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RISK MANAGEMENT, CAPITAL ADEQUACY AND AUDIT QUALITY FOR FINANCIAL STABILITY: ASSESSMENT FROM COMMERCIAL BANKS OF PAKISTAN

Hafiz Waqas Kamran[1+]
Abdelnaser Omran[2]
Shamsul Bahrain Mohamed-Arshad[3]

[1,3]*School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia, Sintok, 06010, Kedah, Malaysia*
[1]*Email: hafizwaqaskamran@gmail.com*
[2]*Email: sham961@uum.edu.my*
[2]*Faculty of Engineering Sciences, Bright Star University, El-Breqa, Libya*
[2]*Email: naser_elamroni@yahoo.co.uk*

(+ Corresponding author)

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ABSTRACT

The purpose of this study is to examine the effect of bank-based risk measures, country related and international risk factors along with capital ratio and audit quality for stability measures. This article has filled the literature gap while addressing two financial stability measures: Z score through return on assets and return on equity (ZROA and ZROE). A sample of 28 commercial banks is collected from national financial market in Pakistan, with annual observations each year from 2007 to 2016. Panel regression models like ordinary least square (OLS), fixed effect and random effect under robust title are applied to examine the effect of risk factors, capital ratio and audit quality on financial stability (FS). Study finds that bank-based risk factors such as liquidity, credit and operational risk have significant negative influence on both stability measures. Excessive capital ratio seems also to adversely affect financial stability measures. Additionally, higher payments to auditors increases audit quality, resulting in a positive influence on both stability measures. Policy makers, financial analysts and credit officers in banks recommend analysis and review of the relationship between risk factors, capital ratio and audit quality, and the FS of Pakistani commercial banks. However, this work is limited to commercial banks, with no consideration of developed financial institutes and industrial banks. Additionally, there is no methodological application of advanced techniques like GMM.

Contribution/ Originality: This study contributes to the existing literature through an examination and analysis of financial stability and risk factors in banking sector of Pakistan. In addition, it takes fresh look by means of panel regression models of these and related matters.

1. INTRODUCTION AND BACKGROUND

Risk is inherent to business. The dynamism and competitivity of contemporary markets increase such risk (Tchankova, 2002). Various strategies have been designed by businesses to mitigate risk, but a dynamic market increases the possibility of both losses and gains which determine the success of an enterprise (Sania and Amjad, 2012). From the corporate finance perspective, a risk is an unplanned event which causes a loss, or increases the potential for a future loss (Bessis, 2011; Vyas and Singh, 2011). In the world of financial intermediation, risk is a key consideration. The receipt of deposits and loan advancement contracts are essential elements of any business agreement, and serve to manage various risk factors: liquidity, credit-worthiness, and operational and market-based

risks. A decade ago, the global financial crisis (GFC) exposed critical shortcomings in risk management by the international banking sector that led to financial disaster on a world-wide scale (Broll *et al*., 2015). This in turn has created a sense of urgency in the banking industry to reshape and redesign risk management practice (RMP) (Bade *et al*., 2011). The old models of risk management are increasingly discredited owing to their general lack of an integrated approach. The GFC adversely affected mega portfolio investment in America, Europe the middle east (Gourinchas and Obstfeld, 2012). In consequence, regulatory authorities across the world economy and financial system have recommended that certain businesses establish the role of Chief Risk Officer to address this issue (Raza Bilal *et al*., 2013).

2. LITERATURE REVIEW

The concept of liquidity risk and its management is an integral component of risk management. (Majid and Rais, 2003) posited that financial institutions must have proper mechanisms for the identification, measurement, monitoring and control of liquidity risk (Goodhart, 2008; Barfield and Venkat, 2009; Cornett *et al*., 2011). Indeed, an established, systematic framework would help banks ameliorate their ever-increasing dependence on capital market funds which have have increased the severity of their liquidity risk. Such pressure is reflected in the complexity of financial statements such as balance sheets. In order to avoid this, banks should strive for maximum transparency when documenting the break-down of their funding sources (Falconer, 2001). The most severe outcome from improperly mitigated liquidity risk is a sudden capitalization catastrophe. Such a crisis may then deepen into the necessity for a fire sale of the firm's assets (Arif and Nauman Anees, 2012). To remediate such a situation, banks may elect to alter the different financial ratios: liquid to total assets; and liquid to total liabilities, as per Goddard *et al*. (2009).

After the GFC of 2008-09, a new regulation titled Basel III was introduced by regulatory authorities with the requirement for capital investment to take account of market and credit risks, and liquidity, in both normal and stressed circumstances (Varotto, 2011). Varotto (2011) provided a framework for how credit and liquidity risks could interact with the Basel Accord's incremental capital charges (ICC) which capture credit risk losses from default. Second, the sensitivity of credit risk, market risk, and liquidity risk have been analyzed in trading portfolios, and their findings are quite consistent that the credit risk is considerable. The Okof credit default's size and nondefault components have been considered by Longstaff *et al*. (2005) who focused on the credit default swaps and concluded that the default in the corporate spread is due to the credit risk and the varying output for the nondefault components.

Operational risk and its exposure is not a new concept to banks and financial markets (Lindblom and Willesson, 2010). The focus of the global economic environment is surely moving towards technological advancement, and latest trends have created intense competition (Moosa, 2008). Such dynamic trends have focused on moving corporate ventures towards more operational risk. Financial distress for a bank can be more harmful, resulting from an unanticipated event in its day-to-day operations, as compared to some credit losses which can occur as the result of financial market collapse (Flores *et al*., 2006; Moosa, 2008; Wahlström, 2009). However, the practices by banking firms to monitor and protect their venture from such negative financial consequences are not well-developed when compared to market and credit risk. One challenging task for banking firms regarding the operational risk is based on the trail distribution, not on the most recent and frequent financial fatalities (Wei, 2007). In academic writing, significant operational events have attracted serious attention, such as the loss of $1.4 billion US by Barings Bank on account of rogue trading activities, culminating in the failure of the whole firm (Ross, 1997; Sheaffer *et al*., 1998).

The growth of trading and business activities since the 1990s has been matched by an increase in financial instability and losses. For this purpose, the concept of a value at risk VAR) approach to measuring such a category of market risk measures the largest portion of its portfolio lost by the business in question (Bredin and Hyde, 2004).

As in other industries, banks have also had to face exposure to exchange rate risk, and their performance can be affected by currency fluctuations. This tends to affect mostly those firms which have operations in foreign states and speculate on exchange rates (Chamberlain *et al.*, 1997). For this purpose, the authors have measured the exposure of exchange rate sensitivity against returns on the equities of US banks. Their findings provide significant evidence that for an adequate measure of currency risk, sensitivity analysis can be used as a benchmark. The exposure of foreign exchange to equity stock return was studied by Di Iorio and Faff (2015) whose findings were consistent with an earlier study of the Australian equities market when exposed to currency fluctuation.

The exposure of exchange rate risk in Asian markets during the Asian Financial Crisis of 1997 and Global Financial Crisis of 2008-09 was analysed by Jeon *et al.* (2017). The study was conducted over the period of 1994-2013 for stock return data and exchange rates on a daily basis. The findings were consistent with the hypothesis that stock returns were significantly affected in most Asian states. Additionally a study by Aftab and Rehman (2017) on the effect of exchange rate risk for the East-Asian economies - Malaysia and Singapore - focused on the industrial level. The data set was obtained from 65 industries in both countries using the generalized autoregressive conditional heteroskedasticity GARCH model approach to measure the exchange rate risk exposure. Their findings affirmed that exchange rate risk has a significant influence on these industries over the long run.

3. METHODS OF THE STUDY

This study is based on the panel data analysis, covering dimensions of the time period and units of observation over time (2007-2016). An overall sample of all commercial banks from Pakistan was selected for robust panel regressions: three panel regression models under the title of OLS regression model, fixed effect, and random effect. Following are the regression equations of the study. Equation 1 to 12 explains panel regression models for ZROA, risk factors, capital ratio and audit quality, while Equation 13 to 24 observes pooled OLs, random effect and fixed effect for ZROE.

Regression Equation for ZROA

$$Y(\text{ZROA}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \beta_7 CAR_7 + \beta_8 AQ_8 + \varepsilon \quad (1)$$

$$Y(\text{ZROA}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \varepsilon \quad (2)$$

$$Y(\text{ZROA}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \varepsilon \quad (3)$$

$$Y(\text{ZROA}) = \partial + \beta_1 CAR_1 + \beta_2 AQ + \varepsilon \quad (4)$$

Regression equations for Fixed Effect: ZROA

$$Y_{it}(\text{ZROA}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \beta_6 FCR_{1,it} + \beta_7 CAR_{7,it} + \beta_8 AQ_{8,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (5)$$

$$Y_{it}(\text{ZROA}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \gamma_2 E_2 + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (6)$$

$$Y_{it}(\text{ZROA}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \beta_6 FCR_{1,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (7)$$

$$Y_{it}(\text{ZROA}) = \beta_0 + \beta_1 CAR_{1,it} + \beta_2 AQ_{2,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (8)$$

Regression equations for Random Effect: ZROA

$$Y(\text{ZROA}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \beta_7 CAR_7 + \beta_8 AQ_8 + U_i + W_{ij} \quad (9)$$

$$Y(\text{ZROA}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + U_i + W_{ij} \quad (10)$$

$$Y(\text{ZROA}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + U_i + W_{ij} \quad (11)$$

$$Y(\text{ZROA}) = \mu + \beta_1 CAR_1 + \beta_2 AQ_2 + U_i + W_{ij} \quad (12)$$

Regression Equation for ZROE

$$Y(\text{ZROE}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \beta_7 CAR_7 + \beta_8 AQ_8 + \varepsilon \quad (13)$$

$$Y(\text{ZROE}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \varepsilon \quad (14)$$

$$Y(\text{ZROE}) = \partial + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \varepsilon \quad (15)$$

$$Y(\text{ZROE}) = \partial + \beta_1 CAR_1 + \beta_2 AQ + \varepsilon \quad (16)$$

Regression equations for Fixed Effect: ZROE

$$Y_{it}(\text{ZROE}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \beta_6 FCR_{1,it} + \beta_7 CAR_{7,it} + \beta_8 AQ_{8,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (17)$$

$$Y_{it}(\text{ZROE}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \gamma_2 E_2 + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (18)$$

$$Y_{it}(\text{ZROE}) = \beta_0 + \beta_1 LR_{1,it} + \beta_2 CR_{2,it} + \beta_3 OR_{3,it} + \beta_4 MR_{4,it} + \beta_5 CTR_{1,it} + \beta_6 FCR_{1,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (19)$$

$$Y_{it}(\text{ZROE}) = \beta_0 + \beta_1 CAR_{1,it} + \beta_2 AQ_{2,it} + \gamma_2 E_2 + \ldots + \gamma_{30} E_{30} + \delta_2 T_2 + \delta_{11} T_{11} + u_{it} \quad (20)$$

Regression equations for Fixed Effect: ZROE

$$Y(\text{ZROE}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + \beta_7 CAR_7 + \beta_8 AQ_8 + U_i + W_{ij} \quad (21)$$

$$Y(\text{ZROE}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + U_i + W_{ij} \quad (22)$$

$$Y(\text{ZROE}) = \mu + \beta_1 LR_1 + \beta_2 CR_2 + \beta_3 OR_3 + \beta_4 MR_4 + \beta_5 CTR_5 + \beta_6 FCR_6 + U_i + W_{ij} \quad (23)$$

$$Y(\text{ZROE}) = \mu + \beta_1 CAR_1 + \beta_2 AQ_2 + U_i + W_{ij} \quad (24)$$

Table 1 explains the detail of both dependent and independent variables of the study. For outcome factor, two proxies through Z-score calculations under the title of ZROA and ZROE are observed. While eight explanatory variables are also added in the models covering the title of liquidity risk LR, credit risk CR, operational risk OR, market risk MR, country risk CTR, financial crisis risk FCR, capital adequacy ratio CAR and audit quality AQ.

Table-1. Description of Variables.

Nature of Variable	Variable Name	Description	Sources
Dependent Variables	ZROA	Describes the ratios ROA over standard deviation of ROA, where ROA indicates net income after tax divided by total assets of the bank	Author's calculation based on the data from State Bank of Pakistan (SBP)
	ZROE	Describes the ratios ROE over standard deviation of ROE, where ROE indicates net income after tax divided by total common stock equity of the bank	Author's calculation based on the data from State Bank of Pakistan (SBP)
Independent Variables	Liquidity Ratio: LR	Describes the ratio of liquid assets over current assets of the bank	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Credit Risk: CR	Indicates the ratio of Non-performing loans to gross advances	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Operational Risk: OR	Specifies the cost to income ratio in the bank	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Market Risk: MR	Indicates annual effective interest rate in the economy	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Country Risk: CTR	Covers annual exchange rate in the country, measured in terms of USD	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Financial Crisis Risk: FCR	Dummy variable equals to 1 if the time is 2007-2012, otherwise 0.	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Capital adequacy Ratio: CAR	Specifies the ratio total equity over total assets	Author's calculation based on the data from State Bank of Pakistan (SBP)
	Audit quality: AQ	Explains the total remuneration paid to the auditors over a year.	Author's calculation based on the data from State Bank of Pakistan (SBP)

Source: Authors calculation based on past literature.

4. RESULTS AND DISCUSSION

Table 2 contains the study's descriptive outcomes. For sample observations the maximum value is 280 links to both stability measures, while minimum belongs to operational risk OR and audit quality AQ. Mean score for ZROA and ZROE is 2.18 and 2.55 with the standard deviation of 2.82 and 3.55 respectively. For LR, average trend is 11.02 and for the credit risk CR it is 10.017. the factor of operational risk OR reflects that in the banking industry, cost to income ratio shows a higher mean trend due to abnormal operational costs faced by the banks. For the market risk as measured through interest rate, average annual interest rate in the economy of Pakistan is 2.73. Additionally, FCR is measured through a dummy variable which supposes 1 for the time period of crisis (2007-2012) or otherwise 0. For capital ratio, average trend in banking industry is 12.062, and for the audit quality log mean value is 6.353.

Table-2. Descriptive Statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
ZROA	276	2.188	2.829	-2.82	11.17
ZROE	280	2.551	3.554	-3.37	16.85
LR	280	11.021	9.317	0	64.4
CR1	261	10.017	8.498	0	51.56
OR1	255	58.006	15.315	19.97	103.21
MR	280	2.735	4.343	-5.08	8.32
CTR	280	88.806	14.104	60.74	104.77
FCR	280	.6	.491	0	1
CAR1	272	12.062	10.597	-3.1	61.4
AQ	251	6.535	.63	4.78	8.19

Source: Authors Findings.

Table-3. Poole Regression Findings.

	(1)	(2)	(3)	(4)
VARIABLES	FSZROA	FSZROA	FSZROA	FSZROA
LR	-0.135***	-0.101***	-0.110***	
	(0.0336)	(0.0299)	(0.0304)	
CR	-0.0950***	-0.0648**	-0.0695***	
	(0.0233)	(0.0251)	(0.0250)	
OR	-0.0778***	-0.0710***	-0.0733***	
	(0.0140)	(0.0134)	(0.0133)	
MR	0.0185	-0.0161	0.00696	
	(0.0418)	(0.0477)	(0.0477)	
CTR	-0.00648	-0.00502	0.0193	
	(0.0203)	(0.0163)	(0.0232)	
FCR	-1.031*		-0.990*	
	(0.533)		(0.574)	
CAR	0.164***			-0.0927***
	(0.0269)			(0.0167)
AQ	0.751***			0.857***
	(0.246)			(0.236)
Constant	5.763*	8.522***	5.975**	-2.317
	(2.966)	(1.744)	(2.445)	(1.660)
Observations	239	250	250	248
R-squared	0.417	0.229	0.238	0.116

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 3 shows OLS findings for first measure of financial stability ZROA. Model 1 predicts all risk measures, capital ratio and audit quality and analyses their impact on the bank's stability. Under first model effect of liquidity, credit and operational risk is significantly negative at one percent, reflecting that three bank-based risk factors have had an adverse impact on ZROA. For market and country based risk, the impact is found to be insignificant. Through FCR, it is believed that ZROA is adversely affected. However, through capital ratio a significantly positive influence with the coefficient of .164 is observed. AQ indicates that more payment to auditors in the banking sector has a positive influence on banking sector stability. Model 2 observes only the risk factors for FS_ZROA. Again liquidity, credit and operational risk have demonstrated an adverse impact on financial stability, while operational, market, and country risk factors show insignificant impact. With the presence of country risk and international risk (FCR) along with bank-based risk factors, the effect of the first three measures is again shown to be significantly negative, while FCR also shows its adverse impact on stability. With the presence of only capital ratio and AQ, it is believed that excessive reserve for the CAR is not suitable for the banks, but audit quality has a positive and significant effect on ZROA.

Under fixed-effect findings as presented in Table 4, credit and operational risk have significant influence on ZROA with the coefficients of -.0339 and -.0326 respectively, while CAR demonstrates its adverse influence on banking sector stability. With the presence of only the risk factors, operational risk seems to significantly and

negatively influence banking sector stability, while model 7 shows that credit risk along with operational risk has significant impact on ZROA. Under model 8, only the effect of capital ratio is found to be significantly negative for financial stability. In addition, Table 5 considers random effect coefficients. It is believed that both CR and OR are causing a significant decline in the value of ZROA, while CAR is also found to be a significant determinant of bank's stability. Model 2 under random effect predicts that when there are risk factors only to ZROA, CR and OR are again significant indicators. This is true for OR only when country risk and FCR are added under model 3. For model 4, the effect on FS_ZROA is negatively significant by CAR. The Hausman test is in favour of the null hypothesis, referring random effect is more appropriate between fixed and random, while Breusch Pagan again specifies the random effect coefficients while comparing it with pooled OLS.

Table-4. Regression Findings for Fixed Effect.

	(5)	(6)	(7)	(8)
VARIABLES	**FSZROA**	**FSZROA**	**FSZROA**	**FSZROA**
LR	-0.0136	-0.00567	-0.00773	
	(0.0245)	(0.0236)	(0.0238)	
CR	-0.0339**	-0.0257*	-0.0273*	
	(0.0153)	(0.0137)	(0.0140)	
OR	-0.0326***	-0.0233***	-0.0243***	
	(0.00972)	(0.00837)	(0.00851)	
MR	0.0253	0.0245	0.0278	
	(0.0180)	(0.0172)	(0.0179)	
CTR	0.00649	0.00228	0.00632	
	(0.00921)	(0.00578)	(0.00832)	
FCR	0.291		0.161	
	(0.242)		(0.238)	
CAR	-0.0312**			-0.0132***
	(0.0140)			(0.0017)
AQ	-0.0189			-0.0904
	(0.286)			(0.227)
Constant	4.349**	3.677***	3.308***	3.042**
	(1.851)	(0.732)	(0.914)	(1.519)
Observations	239	250	250	248
R-squared	0.140	0.114	0.116	0.126
Number of banks	27	27	27	27

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1.

For the second measure of stability (ZROE), Table 6 shows pooled OLS findings. It is believed that the effect of LR, CR and OR is significantly negative at one percent on ZROE, which shows that more instability in banks is observed due to liquidity risk, low asset quality, and excessive operational cost. Through CAR this effect is also negatively significant at one percent, while AQ specifies its positive relationship with ZROE. Under model 2 of pooled OLS for ZROE, again the first three measures of risk have shown an adverse influence. With the presence of country risk and FCR, only the fundamental risk-based risk measures have shown a negative influence on FS. However, a mixed trend is observed when the effect of only CAR and AQ is observed on FSZROE.

Table 7 shows the findings of the fixed effect model. It is believed that CR and OR have a significantly negative influence on ZROE, but the effect through MR is significantly positive. In addition, excessive capital ratio is found to be significantly negative. Under model 6 for FE, the effect of CR and OR is significantly negative with the coefficient of -.0387 and -.0199, whereas operational risk has demonstrated a significantly positive influence. With the presence of all risk factors (model 7), key determinants are CR, OR and MR respectively. Additionally, model 8 for FE shows that abnormal capital ratio is not beneficial to banks' stability.

Table-5. Regression Findings for Random Effect: ZROA.

	(1)	(2)	(3)	(4)
VARIABLES	**FSZROA**	**FSZROA**	**FSZROA**	**FSZROA**
LR	-0.0146	-0.00812	-0.0106	
	(0.0248)	(0.0233)	(0.0235)	
CR	-0.0374**	-0.0266*	-0.0285**	
	(0.0153)	(0.0137)	(0.0139)	
OR	-0.0379***	-0.0257***	-0.0269***	
	(0.00967)	(0.00830)	(0.00844)	
MR	0.0238	0.0231	0.0271	
	(0.0185)	(0.0173)	(0.0181)	
CTR	0.00485	0.00215	0.00704	
	(0.00922)	(0.00580)	(0.00836)	
FCR	0.344		0.195	
	(0.248)		(0.240)	
CAR	-0.0402***			-0.159*
	(0.0141)			(0.0916)
AQ	0.159			-0.00788
	(0.267)			(0.222)
Constant	3.643**	3.771***	3.322***	2.400
	(1.821)	(0.863)	(1.026)	(1.554)
Observations	239	250	250	248
Number of banks	26	27	27	27
Hausman (1978) Specification Test				
ZROA			Coef.	
Chi-square test value			10.138	
P-value			.255	
Breusch and Pagan Lagrangian multiplier test for random effect: Estimated results:				
chibar2(01) = 512.11				
Prob > chibar2 = 0.0000				

Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1.

Table-6. Pooled regression for ZROE.

	(1)	(2)	(3)	(4)
VARIABLES	**FSZROE**	**FSZROE**	**FSZROE**	**FSZROE**
LR	-0.196***	-0.134***	-0.143***	
	(0.0428)	(0.0369)	(0.0386)	
CR	-0.150***	-0.124***	-0.129***	
	(0.0325)	(0.0343)	(0.0349)	
OR	-0.0688***	-0.0553***	-0.0577***	
	(0.0162)	(0.0152)	(0.0150)	
MR	0.0275	-0.0155	0.00827	
	(0.0564)	(0.0609)	(0.0621)	
CTR	-0.00825	-0.000128	0.0249	
	(0.0257)	(0.0197)	(0.0289)	
FCR	1.087		1.020	
	(0.760)		(0.791)	
CAR	-0.206***			-0.122***
	(0.0368)			(0.0235)
AQ	0.562**			0.479*
	(0.284)			(0.264)
Constant	8.569**	8.538***	5.912*	0.876
	(3.729)	(2.050)	(3.028)	(1.982)
Observations	239	250	250	248
R-squared	0.354	0.192	0.198	0.087

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table-7. Regression Findings for Fixed Effect: ZROE.

	(5)	(6)	(7)	(8)
VARIABLES	**FSZROE**	**FSZROE**	**FSZROAE**	**FSZROE**
LR	-0.0379	-0.0292	-0.0294	
	(0.0236)	(0.0231)	(0.0234)	
CR	-0.0461***	-0.0385***	-0.0387***	
	(0.0148)	(0.0134)	(0.0137)	
OR	-0.0322***	-0.0199**	-0.0199**	
	(0.00937)	(0.00819)	(0.00834)	
MR	0.0400**	0.0364**	0.0367**	
	(0.0174)	(0.0168)	(0.0175)	
CTR	0.00240	0.00492	0.00527	
	(0.00887)	(0.00566)	(0.00816)	
FCR	0.174		0.0140	
	(0.233)		(0.233)	
CAR	-0.0438***			-0.183***
	(0.0135)			(0.0417)
AQ	0.0548			0.0858
	(0.276)			(0.227)
Constant	5.131***	3.986***	3.954***	2.347
	(1.784)	(0.717)	(0.896)	(1.516)
Observations	239	250	250	248
R-squared	0.226	0.170	0.170	0.013
Number of banks	26	27	27	27

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table-8. Regression Findings for Random Effect: ZROE.

	(1)	(2)	(3)	(4)
VARIABLES	**FSZROE**	**FSZROE**	**FSZROAE**	**FSZROE**
LR	-0.0385	-0.0301	-0.0306	
	(0.0238)	(0.0229)	(0.0232)	
CR	-0.0492***	-0.0399***	-0.0403***	
	(0.0148)	(0.0134)	(0.0137)	
OR	-0.0345***	-0.0209**	-0.0211**	
	(0.00938)	(0.00816)	(0.00831)	
MR	0.0392**	0.0354**	0.0361**	
	(0.0176)	(0.0169)	(0.0176)	
CTR	0.00202	0.00497	0.00585	
	(0.00890)	(0.00567)	(0.00818)	
FCR	0.204		0.0351	
	(0.236)		(0.235)	
CAR	-0.0487***			-0.0203*
	(0.0136)			(0.0116)
AQ	0.117			0.110
	(0.268)			(0.223)
Constant	4.826***	3.972***	3.892***	2.077
	(1.834)	(0.945)	(1.089)	(1.623)
Observations	239	250	250	248
Number of banks	26	27	27	27
Hausman (1978) specification test				
ZROE			Coef.	
Chi-square test value			12.125	
P-value			.146	
Breusch and Pagan Lagrangian multiplier test for random effect: Estimated results:				
chibar2(01) = 680.81				
Prob > chibar2 = 0.0000				

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 8 reflects the findings for ZROE under RE. Again model one for RE indicates that CR and OR have their negative influence on bank's stability while MR is positively associated to ZROE. CAR continues to prove its adverse influence on the banks. Model two specifies that key determinants for the bank stability are CR, OR and MR respectively. With the presence of all risk factors, only the bank-based risk factors are found to be significant determinants of ZROE. For model four, CAR has shown an adverse influence, while AQ has not impacted on the Z measure of financial stability.

5. CONCLUSION

This study has examined the effect of risk factors, capital ratio and audit quality on stability of commercial banks in Pakistan. Panel regression models like OLS, random and fixed effect are applied for two different measures of financial stability (ZROA, ZROE). Findings through OLS for ZROA indicates that key risk factors to the creation of financial instability in banks are liquidity, credit and operational risk, while CAR and audit quality also significantly affect the ZROA. With the consideration of risk factors only through OLS, it is apparent that bank-based risk factors have a significant influence on stability. With the addition of country based and international risk like financial crises, only the effect of FCR along with bank-related risk are significant, while the individual effect of CAR and AQ is also found to be significant indicator of ZROA. Under fixed and random effect, both credit and operational risk, and CAR, are found to negatively affect the Z measure of ROA. Through OLS for ZROE, all bank-based risk measures have a significant influence on the CAR and AQ. Through FE, credit and operational risk are found to be significant determinants of ZROE. Under random effect, CR, OR, and MR with CAR, are significant indicators of financial stability. These findings indicate that financial stability in banks is influenced by both bank-based risk factors. These require serious attention from risk managers and credit officials in banking sector of Pakistan. In addition, an excessive capital ratio seems not to be an effective means of ensuring financial stability. Based on these findings, several issues have been highlighted for policy makers. First, liquidity and credit risk measures need a higher level of attention due to their adverse effect on both stability indicators. Secondly, to improve banks' stability, regulators and decision makers should re-evaluate their risk management practices. Third, there is a strong need to establish such polices as may secure banks from international risk factors in the future. Finally, this study has certain limitations. The work is limited to commercial banks and does not examine other financial institutions and industrial banks. Also, there is no consideration of methodological non-application of advance techniques like GMM. Future studies may address these limitations.

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