01$), indicating that cooperative banks with sound financial standing kept their liquidity levels lower across all quantiles.

Table 9

Regression results for the impact of EPU on bank profitability for cooperative and investment banks

Cooperative Banks				Investment Banks			
VARIABLES	25th Percentile	50th Percentile	75th Percentile	VARIABLES	25th Percentile	50th Percentile	75th Percentile
EPU	-0.0141	-0.0111*	-	EPU	0.659*	0.605*	0.573*
	(-1.504)	(-1.679)	0.00929*		-1.72	-1.852	-1.665
CAR	0.00148*	0.00159*	0.00166*	CAR	-	-	-
		**	**		0.159***	0.143***	0.134***
	-1.682	-2.605	-3.262		(-3.358)	(-3.539)	(-3.137)
Moderation (EPU X CAR)	1.000***	1.000***	1.000***	Moderation (EPU X CAR)	-0.0127*	-	-0.0107*
						0.0114**	
Bank_SZ	-1,821	-2,622	-3,150	Bank_SZ	(-1.905)	(-2.007)	(-1.778)
	0.0111	0.00785	0.00586		0.645*	0.733**	0.782**
	-1.215	-1.219	-1.074		-1.71	-2.278	-2.306
CRG	0.0110*	0.00927*	0.00817*	CRG	-0.559	-0.385	-0.286
		*	*				
	-1.898	-2.254	-2.35		(-1.096)	(-0.886)	(-0.623)
C_GDP	0.00435	0.00404	0.00385*	C_GDP	0.0257	0.123	0.179
	-1.083	-1.448	-1.656		-0.0925	-0.52	-0.716
G_P_Savings	-0.0720*	-	-	G_P_Savings	2.676	2.448	2.317
		0.0675**	0.0647**				
		*	*				
	(-1.918)	(-2.585)	(-2.972)		-1.474	-1.582	-1.419
DOM_CR_Perc tge_GDP	0.0155	0.0184	0.0203	DOM_CR_Perc tge_GDP	-0.494	-0.573	-0.619
	-0.649	-1.112	-1.467		(-0.582)	(-0.793)	(-0.811)
Observations	105	105	105	Observations	256	256	256
	Standard errors in parentheses				Standard errors in parentheses		
	*** p<0.01, ** p<0.05, * p<0.1				*** p<0.01, ** p<0.05, * p<0.1		

Source: Author owned Developed through analysis process in STATA

Specifically, the results show CAR to have a significant and robust moderation effect on the EPU relationship across all quantiles (1.000, t-values: 1.821 ($p < 0.01$), 2.622

($p < 0.01$), and 3.150 ($p < 0.01$)), indicating that capital buffers act as a strong mitigating factor against the impact of policy uncertainty. Since the presence of bank size is statistically insignificant across the distribution, bank size has little bearing on cooperative banks' performance. CRG is positively associated with performance, with coefficients of 0.0110 ($t = 1.898$, $p < 0.10$), 0.00927 ($t = 2.254$, $p < 0.05$), and 0.00817 ($t = 2.350$, $p < 0.05$), respectively. Country GDP growth (C_GDP) is only marginally significant at the 75th percentile (0.00385, $t = 1.656$, $p < 0.10$). Gross private savings (G_P_Savings), on the other hand, consistently has a negative and significant relationship, -0.0720 ($t = -1.918$, $p < 0.10$), -0.0675 ($t = -2.585$, $p < 0.01$), -0.0647 ($t = -2.972$, $p < 0.01$)—, suggesting greater private savings reduces cooperative bank profitability. Finally, domestic credit over GDP (DOM_CR_Perctge_GDP) is positive but statistically insignificant across the entire distribution.

Quantile regression analysis shows that the effects of the EPU, capital adequacy, and other control variables on the performance of investment banks vary across different parts of the performance distribution, as shown in Table VIII-(b). EPU has a positive and statistically significant impact on investment bank performance at the 0.25 quantile by 0.659 ($t = 1.720$, $p < 0.10$), at the median by 0.605 ($t = 1.852$, $p < 0.10$), and at the 0.75 quantile by 0.573 ($t = 1.665$, $p < 0.10$). These findings imply that investment banks might profit from greater policy uncertainty, perhaps because volatility tends to increase demand for advisory and hedging services. However, we observe a strong and highly significant adverse effect on the Capital Adequacy Ratio (CAR) across all quantiles: -0.139 ($t = -3.358$, $p < 0.01$), -0.143 ($t = -3.539$, $p < 0.01$), and -0.134 ($t = -3.137$, $p < 0.01$); it appears that investment bank profitability is constrained by higher regulatory capital. EPU \times CAR is concerned with the interaction term between EPU and CAR, which is negative and significant over the conditional distribution—0.0127 ($t = -1.905$, $p < 0.10$), -0.0114 ($t = -2.007$, $p < 0.05$), and -0.0107 ($t = -1.778$, $p < 0.10$). It suggests that larger capital buffers moderate the positive effects of EPU. Bank size (Bank_SZ) relates positively to performance and is significant at the 25th (0.645, $t = 1.710$, $p < 0.10$), 50th (0.733, $t = 2.278$, $p < 0.05$), and 75th percentiles (0.782, $t = 2.306$, $p < 0.05$), suggesting larger investment banks experience economies of scale. Credit as a percentage of GDP was statistically insignificant across all quantiles. GDP growth, gross private savings, and domestic credit as a percentage of GDP were relatively insignificant across all quantiles; therefore, these parameters appear to have minimal explanatory power in determining investment bank performance.

Table 10 presents the results of Islamic banks, which indicate that EPU affects banks profitability adversely, and this effect remains significant across the whole conditional distribution as its coefficients equal to -2.470 ($t = -2.737$, $p < 0.01$) at the 25th, -2.624 ($t = -3.007$, $p < 0.01$) at the median and -3.132 ($t = -2.716$, $p < 0.01$) at the 75th percentile. In contrast, a higher capital adequacy ratio (CAR) is positively associated with banks' profitability at 0.651 ($t = 1.838$, $p < 0.10$), 0.712 ($t = 2.069$, $p < 0.05$), and 0.912 ($t = 2.008$, $p < 0.05$) at the 25th, 50th, and 75th percentiles, respectively, that better CAR ratio increases the bank's profitability.

Table 10

Regression results for the impact of EPU on bank profitability for Islamic banks and Private Banking/Asset Management Companies

Islamic Banks				Private Banking/ Asset Management Companies			
Variables	25th Percentile	50th Percentile	75th Percentile	Variables	25th Percentile	50th Percentile	75th Percentile
EPU	2.470*** (-2.737)	2.624*** (-3.007)	3.132*** (-2.716)	EPU	0.965 -0.0548	1.581 -0.138	2.466 -0.779
CAR	0.651* -1.838	0.712** -2.069	0.912** -2.008	CAR	-0.100 (-0.0502)	-0.19 (-0.146)	-0.319 (-0.886)
Moderation (EPU X CAR)	0.0694** *	0.0699** *	0.0714** *	Moderation (EPU X CAR)	0.0114 -0.0295	0.0203 -0.081	0.0332 -0.48
Bank_SZ	-3.976 -6.097* (-1.862)	-4.246 -6.488** (-2.072)	-3.396 -7.774* (-1.912)	Bank_SZ	0.504 -0.0386 (-0.0157)	0.144 -0.0169 -0.0432	-0.373 (-0.159)
CRG	2.679 -1.103	2.854 -1.241	3.433 -1.162	CRG	-0.327 (-0.0157)	0.586 -0.0432	1.898 -0.508
C_GDP	0.00616 -0.00942	0.146 -0.227	0.609 -0.703	C_GDP	-0.678 (-0.0541)	-0.555 (-0.0679)	-0.377 (-0.167)
G_P_Savings	20.1 -1.429	22.59* -1.647	30.80* -1.697	G_P_Savings	-2.499 (-0.0231)	1.912 -0.0271	8.253 -0.424
DOM_CR_Perctge_GDP	- 30.13*** (-4.192)	- 31.38*** (-4.512)	- 35.50*** (-3.857)	DOM_CR_Perctge_GDP	-2.51 (-0.0295)	-0.666 (-0.0120)	1.984 -0.130
Observations	23	23	23	Observations	203	203	203
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Source: Author owned Developed through analysis process in STATA

Notably, the moderating role of CAR on the relationship between EPU and uncertainty achieves significant positive coefficients of 0.0694 ($t = -3.976$, $p < 0.01$), 0.0699 ($t = -4.246$, $p < 0.01$), and 0.0714 ($t = -3.396$, $p < 0.01$) through the three quantiles. The adverse bank size effect is -6.097 ($t = -1.862$, $p < 0.10$), -6.488 ($t = -2.072$, $p < 0.05$), and -7.774 ($t = -1.912$, $p < 0.10$), which implies that the larger an Islamic bank, the less profitable it is, probably because of complexity or regulatory burdens. CRG and C_GDP are statistically insignificant at all times. Gross private savings are positively correlated at the median (22.59, $t = -1.647$, $p < 0.10$) and upper quantile (30.80, $t = -1.697$, $p < 0.10$) but not at the lower tail. The last variable that consistently and significantly decreases profitability is the domestic credit-to-GDP ratio (DOM_CR_Perctge_GDP) (in the previous three specifications with coefficients of -30.13 ($t = -4.192$, $p < 0.01$), -31.38 ($t = -4.512$, $p < 0.01$), and -35.50 ($t = -3.857$, $p < 0.01$) suggesting that the deepening of credit market can induce competition leading to increasing squeeze in the margin structure of Islamic banking sector.

However, table 10 representing the quantile regression coefficients in private banking and asset management companies confirms that none of the investigated variables significantly affect the profitability represented at the 25th, 50th, and 75th percentiles. More specifically, Economic Policy Uncertainty gives coefficients of 0.965 ($t = -0.055$), 1.581 ($t = -0.138$), and 2.466 ($t = -0.779$), all $p > 0.10$. The Capital Adequacy Ratio is also not statistically significant, with point coefficients of -0.100 ($t = -0.050$), -0.190 ($t = -0.146$), and -0.319 ($t = -0.886$). Its interaction with EPU gives small coefficients of 0.0114 ($t = -0.030$), 0.0203 ($t = -0.081$), and 0.0332 ($t = -0.480$), again $p > 0.10$. Coefficients for the size of the bank (on the bank level) of 0.504 ($t = -0.039$), 0.144 ($t = -0.017$), and -0.373 ($t = -0.159$), as well as for credit growth (-0.327 to 1.898, $t = -0.016$ to -0.508), country GDP growth (-0.678 to -0.377 , $t = -0.054$ to -0.167), gross private savings (-2.499 to 8.253, $t = -0.023$ to -0.424), and domestic credit/GDP (-2.510 to 1.984, $t = -0.030$ to -0.130) never reach the levels of conventional significance. These results imply that, in this segment, profit dispersion is not driven by systematic differences in policy uncertainty, capital buffers, scale, credit dynamics or macroeconomic aggregates—which instead point to the likely relevance of unobserved factors, including fee structures, asset-management strategies or regulatory particulars.

The results of the quantile regression for performance of the real estate and mortgage banks group Table 11 confirms that economic policy uncertainty (EPU) decreases performance at all quantiles of profitability (EPU coefficients are -0.192 ($t = -2.413$, $p < 0.05$) at the 25th percentile, -0.186 ($t = -2.895$, $p < 0.01$) at the median, and -0.177 ($t = -1.829$, $p < 0.10$) at the 75th percentile). Moreover, the coefficient for the Capital Adequacy Ratio (CAR) and its interaction with EPU are insignificant across all quantiles (e.g., CAR: 0.0326, $t = -1.027$; interaction: -0.0131 , $t = -0.975$ at the 25th percentile), indicating that; adequate level of CAR does not moderate the effect of EPU on banks profitability. However, the size of banks has a substantial adverse effect on profitability conditioning through its distribution with coefficients of -1.476 ($t = -4.035$, $p < 0.01$), -1.418 ($t = -4.792$, $p < 0.01$), and -1.327 ($t = -2.978$, $p < 0.01$) at the 25th, 50th and 75th percentiles. Unlike the above, country risk governance (CRG) has an insignificant impact on banks' profitability (CRG = 0; e.g., 0.0824, $t = -0.181$ at the 25th percentile), and median quantile (-0.407 , $t = -1.807$, $p < 0.10$; -0.371 , $t = -2.036$, $p < 0.05$), but not in the upper tail (-0.314 , $t = -1.146$). GDP growth displays a significant negative association. Gross private savings is positively and marginally significant at the median (2.154, $t = -1.854$, $p < 0.10$) and upper quantiles (3.134, $t = -1.796$, $p < 0.10$) but non-significant at the 25th percentile (1.533, $t = -1.072$). Lastly, domestic credit to the private sector (% of GDP) proves insignificant in each quantile, reinforcing this insight that policy uncertainty, capital adequacy, and the size of the bank are of utmost importance in effectively influencing the performance of both real estate and mortgage banks.

Table 11

Regression results for the impact of EPU on bank profitability for Real Estate and Mortgage banks and Saving banks

Real Estate and Mortgage Banks				Saving Banks			
Variables	25th Percentil e	50th Percentil e	75th Percentil e	Variables	25th Percentil e	50th Percentil e	75th Percentil e
EPU	-0.192** (-2.413)	0.186*** (-2.895)	-0.177* (-1.829)	EPU	0.00528* -1.737	0.00549* ** -2.668	0.00574* * -2.154
CAR	0.0326 -1.027	0.0163 -0.633	-0.00939 (-0.242)	CAR	0.00214* * -2.346	0.00207* ** -3.341	0.00198* * -2.473
Moderation (EPU X CAR)	-0.0131 (-0.975)	-0.00678 (-0.620)	0.00327 -0.199	Moderation (EPU X CAR)	1.000*** -1,740	1.000*** -2,569	1.001*** -1,983
Bank_SZ	1.476*** (-4.035)	1.418*** (-4.792)	1.327*** (-2.978)	Bank_SZ	0.0159** * (-3.666)	0.0167** * (-5.653)	0.0176** * (-4.618)
CRG	0.0824 -0.181	0.217 -0.59	0.429 -0.776	CRG	5.15E-05 -0.00739	0.000968 -0.204	0.00204 -0.333
C_GDP	-0.407* (-1.807)	-0.371** (-2.036)	-0.314 (-1.146)	C_GDP	0.00441* * -2.051	0.00436* ** -2.992	0.00430* * -2.277
G_P_Savings	1.533 -1.072	2.154* -1.854	3.134* -1.796	G_P_Savings	0.0489 -1.521	0.0675** * -2.975	0.0891** * -3.153
DOM_CR_Perct ge_GDP	-0.16 (-0.0860)	0.587 -0.388	1.766 -0.778	DOM_CR_Perct ge_GDP	0.0134 -0.426	0.0123 -0.573	0.0109 -0.392
Observations	341	341	341	Observations	84	84	84
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Source: Author owned Developed through analysis process in STATA

The Economic Policy Uncertainty has a positive effect that increases with the profitability of saving banks— $\beta = 0.00528^*$ at the 25th, 0.00549^* at the 50th, and 0.00574 at the 75th percentiles—and similarly for the Capital Adequacy Ratio with $\beta = 0.00214^*$ (25th), 0.00207^* (50th), and 0.00198^* (75th). As is apparent, their interaction (EPU \times CAR) is highly statistically significant ($p < 0.01$) across all quantiles (coefficients ≈ 1.000 – 1.001), implying that stronger CAR provides a cushion against EPU. In contrast, a larger bank size has consistently and statistically significant negative impact on profitability ($\beta = -0.0159$, -0.0167 and -0.0176), which indicates diminishing returns to scale. – credit growth and domestic credit-to-GDP share; both exhibit no significant effects at any quantile, whereas

consumption-to-GDP positively influences performance at all levels ($\beta = 0.00441^{**}$ at 25th, 0.00436 at 50th, 0.00430* at 75th). Finally, gross private savings are relevant only when the median and upper-tail banks are considered ($\beta = 0.0675^*$ at the 50th and 0.0891** at the 75th), suggesting the growing salience of internal private demand for increasingly profitable savings banks.

6. Discussion of the Results

EPU has shown a starkly heterogeneous effect across different types of banks. The main findings confirm that Economic Policy Uncertainty (EPU) significantly negatively affects profitability for Bank Holdings & Holding Companies ($\beta = -0.168, -0.201, -0.255$), Commercial Banks ($-0.101, -0.109, -0.113$), Real Estate & Mortgage Banks ($-0.192, -0.186, -0.177^*$), and Islamic Banks ($-2.470, -2.624, -3.132$) while having a slight but significant adverse effect for Cooperative Banks at the median and the upper quantiles ($-0.0111, -0.00929$). In contrast, Investment Banks are strongly positively affected by EPU (coefficients: 0.659, 0.605, 0.573), and Saving Banks find no more than small significant gains (0.00528, 0.00549, 0.00574), while Private Banking/Asset Management Companies show no significant effect (0.965, 1.581, 2.466). The Capital Adequacy Ratio (CAR) also differs by sector: it considerably reduces returns for Bank Holdings ($-0.0164, -0.0210, -0.0282$) and Investment Banks ($-0.159, -0.143, -0.134$), but increases profitability for Commercial Banks (0.0428*, 0.0529, 0.0577), Cooperative Banks (0.00148*, 0.00159, 0.00166), Islamic Banks (0.651*, 0.712, 0.912), and Saving Banks (0.00214, 0.00207*, 0.00198); however, it is not significant for Private Banking and Real Estate.

Our results show that collective effects occur at the banking level because Economic Policy Uncertainty (EPU) has varying effects on different bank types. EPU has a negative impact on the profitability of commercial banks, real estate and mortgage banks, Islamic banks, and bank holdings and holding companies; it significantly reduces the gains of cooperative banks; it has a positive impact on investment banks and savings banks; and it does not affect private banking or asset management. According to (Ozili, 2022), a high EPU typically lowers bank income in developed nations, but it can raise equity returns in Asia and the Americas. Additionally, they discover that regional traits can lessen the impact of policy uncertainty. The study findings align with previous empirical studies (Ashraf & Shen, 2019; Desalegn et al., 2023; Gürçay & Akbalık, 2025; Killins et al., 2019; Sousa, 2023) who also document a negative impact of EPU on bank profitability and stability. This leads to the acceptance of hypothesis H1A that EPU causes uncertainty in government monetary, fiscal and interest rate policy, which leads firms to delay investments, resulting in output losses, an increase in non-performing loans and bank losses resulting in a decline of banking sector profitability.

The results suggest that capital adequacy ratios are negatively related to the profit performance of bank holding and holding companies and investment banks, while they are positively related to the performance of commercial, cooperative, saving, and Islamic banks. In contrast, there is no statistically significant effect of capital adequacy on the profitability of Private Banking/ Asset Management Companies and Real Estate and Mortgage Banks. These mixed effects indicate that the trade-off between CAR and financial performance depends on each sector's institutional context, market conditions, and governance structure. The study findings are aligned with previous literature (Agbeja et al., 2015b; Al-Sharkas & Al-Sharkas, 2022; Brastama & Yadnya, 2020; Madugu et al., 2020; Silaban, 2017).

7. Conclusion

The objective of the study is to examine the impact of EPU on bank profitability and investigate whether CAR moderates the relationship between EPU and bank profitability. The quantile regression analysis reveals complex and highly heterogeneous relationships between EPU and CAR, EPU interaction with CAR, and profitability within the eight banking segments. EPU's impact on ROE is markedly varied across segments, from EPU proving detrimental to performance in bank holding companies, commercial banks, real estate and mortgage banks, and Islamic banks, which most affect their performance. In contrast, EPU exerts a slight, yet unfavorable, effect on cooperative banks' performance. In contrast, investment banks and saving banks realize weak but significant increases in profitability during periods of elevated policy uncertainty, whilst private banking and asset management companies do not display any observable sensitivity. Likewise, CAR's relationship with profitability differs significantly: higher capital cushions are found to lead to lower returns for bank holding companies and investment banks but higher profitability for commercial, cooperative, saving, and Islamic banks and have little impact on private banking/asset management and real estate lending.

Third, the interface between EPU and CAR is another distinguishing factor of those institutions. Robust capital cushions in commercial, cooperative, saving and Islamic banks enhance resilience under uncertainty, yielding good profitability. In investment banks, on the other hand, high capital requirements in the presence of policy uncertainty worsen margin pressures. This relationship is, however, not statistically relevant for bank holding companies, real estate and mortgage banks, and private banking/asset management companies, suggesting that profit flows in times of uncertainty are rather market-based or fee-based than regulated-based – with relation to issuing regulated- capital. All these results suggest that the impact of macroeconomic volatility and prudential buffer are anything but uniform across the banking sector, as each segment's organizational model, risk-nature orientation, or regulatory framework frame the way in which uncertainty and capital condition the banks' financial performance.

The findings indicate that each banking segment should have a different approach: bank holding companies and real estate and mortgage banks, which experience significant EPU-driven profit declines and do not benefit from higher CAR, should prioritize revenue diversification and cost discipline over raising buffers; commercial banks and cooperative banks, which face moderate EPU drag but have a firm CAR×EPU cushion, should maintain modestly elevated capital ratios to absorb shocks while selectively expanding lending or services; Islamic banks, which record direct EPU gains that are further amplified by CAR, should confidently hold slightly above-minimum buffers to capitalize on volatility; investment banks, which profit from uncertainty but are penalized when capital rises, should optimize their funding mix through hybrid instruments rather than bulk equity increases; and private banking & asset management, which are unaffected by EPU or CAR, should concentrate on fee diversification, product innovation, and client-service improvements rather than capital adjustments.

Future studies could examine the moderating role of corporate governance and risk governance mechanisms such as risk committee and chief risk officer effectiveness on the relationship between EPU and bank profitability. Similarly, the impact of EPU on bank risk management effectiveness and bank stability could be the avenues for future research. Interaction among EPU and ESG dimensions, and regulatory pressures efforts could provide new perspectives on long-term profitability and stability.

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