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## Sustainable banking regulations pre and during coronavirus outbreak: the moderating role of financial stability

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### ABSTRACT

With the worldwide dispersion of COVID-19, banking sector, among others, needs to adapt to unexpected challenges. For this purpose, this study examines the impact of sustainable banking regulations on bank-specific characteristics pre and during COVID-19 period in Pakistan for the period spanning from 2006 to 2020. Moreover, financial stability is employed to test its moderating role on sustainable banking regulations. The dynamic estimator, named the system-Generalized Method of Moments, is used to analyze the endogenous nature of the data. Findings suggest that capital adequacy ratio, deposit ratio, and loan ratio are positive whereas leverage ratios are negatively related to profitability and market return. Overall, findings reveal that sustainable banking regulations influenced the bank-specific characteristics substantially. Importantly, the year-wise averages of variables reveal that Pakistani banks have made significant improvements in profitability, market return, capital adequacy, and deposit ratio pre and during pandemic era. Additionally, the financial stability significantly moderates the relationship highlighting lower default risk and the effectiveness of sustainable banking operations. Practically, despite global lockdowns, economic and trade restrictions during COVID-19, State Bank of Pakistan, sustained health of banking sector through its well-regulated monitoring mechanism.

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## 1. Introduction

Increased global threats, sudden lockdowns, uncertain circumstances, rapid closure of all running processes and widespread of novel corona-virus around the world created an alarming situation for whole businesses, production units, supply chains, and financial markets. Banking sector, having a significant role in the financial markets, is also not spared from the challenging circumstances that appeared due to COVID-19 across the globe (Chang et al., 2020; Umar et al., 2021a, 2021b). Banks are considered as the main drivers of economic growth (Amina and Fedhila, 2018; Kassem and Sakr, 2018) where they are directly related to the money supply and demand within an economic state. The global financial crisis of 2007 and 2008, similar to the recent crisis of COVID-19, created a state of bewilderment among the financial partners that raised the questions of their deposits and investments in the financial sector, which led to various types of risks such as financial risk, insolvency risk, bankruptcy risk, and liquidity risk. In this perplexing state of affairs, the role of regulatory authorities is enhanced manifolds where they have to maintain a balance between the risks and ensuring the creditworthiness of the banking sector in a way that customers' investments and deposits are less prone to uncertain circumstances (Khullar et al., 2020; Karim et al., 2020a, 2020b; Sheikh and Karim, 2016).

Financial stability is often characterized by default risk, where a higher default risk indicates the bank's financial instability. A financial institution is susceptible to default when there are no sufficient resources to fulfill the financial obligations and clients have to bear the consequences of default associated with a bank or a lending institution. In general, banks retain substantial resources to avoid the default risk (Umar et al., 2021c, 2021d). However, in case of financial mishaps and crisis situations, banks have to concentrate more on the strategies to escape the risk of default and maintain financial stability during the stress periods (Naqvi et al., 2021; Naeem and Karim, 2021). Thus, the current pandemic situation insinuates the sustainability and stability of the overall banking system to avoid the drastic effects of the crisis and retain its customer base.

In this vein, the IMF and World Bank (2020) conducted a joint study on monitoring and regulatory implication in the banking sector during COVID-19 in 2020 presenting an overview of the steps taken so far in the entire jurisdiction. The report outlined the high-level recommendations guiding the national regulatory and supervisory authorities of COVID-19 epidemics responses. The report argued that the banking institutions play significant role in reducing the unprecedented macro-economic and financial shockwave caused by epidemic thus, targeted and designed supervisory and regulatory actions are necessary to preserve the provision of vital financial services. According to the report, national policy measures have been targeted worldwide to help affected lenders, improve the capital and liquidity of banks, promote transparency in the balance sheet, the operational and firm performance of capital and liquidity of the banks, and payment systems. However, some of the developing economies have fewer options due to limited policy buffers, weak enforcement, and less sophisticated regulatory frameworks (Naeem et al., 2021a, 2021b, 2021c; Karim et al., 2021a, 2021b).

Another regulatory authority, the Basel Committee (2020), convened a conference on banking supervision in 2020 to discuss the effect of rapidly spreading disease of COVID-19 on the global banking system. The report highlighted that epidemic situation has reached in a critical phase and has continuously impacted economic activities where banks have potential to absorb shocks and reduce interruption in banking services due to its higher level of liquidity and capital. Over the past few decades, Basel III standards (jointly formulated by Basel Committee and Financial Stability Board (FSB) have continuously strengthened the pliability of the banking and banks have been able to overcome its stress due to its unique framework. This framework allows the use of resources (capital and liquidity buffers) that were designed to reduce any stress situation. Since financial stability is an important tool to monitor the sustainable banking regulations, the regulatory authorities and banking supervisory boards have stressed to highlight financial stability indicator through market volatility, market pressures and vulnerability of banking system measured through default risk (Basel Committee, 2020).

Similarly, OECD (2020) report on policy response to COVID-19 in global financial markets states that most of the central banks in OECD countries have changed their monetary policies to provide liquidity to perform well in the markets. The report recommended post COVID-19 measures where central banks should consider sustainable aspects of banking regulations by pointing out how to deal with risk associated with programs with low rating issuers. Accordingly, central banks and banks should consider market-based solutions to deal with rising non-performing assets on bank balance sheets. Concerning the similar scenario in Pakistan, State Bank of Pakistan (SBP) has provided specific guidelines for ensuring sustainable banking regulations where banks have to determine the additional provisioning requirement under each shock (SBP, 2020). Moreover, each bank must examine tax-adjusted impact of the additional provisions on capital and subtract after-shock Risk-Weighted Assets (RWAs) net of additional provisions and measure post-shock Capital Adequacy Ratio (CARPS). As a result of these provisions, temporary debt ratio increased from 60% from 50%, that is, 10% increase in temporary debt-ratio during COVID-19. Excess over limit (EOL) increased up to 15% from the original limit, capital adequacy ratio increased from 15% to 18.7% during COVID-19 era, and authorized financial institutions like branchless banking took immediate measures to reduce risk COVID-19.

Given these conditions, this study is unique in providing the empirical evidence on the influence of sustainable banking regulations measured by profitability (return on assets and return on equity) and market ratios (Tobin's Q) on bank-specific characteristics during 2006-2020 containing 585 bank-year observations. Meanwhile, the data of only commercial banks and microfinance banks have been analyzed due to different nature of data of other financial sectors. This study employed the dynamic estimator – system generalized method of moments for analysis purpose that caters the potential endogenous nature of data (Ji et al., 2021; Karim, 2021a, 2021b; Naeem et al., 2020). The findings of the study reveal that capital adequacy ratio, deposit ratio and loan ratio are significantly and positively related to banking regulations. Contrarily, leverage ratios measured by total debt and long-term debt ratios are negatively and significantly related to the banking profitability and market return. Control

variables, such as firm age and size are significant predictors of sustainable banking regulations whereas growth opportunities are insignificant in predicting the bank performance. Meanwhile, the financial stability measured by default risk shows substantial moderating impact on the given relationship contending the distress times lower down the default risk as well as the sustainable banking system strengthens the economic system during the economic fragility periods. Moreover, the findings highlight that despite severe uncertain circumstances appeared due to COVID-19, banking sector outperformed during the crisis of COVID-19 reflecting sound and sustainable regulatory mechanism of banking sector of Pakistan monitored by the State Bank of Pakistan (SBP).

The remainder research paper is organized as follows; Section 2 presents literature review along with hypothesis development; Section 3 highlights data, variables, and methodology whereas Section 4 presents data analysis, empirical results, and discussion. Finally, the paper concludes with implications for practitioners and academicians in Section 5.

## **2. Literature review**

### ***2.1. The impact of sustainable banking regulations on Bank-Specific characteristics***

There is a little empirical evidence examining the impact of sustainable banking regulations on bank-specific characteristics. Moreover, the findings of the studies are inconsistent and inconclusive based on this relationship in different emerging and developed economies (Amina and Fedhila, 2018; Ejaz, 2019). There are few studies that address this relationship during COVID-19 pandemic such as Awad et al., (2020) provided some broad policy views on the appropriate regulatory and supervisory response to deal with the impact of COVID-19 by suggesting that banks should work constructively with affected borrowers and supervisors and encourage loan to the firms that are the most affected by the pandemic. To mitigate financial risk and maintain cash flows, the supervisors and regulators recommended that banks rebuild their structure, help the borrowers meet their losses, create accounting rule relaxation for borrowers, and contact relevant institutions and agencies to rebuild confidence to avoid market uncertainty. Meanwhile, in Pakistan, Ejaz (2019) examined the impact of regulatory capital on banking financial stability and competition. Financial stability was measured by using the balance sheet indicators provided by State Bank of Pakistan (SBP) and used Lerner index (“1” and “0”) to measure the competition. The study found that there is statistically no significant relationship between the variables as higher capital requirements might lead to accumulation of pricing power of the banks while affecting competition in process that causes financial instability.

In addition, Amina and Fedhila (2018) studied regulations and bank performance to assess the effect of prudential regulation issued by international regulators on bank performance in Tunisia during 2001-2016. The authors found that the liquidity ratio and the regulatory solvency ratio act as catalysts for accounting performance. The empirical results indicate that the Tunisian banking industry exhibited excellent external governance structures directly reflected in the prudential regulations. Notably, the

liquidity ratio and the solvency ratio had shown their benefits in the conduct of banks in the desired direction. Moreover, Cantu et al. (2020) analyzed how the evolution of the banking system had influenced the drivers of credit supply in multiple countries. The study has shown the effect of monetary policy on lending with low liquidity and capitalization. Many countries lowered their monetary rates to zero, but most Latin American banks do not imply this policy. The authors concluded that bank-specific characteristics that positively affect credit supply in Mexico were size, high capital, and lower share of riskier loans, a commercial business model, and high long-term funding.

Khullar et al. (2020) examined the COVID-19 impact on financial services and risk management. The authors refer to the crisis of 2008 where financial institutions and banks have been well-prepared with various regulatory requirements. After this arrangement, banks have faced high volatility in the markets, deteriorated credit quality, rapid shift in the liquidity, reduction in collateral values, near-zero level of interest rates and cancelled payments. The authors highlighted some major impacts of pandemics on the financial services, for instance, market and financial risk, credit and counterparty risk, and financial and portfolio risk. Correspondingly, some factors to overcome the impact of pandemics are monitoring liquidity stress testing reports, checking and balancing the liquidity coverage ratios, reviewing capital allocation and hedging strategies, communicating beyond the liquidity credit risk requirement, and contingency funding plan etc.

Similarly, Larbi-Odam et al. (2020) highlighted the financial risk implications on banks during COVID-19. During this period, banks faced increased volatility in markets, liquidity shortfalls, increased cyber securities fraud, increased default rates, business model failures and higher counterparty and sovereign default risk. It is asserted that banks should redesign business plan, examine credit and collateral quality impact of affected customers and apply robust stress test model in the short-run. While in the medium-run, banks should continuously monitor credit portfolio by using automated credit risk measurement tool, consider the effectiveness of hedging strategies, and develop risk adjusted return on capital model and in the long-run banks should re-assess effectiveness of business plans and align process of the business to protect future crises/pandemics.

Finally, Disemadi and Shaleh (2020) studied the impact of the banking credit restructuring policy in Indonesia during COVID-19 by collecting secondary data on legislation and available documents on the banking sector. Using the normative legal research method, findings of this study showed that policy settings in overcoming economic uncertainty are the issuance of policy to provide national economic stimulus through the application of financial services authority regulation. This policy, which is entitled to the quality of restructured loans, regulates the existing system of credit restructuring. It can be determined smoothly and gave to those who affected by this epidemic.

## **2.2. Hypothesis development**

Banks uses the capital adequacy ratio to pay their liabilities and overcome different risks such as credit and operational risks. A common perception is that the high

capital adequacy ratio reflects health of the banking sector and reveals the bank has enough capital to bear the potential losses and be insolvent (Basel, III). After global financial crisis, the requirement of capital adequacy ratio became stricter by the Bank of International Settlements (BIS) to protect the interests of the depositors (Kassem and Sakr, 2018). For this purpose, capital is divided into two categories; tier1 capital covering shareholders' equity and retained earnings, and tier2 capital, including revalued reserves, undisclosed reserves, and hybrid securities. Tier1 capital is responsible for maintaining the financial health of banks that is capable of realizing the losses and does not impact the normal processes of the organizations whereas Tier2 capital, also known as supplementary capital is less liquid, is of lower quality, and difficult to measure. The denominator of the equation consists of risk-weighted assets. For each asset, there is different level of risk, depending on the decline in the value of asset, in this way, risky assets are weighed and calculated for capital adequacy ratio (Sheikh and Karim, 2016).

According to banking regulations of Basel III, banks need to maintain the capital adequacy ratio of at least 8 percent where prime important is given to Tier1 capital that Tier1 capital divided by risk-weighted assets must be at least 6 percent (Basel III). Earlier empirical studies (Kohlscheen et al., 2018; Amina and Fedhila, 2018; Sheikh and Karim, 2015) also reveal that banks having sound CAR, tend to effect performance of banks significantly as banks having sound CAR reduce the financial risk, overcome the financial challenges arise during the crisis and sustain the processes of banks at a normal pace. Therefore, it is hypothesized,

*H1:* There is a positive relationship between sustainable banking regulations and capital adequacy ratio.

The *leverage ratios*, total-debt and long-term debt ratios, calculated by total liabilities to total assets and long-term liabilities to total assets, respectively, is used to observe the bank's financing pattern of its total assets from the liabilities. Since the banking sector is mainly reliable on deposits, their leverage ratios are generally higher (Karim et al., 2021a, 2021b; Sheikh and Karim, 2015; Sheikh and Karim, 2016). It can be argued that leverage ratios are counterpart of solvency and capital adequacy ratios (Kassem and Sakr, 2018). Due to their opposite relationship with capital adequacy, it is argued that leverage ratios negatively affect the profitability and market ratio of banks as main reliance of the capital structure of banks on external funds enhance the risk of customers' protected interests and raise the issues of creditworthiness (Karim et al., 2019; Karim et al., 2020a, 2020b). Based on these arguments, this study also hypothesizes that,

*H2:* There is a negative relationship between sustainable banking regulations and leverage ratios.

Conspicuously, *deposit ratio*, measured by total deposits to total assets, indicates that banks significantly depend on customer deposits to allocate credits to the customers that provides more loans to the banks. There is a general assumption that higher amount of deposits is responsible for generating more profits for the banks as it is also an indicator of liquidity for the banks, but in other aspect, it is a liability of the bank as banks need to retain their depositors by providing consistent returns and

generating profitability for the bank (Kassem and Sakr, 2018). Evidence suggests that deposit ratio is directly related to bank profitability and market return (Abobakr, 2018; Menicucci and Paolucci, 2016; Sheikh and Karim, 2016) as more deposits bring soundness in the lending capacity of the banks, ultimately resulting in higher profits. Thus, it is hypothesized that,

*H3:* There is a positive relationship between sustainable banking regulations and deposit ratio.

The *loan ratio* measured by total loans to total assets, is also an indicator of good profitability and higher market return as banks who lend more from the customers generate higher returns derived from the financing interest rates (Rabbani et al., 2021; Sanderson and Pierre, 2016). However, it is assumed that banks having higher loan ratio may not generate higher returns due to more liquid assets but instead they represent that assets are less prone to liquidity risk (Sheikh and Karim, 2016). Empirical studies found a mixed relationship between banking regulations and loan ratio (Abobakr, 2018; Kassem and Sakr, 2018; Amina and Fedhila, 2018), suggesting that the higher the loan ratio, the higher the asset liquidity chances of risk during the crisis situation. For this reason, a moderate level of loan ratio must be maintained by the banks in order to avoid liquidity risk (Karim et al., 2019). Hence, it is hypothesized,

*H4:* There is a positive relationship between sustainable banking regulations and loan ratio.

*Default risk* is one of the significant financial stability measures obtained by dividing the earnings before interest and taxes to the sum of taxes. The higher ratio of default risk suggests that the bank has sufficient income to cover its financial obligations. Particularly, during stress periods, the default risk ensures whether banks have substantial income to escape the risk of going default in the volatile times. The efficient market hypothesis (Fama, 1965) suggests an inverse relationship between banks' profitability and default risk. Conversely, higher the default risk, lower will be the profitability and market returns of the financial institutions. Moreover, based on agency theory, agents pursuing their own financial benefits tend to enhance the default risk of banks as the conflict of interest rises between the owners and managers (Karim et al., 2020c). Following these arguments, financial stability is indirectly associated with default risk. Since financial stability is used as a moderator to examine the role of default risk in the pandemic situation, this study hypothesizes,

*H5:* There is a significant moderating effect of financial stability on the nexus between sustainable banking regulations and bank's profitability and market returns.

In sum, it is expected that this study, investigating the impact of sustainable banking regulations on bank-specific characteristics will bridge the gap configured in the studies reviewed earlier and particularly during COVID-19 era. Moreover, the role of financial stability adds to the novelty of the research significantly. In this way, this study will present a comprehensive outlook of sustainable banking regulations in Pakistani banking sector by empirically testing the relationships.

**Table 1.** Operational definition and measurement of variables.

Variables	PROXY	Definition
<i>Dependent variables</i>		
Return on assets	$ROA_{it}$	Net income to total assets.
Return on equity	$ROE_{it}$	Net income to total equity.
Tobin's Q	$TQ_{it}$	Market value of equity added to the book value of the debt over the book value of the total assets
<i>Moderating variable</i>		
Financial stability	$FS_{it}$	Ratio of Earnings before Interest and Tax to Total Taxes
<i>Independent and control variables</i>		
Capital adequacy ratio	$CAR_{it}$	The ratio of Tier1 capital + Tier2 capital to the average risk-weighted assets.
Total-debt ratio	$TD_{it}$	Ratio of total debt (short & long-term) to total assets.
Long-term debt ratio	$LTD_{it}$	Ratio of long-term debt to total assets.
Deposit ratio	$DR_{it}$	Ratio of total deposits to total assets.
Loan ratio	$LR_{it}$	Ratio of total advances to total assets.
Age	$AGE_{it}$	Total number of years of a firm since its incorporation.
Size	$SIZE_{it}$	Natural logarithm of total assets.
Growth opportunities	$GROW_{it}$	Annual change in the book value of total assets.
Dummy year 2007 <sup>a</sup>	$DYEAR_{2007}$	Dummy variable for year 2007.
Dummy year 2008 <sup>a</sup>	$DYEAR_{2008}$	Dummy variable for year 2008.
Dummy year 2020 <sup>a</sup>	$DYEAR_{2020}$	Dummy variable for year 2020.

<sup>a</sup>STATA software creates dummy variable for years automatically.

Source: Authors' Own Estimations.

### 3. Data, variables, and methodology

The data for the study were obtained from the commercial banks and microfinance banks regulated by the State Bank of Pakistan (SBP) during 2006-2020. SBP regulated 29 commercial banks and 11 microfinance banks out of which the data of 28 commercial banks and 11 microfinance banks were finalized for analysis purpose, resulting in 585 bank-year observations for 15 years. Meanwhile, the dynamic estimator, generalized system method of moments was employed on the dataset to control the dynamic nature of the data in terms of endogeneity, simultaneity and unobserved heterogeneity.

Dependent variables include the banking regulations that are measured in terms of profitability ( $ROA_{it}$ ,  $ROE_{it}$ ) and market return ( $TQ_{it}$ ). And, independent variables include capital adequacy ratio, total-debt ratio, long-term debt ratio, deposit ratio, and loan ratio whereas bank age, size and growth opportunities are used as control variables. In addition, default risk is used as a measure of financial stability during crisis period. The data covers the years of global financial crisis and COVID-19 outbreak; therefore, the data of years 2007, 2008, and 2020 have been controlled to avoid any misrepresentation of the empirical results. Operational definition and measurement of variables is given the Table 1.

This study employs dynamic panel estimation that is carried out using the generalized method of moments (GMM) estimator. The application of this dynamic panel estimator is preferable for several reasons. It allows for lagged dependent variable and

unobserved individual-specific effects in the specification may contribute towards consistent and unbiased estimates of other parameters, thus leads to a more influential model (Lucey and Zhang, 2011). The GMM estimator is claimed as robust in the class of all estimators since this estimation method does not require unnecessary assumptions. For example, there is no requirement to have complete information of the exact distribution of data generating process and the error terms. In developing the GMM estimation, it is commonly assumed that the error terms in the model are uncorrelated with a set of explanatory variables (Arellano and Bond, 1991; Blundell and Bond, 1998). This econometric method efficiently selects the estimator of parameters so that the correlations between error terms and the explanatory variables are nearly close to zero.

GMM operates in two variants mainly, 1) differenced Generalized Method of Moments and 2) system Generalized Method of Moments. For concrete estimations, this study employs the second variant of GMM, S-GMM (Arellano and Bover, 1995). The mechanism of S-GMM in regression analysis is that it joints the moment conditions in first differences ( $t-1$ ) with the conditions in the levels in the form of original equation. Therefore, lagged variables are employed in the regression equations. Moreover, the S-GMM estimator uses two standard diagnostic tests namely, over-identification of misspecification and autocorrelation to ensure the consistency and reliability of results.

Moreover, for examining the impact of sustainable banking regulations on bank-specific characteristics, following regression equations are formed.

$$\begin{aligned} ROA_{it} = & \beta_0 + \beta_1 CAR_{it} + \beta_2 TD_{it} + \beta_3 LTD_{it} + \beta_4 DR_{it} + \beta_5 LR_{it} + \beta_6 AGE_{it} \\ & + \beta_7 SIZE_{it} + \beta_8 GROW_{it} + \beta_9 DYEAR_{2007it} + \beta_{10} DYEAR_{2008it} \\ & + \beta_{11} DYEAR_{2020it} + \beta_{12} ROA_{it-1} + \varepsilon_{it} \end{aligned} \quad (1)$$

$$\begin{aligned} ROE_{it} = & \beta_0 + \beta_1 CAR_{it} + \beta_2 TD_{it} + \beta_3 LTD_{it} + \beta_4 DR_{it} + \beta_5 LR_{it} + \beta_6 AGE_{it} \\ & + \beta_7 SIZE_{it} + \beta_8 GROW_{it} + \beta_9 DYEAR_{2007it} + \beta_{10} DYEAR_{2008it} + \beta_{11} DYEAR_{2020it} \\ & + \beta_{12} ROE_{it-1} + \varepsilon_{it} \end{aligned} \quad (2)$$

$$\begin{aligned} TQ_{it} = & \beta_0 + \beta_1 CAR_{it} + \beta_2 TD_{it} + \beta_3 LTD_{it} + \beta_4 DR_{it} + \beta_5 LR_{it} + \beta_6 AGE_{it} + \beta_7 SIZE_{it} \\ & + \beta_8 GROW_{it} + \beta_9 DYEAR_{2007it} + \beta_{10} DYEAR_{2008it} + \beta_{11} DYEAR_{2020it} + \beta_{12} TQ_{it-1} + \varepsilon_{it} \end{aligned} \quad (3)$$

Moreover, for examining the moderating role of financial stability, following regression equations are developed.

$$\begin{aligned} ROA_{it} = & \beta_0 + \beta_1 FS_{it} + \beta_2 CAR_{it} + \beta_3 FS_{it} * CAR_{it} + \beta_4 TD_{it} + \beta_5 FS_{it} * TD_{it} + \beta_6 LTD_{it} \\ & + \beta_7 FS_{it} * LTD_{it} + \beta_8 DR_{it} + \beta_9 FS_{it} * DR_{it} + \beta_{10} LR_{it} + \beta_{11} FS_{it} \\ & * LR_{it} + \beta_{12} ROA_{it-1} + \varepsilon_{it} \end{aligned} \quad (4)$$

$$\begin{aligned}
 ROE_{it} = & \beta_0 + \beta_1 FS_{it} + \beta_2 CAR_{it} + \beta_3 FS_{it} * CAR_{it} + \beta_4 TD_{it} + \beta_5 FS_{it} * TD_{it} + \beta_6 LTD_{it} \\
 & + \beta_7 FS_{it} * LTD_{it} + \beta_8 DR_{it} + \beta_9 FS_{it} * DR_{it} + \beta_{10} LR_{it} + \beta_{11} FS_{it} \\
 & * LR_{it} + \beta_{12} ROE_{it-1} + \varepsilon_{it}
 \end{aligned}
 \tag{5}$$

$$\begin{aligned}
 TQ_{it} = & \beta_0 + \beta_1 FS_{it} + \beta_2 CAR_{it} + \beta_3 FS_{it} * CAR_{it} + \beta_4 TD_{it} + \beta_5 FS_{it} * TD_{it} + \beta_6 LTD_{it} \\
 & + \beta_7 FS_{it} * LTD_{it} + \beta_8 DR_{it} + \beta_9 FS_{it} * DR_{it} + \beta_{10} LR_{it} + \beta_{11} FS_{it} * LR_{it} + \beta_{12} TQ_{it-1} \\
 & + \varepsilon_{it}
 \end{aligned}
 \tag{6}$$

## 4. Data analysis, empirical results and discussion

### 4.1. Data Analysis

Table 2 presents the descriptive statistics of variables used in the study where the mean value of return on assets yields the value of 10.62 percent, average return on equity is 20.04 percent and average market return depicts the value of 53.70 percent. Moreover, the financial stability indicator shows the mean value of 10 percent, highlighting the probability of default in 10 percent of banks included in the dataset. The average capital adequacy ratio measured using the ratio of tier1 capital added into tier2 capital divided by the average risk-weighted assets shows that the banking sector is maintaining the average value of 13.72 percent capital adequacy during 2006-2020. The mean total debt ratio is 84.36 percent, whereas long-term debt ratio reveals average value of 68.12 percent. Deposit ratio yields mean value of 61.42 percent whereas, average loan ratio is 42.55 percent. The mean bank age is 16 years and average bank size (measured in terms of US dollars) is 3.23. Moreover, there is 0.09 times change in the average growth opportunities.

Table 3 presents the correlation of variables used in the study and indicates that there is no problem of multicollinearity as the values of correlation are fairly small.

**Table 2.** Descriptive statistics of continuous variables.

Variable	Unit	Obs.	Mean	SD	Min.	Max.
$ROA_{it}$	(%)	585	0.1062	0.1498	0.0214	0.4127
$ROE_{it}$	(%)	585	0.2004	0.2103	0.1029	0.5982
$TQ_{it}$	(%)	585	0.5370	0.4369	0.26	1.28
$FS_{it}$	(%)	585	0.1028	0.0809	0.02	0.12
$CAR_{it}$	(%)	585	0.1372	0.1634	0.12	0.85
$TD_{it}$	(%)	585	0.8436	0.8532	0.5187	0.9758
$LTD_{it}$	(%)	585	0.6812	0.5412	0.4863	0.7452
$DR_{it}$	(%)	585	0.6142	0.6328	0.45	0.95
$LR_{it}$	(%)	585	0.4255	0.3298	0.2547	0.7238
$AGE_{it}$	(Years)	585	16.32	6.20	5.40	35.00
$SIZE_{it}$	(USD'000)	585	3.2356	1.3658	1.9854	3.9586
$GROW_{it}$	(Times)	585	0.0954	0.0843	0.0064	0.1269

Source: Authors' Own Estimations.

**Table 3.** Correlation of variables.

	$ROA_{it}$	$ROE_{it}$	$TQ_{it}$	$CAR_{it}$	$TD_{it}$	$LTD_{it}$	$DR_{it}$	$LR_{it}$	$AGE_{it}$	$SIZE_{it}$	$GROW_{it}$
$ROA_{it}$	1										
$ROE_{it}$	0.23**	1									
$TQ_{it}$	0.12***	0.18***	1								
$CAR_{it}$	0.14***	0.26***	0.24**	1							
$TD_{it}$	-0.25**	-0.19**	-0.11***	-0.16***	1						
$LTD_{it}$	-0.14**	-0.27***	-0.15***	-0.12***	-0.24***	1					
$DR_{it}$	0.25***	0.15***	0.16***	0.17***	0.15***	0.14***	1				
$LR_{it}$	0.11***	0.10***	0.15***	0.28***	0.22***	0.21***	0.16***	1			
$AGE_{it}$	0.21***	0.14***	0.16***	0.12***	0.17***	0.15***	0.22**	0.19**	1		
$SIZE_{it}$	0.16**	0.11*	0.21**	0.13***	0.25***	0.24***	0.21***	0.12***	0.18***	1	
$GROW_{it}$	0.24***	0.21***	0.22***	0.18***	0.13***	0.15***	0.11***	0.20***	0.11**	0.14***	1

Significant at \*10%, \*\*5%, and \*\*\*1% levels.

Source: Authors' Own Estimations.

## 4.2. Empirical results and discussion

Table 4 presents the impact of banking regulations on bank-specific characteristics during 2006-2020. The empirical results indicate the value of  $LI$  (lagged dependent variable) is positively significant indicating that the models are dynamic and do not suffer the problem of endogeneity, simultaneity and reverse causality. Further to that, capital adequacy ratio is significant and positively related to profitability and market return (H1 accepted). As mentioned earlier, capital adequacy ratio reflects the health of overall business of banks therefore, there is a direct relationship between bank's profitability and capital adequacy ratio. It also indicates despite economic downturns and unfavorable business circumstances, Pakistani banks have maintained sufficient capital to satisfy the claims of the depositors and protect their interests within the bank. This finding also implies that State Bank of Pakistan (SBP), acting as a regulatory authority of banking sector, has efficiently monitored the banking operations and provided sufficient sustainable guidelines to meet the depositors and investors demands.

Correspondingly, leverage ratios (total debt and long-term debt ratios) are negatively and significantly related to bank profitability and Tobin's Q. Based on the pecking order theory, banks adopt financing patterns based on the availability of the liquid assets (Myers and Majluf, 1984). Since the banking sector has main reliance on the deposits, banks' capital structure is different from other non-financial firms. For this particular scenario, it is argued that Pakistani banks, having the higher leverage ratios, decrease banks' profitability and market return. During COVID-19 pandemic, it is asserted that State Bank of Pakistan (SBP) need to set a limit on the leverage ratios to avoid its negative effect on profitability and ensure higher market return in the long-run.

Notably, deposit ratio is significantly and positively related to banking regulations based on the assumption that as the lending capacity of banking sector becomes stronger, the more it will generate returns for the banks. SBP has mandated the banking sector to maintain the deposit ratios at a significant level in order to avoid default risk pre and during COVID-19. Given in a report, State Bank of Pakistan has provided different categories for the customers' deposits and given concrete guidelines to ensure the profitability of overall banking sector (SBP, 2020). Additionally, loan ratio is also positively and significantly related to profitability and market ratio but the

**Table 4.** The impact of sustainable banking regulations on bank-specific characteristics during 2006–2020.

	$ROA_{it}$	$ROE_{it}$	$TQ_{it}$
L1	0.8426 (0.89)***	0.3652 (1.21)***	0.2141 (0.12)***
$CAR_{it}$	1.0287 (1.32)**	2.0384 (1.63)***	1.9851 (1.28)***
$TD_{it}$	-2.0315 (-1.29)**	-1.8745 (-0.69)***	-0.6745 (-0.58)***
$LTD_{it}$	-1.2584 (-0.63)***	-1.9856 (-1.26)**	-1.2340 (-0.76)**
$DR_{it}$	0.5842 (0.39)*	0.2369 (0.32)**	0.1963 (0.51)**
$LR_{it}$	0.2174 (0.21)*	0.3265 (1.21)*	0.1485 (0.93)*
$AGE_{it}$	0.8521 (1.30)***	0.3298 (1.28)***	0.4125 (1.98)***
$SIZE_{it}$	0.3201 (0.63)***	0.9852 (0.25)***	0.9742 (1.27)***
$GROW_{it}$	2.0351 (1.92)	1.5214 (1.30)	1.0638 (0.52)
DYEAR_2007	1.2846 (0.29)***	1.9846 (0.87)***	1.6596 (0.32)***
DYEAR_2008	0.2816 (1.98)***	0.8554 (0.28)***	0.7468 (1.26)***
DYEAR_2020	1.2032 (0.39)***	1.2565 (0.84)***	0.2358 (1.23)***
C	0.1716 (1.21)**	0.1475 (0.29)**	0.3985 (0.32)**
Sargan Test	0.2541	0.1154	0.1532
AR(2)	0.5498	0.3251	0.2174
Bank-Year Observations	585	585	585
N	15	15	15

Source: Authors' Own Estimations.

significance level is 10 percent across three models. The slight significant relationship is due to the average value of loan ratio given in descriptive statistics (Table 2) indicating that banks maintain loan ratio below 50 percent. But still, this moderate level of loan ratio is creating profitability and generating market returns for the banks.

Control variables also show significant and positive relationship with bank age and size but an insignificant relationship is observed with growth opportunities probably due to lower average value of  $GROW_{it}$  as indicated in Table 2. Finally, dummy variables of years 2007, 2008 and 2020 reveal significant and direct relationship with the dependent variables across three models highlighting that the years of global financial crisis and the recent COVID-19 outbreak did not distort the results and banking sector tend to perform at a regular pace even during and post-pandemic period. Two post-estimation specification tests, namely, Sargan Test of misspecification and Arellano-Bond test of autocorrelation, have been conducted in the system generalized method of moments to observe that the models pass these two tests to ensure robustness of the results. The p-value of both tests must be greater than 0.05 to pass the tests and as indicated in Table 4, it is analyzed that all models passed the Sargan Test and Arellano-Bond test showing no problem of over-identification and autocorrelation.

Table 5 gives the moderating role of financial stability on the relationship between sustainable banking regulations and bank-specific characteristics. The empirical results

**Table 5.** The moderating role of financial stability on the relationship between sustainable banking regulations and bank-specific characteristics during 2006–2020.

	$ROA_{it}$	$ROE_{it}$	$TQ_{it}$
L1	0.2188 (0.11)***	0.8452 (0.28)***	0.1432 (0.26)***
$FS_{it}$	-1.2871 (-0.38)***	-1.9531 (-0.87)**	-0.1243 (-0.30)***
$CAR_{it}$	0.1742 (0.14)	0.1874 (0.84)	0.7213 (0.27)
$FS_{it} * CAR_{it}$	-0.9852 (-0.26)***	-0.2170 (-0.29)***	-0.9531 (-1.23)***
$TD_{it}$	2.0245 (2.31)	0.5457 (1.39)	0.2684 (0.59)
$FS_{it} * TD_{it}$	-2.0872 (-1.27)***	-6.4465 (-2.31)***	-0.1472 (-0.51)***
$LTD_{it}$	2.0471 (0.95)	1.9866 (0.15)	1.2314 (0.36)
$FS_{it} * LTD_{it}$	-1.9875 (-2.01)**	-2.4778 (-2.38)**	-2.1030 (-0.89)**
$DR_{it}$	2.1789 (1.09)	6.0475 (1.06)	3.0785 (2.69)
$FS_{it} * DR_{it}$	-2.9756 (-2.03)**	-1.0286 (-1.32)***	-0.2141 (-0.38)**
$LR_{it}$	1.0328 (0.32)	0.1185 (0.95)	0.5888 (0.22)
$FS_{it} * LR_{it}$	-1.0387 (-0.39)**	-1.5782 (-0.28)***	-1.7884 (0.13)***
C	1.2584 (1.21)***	1.4789 (2.39)***	1.0698 (2.07)***
Sargan Test	0.1521	0.1746	0.1321
AR(2)	0.5243	0.5894	0.5101
Bank-Year Observations	585	585	585
N	15	15	15

Source: Authors' Own Estimations.

suggest that financial stability is negatively and significantly moderating the relationship between sustainable regulations and bank profitability. Based on the arguments of Fama (1965), the financial stability and default risk are inversely related. Thus, the negative significant moderating impact suggests that Pakistani banks have sustained their growth and financial sustainability in the face of uncertain economic conditions. Correspondingly, the statistics also reveal that banks and financial institutions not only sustained the normal business operations despite social distancing and precautionary measures, but also they have substantially contributed to the bank's profitability and enhanced market returns. Our findings are consistent with Nurul and Worthington (2015) and Dima et al. (2014).

In Table 6, year-wise averages of both dependent and independent variables are given. It can be observed that banking sector in Pakistan, with few exceptions, tend to enhance the profitability, market, capital adequacy, deposit and loan ratios throughout the years. More importantly, the averages of year 2020 (during COVID-19) showed that in terms of profitability, banking sector has worked efficiently to maintain the operations successful despite continuous lockdowns and trade restrictions. In terms of capital adequacy ratio, it is again stressed that banking sector in Pakistan has outperformed the previous years by maintain the average capital adequacy ratio of 18.7 percent. Following the trend, deposit ratio has also increased

**Table 6.** Year-wise averages of dependent and independent variables.

	$ROA_{it}$	$ROE_{it}$	$TQ_{it}$	$CAR_{it}$	$TD_{it}$	$LTD_{it}$	$DR_{it}$	$LR_{it}$
2006	0.066	0.128	0.516	0.117	0.781	0.652	0.623	0.328
2007	0.074	0.134	0.501	0.129	0.769	0.698	0.520	0.301
2008	0.052	0.124	0.491	0.135	0.723	0.701	0.491	0.336
2009	0.092	0.136	0.503	0.152	0.786	0.688	0.635	0.369
2010	0.102	0.153	0.506	0.112	0.853	0.745	0.526	0.395
2011	0.124	0.186	0.521	0.158	0.862	0.634	0.631	0.381
2012	0.106	0.192	0.560	0.120	0.890	0.620	0.627	0.413
2013	0.104	0.203	0.586	0.118	0.847	0.687	0.751	0.418
2014	0.120	0.215	0.632	0.107	0.821	0.553	0.712	0.428
2015	0.126	0.239	0.598	0.116	0.910	0.740	0.681	0.492
2016	0.118	0.256	0.541	0.153	0.856	0.682	0.592	0.528
2017	0.130	0.263	0.584	0.127	0.847	0.657	0.583	0.532
2018	0.121	0.239	0.523	0.169	0.914	0.723	0.528	0.571
2019	0.129	0.251	0.510	0.159	0.905	0.736	0.623	0.481
2020	0.130	0.287	0.483	0.187	0.890	0.702	0.690	0.410
Obs.	585	585	585	585	585	585	585	585
N	15	15	15	15	15	15	15	15

Source: Authors' Own Estimations.

its mean value whereas there is a decline in total debt, long-term debt and loan ratios.

Overall, it can be summed up that banking sector in Pakistan has sustained its profitability and market returns through effective, well-regulated, and monitored policies of State Bank of Pakistan to ensure that the mechanism of financial markets is modified and adapted based on the given challenges of during and post COVID-19 era. In this way, the financial health of banking sector is sustained and the empirical results, particularly year-wise averages, indicate that banks outperformed during and post COVID-19 time.

## 5. Conclusion

This study investigated the impact of sustainable banking regulations as measured by profitability (return on assets and return on equity) and market return (Tobin's Q) on bank-specific characteristics (capital adequacy ratio, leverage ratios, deposit ratio, and loan ratio). Moreover, the role of financial stability on the given relationship is observed. The study employed the dynamic estimator of system-Generalized Method of Moments to control the dynamic nature of data and avoiding the potential endogeneity, simultaneity, and reverse causality problems. The findings of the study reveal that capital adequacy ratio, deposit ratio and loan ratio are significantly and positively related to banking regulations whereas leverage ratios are negatively affecting profitability and market return. Meanwhile, bank size and age are also directly impacting the banking regulations. Correspondingly, the moderating impact of financial stability reveal an inverse moderating role suggesting that banking sector of Pakistan has sustained the business operations particularly during the crisis period.

The findings of the study have several implications for both academicians and practitioners. For academics, this study contributed to the existing literature by empirically examining the relationship between sustainable banking regulations and bank-specific characteristics of Pakistani banks during 2006-2020. Peculiarly, the evidence provides significant insights to the academicians for pre and during COVID-19

pandemic in understanding and bridging the gap of existing literature during the times of crisis. For practitioners, this study is valuable in providing the complete outlook of overall health of banking sector of Pakistan. Moreover, the study is significant for regulatory authorities such as State Bank of Pakistan, Securities and Exchange Commission of Pakistan, Pakistan Stock Exchange, banks, depositors, investors, managers and other stakeholders of banking sector of Pakistan. The findings highlight that effective monitoring and well-established guidelines provided by the regulators to the banks generate fruitful results in terms of profitability and market outcomes. Further, it is necessary to adapt to the exposed challenges during crisis times as it is evident in the empirical results of the study. Despite so many restrictions, lockdowns, economic and trade barriers, banking sector of Pakistan facing all the odds, performed sustainably pre and during COVID times following the standard operating procedures (SOPs) within the banks and through efficient and well-directed policies of State Bank of Pakistan to all the commercial and microfinance banks.

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No potential conflict of interest was reported by the author(s).

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### Data availability statement

Data will be available on the corresponding author's request due to privacy and ethical concerns.

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