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Efficiency Effects on Iranian Banks' Performance and Stability during COVID-19

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ABSTRACT
This research investigates the impact of market concentration and operational efficiency on the financial performance (Return on Assets and Return on Equity) and financial stability (Z-score) of banks listed on the Tehran Stock Exchange, particularly during the unprecedented COVID-19 pandemic period. Utilizing panel data from 10 Iranian banks over the period 2014-2023, three distinct regression models were analyzed with the aforementioned dependent variables and interaction terms with a COVID-19 period dummy variable.
Descriptive statistics and inferential tests, including the F-Limer and Hausman tests, were employed to identify the appropriate estimation models. Findings consistently indicate that operational efficiency significantly enhances bank performance and financial stability across all models, both during normal periods and during the pandemic. In contrast, market concentration does not demonstrate a statistically significant effect on performance or stability. During the COVID-19 pandemic, the moderating effect of efficiency remains positive and significant, while concentration continues to show no impact.
The models yield substantial explanatory power, with adjusted R-squared values ranging from 43% to 62%, and their F-statistics confirm overall robustness and significance. Durbin-Watson statistics suggest no first-order autocorrelation. These findings underscore the critical role of efficiency in sustaining bank profitability and resilience during economic shocks, providing relevant insights for policymakers and regulators aiming to enhance the banking sector's preparedness for future crises.

Keywords: *COVID-19*, *Bank Performance*, *Financial Stability*, *Efficiency*, *Market Concentration*

1. INTRODUCTION

Achieving sustainable economic growth and development is a paramount economic objective, fundamentally dependent on stable economic conditions. In this context, the banking sector plays a pivotal role by mobilizing financial resources, allocating capital, and supporting business activity (Beck, 2020). Banks serve not only as financial intermediaries but also as stabilizing forces during times of economic uncertainty.

When COVID-19 emerged in China and started spreading to other countries, it severely impacted the global financial markets. Some of the global impacts of the COVID-19 outbreak are increased unemployment globally, application of heavy shocks on the world economy, a decline in crude oil prices, a decrease in international trade in the most affected countries, and shutting down the doors of the world for foreign trade (Maleki Oskouei and Borhani, 2025). In other words, the COVID-19 pandemic in late 2019 created an unprecedented global health and economic crisis. Beyond its public health implications, the pandemic triggered economic shocks that

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significantly affected the financial performance of banks, which faced heightened credit risks, liquidity constraints, and operational disruptions (Demirgüç-Kunt et al., 2020). Evaluating how banks responded to such crises is essential for understanding broader economic vulnerabilities and for improving financial system resilience.

Several factors underscore the importance of examining bank performance and stability during economic shocks. First, banks play a crucial role in financing businesses and households. In crisis situations, their performance in providing loans and financial facilities is vital for maintaining economic sustainability (Goodell, 2020). Second, the financial stability of banks is a core element of overall economic stability. Bank instability can lead to decreased public trust and increased uncertainty in financial markets (Elnahass and Trinh, 2021). Third, policymakers require accurate and up-to-date information on banks' financial performance to develop suitable fiscal and monetary policies aimed at mitigating the pandemic's negative economic effects (Anginer et al., 2019). Fourth, crises test the robustness of banks' risk management systems and the adequacy of regulatory oversight (FSB, 2022).

However, the relevance of this issue extends beyond the COVID-19 pandemic. In today's increasingly interconnected and volatile global environment, banks are exposed to a wide range of systemic risks, including geopolitical tensions, climate-related disruptions, cyber threats, and monetary policy shocks. These developments demand a deeper understanding of both short-term performance and long-term financial stability.

Morozova and Sahabutdinova (2013) classify financial stability into two categories: first, the interconnectedness among financial institutions, where the crisis of one institution can create uncertainty leading to bank failures; and second, the impact of external shocks on financial institutions, which may result in their collapse and destabilize the entire economy. Financial stability can thus be described as the banking system's ability to withstand crises. Too and Simiyu (2018) and Caruntu and Romanescu (2008) argue that financial performance is shaped by both internal factors, such as liquidity, profitability, capital structure, firm size, and leverage, as well as external macroeconomic variables. Recent studies also emphasize the role of governance, digital capacity, and Environmental, Social, and Governance (ESG) practices in promoting resilience (Hardy et al., 2024).

Despite a growing body of research on bank performance during crises, a notable gap remains in integrated analyses that consider both financial performance and stability. This issue is more prominent, especially in developing economies like Iran, where banks dominate the financial system, and capital markets are less mature. Most studies analyze these dimensions in isolation and fail to address the combined effect of internal characteristics and macroeconomic conditions.

This study aims to fill that gap by investigating the relationship between financial stability and financial performance among 10 commercial banks listed on the Tehran Stock Exchange. By examining firm-specific variables and external economic indicators, this research seeks to identify the key factors that contribute to financial resilience in the face of economic shocks, offering valuable insights for regulators, policymakers, and financial institutions in emerging markets.

2. THEORETICAL BACKGROUND & HYPOTHESIS

Empirical literature frequently highlights competition within the banking industry as a primary determinant of efficiency and stability. This section reviews two theoretical models that elucidate the impact of competition on bank behavior.

The Structure-Conduct-Performance theory is one of the key analytical frameworks in industrial economics, used to understand and analyze market behavior and performance. The level of market power can determine the form of competition. Furthermore, high competition between banks can reduce their ability to generate profits, causing banks to lower lending rates and thereby reduce the risk of default on debtors. One of the aspects explained through market power theory is the Structure-Conduct-Performance (hereafter SCP). Market concentration and market share are described in the SCP (Zulkifli et al., 2024). This theory is based on several hypotheses that each analyzes how market structure influences firm behavior and ultimately market performance.

Structure to Conduct Hypothesis. This hypothesis explains how market structure affects firm behavior. Market structure refers to economic and organizational features such as high concentration and entry barriers. For example, in markets dominated by a few large firms, these companies may opt for collusion rather than competition to maximize profits. Similarly, high entry barriers can lead to monopolistic behavior (Mateev et al., 2024).

Conduct to Performance Hypothesis. This shows how firm behavior, such as pricing strategies, advertising, and innovation, affects market performance. For instance, higher pricing in a monopolistic market can lead to greater profitability, or investments in R&D can result in new products and improved market outcomes. Bank behavior in areas such as cost control and risk management, captured by the Cost-to-Income ratio (C/I) and Loan-to-Deposit ratio (LD), directly affects performance. Inefficient cost structures (high C/I) or excessive lending (high LD) may reduce profitability and stability (Berger & Hannan, 1998).

Structure to Performance Hypothesis. This combines the previous two and asserts that market structure not only affects firm behavior but also directly influences market performance. For example, monopolistic markets may lead to lower allocative efficiency due to pricing power and potentially lower productivity. Higher market concentration could result in higher ROA/ROE, but potentially lower CAR if risk management is compromised (Mateev et al., 2024).

Feedback Hypothesis. This posits that market performance can, in turn, influence market structure and firm behavior. For example, high profitability may attract new entrants, altering the market structure, or successful innovation may increase a firm's market share, thus changing market dynamics.

The SCP framework, through these hypotheses, illustrates how market structure influences firm behavior and ultimately market performance. This framework aids economists and policymakers in understanding market dynamics and designing appropriate policies.

The Efficient Structure Hypothesis (ESH) is a related theory linking market structure to firm performance. It posits that market structure and firm efficiency are interrelated. The core idea is that more efficient firms have lower costs, allowing them to capture greater market share and generate higher profits. Over time, this efficiency leads to increased market concentration, as less efficient firms cannot compete effectively.

The ESH asserts that efficiency leads to profitability, which in turn results in higher market concentration. Efficient firms, due to lower costs and higher productivity, tend to dominate markets. As they grow, market concentration rises not because of anti-competitive behavior, but due to their natural advantages.

Efficient banks tend to have higher ROA/ROE due to superior cost management, and their strong internal systems and low-risk operations also lead to higher Capital Adequacy Ratios (CAR). As they grow, they contribute to increased market concentration (CI) not through anti-competitive behavior, but through performance advantages (Homma et al., 2014).

In summary, the SCP model suggests that market structure (e.g., concentration) affects firm behavior (conduct), which influences performance (profitability). In contrast, the ESH reverses this causality, proposing that efficiency drives structure and performance. The performance of banks plays a critical role in ensuring financial stability. By facilitating capital flow, providing loans, accepting deposits, and offering financial services to individuals and businesses, banks contribute significantly to economic growth. Sound bank performance involves effective risk management, adequate liquidity provision, and sufficient capital maintenance, which collectively help prevent financial crises. Furthermore, effective supervision and regulation by oversight bodies enhance the transparency and health of the banking system, thereby supporting financial stability. Ultimately, banks play a key role in sustaining economic stability by fostering trust and confidence in the financial system. Therefore, this study aims to investigate the relationship between financial stability and the performance of banks listed on the Tehran Stock Exchange. The following section presents a review of related domestic and international studies.

Mirzaei (2013) examined the performance of banks during the global financial crisis of 2007–2010. Using data from 6,540 banks across 49 emerging and advanced economies, the study analyzed the crisis's impact on bank performance. The results, obtained using the Generalized Method of Moments (GMM) econometric model, showed that the financial crisis had a generally negative effect on bank profitability and stability. Moreover, banks with adequate capital and sound risk management coped better with crisis-related challenges. Adusei (2015) investigated how bank size and funding risk affect bank stability. The analysis was based on 112 out of 137 rural banks in

Ghana as of January 2013. Panel data model estimation results show that effective management of funding risk is essential to maintaining banking stability. Karshenasan et al. (2018) examined the impact of domestic financial crises on bank performance using the CAMEL model from 2009 to 2015. The sample included 9 commercial banks. Regression analysis revealed a significant negative relationship between financial crises and profitability at a 95% confidence level, while other performance indicators were unaffected. The study also found that banks did not significantly shift to non-operational activities during financial crises.

Saadat Mir Ghadim and Khani Jazani (2019) investigated the effect of ownership structure on the financial stability of companies listed on the Tehran Stock Exchange. The research method used is descriptive-survey and correlational. The statistical sample of the present study includes 156 companies listed on the Tehran Stock Exchange from 2012 to 2016. The results indicate that there is no significant relationship between different types of ownership, including corporate, institutional, managerial, governmental, and ownership concentration, with financial stability. Therefore, the findings indicate that the ownership structure does not affect financial stability.

Sargolzaei et al. (2020) studied the effect of key financial performance indicators on the profitability of Bank Mellat using Johansen and Juselius co-integration tests and a Vector Error Correction Model (VECM) from Q1 2010 to Q2 2018. The results indicate a long-term negative relationship between ROA and variables such as non-performing loans ratio, debt-to-asset ratio, and time deposits to total assets. Conversely, capital adequacy ratio, net operating income to total assets, and loan-to-deposit ratio have a significant positive long-term relationship with ROA. Pham et al. (2021) studied the determinants of bank stability in an emerging market context, using data from listed commercial banks in Vietnam between 2010 and 2018. Results from the GMM method indicate that banking sector indicators such as equity ratio, bank size, loan-to-asset ratio, and income diversification positively affect bank stability. Antwi and Kwakye (2022) explore the relationship between bank performance and stability in 16 selected African countries from 2002 to 2019. Using the Augmented Mean Group (AMG) estimator and panel data, the study find a significant long-term positive relationship between Return on Assets (ROA) and financial stability.

Masoudian et al. (2022) analyze the relationship between macroeconomic variables and banking stability and competition using panel vector autoregression (PVAR) for listed banks in Tehran Stock Exchange from 2006 to 2018. The findings indicate that economic growth positively affected banking stability and competition, and in return, banking stability positively influences economic growth and bank competition. Bakhouche (2024) assessed the relationship between competition and stability in the Tunisian banking sector from 2005 to 2020, examining whether cost efficiency played a role. The findings showed that competition reduced stability, and that inflation, GDP growth, and rule of law affected bank stability.

Yousefi et al. (2023) conducted a panel data analysis from 2011 to 2016 to identify internal factors affecting bank performance in 11 publicly listed banks in Iran. The results reveal no significant impact of capital adequacy on ROE, a negative relationship between non-performing loans and ROE, and a negative relationship between bank liquidity and interest margin with ROE. The study recommended careful loan quality management to enhance profitability. Maroun and Fromentin (2024) analyzed the relationship between bank performance (liquidity, profitability) and financial system instability in Lebanon using annual data from 1997 to 2019. Employing both fixed-effects OLS and GMM, they find that increased liquidity correlated significantly with reduced financial stability, while profitability has a positive relationship with systemic stability. Mateev et al. (2024) investigated the role of market concentration and efficiency in banking system stability during the COVID-19 pandemic. Using GMM for a sample of 575 banks across 20 Middle East and North Africa (MENA) countries, the study concludes that efficiency is positively associated with bank profitability, while market concentration has a small negative impact on bank performance. Tamizi (2025) assessed the impact of the misery index on the financial performance of banks listed on the Tehran Stock Exchange from 2014 to 2021. Using multivariate regression and fixed-effect panel data models, the study suggests that a higher misery index negatively affects bank financial performance. Hence, controlling inflation and unemployment should be prioritized due to their widespread economic impacts.

H1: Market concentration has a significant impact on bank performance, and this effect diminishes during the COVID-19 pandemic.
H2: Operational efficiency has a significant impact on bank performance, and this effect diminishes during the COVID-19 pandemic.
H3: Market concentration has a significant impact on financial stability, and this effect diminishes during the COVID-19 pandemic.
H4: Operational efficiency has a significant impact on financial stability, and this effect diminishes during the COVID-19 pandemic.

3. RESEARCH METHODS

Data

Since the published financial statements of banks listed on the Tehran Stock Exchange provide the necessary information and data for the calculations, the scope of this research is limited to listed banks. The data used in this study are extracted from the audited annual financial statements of 10 banks listed on the Tehran Stock Exchange over the period 2014 to 2023 (1393–1402 in the Persian calendar).

Model Introduction and Methodology

In the first hypothesis, the impact of concentration and efficiency on banks' financial performance during the COVID-19 period is examined. Accordingly, the following model is proposed.

This model is estimated in two scenarios. In the first scenario, Return on Assets (ROA) is considered the indicator of financial performance. In the second scenario, Return on Equity (ROE) is used as the indicator of financial performance.

$$BP_{it} = \beta_0 + \beta_1 Concentration_{it} + \beta_2 Concentration_{it} \times COVID - 19 + \beta_3 Efficiency_{it} + \beta_4 Efficiency_{it} \times COVID - 19 + \beta_5 IB_t + \beta_6 COVID - 19 + \psi X_{it-1} + U_{it} \quad (1)$$

In the second hypothesis, the impact of concentration and efficiency on banks' financial stability during the COVID-19 period is examined. Therefore, the following model is proposed:

$$BC_{it} = \beta_0 + \beta_1 Concentration_{it} + \beta_2 Concentration_{it} \times COVID - 19 + \beta_3 Efficiency_{it} + \beta_4 Efficiency_{it} \times COVID - 19 + \beta_5 IB_t + \beta_6 COVID - 19 + \psi X_{it-1} + U_{it} \quad (2)$$

Definition and Measurement of Variables

Dependent Variables

In the first model, the dependent variable is bank financial performance, which is measured using two indicators: Return on Assets (ROA) and Return on Equity (ROE). In the second model, the dependent variable is bank financial stability, measured by the Z-score index, as follows (Shahriar et al., 2023):

$$Z = \frac{\mathrm{ROA} + CAR}{\delta \mathrm{ROA}} \quad (3)$$

Where:
ROA is the Return on Assets ratio
CAR is the Capital Adequacy Ratio
∂ROA is the standard deviation of the Return on Assets ratio

Independent Variables

The concentration index is measured by the market share of the top three banks based on total assets within the banking sector of the country. Efficiency (EFF), or operational efficiency, is measured using the Stochastic Frontier Analysis (SFA) method, first introduced by Aigner et al. (1977). This method is based on econometric models and microeconomic theory. The stochastic production frontier represents the efficient frontier of firms and is estimated using econometric techniques. The gap between actual and frontier output reflects inefficiency and random factors. The general structure of the stochastic frontier function is:

$$Y = \beta X + \varepsilon \quad (4)$$
$$\varepsilon = V - U$$

Where:
Y is the output produced.
X is the input vector,
V is the random error term,
U represents technical inefficiency.

V is assumed to be normally distributed with a mean of zero and variance, and is independent of U.

Operational efficiency values range between 0 and 1, with values closer to 1 indicating higher efficiency (Tayebi et al., 2009). Anis et al. (2023) also used the SFA method to calculate bank efficiency, allowing researchers to identify differences in efficiency across units and determine which ones underperform relative to their capacity. Cost efficiency (C/I) is measured as the ratio of operating expenses to operating income. A higher value indicates lower cost efficiency.

Capital Adequacy Ratio (CAR) is calculated as the ratio of capital (core and supplementary) to risk-weighted assets, based on the Basel Accord's risk weights. Negative CAR values reflect accumulated losses exceeding regulatory capital in certain banks during specific years. Such cases mainly occurred during periods of heightened financial stress, particularly around the COVID-19 shock.

Core capital includes shareholder equity and non-cumulative perpetual preferred shares. Supplementary capital includes hybrid capital instruments, loan-loss reserves, and revaluation reserves (Eisavi et al., 2021). The formula is defined as:

$$\mathbf{CAR} = \frac{\mathbf{Tier\ 1\ capital + Tier2\ Capital}}{\mathbf{RiskWeight * Assest}} \quad (5)$$

Where:
CAR is the capital adequacy ratio.
Tier 1 Capital is core capital,
Tier 2 Capital is supplementary capital
RiskWeight*Assest is risk-weighted assets.

Bank Size (SIZE) is recognized as a key determinant of bank profitability. Larger banks tend to generate more revenue, although some argue that they may exhibit lower cost efficiency due to diseconomies of scale (Mateev et al., 2024). Bank age (AGE) is the natural logarithm of the time span between the bank's establishment year and the target year. Furthermore, Capital Adequacy Ratio (CAR) is calculated as the ratio of capital (core and supplementary capital) to risk-weighted assets. This ratio is reported in the board of directors' activity reports of companies (Eisavi et al., 2021). Last, economic growth (GDP) is the macroeconomic indicators such as economic growth rate can influence bank performance (Mateev et al., 2024).

The summary of the variable measurement is provided in Table 1.

Table 1: Summary of Variable Measurement

Variable	Symbol	Measurement
	Dependent Variable	
Bank Financial Performance	BP_{it}	Return on Assets / Return on Equity
Bank Financial Stability	BC_{it}	$Z = \frac{\text{ROA} + CAR}{\text{Std. Dev. of ROA}}$ CAR is the Capital Adequacy Ratio

	Independent Variables	
Concentration Index	$Concentraion_{it}$	Share of top 3 banks in total sector assets
Efficiency	EFF	Measured via Stochastic Frontier Analysis (SFA)
	Control Variables	
Bank Size	SIZE	Log of total assets of each bank
Cost of Efficiency	C/I	Ratio of operating expenses to operating income
Loan-to-Deposit Ratio	LD	Loans to customers divided by customer deposits
Capital Adequacy Ratio.	CAR	$CAR = \frac{Tier\ 1\ capital + Tier2\ Capital}{RiskWeight * Assest}$

4. DATA ANALYSIS & DISCUSSION

In this study, data analysis is conducted using both descriptive and inferential statistics. Descriptive statistics are employed to estimate frequencies and compute means and standard deviations. For variable estimation and model building, quantitative econometric and statistical methods are utilized through appropriate econometric software, specifically applying the panel data approach.

Descriptive Statistics of Research Variables

To examine the general characteristics of the variables and conduct an in-depth analysis, familiarity with descriptive statistics related to the variables is essential. Table 2 presents the descriptive statistics of the variables used in the study.

Table 2: Descriptive Statistics of the Research Variables

Variable Name	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
Return on Assets (ROA)	0.013	0.012	0.058	-0.045	0.018	-0.084	3.571
Return on Equity (ROE)	0.163	0.185	0.883	-1.904	0.363	-2.756	16.321
Financial Stability	15.796	10.509	113.374	-4.561	17.714	2.692	13.456
Concentration	0.672	0.671	0.688	0.652	0.011	-0.266	2.209
Efficiency	0.429	0.375	0.810	0.164	0.180	0.586	2.191
Logarithm of Firm Age	3.183	3.135	4.262	1.386	0.620	-0.452	3.244
Capital Adequacy	0.040	0.046	0.141	-0.109	0.056	-0.555	2.986
Bank Size	20.811	20.902	23.540	18.026	1.387	-0.055	2.145
Economic Growth	0.026	0.035	0.060	-0.030	0.031	-0.860	2.184

The main measure of central tendency is the mean, which indicates the balance point and the center of gravity of the distribution and serves as a good indicator of data centrality. For instance, the average capital adequacy is 0.040, indicating that most data points are concentrated around this value. In other words, the capital adequacy of the studied banks is below the legal threshold of 8%.

Overall, dispersion parameters provide a measure of how much data differ from each other or deviate from the mean. Among the most important dispersion parameters is the standard deviation. In the descriptive statistics, the standard deviation for financial stability is 17.714, and 0.011 for concentration, indicating that these two variables have the highest and lowest standard deviations, respectively. The CAR ranges from −0.109 to 0.243. Negative CAR values reflect accumulated losses exceeding regulatory capital in certain banks during specific years.

The level of measurement for some variables includes nominal and ordinal scales, which are applied to qualitative variables. These variables are typically binary or categorical, and it is not appropriate to use mean, standard deviation, skewness, or kurtosis to describe them. Since these measures are not logically applicable to qualitative variables, they are described using the mode and frequency percentages. The percentage frequency of a binary variable indicates the proportion of data coded as 1 and 0, respectively (Bani Mahd and Arabi, 2016). Table 3 suggests the frequency distribution of the COVID-19 variable, representing 37.5% of the observed time periods in Iran.

Table 3: Frequency Distribution of COVID-19 Variable

Value	Frequency	Percentage
0	50	62.5%
1	30	37.5%
100	80	100%

Finding

Panel data models combine both time-series and cross-sectional dimensions. When estimating these models, two general scenarios may emerge: either the intercept is consistent across all cross-sections (pooled regression model) or it varies across sections (panel data model). The FLimer test is employed to determine the appropriateness ofd pooled regression and fixed-effects models. If the p-value of the FLimer (Chow) test is less than 0.05, the panel data model is preferred. Subsequently, the Hausman test is utilized to ascertain whether fixed or random effects are more appropriate for the panel data model.

If the significance level (p-value) of the Chow test is less than 0.05, the panel data model is preferred. Subsequently, the Hausman test is used to determine whether fixed or random effects are appropriate.

Table 4: F-Limer Test Results

Model	Test Statistic	Significance	Result
Model 1	4.193	0.000	Panel Data
Model 2	1.317	0.247	Pooled Regression
Model 3	2.135	0.039	Panel Data

As presented in Table 4, given that the significance level of the F-Limer test for Model 1 and Model 3 is less than 0.05, the panel data approach is accepted over the pooled regression approach for these models.

Table 5: Hausman Test Results

Model Name	Test Statistic	Significance Level	Conclusion
Model 1	69.365	0.000	Fixed Effects (Intercept) Accepted
Model 2	Since the significance level in the F-Limer test in the previous table is greater than 5%, there is no need to perform the Hausman test.		
Model 3	79.250	0.000	Fixed Effects (Intercept) Accepted

As shown in Table 5, the significance level of the Hausman test for Model 1 and Model 3 is less than 0.05. This means the fixed effects model is accepted over the random effects model for these two models.

Table 6: Final Estimation of the First Regression Model (Dependent Variable: Return on Assets)

Variable	Coefficient	z-statistic	Std. Error p-value	p-value
Concentration	0.272	0.161	1.687	0.097
Efficiency	0.468	0.104	4.468	0.000
COVID-19	-0.118	0.053	-2.219	0.029
Concentration × COVID-19	0.011	0.006	1.621	0.111
Efficiency × COVID-19	0.023	0.005	3.986	0.002
Log(Age of Bank)	-0.048	0.028	-1.726	0.090
Capital Adequacy	0.060	0.019	3.041	0.003
Bank Size	0.018	0.007	2.451	0.017
Economic Growth	0.019	0.088	0.217	0.828
C	-0.422	0.197	-2.132	0.037
AR(1)	0.104	0.161	0.648	0.519
Additional Statistics				
Adjusted R-squared			0.627	
F-statistic (Significance Level)			7.108(0.000)	
Durbin-Watson			1.957	
Normality of Residuals			1.958(p=0.375)	

Table 6 presents the final estimation results for the first regression model, with Return on Assets (ROA) as the dependent variable. The results indicate that the concentration variable is not statistically significant at the 5% level. Although the coefficient of market concentration is not statistically significant, this result can be explained by the limited variation in the concentration index across banks and over time. As indicated in the descriptive statistics, the concentration measure exhibits a narrow range and a low standard deviation, which reduces its explanatory power in regression analysis, suggesting that it has no meaningful impact on ROA. Conversely, efficiency is positively and significantly related to ROA. The interaction term between market concentration and the COVID-19 period (Concentration × COVID-19) is not statistically significant. This suggests that the pandemic did not materially alter the effect of market concentration on bank performance. One possible explanation is that market concentration in the Iranian banking sector remained relatively stable during the sample period, limiting the scope for COVID-19 to amplify or weaken its impact. Moreover, the COVID-19 shock affected banks in a broadly systemic manner, reducing the role of structural market characteristics relative to bank-specific factors such as efficiency and capital strength. However, the interaction term (Efficiency × COVID-19) is positive and significant, indicating that efficiency positively influenced bank performance during the pandemic.

Regarding the control variables, capital adequacy (coefficient=0.060, p-value=0.003) and bank size (coefficient=0.018, p-value=0.017) are positively and significantly related to ROA. Log (Age of Bank) (coefficient=-0.048, p-value=0.090) shows a negative but marginally significant relationship. Economic growth does not exhibit a statistically significant effect on bank performance in Model 1. This result suggests that during periods of heightened uncertainty, such as the COVID-19 shock, macroeconomic growth indicators may have limited direct influence on bank-level outcomes. In such environments, bank performance is more strongly driven by internal characteristics, including operational efficiency and capital adequacy, rather than aggregate economic conditions.

The coefficient of bank age is also statistically insignificant, indicating that long-established banks do not necessarily perform better than more recently established ones in the Iranian banking sector during the sample period. This may reflect the highly regulated nature of the banking industry, where institutional age does not translate into competitive advantages. Additionally, crisis conditions may diminish the benefits of experience, as both older and younger banks are subject to similar regulatory constraints and systemic risks.

The adjusted R-squared of 0.627 suggests that the model explains approximately 62.7% of the variance in ROA, indicating strong explanatory power. The F-statistic (7.108 with a significance level of 0.000) confirms the overall statistical validity and good fit of the model. Furthermore, the Durbin-Watson statistic of 1.957 indicates the absence of first-order autocorrelation in the residuals. The normality of residuals (p=0.375) further supports the model's assumptions.

In the second hypothesis, the dependent variable is Return on Equity. In Table 7, the results are presented.

Table 7: Final Estimation of the Second Regression Model (Dependent Variable: Return on Equity)

Variable	Coefficient	z-statistic	Std. Error p-value	p-value
Concentration	0.003	0.005	0.561	0.576
Efficiency	0.085	0.032	2.623	0.010
COVID-19	-0.318	0.159	-1.996	0.049
Concentration × COVID-19	-0.182	0.156	-1.166	0.247
Efficiency × COVID-19	0.014	0.006	2.282	0.025
Logarithm of Firm Age	-0.179	0.085	-2.105	0.038
Capital Adequacy	0.014	0.005	2.808	0.006
Bank Size	0.017	0.042	0.405	0.686
Economic Growth	1.416	1.914	0.740	0.461
Constant (C)	-0.571	0.155	-3.671	0.005
Additional Statistics				
Adjusted R-squared		0.501		
F-statistic (Significance Level)		18.565 (0.000)		
Durbin-Watson		1.832		
Normality of Residuals		3.781 (: 0.150)		

Table 7 displays the final estimation results for the second regression model, with Return on Equity (ROE) as the dependent variable. Consistent with the previous model, market concentration remains statistically insignificant, which may again be attributed to its limited variability across banks and over time. In contrast, efficiency is positively and significantly associated with ROE (coefficient=0.085, p-value=0.010). The interaction effect between market concentration and COVID-19 continues to be insignificant, suggesting that the pandemic does not materially modify the role of market structure in shaping bank outcomes. However, the interaction term for efficiency (Efficiency × COVID-19) is positive and significant (coefficient = 0.014, p-value = 0.025), confirming that efficiency enhanced financial performance during the COVID-19 period.

Among the control variables, the coefficient of bank age remains insignificant, consistent with earlier findings and indicating that institutional age does not provide a systematic performance advantage under the prevailing regulatory environment. Capital adequacy (coefficient=0.014, p-value=0.006) has a positive and significant effect, while bank size and economic growth do not have significant effects on ROE. Similar to the earlier results, economic growth does not exhibit a significant effect, reinforcing the limited direct role of macroeconomic conditions during the crisis period.

The adjusted R-squared of 0.501 indicates that the model explains approximately 50.1% of the variance in ROE, representing a good model fit. The F-statistic (18.565 with a significance level of 0.000) confirms the model's overall credibility and statistical validity. The Durbin-Watson value of 1.832 further suggests the absence of first-order autocorrelation. The normality of residuals (p=0.150) suggests normal distribution.

In the third hypothesis, the dependent variable is financial stability. In Table 8, the results are presented.

Table 8: Final Estimation of the Third Regression Model (Dependent Variable: Financial Stability)

Variable	Coefficient	z-statistic	Std. Error p-value	p-value
Concentration	0.192	0.202	0.952	0.344
Efficiency	0.096	0.016	5.693	0.000
COVID-19	-0.020	0.007	-2.678	0.009
Concentration × COVID-19	0.087	0.074	1.173	0.244
Efficiency × COVID-19	0.012	0.005	2.388	0.019
Logarithm of Firm Age	-0.155	0.037	-4.153	0.001
Capital Adequacy	0.939	0.399	2.352	0.021
Bank Size	0.045	0.019	2.335	0.022
Economic Growth	0.372	0.910	0.408	0.683
Constant (C)	0.095	0.016	5.720	0.000
Additional Statistics				
Adjusted R-squared			0.439	
F-statistic (Significance Level)			4.441 (0.000)	
Durbin-Watson			2.110	
Normality of Residuals			1.607(0.447)	

Table 8 presents the final estimation results for the third regression model, with financial stability (Z-score) as the dependent variable. Overall, the insignificant coefficients of market concentration, its interaction with COVID-19, economic growth, and bank age are consistent with the earlier results. These findings suggest that structural and macroeconomic factors played a limited direct role during the crisis period, while bank-specific characteristics remained the dominant drivers of performance and stability. However, the interaction term (Efficiency × COVID-19) has a positive coefficient (0.012) and a significance level below 0.05, indicating that efficiency had a direct and significant positive impact on financial stability during the COVID-19 pandemic. Among the control variables, capital adequacy (coefficient=0.939, p-value=0.021) and bank size (coefficient=0.045, p-value=0.022) exhibit positive and significant effects on financial stability.

The adjusted R-squared of 0.439 indicates that the independent and control variables in the model explain 43.9% of the changes in the dependent variable. The significance level of the F-statistic (0.000) confirms that the overall fitted model is statistically valid. Additionally, the Durbin-Watson statistic of 2.110 falls between 1.5 and 2.5, suggesting no first-order autocorrelation in the model. The normality of residuals (p=0.447) suggests a normal distribution.

Table (9): Summary of Findings

Hypothesis	Coefficient	Effect	Conclusion
Concentration affects bank financial performance (ROA)	0.272	+	Rejected
Concentration affects bank financial performance (ROE)	0.003	+	Rejected
Efficiency affects bank financial performance (ROA)	0.468	+	Accepted
Efficiency affects bank financial performance (ROE)	0.085	+	Accepted
Concentration affects bank financial performance (ROA) during COVID-19	0.011	+	Rejected
Efficiency affects bank financial performance (ROA) during COVID-19	0.023	+	Accepted
Concentration affects bank financial performance (ROE) during COVID-19	-0.182	-	Rejected
Efficiency affects bank financial performance (ROE) during COVID-19	0.014	+	Accepted
Concentration affects bank financial stability during COVID-19	0.087	+	Rejected
Efficiency affects bank financial stability during COVID-19	0.012	+	Accepted

5. CONCLUSIONS, IMPLICATIONS, SUGGESTIONS, AND LIMITATIONS

This study analyzes the financial performance and stability of

Iranian banks from 2014 to 2023, with a specific focus on the systemic shock of the COVID-19 pandemic. The results reveal a powerful truth that suggests that operational efficiency plays a decisive role in both bank profitability and resilience. Drawing on panel data from 10 publicly listed banks, our consistent findings across three regression models underscore the paramount importance of internal capabilities.

This study specifically examines the effects of market concentration and operational efficiency on bank performance and financial stability in Iranian listed banks during the COVID-19 period. Using panel data for 10 commercial banks over the period 2014–2023, the analysis provides several important findings.

The results indicate that market concentration does not have a statistically significant impact on bank performance or financial stability. In contrast, operational efficiency shows a positive and significant effect on both bank performance and financial stability. These findings suggest that internal bank-specific factors play a more critical role than market structure in determining bank resilience, particularly during periods of systemic stress such as the COVID-19 pandemic.

From a practical perspective, this study contributes to the banking literature by demonstrating that improving operational efficiency is more effective than relying on market concentration to enhance bank performance and stability in emerging economies. The results imply that policymakers and bank managers should prioritize strengthening internal efficiency, risk management practices, and capital planning over emphasizing structural concentration policies, especially during crisis periods.

This study has several limitations that should be acknowledged. First, the sample is limited to 10 listed commercial banks, which may restrict the generalizability of the findings. Second, the use of accounting-based measures for capital adequacy may generate extreme values during periods of financial distress. Negative CAR values reflect accumulated losses exceeding regulatory capital in certain banks during specific years. Future research could address these limitations by employing alternative regulatory capital measures, broader samples, and dynamic estimation techniques.

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