IFA
IRAN FINANCE ASSOCIATION

Iranian Journal of Finance

Print ISSN 2676-6337
Online ISSN 2676-6345

Impact of Exchange Rate Fluctuations on the Financial Soundness of Iranian Banks: The Role of Bank Size and Soundness Levels

Azam Ahmadyan*

*Corresponding Author, Assistant prof, Department of Banking, Monetary and Banking research institute, Tehran, Iran. (Email: a.ahmadian@mbri.ac.ir)

Iranian Journal of Finance, 2026, Vol. 10, No.1, pp. 63-118.
Publisher: Iran Finance Association
doi: https://doi.org/10.30699/ijf.2026.517792.1512
Article Type: Original Article

Received: August 02, 2025
Received in revised form: October 13, 2025
Accepted: December 27, 2025
Published online: January 01, 2026

Abstract

This empirical study investigates the impact of exchange rates on the financial soundness of Iranian banks from 1996 to 2023, utilizing financial soundness indicators, financial statement data, and macroeconomic variables. The selection of Iran is based on the significant role of exchange rate fluctuations in the financial soundness of its banking sector. Financial strategies and risk management adaptations are required as a result of these fluctuations, which have an impact on profitability, liquidity, and lending behavior. In contrast to the existing literature, which focuses on specific financial soundness indicators, this research establishes a composite metric informed by the International Monetary Fund's financial soundness indicators. This metric enables the analysis of exchange rate effects across a range of financial soundness levels. The study employs ARDL and quantile methodologies to investigate the differential effects on banks by their scale and the distinct impacts of official and unofficial exchange rates. The findings reveal intricate relationships,

including inverse U-shaped dynamics between exchange rates and financial soundness through bank size, as well as varying effects across various quantiles of financial soundness. These insights provide crucial guidance for policymakers and financial institutions in stabilizing the banking sector in the face of economic uncertainties and underscore the necessity of customizing strategies to account for the bank size and the dynamics of exchange rates.

Keywords: ARDL, Exchange Rate, Financial Soundness, Size of Banks

JEL Classification: C01, C13, C22, G21

Introduction

Using financial soundness indicators, financial statement data, and macroeconomic data from 1996 to 2023, this study empirically investigates the influence of exchange rates on the financial soundness of Iranian banks. The following are the reasons why Iran was selected as the research subject: Initially, the financial soundness of banks in Iran is significantly impacted by fluctuations in exchange rates. These fluctuations can have a direct impact on lending behavior, overall liquidity, and profitability, frequently necessitating modifications to financial strategies and risk management practices, as the Iranian banking sector serves as a key driver of economic growth and soundness.

Abdi Seyyedkolaee et al. (2021) have demonstrated that Iranian banks initially experience an increase in the credit-to-deposit ratio following an exchange rate disturbance. This response is the result of a sense of optimism, as banks assume that the economic outlook will be favorable in the aftermath of the shock. Nevertheless, this upward trend in lending activities is unsustainable. The negative correlation between persistent fluctuations and lending behavior in banks is underscored by the finding that prolonged exchange rate volatility is associated with lower credit growth over time (Abdi Seyyedkolaee et al., 2021).

Studies have demonstrated that sustained increases in exchange rates beyond a specific threshold (e.g., Rials 42,475) tend to destabilize the banking system, contrary to conventional expectations that higher exchange rates can bolster banks' financial positions. Although banks can initially withstand moderate levels of volatility, their financial soundness can be compromised, nonperforming loans (NPLs) can increase, and profits can be weakened by excessive exchange rate appreciation (Mohammadi et al., 2020). Inflation

typically impedes credit growth by eroding purchasing power and diminishing loan demand. GDP growth has a positive effect, as it increases the availability of credit and strengthens financial soundness (Abdi Seyyedkolaee et al., 2021).

In conclusion, exchange rate fluctuations are vital macroeconomic factors that influence bank performance in Iran. To stabilize the banking sector amid economic uncertainties, policymakers and financial institutions must implement proactive measures that take these dynamics into account.

Secondly, the financial soundness of banks in Iran is significantly affected by their size when exchange rates fluctuate. The responses of larger and smaller banks to macroeconomic factors depend on their management capabilities, resource allocations, and operational focus. A more comprehensive understanding of the banking system's vulnerabilities and strengths is achieved by examining the impact of exchange rate fluctuations on bank scale, which, in turn, facilitates more effective policymaking. The following section provides a discussion of the rationale behind this examination, accompanied by relevant references. Risk management mechanisms, access to sophisticated hedging instruments, and diversified portfolios are typically more robust in larger banks. This enables them to manage foreign exchange risks more effectively. For example, they may engage in cross-border operations or hold reserves in various currencies, reducing the adverse impact of a depreciating rial. Consequently, larger banks are more likely to sustain financial soundness during currency fluctuations (International Monetary Fund, 2007).

Insufficient resources at smaller banks frequently impede the implementation of sophisticated risk management strategies. Their limited portfolios and reliance on local markets increase their vulnerability to exchange rate shocks, which can lead to reduced profitability and liquidity issues (Ebrahimi et al., 2021).

Larger banks typically hold foreign-currency-denominated liabilities due to their participation in global transactions. Although this increases their exposure, they are better equipped to hedge these risks through various mechanisms. Smaller banks may face an elevated burden if their clients default on foreign-currency loans during currency depreciations, given their limited foreign operations. According to the International Monetary Fund (2007), this obstacle significantly undermines the financial soundness of smaller banks relative to their larger counterparts.

Studies indicate that larger banks generally experience less financial instability during periods of currency volatility, thanks to their diversified revenue streams. Foreign reserves, access to international markets, and stabilization mechanisms enable them to sustain operations during periods of adverse exchange rate fluctuations (Ebrahimi et al., 2021).

In contrast, smaller banks, which have fewer resources, are at greater risk of financial soundness decline under comparable circumstances. This can result in reduced lending capacity, increased nonperforming loans (NPLs), and decreased investor confidence in smaller institutions (International Monetary Fund, 2007).

Policymakers often design support mechanisms for the banking sector without differentiating between bank sizes. However, the needs of large banks differ significantly from those of small banks during exchange rate fluctuations. Regulatory guidelines may be necessary for the management of foreign operations and currency reserves by larger banks. Ebrahimi et al. (2021) assert that smaller banks require greater direct support and access to hedging instruments in order to withstand currency shocks.

This research has made numerous contributions. Primarily, it deviates from existing literature that predominantly focuses on examining the impact of exchange rates on specific financial soundness indicators of banks, such as return on assets (ROA), return on equity (ROE), or the ratio of nonperforming loans (NPL) (Bani Yousef et al., 2024; Cheluget et al., 2023). Instead, this study introduces a novel composite metric for evaluating bank financial soundness, drawing on research by the International Monetary Fund.

To the best of our knowledge, this study is among the first to empirically examine the impact of exchange rates on banks' financial soundness. This approach not only establishes a novel metric for evaluating banks' financial soundness, but also allows for an examination of how exchange rates affect banks’ financial soundness relative to their level (e.g., high or low).

Secondly, this study separately evaluates the influence of official and unofficial exchange rates on banks' financial soundness, as exchange rates in Iran are available in both official and unofficial forms. This innovation enables the differentiation of the effects of these exchange rates and elucidates how their distinct impacts affect the financial soundness of banks. In contrast, other research in the field typically employs a single exchange rate for analysis.

Thirdly, the scale of banks in Iran is heterogeneous, and the existing literature indicates that exchange rate fluctuations have a distinct impact on banks of varying sizes. Thus, differentiating banks by size can facilitate a more comprehensive understanding of their susceptibility to exchange rates.

Fourthly, from a data analysis perspective, the study employs sophisticated methodologies. The ARDL methodology is employed to investigate the dynamics of official and unofficial exchange rates, their nonlinear effects, and the impact of exchange rates based on ownership type and bank size. Quantile methodology is employed to investigate the effects of exchange rates (both official and unofficial) across different levels of financial soundness—categorizing banks into high, medium, and low financial soundness.

The study represents a significant improvement in understanding the intricate effects of exchange rates on the financial soundness of banks in Iran, resulting from the combination of these innovations. These innovative and insightful data compilations not only serve as a benchmark for the empirical examination of the effects of exchange rates and the progression of financial soundness in other emerging markets, but also underpin our analysis of the influence of exchange rates on financial soundness.

The remainder of of this paper is organized as follows. Section 2 provides the literature review, and Section 3 discusses the data analysis and methodologies. The empirical results are provided in Section 4. Finally, Section 5 closes the paper with concluding remarks.

Literature Review

Bani Yousef et al. (2024) investigated the correlation between foreign exchange (FOREX) risk and the financial performance of banks in the Middle East and North Africa (MENA) region. They explicitly examined the impact of exchange rate fluctuations on bank profitability and risk management practices using data from 135 banks across 14 MENA countries from 2015 to 2019. The research established a negative correlation between increased foreign exchange risk and bank performance. This implies that financial performance is generally lower for banks with a greater degree of exposure to FOREX risk. The adverse effects stem from the uncertainty and volatility caused by foreign currency fluctuations, which disrupt profit margins, particularly for banks active in foreign-denominated transactions. The paper underscores the significance of employing robust strategies to mitigate these risks. These include financial

hedging instruments such as forward contracts, swaps, and currency options, as well as diversifying liabilities denominated in foreign currencies. The findings also underscore the need to establish frameworks for the timely reporting of foreign exchange losses.

Cheluget et al. (2023) examined the effect of macroeconomic variables, specifically exchange rates and inflation rates, on the financial performance of Co-operative Bank of Kenya. The research employed a descriptive approach, examining both primary data collected through questionnaires from a sample of 120 respondents and secondary data from the bank's annual financial reports, the Central Bank of Kenya (CBK), the Kenya Bureau of Statistics, and World Bank reports. The data was analyzed from 2016 to the first quarter of 2022. The research was founded on liquidity preference theory, efficient market theory, and modern portfolio theory. It examines how exchange rates and inflation affect bank performance, as measured by indicators such as return on assets (ROA) and return on equity (ROE). Key findings from the regression analysis indicate that inflation has a positive relationship with bank performance, whereas exchange rates have a negative impact. Respondents generally agreed that exchange rates significantly affect bank performance and emphasized the need for policies to address balance-of-payments deficits. However, they maintained their neutrality regarding the direct influence of exchange rate fluctuations on ROE. The study also found that depreciation of the Kenyan currency negatively affects returns, and that credit and deposits are adversely affected by exchange rate volatility. The study found that inflation indirectly affects the banking sector by diminishing individuals' purchasing power, thereby limiting their capacity to save and invest. Bank performance is also significantly influenced by fluctuations in the Kenya shilling exchange rate, as currency depreciation can reduce bank profits. Recommendations include the government creating a supportive environment for financial institutions, especially given the impact of COVID-19, and the CBK developing monetary measures to neutralize the adverse effects of inflation and exchange rate fluctuations on bank performance. The study recommends additional research on the challenges that commercial banks face post-COVID-19, as well as the internal and external factors that influence bank performance.

Saleh et al. (2022) investigated the financial performance of banks in relation to foreign currency exchange rates, with a particular emphasis on the early implementation of IFRS 9. It underscored the importance of this subject in the context of globalization and international financial integration. The study evaluated the impact of exchange rate fluctuations on banks' profitability over

5 years (2013-2018) and assessed compliance with IFRS 9 using data from international banks. The document outlines the importance of understanding exchange rate risk to manage currency risk effectively, as well as the obstacles banks face when attempting to mitigate it. It notes that large banks, particularly those establishing international branches, are significantly exposed to these risks, which can impact their profitability. The study provides a detailed assessment by controlling for factors such as Return on Equity, bank size, and inflation. It also underscores the necessity for developing countries to adhere to international financial standards and the advantages of early compliance, as illustrated by the Malaysian example. In conclusion, the results indicate that exchange rate fluctuations significantly influence bank performance, and it is essential to implement effective financial reporting and risk management strategies to mitigate these effects.

Işık & Şendeniz-Yüncü (2022) conducted a study examining the impact of dollarization on the performance of Turkish banks from 2012 to 2017. The Generalized Method of Moments (GMM) was employed to analyze data from 26 banks operating in Turkey, and the research employed both static and dynamic panel data analyses. The results of the study suggest that deposit dollarization has a statistically significant negative impact on Return on Assets (ROA) and Return on Equity (ROE). Therefore the profitability of banks is negatively affected by increased deposit dollarization. Regarding credit dollarization, the results are less conclusive. Although some models indicate that credit dollarization has a detrimental effect on ROA and ROE, other estimates do not show a significant effect on bank performance. The authors conclude that their findings are consistent with the expectation that deposit dollarization can impede financial deepening and shift exchange rate risk onto credit risk in dollarized economies. The research is a valuable addition to the ongoing discourse regarding the relationship between dollarization and bank performance, with a particular emphasis on the Turkish banking sector.

Jackson et al. (2021) examined the relationship between exchange rate fluctuations, inflation, and the performance of commercial banks in Sierra Leone from 2009Q1 to 2020Q2. It employs Return on Equity (ROE) and Return on Assets (ROA) as indicators of bank performance, while inflation and nominal exchange rates are considered critical explanatory variables. The autoregressive distributed lag (ARDL) model is used in the analysis. The results suggest that inflation has a positive impact on the performance of commercial banks in Sierra Leone; however, exchange rate fluctuations exert a negative spillover effect on the banking sector and the broader economy. The

study emphasizes the obstacles Sierra Leone faces due to its substantial dependence on imported products, which exacerbate exchange rate pressures and inflationary trends driven by supply-demand imbalances. The findings indicate that the macroeconomic environment must be stabilized and exchange rate volatility managed through collaborative efforts among monetary authorities, including the central bank, and the government. By maintaining a stable exchange rate and mitigating inflationary pressures, the banking system can more effectively support sustainable growth and development in Sierra Leone. The study concludes by proposing specific policy measures to enhance the region's financial and macroeconomic stability.

The study conducted by Angela Obiageli (2021) concentrated on the impact of exchange rate fluctuations on the performance of deposit money banks in Nigeria. Key objectives of the research include examining the impact of nominal exchange rates, real exchange rates, interest rates, and exchange rate fluctuations on bank performance, with particular emphasis on their influence on Return on Assets (ROA). The study employs econometric methods, including Augmented Dickey-Fuller tests for unit roots, Granger cointegration analyses, and vector autoregression (VAR) estimates. It finds that both nominal and real effective exchange rates have a positive and significant effect on ROA. Conversely, exchange rate fluctuations and interest rates exert a negative but insignificant influence on bank performance. This suggests that, although banks' profitability is generally significantly influenced by exchange rates, fluctuations and variability in those exchange rates do not have a decisive impact. The study concludes that the banking sector's performance has been adversely affected by exchange rate dynamics, and investments have not been effectively facilitated during the period under analysis. The research recommends that banks in Nigeria could increase their deposit interest rates to mobilize more deposits from the economy's surplus sectors. It also implies that banks should prioritize mobilising savings by improving customer service, as savings are the primary funding source for deposit-taking banks. As a result, these measures are expected to enhance the financial sector's overall performance by mitigating the adverse effects of exchange rate fluctuations.

Seifollahi & Abrishami (2021) focused on the impact of economic growth and exchange rate volatility on banks, with particular emphasis on nonperforming loans (NPLs) and noncurrent receivables. This study examines data from 15 Iranian banks spanning 2008 to 2018. The banking industry in Iran is essential for financing due to the underdeveloped capital market. However, it faces challenges, primarily due to non-current receivables. The

generalized method of moments is used in conjunction with panel data and ordinary least squares in the econometric model of the study. Key findings indicate that exchange rate risk has a positive and significant impact on NPL, suggesting that exchange rate fluctuations exacerbate banks' credit risks. The Economic Growth Rate had a negative, significant impact, indicating that banks' nonperforming loans (NPLs) decline as economic conditions improve. In the same vein, the adverse effects of higher interest rates on non-current receivables suggest that favorable economic policies enhance banks' financial soundness. The research emphasizes the necessity for banks to mitigate credit risks by managing exchange rate fluctuations and aligning their financial strategies with economic development trends. This can result in enhanced operational efficiency and an improved role in financing the economy. In general, the research offers a comprehensive understanding of the ways in which macroeconomic factors influence the financial soundness and performance of banks, emphasizing critical areas in which management should concentrate to reduce the risks associated with exchange rate volatility and economic fluctuations.

Wulandari & Harjito (2021) investigated the impact of these three critical macroeconomic variables on the profitability of publicly listed Indonesian banks (state-owned and private). The study employs a quantitative approach and analyzes financial data from 2015 to 2019, with a particular emphasis on banks classified under the Commercial Banks Business Group (BUKU IV) that have core capital exceeding IDR 30 trillion. It employs panel-data regression analysis in EVIEWS to test its hypotheses. The research reveals that interest rates have a positive, significant effect on bank profitability. Higher interest rates lead to higher profitability through increased loan interest income. This aligns with previous literature highlighting the importance of interest rates to banks' revenue generation. Bank profitability is significantly and adversely affected by exchange rate fluctuations.

The Indonesian rupiah's depreciation increases foreign-currency liabilities and reduces debtors' repayment capacity, leading to liquidity issues and lower profitability. The capital structure, measured by the Debt-to-Equity Ratio (DER), has a positive and significant effect on profitability. This indicates that banks that rely more heavily on debt for operational funding can deliver higher returns to shareholders, provided risks are managed effectively. Interest rates, exchange rates, and capital structure jointly have a significant impact on bank profitability. Their interaction underscores the significance of concurrently regulating these macroeconomic variables. The research establishes that

interest rates positively influence profitability, while exchange rate volatility has a detrimental effect. Managing capital structure effectively contributes positively to profitability. The findings underscore the interconnectedness of macroeconomic factors and their critical roles in shaping banks' financial performance. It recommends that banks optimize their returns by implementing comprehensive risk management practices and aligning their strategies with macroeconomic conditions.

Delani & Turgut (2020) examined the impact of inflation and exchange rate fluctuations on the financial performance of four significant South African banks: Standard Bank, Nedbank, Capitec Bank, and Firstrand Bank, from 2003 to 2019. The study evaluates financial performance by using Return on Equity (ROE) as the dependent variable and inflation and exchange rates as independent variables. The analysis is conducted using advanced econometric models, including the ARDL (autoregressive distributed lag), FMOLS (Fully Modified Ordinary Least Squares), and DOLS (Dynamic Ordinary Least Squares) approaches. Inflation and ROE exhibit a significant inverse relationship. This suggests that the profitability and financial performance of South African banks are adversely affected by increased inflation. The relationship between exchange rate fluctuations and ROE is weak, suggesting that exchange rate volatility has a limited direct impact on these banks' financial performance. In conclusion, the research underscores the significant influence that macroeconomic conditions have on the financial soundness of South African banks. The paper emphasizes the necessity of a stable economic environment to facilitate sustainable growth and profitability in the banking sector.

Keshtgar et al. (2020) examines how fluctuations in exchange rates have impacted the performance of Iranian banks during the period 2007 to 2017. The research aims to understand the relationship between exchange rate volatility and a range of banking performance metrics in a country with a bank-based financial system. The study evaluates two critical performance criteria: profitability (measured by the capital return ratio) and liquidity (measured by the ratio of loans to total bank deposits) using panel data methodology. The GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model is employed to derive exchange rate fluctuations, enabling a comprehensive examination of volatility over time. Exchange rate volatility negatively and significantly affects banks' returns on capital. This underscores that operational and transaction risks are exacerbated by exchange rate fluctuations, which erode profitability. The research revealed a positive relationship between

exchange rate volatility and the loan-to-total-deposit ratio. This indicates that exchange rate fluctuations exacerbate banks' financial gaps, thereby heightening credit risk. As this financial gap widens, maintaining stable liquidity levels becomes more challenging. The study, consistent with previous research, posits that exchange rate volatility increases nonperforming loans, thereby increasing credit risk for banks. From a macroeconomic perspective, exchange rate volatility not only exacerbates broader economic instability but also poses direct risks to foreign-exchange-related banking activities. It influences both borrowers' and depositors' behavior, disrupting the overall soundness of the banking system. The study concludes by underscoring the importance of exchange rate soundness in promoting improved banking performance. Policymakers and banking institutions must establish strategies to effectively manage exchange rate risks, as the soundness of the Iranian banking sector depends on them. The findings underscore the broader implications of foreign currency fluctuations for financial soundness, providing valuable insights for regulators and economists operating in markets experiencing exchange rate volatility.

Tamizi (2020) investigated the impact of exchange rate fluctuations on bank deposit volume in Iran from 1986 to 2017. The study uses econometric models, such as ARCH/GARCH, to measure exchange rate volatility and employs the ARDL (autoregressive distributed lag) model to investigate both short- and long-term relationships. The results indicate that exchange rate volatility negatively impacts the volume of bank deposits in Iran. People are less inclined to deposit money in banks as exchange rates fluctuate, likely due to the uncertainty and risk associated with retaining value. Bank deposits are significantly and positively correlated with economic growth. This implies that when the economy expands, businesses and individuals are inclined to deposit more money in banks, likely a result of heightened financial soundness and confidence. The study underscores the significance of exchange rate policies in mitigating adverse effects on banking performance. It is concluded that the financial soundness of the banking sector can be enhanced by promoting deposit growth and mitigating exchange rate fluctuations through appropriate policy measures. Policymakers can improve public confidence in the banking system, reduce risk perception, and promote savings by stabilizing exchange rates. The research emphasizes that bank deposits are a crucial funding source for financial institutions and that their soundness is essential to economic development and growth.

Sinaga et al. (2020) investigated the financial performance of Sudanese

banks from 2002 to 2017 in relation to exchange rate fluctuations. This study, which was conducted by Elhussein & Osman, examines the nature and direction of the relationship between exchange rate volatility and banking performance. The study covers all 37 operational banks in Sudan during the analysis period. It is based on secondary data from consolidated financial reports and official publications from the Central Bank of Sudan and the Ministry of Finance. In addition to diagnostic tests, the research employs econometric techniques, including Ordinary Least Squares (OLS), Generalized Least Squares (GLS), and Autoregressive Distributed Lag (ARDL) models, alongside diagnostic tests to validate the models. The findings reveal that the financial performance of Sudanese banks is only slightly negatively affected by fluctuations in exchange rates. Sudan's economic isolation due to international sanctions has had a limited impact, as it has been unable to integrate into the global financial system fully.

As a result, Sudanese banks were largely insulated from international currency exchange risks, engaging instead in mainly domestic transactions. The chronic devaluation of the Sudanese Pound is also emphasized in the study, further restricting the banking sector's performance. For instance, in 2012, the Sudanese Pound was devalued by 91% to address the discrepancy between official exchange rates and the parallel market. However, the difference between the two rates continued to widen dramatically, exacerbating economic uncertainty. The research suggests that the Sudanese banking system is predominantly domestic and lacks the competitive investment environment necessary to attract significant foreign funds or foreign direct investment (FDI). This limits its ability to reduce the risks associated with exchange rate fluctuations. Fluctuations in exchange rates, which can lead to unpredictable profits or losses, are critical to banks' financial soundness. However, due to Sudan's isolation, exposure to such risks was relatively minimal during the period studied. The research emphasises the significance of economic reforms and stable exchange rate policies in enhancing the performance of Sudanese banks. The banking sector's effectiveness can be enhanced by addressing issues such as exchange rate mismanagement and by establishing a more favorable investment climate through integration with the international financial system. The study concludes by suggesting that Sudanese banks should implement policies to stabilize the economy and conduct more rigorous surveillance of exchange rate fluctuations. This would help them manage risks and improve their financial performance.

In their 2019 study, Elhussein & Osman investigated the financial

performance of Sudanese banks from 2002 to 2017. They investigated the influence of exchange rate fluctuations on this performance. This paper utilized secondary data from financial reports and official publications to examine all 37 operating banks in Sudan. The relationship between exchange rate fluctuations and financial performance indicators is analyzed using econometric techniques, including Ordinary Least Squares (OLS), Generalized Least Squares (GLS), Autoregressive Distributed Lag (ARDL), and diagnostic tests. The findings show that exchange rate fluctuations have a weak negative effect on the profitability of Sudanese banks. This is ascribed to the economic embargo on Sudan that was in effect during the study period. It isolated the country from international financial systems and restricted cross-border banking activities. Consequently, Sudanese banks were mainly protected from the risks associated with global currency fluctuations.

Additionally, the continuous devaluation of the Sudanese Pound, along with low levels of foreign direct investment (FDI), created an uncompetitive investment environment and restricted the country's banking system largely to domestic operations. Sudan's exchange rate policies have been historically contextualized in the study, which includes a transition from a fixed to a flexible system and numerous devaluations of the Sudanese Pound, including a 91% devaluation in 2012. Despite efforts to stabilize the exchange rate, the disparity between the official and parallel market exchange rates increased considerably, reaching 184% by 2017. The banks' capacity to effectively manage risks and participate in the foreign exchange market was adversely affected by this devaluation. The paper emphasized the essential role of macroeconomic stability in bank performance. Although Sudanese banks were relatively insulated from external exchange rate shocks, their profitability and competitiveness were impeded by the domestic economic instability, currency devaluation, and limited integration with international financial markets. The study concludes by underscoring the significance of effective exchange rate management and of enhancing the domestic investment environment to improve the financial performance of Sudanese banks.

Using the 2015 Swiss franc (CHF) appreciation shock as a natural experiment, Agarwal (2018) examined the effects of exchange rate fluctuations on banks and the broader economy. The study identifies a "bank-lending channel" in which banks' lending capacity is influenced by exchange rate shocks, depending on their balance-sheet exposure to foreign currencies. In particular, the negative impact of currency appreciation on firms associated with banks with a higher ratio of foreign currency liabilities to assets was

partially mitigated by an increase in credit supply during the currency appreciation. This finding is in direct opposition to conventional theories that posit that depreciation consistently enhances real activity by enhancing export competitiveness. The study shows that the franc's appreciation had heterogeneous effects on firms: those that were dependent on banks with increased credit supply were able to invest more, thereby counteracting the adverse effects. Conversely, other sectors experienced negative consequences. This was demonstrated using Swiss bank data. The study suggests that a bank's foreign currency exposure can account for the diverse economic responses to exchange rate shocks across countries and time periods by extending the analysis to historical exchange rate events (1950–2016). In general, the results emphasize the intricacies of exchange rate impacts, which extend beyond the trade and corporate balance sheet channels. They also disclose the significant role of banks' foreign currency exposure on economic outcomes during currency shocks. The research contributes to understanding the nuanced mechanisms behind exchange rate policies and their implications for emerging and advanced economies.

A concise summary of the primary distinctions between our article and the main empirical studies that are referenced in it is provided in Table 1:

Table 1. Key differences between this study and related empirical studies

Study / Feature	Financial Soundness Indicators Used	Type of Exchange Rate Analyzed	Bank Size Considered	Methodology	Main Distinction / Innovation
The current study	Composite Index (based on IMF FSIs: capital adequacy, asset quality, profitability, liquidity)	Both official and unofficial exchange rates (analyzed separately)	Yes (explicit effects by bank size and financial soundness level)	ARDL & quantile regression (1996-2023)	- Creates a novel composite financial soundness index – Differentiates between official and unofficial exchange rates - Evaluates the impact of bank size and solvency on nonlinear and heterogeneous effects - Utilizes sophisticated quantile regression methodologies to surpass conventional profitability metrics

Bani Yousef et al. (2024).	Profitability only (ROA, ROE, and NPLs)	Single (FOREX) exchange rate	No	Panel data (2015-2019)	- Focused solely on profit and risk management, without distinguishing between different forms of exchange rates or taking into account the size of the bank
Elhussein & Osman (2019).	Traditional profitability indicators	Single exchange rate (Sudanese Pound)	No	OLS, GLS, ARDL (2000–2016)	The study focused on Sudan and identified a mild effect of isolation. It did not employed composite indicators or analyze by bank size.
Agarwal (2018)	Bank lending channel exposure	Foreign currency exposure/shocks	Yes (foreign currency exposure as a proxy for size/importance)	Event study & cross-country analysis (2005–2015)	Highlighted the lending channel and the firm's impact from bank exposure, distinctive in its use of the Swiss franc shock as a natural experiment.
Cheluget et al. (2023).	Profitability & NPLs	Single exchange rate (Kenyan shilling)	No	Traditional econometrics (2016–2022)	The research exclusively examines the direct impact on profit and NPL; there is no differentiation based on bank size or composite index.
Ebrahimi et al. (2021)	Traditional financial ratios	Single exchange rate	Partially (aggregate analysis, not detailed by size or soundness)	Panel data (2000–2018)	Examined the performance of banks using exchange rates, but does not provide a detailed stratification based on size, soundness or composite metrics

This paper establishes a composite financial soundness indicator that complies with the International Monetary Fund (IMF) guidelines. It also investigates the distinct impacts of both official and unofficial exchange rates on Iranian banks, taking into consideration the size and soundness level of the

banks. Using ARDL and quantile regression, it reveals nonlinear and heterogeneous relationships often overlooked in prior work.

Three primary deficiencies are present in existing research on banking soundness and exchange rates, particularly in Iran and comparable emerging markets:

1. Single exchange rate focus: The majority of analysts neglect the coexistence of parallel-market rates, each with distinct macro-financial transmission channels, and rely solely on the official rate. This poses a risk of biased or incomplete inference in economies such as Iran.
2. Neglecting structural heterogeneity by size: Effects are typically modeled uniformly, disregarding asymmetries in risk management capacity, hedging access, and foreign-currency exposure between large and small banks. This threshold effect can alter the sign and magnitude of exchange-rate impacts.
3. Narrow performance metrics: A significant portion of the literature focuses on a single indicator (ROA, ROE, NPL ratio), neglecting broader aspects of stability, such as capital adequacy, liquidity resilience, and income sustainability.

These deficiencies are rectified through this investigation:

- Separately modeling official and unofficial rates to account for their unique influences;
- Reflecting heterogeneous responses by incorporating bank size and its interaction with exchange rates;
- Constructing a composite soundness index from IMF Financial Soundness Indicators for a multidimensional, policy-relevant evaluation.

By incorporating multiple exchange-rate measures, structural heterogeneity, and a holistic stability metric, the analysis provides a more comprehensive, empirically grounded comprehension of the impact of currency movements on banking soundness in multi-rate economies with diverse institutional profiles.

Research Methodology

Data Description

Our dataset comprises macroeconomic and bank-level data from two distinct sources. First, we utilize data from the Iran Banking Institute regarding banks. Second, we use economic data from the Central Bank's time-series database. Our final dataset is illustrated in Table 2.

Table 2. Number of banks and observations

Bank name	Establishment year	Number of observations during 1996–2023
Iran Zamin	2011	12
Pasargad	2005	18
Parsian	2001	22
Middle East	2012	11
Eghtesad Novin	2001	22
Tejarat	1979	27
Tose’e Ta’avon	2009	14
Export Development Bank of Iran	1991	27
Day	2010	13
Refah Kargaran	1960	27
Saman	2002	21
Sepah	1925	27
Sarmayeh	2005	18
Sina	2008	15
Shahr	2008	15
Saderat	1952	27
San’at va Ma’dan (Industry & Mine)	1977	27
Gharzolhassaneh Ressalat	1997	26
Gharzolhassaneh Mehr	2008	15
Gardeshgari (Tourism Bank)	2010	13
Maskan (Housing Bank)	1979	27
Mellat	1980	27
Melli (National Bank of Iran)	1978	27
Karafarin	1999	24
Keshavarzi (Agriculture Bank)	1933	27
Post Bank	1996	26

The sample comprises 27 banks in Iran, which were observed annually from 1996 to 2023. The number of observations for each bank is proportional to the number of years for which comprehensive data is available, with a range of 11 to 27 annual observations per bank, contingent upon the year of establishment. This structure produces an unbalanced dataset with over 600 bank–year observations. This size is deemed sufficient for the econometric techniques used in the study, which include ARDL and quantile regression, as it provides sufficient degrees of freedom and statistical power to identify relationships among exchange rate variables, bank size, and financial soundness across various quantiles. The inclusion of both older, well-established banks and newer entrants encompasses a wide cross-section of institution sizes, governance structures, and operational histories, thereby enhancing external validity. Additionally, the dataset is representative for robust inference due to its temporal coverage, which encompasses multiple macroeconomic cycles, exchange rate regimes, and regulatory adjustments.

A new variable for financial soundness has been developed in line with the existing literature on bank financial soundness. As a composite indicator, this metric is predicated on the 2019 Financial Soundness Indicators Compilation Guide (2019 FSIs Guide)[1]. The $new\ financial\ soundness$ is the dependent variable. To investigate the nonlinear effect of the exchange rate, we have used the

$official\ exchange\ rate^2$ and

$unofficial\ exchange\ rate^2$. Dynamic explanatory variables include the $official\ exchange\ rate^2$ and the

$unofficial\ exchange\ rate^2$.

The inclusion of interaction variables, such as exchange rate $\times$ size^2, is based on both theoretical reasoning and empirical evidence regarding the nonlinear and size-dependent effects of exchange rate movements on the financial soundness of banks.

Prior literature (e.g., IMF, 2007; Ebrahimi et al., 2021) indicates that, from a theoretical perspective, banks' capacity to absorb and manage exchange rate shocks is influenced by their size. Larger banks generally possess more

[1] International Monetary Fund (2019). Financial Soundness Indicators Compilation Guide. International Monetary Fund, publisher.

sophisticated risk management capabilities, diversified revenue streams, and improved access to hedging instruments. Nevertheless, this benefit is not infinite. Operational complexity, potential inefficiencies, and increased exposure to foreign-denominated liabilities can introduce vulnerabilities that offset stability advantages beyond a certain scale. The interaction's squared size term captures this threshold effect, enabling us to simulate an inverted U-shaped relationship in which the marginal benefit of size diminishes and may even reverse at higher levels.

The exploratory analysis of our dataset (1996–2023) from an empirical perspective demonstrated that the marginal effect of exchange rate changes on financial soundness varies systematically with bank size, and this variation is nonlinear. The model could potentially obscure critical inflection points in the exchange rate–size–soundness nexus by constraining these effects to be linearly proportional, in the absence of a squared term. The interaction term thus allows us to:

1. Explicitly evaluate the presence of such thresholds.
2. Distinguish between small, medium, and large banks in terms of their susceptibility to currency fluctuations.
3. Determine the policy-relevant bank size ranges in which exchange rate volatility has the most significant stabilizing or destabilizing effects.

This specification is further supported by significant coefficients on the interaction terms and confirmed by heterogeneity tests (Quantile Slope Equality and Symmetry Tests), which demonstrate that banks' responses to exchange rate shocks vary not only by size but also by the quantile of financial soundness, in a nonlinear pattern.

The subsequent set of fixed explanatory variables is included in accordance with previous research. The impact of the exchange rate may vary by bank size, and the effect may be nonlinear. Therefore, we employ the term "interaction" to refer to the relationship between $official\ exchange\ rate \times size^2$ and $unofficial\ exchange\ rate \times size^2$. Secondly, we incorporate the $liquid\ asset\ to\ total\ assets$,$loans\ to\ total\ assets$, $due\ to\ banks\ to\ total\ liabilities$, $and\ investment\ deposits\ to\ total\ liabilities$ as a combination of assets and liabilities. Finally, we incorporate $economic\ growth$ and $stock\ price$ as macroeconomic variables.

Construction of New Financial Soundness

A novel financial soundness indicator is developed. Table 3 displays the financial soundness indicators used to develop the new financial soundness.

Table 3. Financial soundness indicators

Core indicators category	Indicator	Definition	Data Source
Capital Adequacy	Regulatory capital to risk-weighted assets	Ratio of total regulatory capital (Tier 1 + Tier 2) to RWA; measures capacity to absorb losses and meet Basel capital adequacy rules.	Audited bank financial statements; risk-weighted asset calculations under Basel guidelines
	Tier 1 capital to risk-weighted assets	Ratio of highest-quality capital (CET1 + AT1) to RWA; focuses on core loss-absorbing capacity.	Supervisory returns; capital adequacy templates; bank balance sheets and regulatory filings
Asset Quality	Nonperforming loans to total gross loans	Share of loans in default relative to total loans, showing credit risk level.	Loan portfolio details from banks
Earning and Profitability	Return on assets (ROA)	Net income after tax as % of average total assets, showing efficiency of asset use.	Income statement and balance sheet data; bank annual reports
	Return on equity (ROE)	Net income after tax as % of average shareholders' equity, measuring return to owners.	Income statement, changes in equity reports, and bank annual reports
	Interest margin to gross income	Net interest income as % of total gross income, indicating reliance on interest vs. other sources.	Income statement; interest income and expense breakdowns; bank annual reports
Liquidity	Liquid assets to total assets	Ratio of cash and readily marketable assets to total assets; measures short-term resilience.	Balance sheet data; bank annual reports
	Liquid assets to short-term liabilities	Ratio of liquid assets to short-term liabilities; measures ability to meet short-term obligations.	Balance sheet data; bank annual reports

Notes: Financial integrity indicators were introduced using the IMF (2019). However, the selected indicators can be calculated using the data the banks have disclosed. The financial integrity indicators did not include sensitivity to market risk, as it could not be calculated using the disclosed data.

The Composite Financial Soundness Index (CFSI) was developed in this study to provide a unified, comprehensive assessment of the banking system's overall soundness. The subsequent procedures composed the construction process:

1. Financial statement aggregation: To gain a comprehensive understanding of the banking sector, we began by combining the financial statements of all banks in the sample.
2. Primary indicators computation: Table 1 contains eight financial soundness indicators. These indicators encompass the primary components of banking soundness, including capital adequacy, asset quality, profitability, and liquidity.
3. Normalization of indicators: Equation 1 was employed to normalize each indicator over its minimum and maximum values from 1996 to 2023:

$$I_{ti} = \frac{X_{it} - \min(X_{it})}{\max(X_i\text{t}) - \min(X_i\text{t})} \quad (1)$$

i represents each financial soundness indicator. I_{ti} is normalized financial soundness indicators in Table 1. X_{it} is one of the financial soundness indicators. $\min(X_{it})$ is the minimum financial soundness indicator during 1996-2023. $\max(X_i\text{t})$ is the maximum value of the financial soundness indicator from 1996 to 2023.

Fourth, a novel financial soundness indicator is developed using Equation 2.

$$new\ financial\ soundness_t = \frac{\sum_{t=0}^{t=t} I_{ti}}{n} \quad (2)$$

n is the number of indicators, which is 8. The $new\ financial\ soundness_t$ is between -1 and 1. Low financial soundness is indicated by the $new\ financial\ soundness$ between 0 and -1, while robust financial soundness is indicated by the $new\ financial\ soundness$ between 0 and 1.

Rationale for Selecting Eight Indicators and Excluding Market Risk Sensitivity:

- Selection of eight indicators:

Eight indicators were selected based on four primary criteria:

1. Coverage of the fundamental dimensions of the Basel framework and the IMF's core FSIs, which include capital adequacy, asset quality, profitability, and liquidity;
2. Availability and data consistency over a lengthy historical period (1996–2023);
3. Empirical relevance in both domestic and international literature as reliable early-warning indicators of banking sector soundness;
4. Compatibility with aggregated data sources eliminates the necessity for confidential transaction-level or detailed securities portfolio data.

- Exclusion of market risk sensitivity:

Although market risk sensitivity is a critical element of the Basel III framework, it was excluded from this investigation for the following reasons:

1. A lack of comprehensive and consistent historical data regarding market-value fluctuations in assets and banks' securities portfolios during the study period.
2. The institutional focus is on Iran's Islamic banking system, where the proportion of high-volatility capital-market activities in bank balance sheets is considerably lower than in conventional banking systems due to Sharia-compliant financing structures.
3. The CFSI's primary objective is to maintain long-term stability, and numerous market-related risks are indirectly represented in other indicators, such as liquidity and asset quality ratios.

In summary, the selection of these eight indicators achieves a balance between the structural characteristics of Iran's Islamic banking sector, comprehensive coverage of financial soundness dimensions, data quality and availability. The CFSI's stability and comparability over the long run are improved by minimizing volatility induced by short-term market fluctuations and by excluding market risk sensitivity.

Descriptive Statistics

Table 4 presents summary statistics for the variables used in the study. The new financial soundness variable, exchange rate variables, bank performance variables, and macroeconomic variables are the primary focus of our analysis. We have observed that during 1996-2023, the *new financial soundness*

exhibits a mean of 0.51. So the financial soundness of Iranian banks is at an average level. Regarding the banks' performance variables, liquid assets account for a mean of 10.6% of total assets, and loans account for a mean of 66.6 % of total assets in the Iranian banking system. Initially, this statistic shows that Iranian banks are unable to serve consumers during periods of sudden bank deposit withdrawals, due to a low liquid-asset-to-total-asset ratio. Secondly, banks' credit risk may rise in the future if the loan-to-asset ratio exceeds 50%. Thirdly, the profitability of Iranian banks may be positively affected by a loan-to-total-assets ratio exceeding 50%. Interest income accounts for 88% of the total income. This statistic shows that Iranian banks primarily focus on interest income rather than non-interest income. The reason is the absence of contemporary financial instruments within the Iranian banking system. The investment represents an average of 81.3% of total liabilities. This statistic affirms that banks possess sufficient long-term resources to offer facilities. Secondly, banks' liquidity risk will increase in future periods due to the maturity mismatch.

Table 4. Descriptive statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	N	Mean	Std.Dev	P1	P2	P3
new financial soundness	26	0.510	0.206	-0.046	0.071	-0.469
Exchange rates:						
official exchange rate	26	16420.81	14522.23	0.296	0.407	0.189
non − official exchange rate	26	40222.31	65135.37	0.215	0.385	0.342
Bank's performance variables:						
size	26	5.241	0.351	0.277	-0.279	0.291
liquid assets to total assets	26	10.676	5.590	0.442	0.214	0.053
loan to total assets	26	66.652	0.569	-0.425	-0.219	0.243
due to banks′ total liabilities	26	1.586	1.789	0.168	-0.379	-0.226
investment deposit to total liabilities	26	81.394	4.819	-0.261	0.264	0.339
interest income to total incomes	26	88.686	7.094	-0.303	-0.144	0.396
Macroeconomic variables:						
inflation	26	18.707	7.748	0.186	-0.330	0.270
economic growth	26	6.088	3.889	-0.209	0.321	-0.281
stock price index	26	30324.39	26123.10	0.377	-0.244	-0.038

Notes: Table 4 reports selected descriptive statistics for the variables included in the analysis.

New financial soundness is the composite of financial soundness indicators.

The official exchange rate is the rate set by the Iranian government.

unofficial exchange rate is the rate at which currency is bought and sold in the informal, non-governmental market.

size is the natural logarithm of total assets.

The liquid asset – to – total assets ratio is the ratio of liquid assets to total assets.

Loan – to – total – assets is the ratio of loans to total assets.

The ratio of due to banks to total liabilities is the ratio of due to banks to total liabilities.

Investment deposit to total liabilities is the ratio of investment deposit to total liabilities.

Interest income to total income is the ratio of interest income to total income.

Inflation is the percentage change in the CPI index.

Economic growth is the annual rate of change in GDP.

The stock price index, which is used to measure the stock market's overall performance, is calculated by dividing the current value of the stock market for the specified period by the current value of the stock market in the base year, then multiplying the result by 100.

Table 5 presents descriptive statistics for the variables used in our study across banks with high and low financial soundness. We observe that low-financial-soundness banks exhibit higher loan – to – total assets ratios than high-financial-soundness banks. This evidence underscores the significance of credit risk management for banks. Furthermore, low financial soundness banks exhibit higher ratios of banks to total liabilities, lower investment deposits to total liabilities, and lower interest income to total incomes, relative to high financial soundness banks.

This finding indicates that banks with low financial soundness levels exhibit higher liquidity risk and interest expense than those with high financial soundness levels. Therefore, liquidity risk management and asset and liability management are crucial for banks with inadequate financial soundness.

Table 5. Descriptive statistics-subsamples

	High Soundness		Low Soundness		Difference	T-statistic
	Mean	Std.Dev	Mean	Std.Dev		
new financial soundness	0.366	0.391	0.136	0.169		2.075**
Exchange rates:						
official exchange rate	521.317	3484.701	892.394	5252.883		-1.189***
unofficial exchange rate	1269.272	1351.77	2193.573	17405.42		-2.772**
Bank's performance variables:						
size	1.980	2.473	2.184	2.565		-2.067*
liquid assets to total assets	5.234	9.004	6.190	12.12		3.059**
loan to total assets	23.352	3.094	65.190	12.125		-3.326**
due to banks′ total liabilities	23.496	6.541	24.257	6.585		-2.381*
investment deposit to total liab	62.003	31.958	61.196	30.464		-2.532***
interest income to total income	53.011	40.242	51.098	40.592		3.757*
Macroeconomic variables:						
inflation	9.327	11.214	9.845	11.196		-0.546
economic growth	1.241	3.130	1.361	3.176		0.179
stock price index	16318.43	25481.71	18391.55	26541.19		0.677

Notes: Table 5 reports the mean, standard deviation, and test of difference in means for variables included in the analysis and for subsamples of banks with high and low financial soundness. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table A1 presents the correlations among the study variables (Appendix A). A negative, statistically significant correlation exists between the official

and unofficial exchange rates and the new financial soundness variable for our bank. This outcome demonstrates the significance of exchange rate management in Iran. Furthermore, there is a negative, significant correlation between new financial soundness and the loan-to-total-assets ratio. This evidence results from the fact that the ratio of loans to total assets decreases financial soundness as the number of loans increases, which in turn leads to an increase in nonperforming loans. The correlation between new financial soundness and economic growth is both negative and significant. As economic growth rises, demand for loans increases, which can lead to higher nonperforming loans and greater credit risk for banks. Subsequently, banks' financial soundness diminishes.

The unit root test is the initial supposition of the autoregressive distributed lag model. The autoregressive distributed lag model can be used in situations where all variables are stationary at the level or at the first difference, or where some variables are stationary at the level and others at the first difference. The variables should not be of the second difference type (I(2)). Various methods of stationarity testing are used in time series models to assess data stationarity. The time series method employs the following tests: the ordinary Dickey-Fuller, the augmented Dickey-Fuller, the Phillips-Perron, the Kiatkowski-Phillips-Schmidt-Shin (KPSS), and the Elliott-Rothenberg-Stock Point Optimal. Table A2 displays the results of the unit root test.

It is imperative to conduct a long-run relationship test after the unit root test. Traditional methods of estimating the cointegrating relationship, such as Engle-Granger (1987) and Johnson (1991, 1995), require that all variables be I(1) and that there is sufficient information to determine which are stationary at the level and which are stationary with one difference. To resolve this issue, Pesaran & Shin (1999) proposed a novel approach based on the autoregressive distributed lag (ADL) model. This approach enables the utilization of variables with varying degrees of cointegration. Additionally, the Pesaran & Shin model allows for variable-specific lag lengths. In an effort to ascertain whether there is a long-term relationship between the dependent variable and the explanatory and control variables in the ARDL model, Pesaran, Shin, and Smith (2001) proposed the bounds test, which is based on cointegration. The null hypothesis of this test is that a long-term relationship exists. The results of this test indicate that the null hypothesis is unacceptable and that a long-term relationship exists. Table A3 displays the findings.

Econometric specification

We suggest that Equation 3 be used to investigate the impact of exchange rates (both official and unofficial) on the financial soundness indicator:

$$\begin{aligned} \boldsymbol{soundness_t} = {} & \boldsymbol{\beta_0} dynamic\ explanatory\ variable_t \\ & + \boldsymbol{\beta_1} Main\ Fixed\ explanatory\ variable_t \\ & + \sum_{\boldsymbol{i=1}}^{\boldsymbol{i=3}} \boldsymbol{\beta_i}\ other\ Fixed\ explanatory\ variables_{\boldsymbol{t}} + \varepsilon_t \end{aligned} \quad (3)$$

The dynamic explanatory variable will be one of the $official\ exchange\ rate$s and

$unofficial\ exchange\ rate$. Also, the main fixed explanatory variables in different estimations will be $of\ ficial\ exchange\ rate^2$, $unofficial\ \ exchange\ rate^2$, $official\ exchange\ rate\ \times\ size^2$, $and\ unofficial\ exchange\ rate\ \times\ size^2$. Other fixed variables are: size, liquid assets to total assets, loan to total assets, due to banks to total liabilities, investment deposits to total liabilities, interest income to total income, inflation, economic growth, and stock market index. ε_t is the error term.

Official and unofficial exchange rates will allow us to examine the direct effects of exchange rates on banks' financial soundness. $The\ official$ and $unofficial\ exchange\ rate^2$s indicate the nonlinear impact of exchange rates on banks' financial soundness. $Official\ exchange\ rate \times size^2$ and $unofficial\ exchange\ rate \times size^2$ indicate the interaction term between the official and unofficial exchange rate and the size of banks. The interaction term between exchange rates and bank size enables us to investigate the indirect impact of banks' financial soundness on exchange rates via bank size.

Therefore, we have varying estimates of Equation 3. Initially, the ARDL method was employed to investigate the dynamics of the effect of official and unofficial exchange rates on the financial soundness of banks. Secondly, to investigate the effect of the exchange rate on the financial soundness of banks, taking into account the degree of financial soundness (low, medium, and high), Equation 1 has been estimated using the Quantile method.

Following the methodology of Pesaran, Shin, and Smith (2001), the autoregressive distributed lag (ARDL) models were estimated. Optimal lag lengths for each variable in the ARDL framework were selected using the Akaike Information Criterion (AIC) to balance model fit and parsimony. The process entailed estimating the unrestricted ARDL model with up to 4 lags for both dependent and independent variables, followed by iteratively selecting the lag structure that minimized the AIC. This approach ensures that the selected model captures the dynamic adjustments between exchange rates, bank size, and financial soundness without over-parameterization.

Three conditional quantiles of the financial soundness distribution were chosen for the quantile regression analysis: the 25th percentile (Q25), the 50th percentile (median, Q50), and the 75th percentile (Q75). These quantiles were chosen to capture the heterogeneous effects of official and unofficial exchange rates, as well as their interaction with bank size, across banks with low, medium, and high levels of financial soundness.

The Q25 group is primarily composed of state-owned banks with relatively weaker soundness indicators, while Q50 includes banks with moderate performance. Q75 is primarily composed of private or formerly state-owned banks with higher soundness metrics. Quantile-specific models were estimated with identical sets of regressors, including both the direct and indirect (interaction) terms, allowing for slope comparison across quantiles using the Koenker & Bassett (1982a) slope equality test and the Newey & Powell (1987) symmetry test.

The nuanced identification of both short- and long-run dynamics and cross-sectional heterogeneity in the relationship between exchange rate fluctuations and bank financial soundness is facilitated by the combined approach of robust lag selection for ARDL and targeted quantile specifications.

Results and Discussion

Main Results

The results of the various estimations of Equation 1 are presented in Table B1 (Appendix B). In Panels A and B of Table B1, the official and unofficial exchange rates are dynamic explanatory variables. Columns 1 and 2 in Panel A examine the direct and indirect effects of the official exchange rate on the banks' new financial soundness without control variables and with control

variables, respectively. In Panel B, columns 3 and 4 investigate the direct and indirect effects of the unofficial exchange rate on the new financial soundness of banks, respectively, with and without control variables.

To investigate the indirect effects of the official and unofficial exchange rates on bank size, we expand our baseline model to include each exchange rate and their interaction with $size^2$. We employ $size^2$ to investigate whether the financial soundness of banks is nonlinearly related to their size across varying exchange rates. Columns 1 and 2 illustrate the effects of the $official\ exchange\ rate \times size^2$ in the absence of control variables and with control variables, respectively. Also, columns 3 and 4 show the effects of $unofficial\ exchange\ rate \times size^2$, with and without control variables, respectively. The results suggest an inverse U-shaped relationship between exchange rates and banks' new financial soundness through size. Given that the influence of these variables diminishes as they are estimated in conjunction with the control variables. This matter underscores the significance of control variables.

The coefficients in all estimations demonstrate that the exchange rate's influence diminishes as control variables are incorporated. This result underscores the importance of control variables in determining banks' financial soundness.

The direct impact of exchange rate fluctuations on banks' financial soundness is further substantiated by the statistical significance of the coefficients for official exchange rate lags (columns 1 and 2). For instance, the exchange rate (-3) in column 1 exhibits a robust positive correlation with financial soundness, with a coefficient of 0.858 (p=0.0688). Similarly, the exchange rate (-1) in column 2 also exhibits a positive contribution of 0.256 (p=0.0689). The interaction term between the official exchange rate and size² indicates a negative impact on financial soundness. In both models, coefficients such as -0.439 and -0.456 (columns 1 and 2) highlight nonlinear behavior, indicating that larger sized banks experience diminished financial soundness when official exchange rates increase drastically.

Column 3 coefficients, such as 0.125 (p=0.0474) and its lag terms, corroborate statistical significance over multiple periods, suggesting that the unofficial exchange rate has a positive direct impact. For instance, the unofficial exchange rate lag (-3) exhibits the highest positive coefficient (0.978 (p=0.0287)), which suggests that it is resilient over time. This implies that

banks are exposed to significant long-term vulnerabilities due to unofficial exchange rates. Nevertheless, the squared term of unofficial exchange rates (-0.297 (p=0.0363) in column 3) indicates an inverse relationship, suggesting that long-term financial soundness is negatively impacted by excessive volatility or drastic changes in unofficial rates.

The interaction between bank size and exchange rates illustrates the nonlinear character of exchange rate impacts. For instance, column 3 illustrates the positive contribution of size × unofficial exchange rate lagat ١,٣٤٦ .(p=٠,٠٤٧٨) When unofficial rates fluctuate moderately, larger banks appear to benefit more; however, this advantage is diminished by extreme exchange rate volatility. Financial soundness is independently correlated with bank size, as evidenced by coefficients of 0.389 (p=0.0352) and 0.402 (p=0.0047) in columns 3 and 4.

The financial soundness of banks is significantly influenced by several financial ratios, as outlined below. A positive relationship (0.892 in column 3, p=0.0409) between Liquid Assets to Total Assets and financial soundness suggests that banks with higher liquidity levels are better able to absorb exchange rate shocks and maintain resilience. A negative correlation (-0.540 in column 3, p=0.0457) between financial soundness and Loans to Total Assets indicates that financial soundness is diminished by an excessive reliance on lending activity, which may be attributed to nonperforming loans during currency volatility. The negative correlation (-0.331 in column 3, p=0.0166) between Interest Incomes to Total Income and financial soundness implies that banks that are excessively reliant on interest-generated revenues are more susceptible to exchange rate risk, particularly in the context of inflation and repayment challenges. The financial soundness of the banks, and the positive coefficient (0.626 in column 4, p=0.0297) for Investment Deposits to Total Liabilities, indicate that high investment deposits buffer financial shocks and stabilize institutions.

The model's macroeconomic indicators contribute to the understanding of broader banking vulnerabilities. Inflation consistently has a negative and significant impact on financial soundness (-0.316 in column 3, p=0.0217), as it increases operational costs and customer repayment risks. Financial soundness is also negatively correlated with economic growth rates (-0.218 in column 3, p=0.0000), suggesting a delayed recovery in volatile exchange rate environments. Conversely, the stock price index exhibits statistically significant positive coefficients in all models (e.g., 5.689 in column 1,

p=0.0000). This suggests that the performance of the equity market directly influences banking soundness.

Robustness Checks

In this section, we expand our analysis by investigating the robustness of our primary findings. The sample was divided using the quantile method. We investigate the impact of the official and unofficial exchange rates on banks' financial soundness ratings (high, median, and low).

Results of the Quantile Method

We divided the sample using the Quantile regression method, as our findings may be contingent upon the financial soundness rating. We employ the Quantile Slope Equality Test and the Symmetric Quantiles Test to determine whether the effects of official and unofficial factors on bank soundness are contingent on their soundness rating (high, median, or low). Our sample is non-identical and independent, which is why we use the Huber-Sandwich method to estimate the covariance. Kernel is the sparsity technique, while Hall-Sheather is the bandwidth method. The best estimation method was selected based on the Pseudo R-squared, Quasi-LR statistic, Normality Test, and Ramsey Test. The quantile method is employed to estimate the result of Equation 1, as shown in Table B2.

The results of the Quantile method, which divides the banks' financial soundness levels into Q25, Q50, and Q75, are presented in Table B2. The direct effect ($official\ exchange_{it}$ and $unofficial\ exchange_{it}$) and indirect effect of exchange rates ($official\ exchange_{it} \times size^2$ and $unofficial\ exchange_{it} \times size^2$) are also included.

Panels A and B report the estimation results, taking into account our key exchange rate variables: Official exchange rate, $official\ exchange\ rate^2$, and $official\ exchange\ rate \times size^2$. In each panel, columns 1 and 4 report the regression results for the subsample in which the variable $soundness_{it}$ is below the sample median (Q25). Similarly, columns 2 and 5, report the regression results for the subsample, where the $soundness_{it}$ is median (Q50) and columns 3 and 6, report the regression results for the subsample, where the $soundness_{it}$ is greater than the sample median (Q75). For presentation purposes, the results for the control variables are not reported.

The direct impact of official and unofficial exchange rates is illustrated in Table B2 by columns 1 and 4 in Q25, columns 2 and 5 in Q50, and columns 3 and 6 in Q75. We find that the soundness of banks is positively and statistically significantly influenced by our two exchange rate variables (official and unofficial exchange rates) when the bank's soundness is below the median (Q25), at the median (Q50), or above the median (Q75). The effect of $official\ exchange_{it}$ in Q25 is 3.395 and greater than 1.250 in Q50 and 2.490 in Q75. However, the effect of $unofficial\ exchange_{it}$ in Q25 is 1.878, which is lower than the 3.296 in Q50 and the 7.186 in Q75. The banks in Q25 in Iran are predominantly state-owned and employ the official exchange rate for their foreign exchange activities. Therefore, the effectiveness of this consortium of financial banks from $official\ exchange_{it}$ is greater than $unofficial\ exchange_{it}$. The coefficients of $official\ exchange_{it}$ and $unofficial\ exchange_{it}$ in Q50 and Q75 are compared, and the effect of $unofficial\ exchange_{it}$ is 3.296 in Q50 and 7.186 in Q75, which is greater than the effect of $official\ exchange_{it}$, which is 1.205 in Q50 and 2.490 in Q75. The banks that belong to these two categories were either privately owned from the outset or previously had a government structure that has since been privatized. Consequently, they prioritize the use of unofficial exchange rates over official exchange rates in their foreign exchange activities, which are primarily focused on the acquisition and disposal of currency.

By examining the indirect effect of exchange rate through bank size on soundness, columns 1, 2 and 3 report the coefficient estimate of the interaction term between $official\ exchange_{rat}e$ and $size^2$ and columns 4, 5, and 6 report the coefficient estimate of the interaction term between $unofficial\ exchange_{rat}$e and $size^2$. We have employed the metric to determine whether the indirect impact of the exchange rate on the magnitude is nonlinear. That the size of the banks has a threshold effect is indicated by the confirmation of the nonlinear effect of size. Bank size is positively associated with soundness in all columns, $official\ exchange_{it} \times size^2$ in columns 1, 2, and 3, and $unofficial\ exchange_{it} \times size^2$ in columns 4, 5, and 6 are negatively associated with soundness. Therefore, the financial soundness of the banks increases as the exchange rate, both official and unofficial, and the size of the banks increase. However, the banks' financial soundness decreases after the maximum level of soundness is reached, as the exchange rate and the size of the banks continue to increase.

We have used the Quantile Slope Equality Test and the Symmetric Quantiles Test to examine the heterogeneous and asymmetric effect of

$exchange_{it}$, $official\ exchange_{it} \times size^2$, $unofficial\ exchange_{it}$ and $unofficial\ exchange_{it} \times size^2$. The results of these experiments demonstrate the heterogeneity of the coefficients and the asymmetry in their impact on the financial soundness of banks across various quantiles.

The Quantile Slope Equality Test is illustrated in Table 6. We employ a specific set of coefficients to compare the slope coefficients for the direct and indirect effects of the official and unofficial exchange rates at the median (Q50) against the upper quartile (Q75) and lower quartile (Q25). The Koenker & Basset (1982a) test is implemented to determine whether the slope coefficients are equivalent across Quantiles. Column 1 shows the result of the Wald test summary, and columns 2 and 3 demonstrate the results of the quantiles slope Equality Test for direct effect and indirect effect of official and unofficial exchange rate. Results indicate that the statistic is statistically significant at conventional test levels, that the coefficients differ across quantiles, and that the conditional quantiles are not identical. In other words, the null hypothesis of homogeneity in Table 4 is rejected in the case of $official\ exchange_{it}$, $exchange_{it} \times size^2$, $unofficial\ exchange_{it}$, and $unofficial\ exchange_{it} \times size^2$.

Table 6. Quantile slope equality test

	Wald test	Quantiles: 0.25, 0.5	Quantiles: 0.5, 0.75	Null hypothesis of homogeneity
Panel A: Columns 1, 2, 3 $official\ exchange_{it}$	8.395 (0.059)	2.205 (0.045)	1.225 (0.078)	rejected
Panel A: Columns 4, 5, 6 $official\ exchange_{it} \times size^2$	7.223 (0.0687)	5.166 (0.0449)	3.886 (0.0485)	rejected
Panel B: Columns 7, 8, 9 $unofficial\ exchange_{it}$	5.749 (0.0000)	2.163 (0.0010)	2.089 (0.0007)	rejected
Panel B: Columns 10, 11, 12 $unofficial\ exchange_{it} \times size^2$	6.485 (0.002)	1.98 (0.036)	2.515 (0.032)	rejected

Notes: Table 6 contains the following information: Quantile slope equality test. The direct effect ($official\ exchange_{it}$) and the indirect effect of the official exchange rate ($official\ exchange_{it} \times size^2$) slope equality test are reported in row 1 and row 2, respectively. Row 3 and row 4 report the direct effect ($unofficial\ exchange_{it}$) and the indirect effect of unofficial exchange rate ($unofficial\ exchange_{it} \times size^2$) slope equality test, respectively. The number in parentheses is the p-value.

The symmetric Quantiles test is illustrated in Table 7. The conditional symmetry test of Newey and Powell (1987) has been implemented. We employ a specific set of coefficients to compare the symmetric coefficients for the direct and indirect effects of official and unofficial exchange rates between Q (25) and Q (75). The results confirm the asymmetry, and the null hypothesis of symmetry in Table 5 is rejected. The test's aggregate P-value is approximately 0.05.

Table 7. Symmetric quantiles test

	Wald test	Quantiles: 0.25, 0.75	Null hypothesis of symmetry
Panel A: Columns 1, 2, 3 $official\ exchange_{it}$	3.796 (0.086)	9.790 (0.003)	rejected
Panel A: Columns 4, 5, 6 $official\ exchange_{it} \times size^2$	3.360 (0.048)	1.286 (0.068)	rejected
Panel B: Columns 7, 8, 9 $unofficial\ exchange_{it}$	3.799 (0.006)	4.243 (0.008)	rejected
Panel B: Columns 10, 11, 12 $unofficial\ exchange_{it} \times size^2$	4.071 (0.006)	4.490 (0.018)	rejected

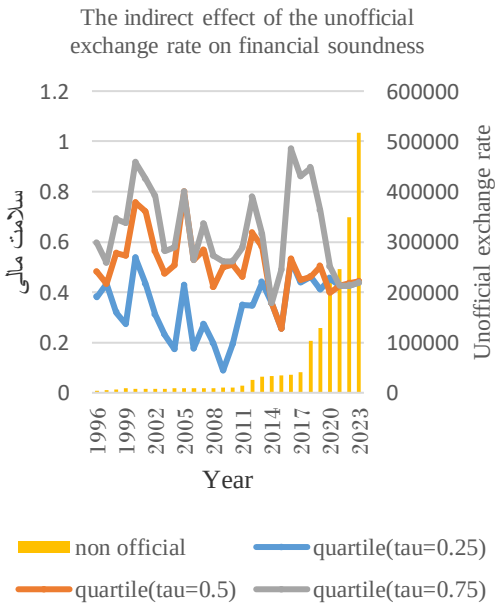
Note: Table 7 reports the symmetric Quantiles test. The direct effect ($official\ exchange_{it}$) and the indirect effect of official exchange rate ($official\ exchange_{it} \times size^2$) symmetric quantile test is reported in row 1 and row 2, respectively. Row 3 and row 4 report the direct effect ($unofficial\ exchange_{it}$) and the indirect effect of unofficial exchange rate ($unofficial\ exchange_{it} \times size^2$) symmetric quantile test, respectively. The number in parentheses is the p-value.

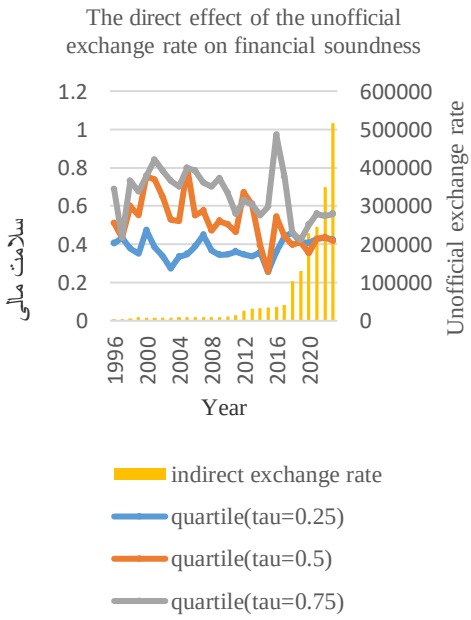
The unofficial exchange rate has been in an upward trend from 1996 to 2000, and a downward trend from 2000 to 2003. Subsequently, it has experienced four price jumps in 2005, 2010, 2018, and 2020. The financial soundness of banks in the country reached its peak at the same time as the exchange rate jump, as evidenced by the co-movement of the unofficial exchange rate and its direct effect on bank financial soundness. Nevertheless, the financial soundness of banks has shown a downward trend both before and after those four peaks. The financial soundness of banks in the 0.25 quantile has maintained a more persistent downward trend than in the other two quantiles. The financial soundness of banks in the 0.75 quantile has improved immediately following the decline.

In comparison, banks in the 0.5 quantile have improved their financial soundness after 2 periods, and those in the 0.25 quantile have improved after more than 2 periods. The study's findings suggest that banks in the 0.25 quantile are more financially vulnerable than other banks. This finding substantiates the idea that banks' financial soundness is influenced by the exchange rate to varying degrees, depending on the degree of financial soundness.

The unofficial exchange rate's indirect effect suggests that the financial soundness of banks has declined due to the simultaneous rise in the exchange rate and the corresponding increase in their size. In other words, the adverse impact of the exchange rate on banks' financial soundness is further exacerbated by their expansion in scale. Furthermore, banks with financial soundness in the 0.25 quantile are more susceptible to an exchange rate increase than the other two categories when their size increases.

The financial soundness of banks is compromised by the concurrent increases in the unofficial exchange rate and bank size, as evidenced by the co-movement of the direct and indirect effects of the unofficial exchange rate. This phenomenon is particularly pronounced for banks in the 0.25 quantile.





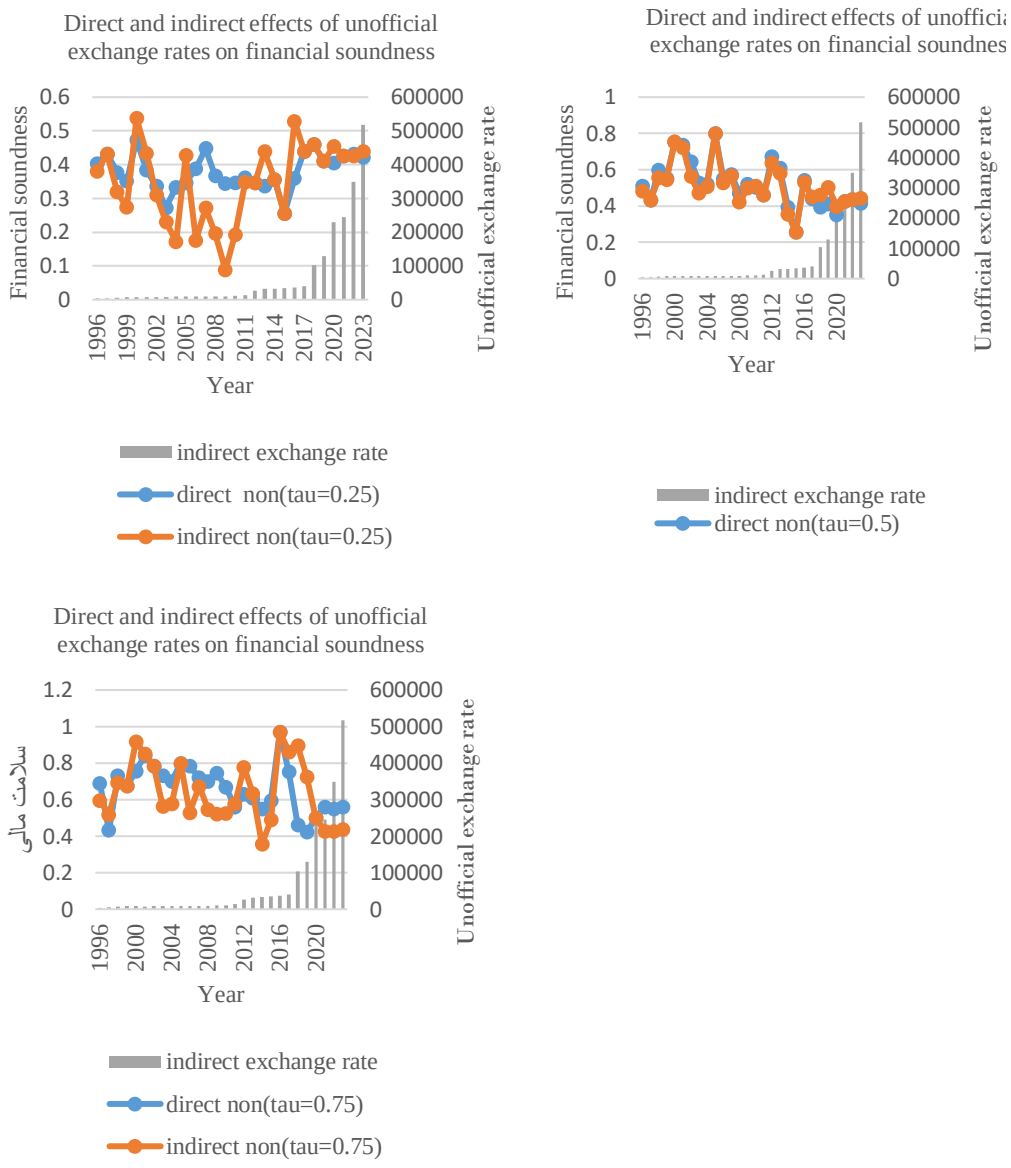
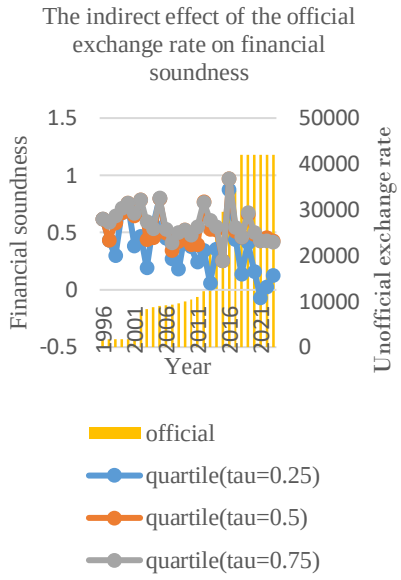
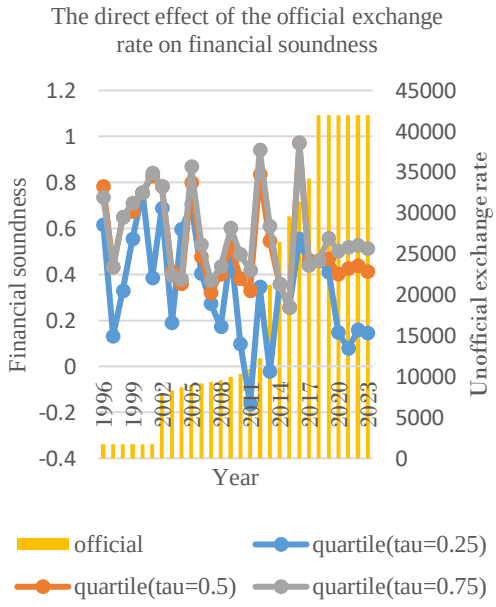
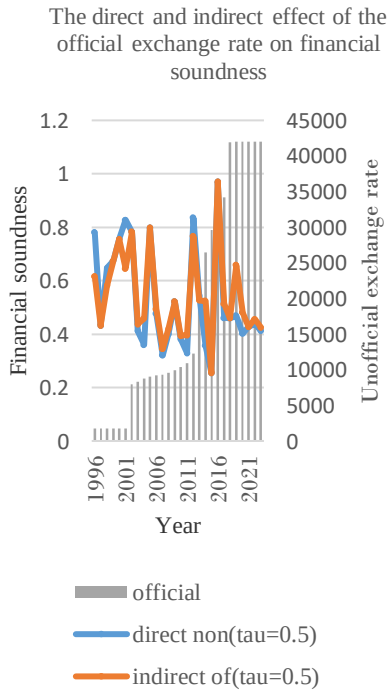


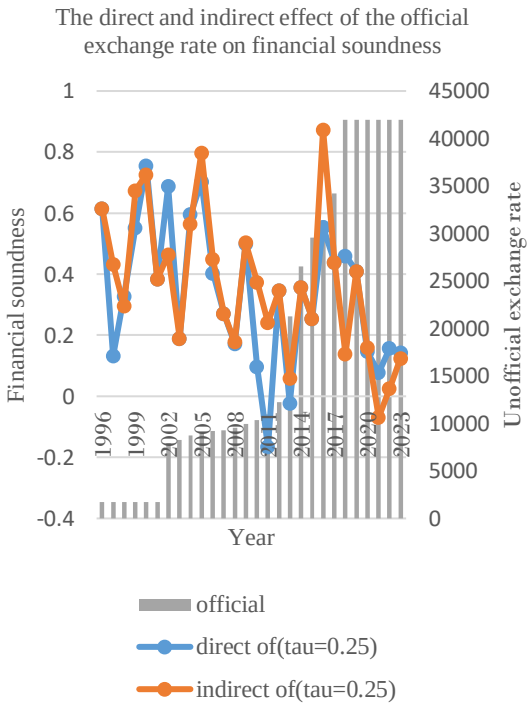
Figure 1. Direct and indirect effects of the unofficial exchange rate on banks' financial soundness

Source: Research findings


The indirect effect of the official exchange rate on financial soundness
Financial soundness
Unofficial exchange rate
Year
official
quartile(tau=0.25)
quartile(tau=0.5)
quartile(tau=0.75)


The direct effect of the official exchange rate on financial soundness
Financial soundness
Unofficial exchange rate
Year
official
quartile(tau=0.25)
quartile(tau=0.5)
quartile(tau=0.75)


The direct and indirect effect of the official exchange rate on financial soundness
Financial soundness
Unofficial exchange rate
Year
official
direct non(tau=0.5)
indirect of(tau=0.5)


The direct and indirect effect of the official exchange rate on financial soundness
Financial soundness
Unofficial exchange rate
Year
official
direct of(tau=0.25)
indirect of(tau=0.25)

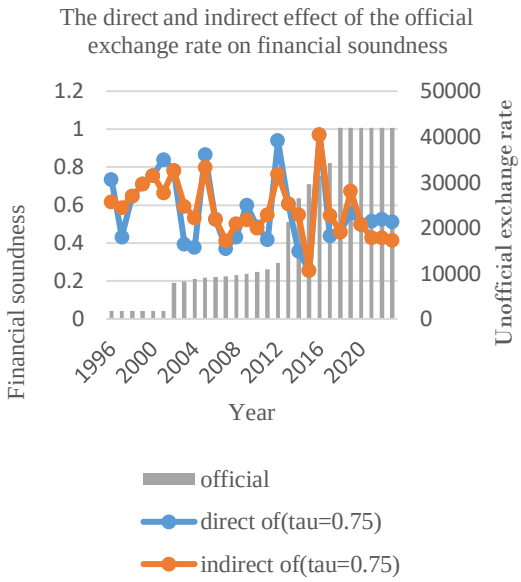


Figure 2. Direct and indirect effects of the official exchange rate on banks' financial soundness

Source: Research findings

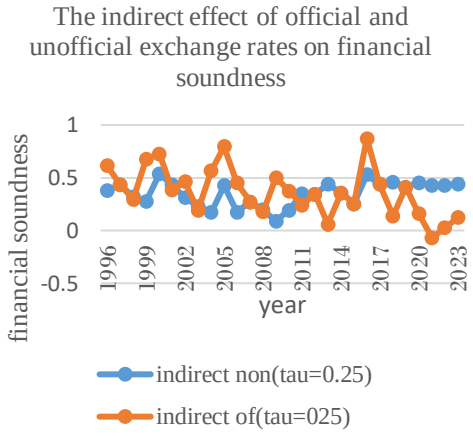
Examining the co-movement of direct and indirect effects of the official and unofficial exchange rates indicates that the fluctuations that the official exchange rate induces on financial soundness are greater than those that the unofficial exchange rate induces. The unofficial exchange rate is associated with a lower level of financial soundness than the official exchange rate, calculated by size. This could be attributed to the official exchange rate's greater stability and fewer fluctuations compared to the unofficial exchange rate. In addition, financial soundness declines significantly immediately after an increase in the official exchange rate, but it subsequently recovers after a few periods. Conversely, financial soundness declines immediately following an increase in the unofficial exchange rate, but it subsequently recovers over time. The fiscal period under review is the reason for this occurrence. The ratios of the financial soundness sub-category respond strongly to increases in both official and unofficial exchange rates, depending on the season of the fiscal year and the fiscal period of banks and credit institutions. This is because banks and credit institutions take a retrospective approach in such situations and consider the worst-case scenarios. This issue is not exclusive to banks; all stakeholders in the banking network respond promptly to a short-term increase

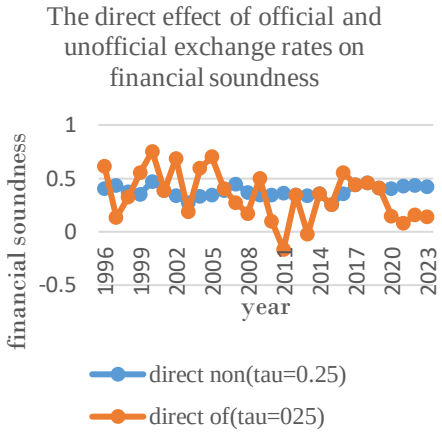
in the exchange rate. In addition, the exchange rate significantly affects banks' open exchange rate positions, reflected in daily inflows and outflows of foreign exchange resources. According to the retrospective approach, because banks assume they have sufficient time to restore financial soundness, the components of banks' financial soundness return to their past trends over several periods. The immediate impact of this increase in the unofficial exchange rate is also assessed as more severe, as it is considered more profound from the perspective of banks. Consequently, its components revert to their previous trend following a period of significant impact on banks' financial soundness.

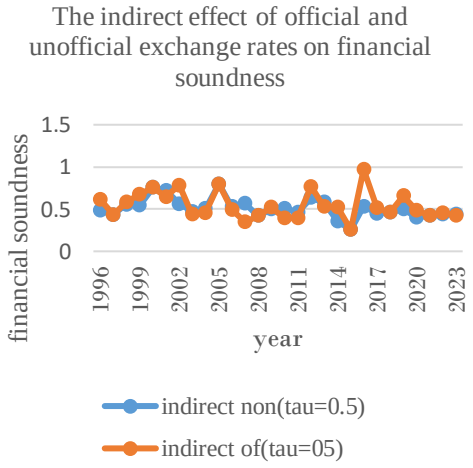
The negative impact of an increase in the exchange rate (both official and unofficial) is more pronounced in the 0.25 quantile than in other quantiles. In other words, less financially sound banks are more adversely affected by exchange rate instability.

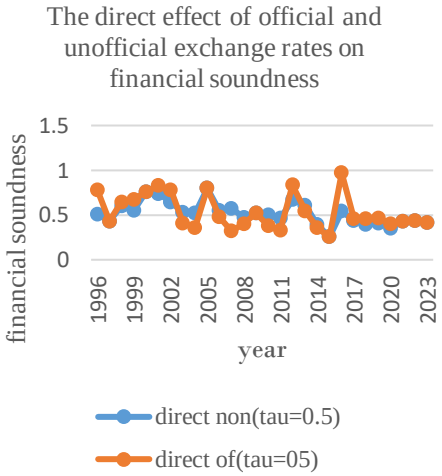
This asymmetry can be explained by the fact that financially weaker banks are more exposed to market-based and unregulated channels of foreign exchange transactions, and therefore rely more heavily on the unofficial exchange rate for balance-sheet valuation, liquidity management, and expectations formation. These banks typically possess thinner capital and liquidity buffers, more fragile funding structures, and a higher sensitivity of asset quality to exchange rate shocks. Consequently, fluctuations in the unofficial exchange rate are transmitted more directly and more rapidly to their open foreign exchange positions, funding costs, and risk perceptions, amplifying the adverse effects on financial soundness. In contrast, financially sounder banks are better able to absorb such shocks through stronger buffers, diversified funding sources, and greater access to official exchange rate mechanisms, which dampens the impact of unofficial exchange rate volatility.

This finding is consistent with the financial accelerator mechanism and balance-sheet channel literature, which suggest that exchange rate shocks disproportionately affect weaker financial institutions due to higher leverage, lower shock-absorption capacity, and stronger feedback effects between market expectations and balance-sheet constraints.


The indirect effect of official and unofficial exchange rates on financial soundness
financial soundness
1
0.5
0
-0.5
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
year
indirect non(tau=0.25)
indirect of(tau=025)


The direct effect of official and unofficial exchange rates on financial soundness
financial soundness
1
0.5
0
-0.5
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
year
direct non(tau=0.25)
direct of(tau=025)


The indirect effect of official and unofficial exchange rates on financial soundness
financial soundness
1.5
1
0.5
0
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
year
indirect non(tau=0.5)
indirect of(tau=05)


The direct effect of official and unofficial exchange rates on financial soundness
financial soundness
1.5
1
0.5
0
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
year
direct non(tau=0.5)
direct of(tau=05)

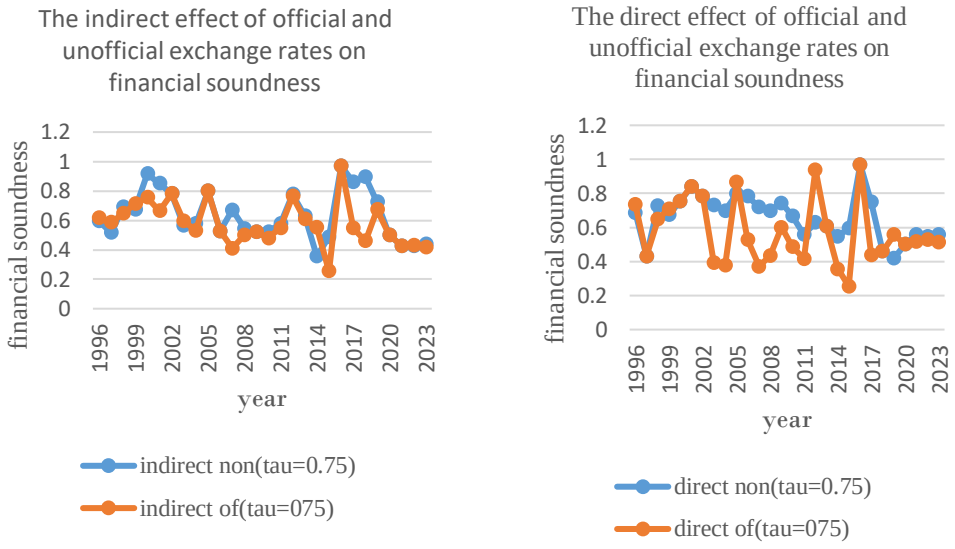


Figure 3. The direct and indirect effects of official and unofficial exchange rates influence the financial soundness of institutions.

Conclusion

This study investigates the influence of exchange rate fluctuations—both official and unofficial—on the financial soundness of Iranian banks, accounting for bank size and macroeconomic factors. The results underscore the critical role of exchange rate management in determining banks' performance and soundness.

The findings indicate that the impact of exchange rates on financial soundness is intricate and nonlinear. Although moderate fluctuations in exchange rates can contribute to financial soundness, banks' financial soundness is adversely affected by excessive volatility, particularly in unofficial rates.

The interaction among market segmentation, financial fragility, and institutional capacity can account for the greater impact of the unofficial exchange rate on banks in the lower-soundness quantile (Q25). The parallel market rate in Iran's dual exchange rate regime is characterized by elevated expectations of macroeconomic instability—such as inflationary pressure, currency shortages, and capital flight risk. Financial fragility theory posits that banks with weaker balance sheets, reduced capital adequacy, and restricted

liquidity reserves are more susceptible to adverse shocks that tighten financing conditions. The domestic-currency burden of foreign-currency liabilities increases when the unofficial rate rises abruptly, while the borrower's repayment capacity deteriorates.

This results in a dual stress channel for banks in the low-soundness group, which have smaller asset bases and narrower income diversification. The stress channel includes (i) deterioration in asset quality as nonperforming loans increase, and (ii) liquidity pressure as depositors respond to exchange-rate-driven uncertainty. In contrast, banks with a higher level of financial soundness frequently leverage their access to hedging instruments, diversified income streams, and larger foreign-reserve buffers to mitigate their vulnerability. This finding is in accordance with the findings of Ebrahimi et al. (2021), who demonstrate the increased currency-risk exposure of smaller and less diversified Iranian banks, and Jackson et al. (2021), who report asymmetric spillover effects of exchange rate volatility on weaker financial banks in other emerging markets. It also corroborates the IMF (2007) observation that the capacity to sustain currency shocks is intrinsically influenced by size and soundness.

The inverse U-shaped relationship between bank size and exchange rates also indicates that financial integrity initially improves with increases in both bank size and exchange rates. However, it diminishes after a threshold is reached. Due to their access to international markets, sophisticated risk management practices, and diversified portfolios, larger banks demonstrate greater resilience to exchange rate volatility. Smaller banks, on the other hand, are more susceptible to liquidity risks and nonperforming loans in volatile exchange rate environments.

The concave pattern suggests that bank soundness improves with moderate exchange-rate increases, up to a quantifiable optimal point, after which further depreciation or appreciation further erodes stability. This threshold effect is consistent with the IMF (2007), which emphasises size-dependent shock absorption, and with Abdi Seyyedkolaee et al. (2021), who report that credit growth is ultimately weakened by protracted exchange-rate volatility. Supervisors may utilize this turning point as a benchmark for opportune interventions, including the imposition of hedging requirements, the deployment of foreign exchange reserves, or liquidity support.

Our findings indicate that interactions between magnitude and exchange

rate heavily influence the curvature of the U-inverse. Ebrahimi et al. (2021) emphasize that smaller Iranian banks reach the instability threshold earlier than larger ones as a result of resource constraints. Therefore, policy instruments—including capital adequacy buffers, liquidity ratios, and open FX position limits—should be adjusted in proportion to the bank's size.

The inverse U-shape underscores the necessity of adaptive hedging and asset-liability modifications to maintain the "stability zone," in which marginal exchange-rate effects are positive, for bank managers. In our data, the passage of the peak is correlated with increased liquidity strain and nonperforming loans, consistent with Seifollahi & Abrishami (2021), who found that exchange-rate risk significantly erodes credit quality.

The quantile-test evidence of heterogeneity and asymmetry across Q25, Q50, and Q75 suggests that correlated distress may result from simultaneous violations of the optimal point triggered by macro shocks. The IMF (2007) recommendation to incorporate nonlinear stress testing into supervisory frameworks is bolstered by this risk channel.

By grounding these applied implications in both our empirical framework and existing literature cited within the manuscript, we strengthen the link between theoretical modeling and actionable guidance for central bank policymakers, bank supervisors, and institutional risk managers.

Significant adverse effects on bank soundness are exacerbated by macroeconomic factors, such as inflation and economic growth, which further compound fluctuations. Inflation increases operational costs and diminishes purchasing power, while accelerated economic growth drives greater credit demand and associated risks. Conversely, a rising stock market index positively correlates with banking soundness, highlighting the supportive role of equity market performance.

This study makes a methodological contribution to the literature by utilizing advanced analytical techniques, including quantile regression and ARDL, to analyze exchange rate effects at a granular level across a range of soundness levels and bank sizes. The distinction between official and unofficial exchange rates offers a distinctive perspective on the divergent effects of these two rates on the performance of Iranian banks.

As evidenced by the studies reviewed in the relevant literature, the current study underscores the significant impact of exchange rate fluctuations on bank

performance. For instance, Bani Yousef et al. (2024) investigate the influence of foreign exchange risk and volatility on bank profitability, consistent with the examination of the financial soundness of Iranian banks under exchange rate fluctuations. Cheluget et al. (2023) also emphasize the detrimental effects of exchange rates on banks, with a particular emphasis on financial indicators such as ROA and ROE. The inclusion of macroeconomic factors such as inflation and GDP growth in this study is consistent with the results of analogous studies. For instance, Jackson et al. (2021) and Saleh et al. (2022) examine the influence of inflation and exchange rates on bank profitability, which is comparable to the current paper's assessment of Iranian banks' soundness in relation to inflation. The present study and other works both investigate the country-specific effects of exchange rates. Mohammadi et al. (2020) and Keshtgar et al. (2020) concentrate on Iran's banking sector and exchange rate volatility. In the same vein, research conducted by Cheluget et al. (2023) and Işık & Şendeniz-Yüncü (2022) examines the efficacy of banks in Kenya and Turkey, respectively. The use of ARDL models aligns with similar methodological approaches in the reviewed studies, Jackson et al. (2021) employ ARDL to analyze exchange rate volatility.

This study introduces a novel composite metric for evaluating financial soundness that surpasses conventional indicators such as Return on Assets (ROA) and Return on Equity (ROE), which are frequently employed in the related literature (e.g., Saleh et al., 2022; Cheluget et al., 2023). This advancement enables a more comprehensive and nuanced examination of financial soundness. Unlike other studies that focus on a single exchange rate measure, this paper distinguishes between official and unofficial exchange rates to identify their separate impacts on Iranian banks. This distinctive methodology is in stark contrast to the analysis of studies such as Keshtgar et al. (2020) and Saleh et al. (2022), which typically employ aggregate or nominal exchange rates. The present study examines how the impact of exchange rates on financial solvency is moderated by bank size, with a focus on the distinction between large and small banks.

In contrast to the majority of the reviewed works, which treat banks as homogeneous entities, this aspect enriches the analysis. For instance, Işık & Şendeniz-Yüncü (2022) concentrate on dollarization without evaluating the influence of bank size. Conversely, this investigation demonstrates that larger financial institutions are more resilient to exchange rate fluctuations due to their sophisticated risk management systems and diversified portfolios. While other studies use conventional econometric models (e.g., linear regressions or

GMM), this paper employs quantile methodology to capture heterogeneous effects across banks with varying levels of financial soundness. The study distinguishes itself from others, including Keshtgar et al. (2020) and Jackson et al. (2021), through this advanced approach. This research is distinctive in that it specifically examines the challenges posed by Iran's dual exchange rate system (official vs. unofficial rates) and offers localized insights into how these factors affect liquidity, lending behavior, and profitability, in contrast to related studies such as Mohammadi et al. (2020), which analyze Iranian banks. Compared to related works that cover shorter timeframes (e.g., Bani Yousef et al. (2024) covering 2015–2019, Saleh et al. (2022) focusing on 2013–2018), the study spans a longer period (1996–2023), providing a more comprehensive analysis of structural changes and trends.

This study is distinguished by its multi-dimensional approach to the analysis of exchange rate impacts, which includes the introduction of innovations such as composite metrics, the differentiation between exchange rate categories, bank size considerations, and quantile regression methodologies. It extends beyond conventional profitability metrics to investigate a broader range of financial soundness indicators. These contributions not only distinguish the study from the reviewed literature but also offer valuable insights for policymakers and researchers who are focusing on banking soundness in emerging markets such as Iran.

The necessity of differentiated support mechanisms specifically designed to meet the requirements of banks based on their size is underscored by policy implications. Smaller banks would benefit from increased access to liquidity support and hedging tools to mitigate exchange rate shocks. In comparison, larger banks necessitate more stringent guidelines for managing foreign currency operations and reserves. Policymakers must also address the volatility in unofficial exchange rates, which disproportionately affect banks that rely on informal foreign currency markets. The central bank should implement a dual-tier soundness mechanism in light of the more volatile and significant impact of the unofficial exchange rate on mid- and high-soundness banks (Q50 and Q75 groups) as illustrated in Table B2. This could be achieved by integrating transparent guidelines for permissible deviations from the official rate with targeted foreign-exchange interventions in the parallel market. A framework of this nature would mitigate uncertainty for banks that significantly depend on the unofficial market. Our quantile interaction results indicate that smaller banks (frequently in the Q25 group) cross the instability threshold at lower levels of exchange-rate volatility, particularly with the official rate. To alleviate

this issue, the central bank could implement subsidized currency-hedging instruments, such as swap facilities or forward contracts, that are priced to be particularly attractive to small and medium-sized banks to counteract their increased marginal exposure. It is recommended that regulatory capital requirements be adjusted in line with anticipated turning points in the size–exchange rate stability zone, as outlined in IMF (2007) and Ebrahimi et al. (2021). This guarantees that larger banks have sufficient reserves to withstand prolonged volatility, while smaller banks receive targeted relief to prevent credit contraction. The necessity of supervisory stress tests that integrate nonlinear exchange-rate shocks and size asymmetries is underscored by the heterogeneity observed across the Q25–Q75 levels. This would prevent systemic instability if multiple banks simultaneously exceed their soundness thresholds due to macroeconomic shocks.

The dataset encompasses a variety of Iranian banks and spans a lengthy period (1996–2023); however, the number of institutions is inherently constrained by the size of the domestic banking sector. This limits the statistical power to capture within-group heterogeneity, particularly in the smaller bank segment (Q25 group). Data on specific financial soundness indicators and exchange rate series, particularly for the unofficial market, are susceptible to reporting gaps, inconsistencies, and changes in measurement methodology over time. The precision of coefficient estimates may be influenced by these constraints. The findings are derived from the unique institutional, regulatory, and currency regime context of Iran. Consequently, it is prudent to exercise caution when making generalizations beyond comparable macro-financial environments.

In addition, the unofficial exchange rate amplifies balance-sheet fragility precisely because banks with weaker financial soundness rely more heavily on short-term or informal FX channels, face higher marginal funding costs in the parallel market, and are unable to access stabilizing instruments—such as official FX auctions, regulated swap facilities, or low-cost liquidity windows—that larger and stronger banks utilize. This structural asymmetry causes shocks in the unofficial market to transmit more rapidly and with greater intensity to low-soundness banks.

In conclusion, this research emphasizes the critical importance of Iranian banks and regulators implementing proactive strategies that consider economic uncertainties, exchange rate fluctuations, and bank size disparities in order to mitigate risks and preserve financial soundness in a difficult macroeconomic

environment.

To translate these findings into more actionable policy guidance, supervisors should introduce a targeted set of risk-mitigation instruments tailored to the structural vulnerabilities of small and low-soundness banks. First, the central bank could establish a subsidized FX-hedging facility—such as standardized forward contracts, swap lines, or capped-premium options—explicitly designed for banks that predominantly rely on the parallel market and therefore face higher marginal exposure to unofficial-rate volatility. Second, supervisory authorities should implement a transparent monitoring framework for unofficial exchange-rate deviations, linking it to graduated supervisory responses, including temporary open-FX-position caps, liquidity add-on requirements, and mandatory short-term stress tests triggered when parallel-market spreads exceed predefined thresholds. These measures would provide small banks with practical tools to manage currency-risk shocks while enabling regulators to contain the systemic vulnerabilities arising from the dual-rate structure.

Directions for Future Research

1. Extension to other emerging markets: Applying the composite financial soundness metric and the ARDL–quantile framework to other emerging economies would enable a comparative analysis of the effects of exchange rates across varying regulatory and currency arrangements.
2. Future research could incorporate variables such as interest rate spreads, terms of trade, capital flows, or political risk indices to disentangle further the channels through which exchange rate fluctuations affect bank soundness.
3. Ownership and market structure: Subsequent research could incorporate measures of market concentration and competition to investigate the extent to which structural characteristics moderate exchange rate impacts, building on the ownership categories and size effects of this paper.
4. High-frequency data analysis: Using higher-frequency (monthly or weekly) data on exchange rates and banking indicators could provide more detailed insights into the short-term transmission of currency shocks into bank soundness.

Declaration of Conflicting Interests

As the corresponding author, I certify that there is no actual or potential conflict of interest concerning this article.

Funding

The authors received no financial support for the research, authorship and, or publication of this article.

References

Abbas Elhussein, N. H. & Elfaki Osman, O. E. (2019). Exchange Rate fluctuations and Financial Performance of Banks : Evidence from Sudan. *International Journal of Economics and Finance*, 11(12), 15–27. https://doi.org/10.5539/ijef.v11n12p15

Abdi Seyyedkolaee, M., Ehsanfar. M. H., & Mozaffari Ahangarkolaei, F.(2021). The Effect of Exchange Rate Fluctuations on the Bank's Lending Power in Iran. . Journal of Islamic Economics & Banking, 10 (34), 7–34. (In Persian).

Agarwal. (2018). Banks' Foreign Currency Exposure and the Real Effects of Exchange Rate Shocks (June 4, 2018). Paris, December 2018 Finance Meeting EUROFIDAI - AFFI, Retrieved from SSRN: https://ssrn.com/abstract=3190647 or http://dx.doi.org/10.2139/ssrn.3190647

Angela Obiageli, I. (2021). Exchange Rate and Performance of Deposit Money Banks in Nigeria. International *Journal of Innovative Finance and Economics Research*, 9(1), 158–170. www.seahipaj.org

Bani Yousef, A.N., Taha, R., Nurian Muhmad, S., & Zainul Abidin, A. F. (2024). Foreign Exchange risk and Performance: Evidence from MENA Banks. *International Journal of Business and Society*, 25(3), 1054–1071. https://doi.org/10.33736/ijbs.8558.2024.

Cheluget, J., Sile, I., & Amoi, A.K. (2023). Effect of Exchange Rate and Inflation Rate on the Financial Performance of Banks in Kenyan: A Case of Co. Bank Limited. *International Journal of Research Publication and Reviews*, 4(2), 628-642, February 2023

Delani, A., & Tutgut, T. (2020). Impact of Inflation and Exchange Rate on the Financial Performance of Commercial Banks in South Africa. MPRA Paper No. 101383, posted 29 Jun 2020, https://mpra.ub.uni-muenchen.de/101383/

Ebrahimi, P., Fekete-Farkas, M., Bouzari, P., & Magda, R. (2021). Financial

Performance of Iranian Banks from 2013 to 2019: A Panel Data Approach. *Jornal of Risk and Financial Management*, 14(6), 257, https://doi.org/10.3390/jrfm14060257

IMF. 2019 .Financial Soundness Indicators Compilation Guide. https://www.imf.org/en/Data/Statistics/FSI-guide

International Monetary Fund. (2007). Managing the Transition to a Market Economy. International Monetary Fund, https://www.elibrary.imf.org/display/book/9781589064416/ch004.xml, https://doi.org/10.5089/9781589064416.058

Işık, S., & Şendeniz-Yüncü, İ. (2022). Effects of dollarization on bank performance: Analysis for Turkey. Hacettepe University *Journal of Economics and Administrative Sciences*, 40 (1), 58-86. https://doi.org/10.17065/huniibf.929924

Jackson, E. A., Barrie, M. S., & Johnson, L. (2021). Impact Exchange Rate and Inflation on Commercial Bank's Performance in Sierra Leone. *Journal of Smart Economic Growth*, 6(3), 67–95. https://ssrn.com/abstract=3944548

Keshtgar, N., Pahlavani, M., & Mirjalili, S. H. (2020). The Impact of Exchange Rate volatility on Banking Performance (case of Iran), *International Journal of Business and Development Studies*,12(1), 39–56.https://doi.org/10.22111/ijbds.2020.5436.

Koenker, R., & Gilbert, B. J. (1982a). Robust Tests for Heteroskedasticity Based on Regression Quantiles, *Econometrica*, 50(1), 43–62.

Mohammadi, T., Shakeri, A., Taghavi, M. & Samanipour, H. (2020). Exchange Rate Threshold Affecting Financial Stability of Iranian Banks. Financial Management Strategy, 8(4), 1–22. doi: 10.22051/jfm.2020.29180.2261.

Newey, W. K., & James L. P. (1987). Asymmetric Least Squares Estimation, *Econometrica*, 55(4), 819–847.

Saleh, S.Y., Mahmood, A., & Bahjet, S.N. (2022). Measuring the Effect of Foreign Currency Exchange Rate on Bank's Financial Performance with Early IFRS 9 Compliance. *American Journal of Economics and Business Management.* 5(2), 42–62. https://doi.org/10.31150/ajebm.v5i3.935.

Seifollahi, H,. & Abrishami, H. 2021. Investigating the Effect of Exchange Rate Risk and Economic Growth Rate on Banks' Performance. *Iranian Journal of Agricultural Economics and Development Research*, 52(2), 389–404. https://doi.org/10.22059/ijaedr.2021.317731.669004

Sinaga, J. S., Muda, I., & Syahputra Silahi, A. (2020). The Effect of BI Rate, Exchange Rate, Inflation and Third Party Fund (DPK) on Credit Distribution and Its Impact on Non Performing Loan (NPL) on XYZ Commercial Segment Bank. Universal *Journal of Accounting and Finance*, 8(3), 55-64.

https://doi.org/10.13189/ujaf.2020.080301

Tamizi, A.R. (2020). The effect the volatility exchange rate on bank deposits Iran . *Journal of Development and Capital*, 5(2), 123-136 [In Persian]. https://doi.org/10.22103/jdc.2020.16146.1100

Wulandari, D., & Harjito, A. (2021). The effect of interest rates, exchange rates and capital structure on banking profitability of BUMN and Private Go Public in Indonesia. *Intrernational Journal of Research in Business and Social Science*, 10(3), 338–351. https://doi.org/10.20525/ijrbs.v10i3.1086

Appendix

Table A1. Pearson Correlation Matrix.

	new financial soundne	fficial exchang rate	non – official exchange rate	liquid assets to total assets	loan to total assets	due to banks to total liabilitie	investme deposit t total liabilities	interest income t total incomes	inflatio	econom growth	stock price index	size
new financial soundness	1											
fficial e xchange rate	-0.141***	1										
non – official exchange rate	-0.118***	0.799**	1									
liquid assets to total assets	0.072*	0.628***	0.616**	1								
loan to total assets	-0.146**	-0.604**	-0.400**	-0.789**	1							
due to banks to total liabilities	-0.155*	-0.264**	-0.336***	0.083*	0.107**	1						
investmen deposit to total liabilities	-0.101**	0.163***	0.098**	-0.221*	0.262*	-0.604***	1					
interest income to total incomes	0.029**	-0.467**	-0.038*	-0.347***	0.676*	-0.136**	-0.205**	1				
inflation	-0.161***	-0.079*	-0.074*	0.051**	-0.009**	0.376**	-0.314***	-0.049*	1			
economic growth	-0.002**	0.086**	0.119*	-0.163***	0.069**	-0.306***	0.167*	0.072**	-0.764*	1		
stock price index	-0.066**	0.011*	-0.109**	-0.461***	-0.321*	0.357**	-0.453***	-0.311**	0.270**	0.361**	1	
size	0.346**	-0.030**	-0.013*	0.264***	0.055*	0.295**	0.293**	0.028***	0.262*	-0.414**	0.757**	1

Notes: TableA1: Pearson Correlation Matrix reports the Pearson correlation coefficients for the variables included in the analysis. . *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A2. Unit root Test

	Augmented Dickey-Fuller test statistic: T-statistic (prob)	Elliott-Rothenberg-Stock DF-GLS test statistic : T-statistic (prob)	Phillips-Perron test statistic: T-statistic (prob)	Kwiatkowski-Phillips-Schmidt-Shin test statistic	Elliott-Rothenberg-Stock test statistic: P-Statistic	
fficial e xchang rate	-3.551071 (0.0152)**	-3.496391 (0.0019)**	-3.548710 (0.0153)**	0.289590**	2.322809*	Intercept and 1st difference
non – offic exchan rate	7.071359 (0.0000)**	-0.314169 (0.0045)*	-3.509328 (0.0167)**	0.423417**	1.881956*	Intercept and 1st difference
liquid assets total assets	-6.958447 (0.0000)**	-6.483688 (0.0000)**	-9.232379 (0.0000)**	0.276705**	2.631602***	Intercept and 1st difference
loan to total assets	-3.056152 (0.0433)**	-3.111458 (0.0048)**	-2.971550 (0.0515)***	0.488877*	2.489154*	Intercept and Level
due to banks t total liabiliti	-2.751419 (0.0798)***	-2.685650 (0.0129)**	-2.715327 (0.0855)***	0.142611**	3.481507**	Intercept and Level
investr deposi total liabiliti	-2.848190 (0.0660)***	-2.825728 (0.0094)**	-2.848190 (0.0660)***	0.104038**	2.644639*	Intercept and Level
interes income total income	-4.737853 (0.0032)**	-3.638484 (0.0014)**	-4.245792 (0.0031)**	0.079577**	3.725512**	Intercept and 1st difference
inflatio	-11.47644 (0.0000)**	-3.711950 (0.0023)**	-3.534649 (0.0154)**	0.102645**	9.415217**	Intercept and Level
econor growth	-4.752300 (0.0009)**	-4.170876 (0.0004)**	-3.688931 (0.0108)**	0.080994**	0.907400**	Intercept and Level
stock price index	-4.308896 (0.0034)**	-3.400210 (0.0028)**	-2.781850 (0.0752)***	0.078435**	6.922401**	Intercept and Level
size	-3.196119 (0.0323)**	-2.636350 (0.0145)**	-3.199326 (0.0320)**	0.155350**	5.458607**	Intercept and Level

Notes: TableA2: This table reports the Unit root test for the variables included in the analysis. . *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A3. ARDL Long Run Form and Bounds Test

Null Hypothesis: No levels relationship			F-Bounds Test	
I(1)	I(0)	Signif.	Value	Test Statistic
	Asymptotic: n=1000			
4.78	4.04	10%	61.25109	F-statistic
5.73	4.94	5%	1	k

6.68	5.77	2.5%		
7.84	6.84	1%		

Appendix B

Table B1. ARDL Method estimation results

	Panel A: Official exchange rate		Panel B: Non-Official exchange rate	
	(1)	(2)	(3)	(4)
Selected model	ARDL(1,4)	ARDL(2,4)	ARDL(1,0)	ARDL(4,4)
Total banks 'financial soundness(-1)	0.310 (1.592) [0.1336]	0.471 (1.895) [0.1309]	0.302 (1.526) [0.1418]	0.614 (2.540) [0.1262]
Total banks 'financial soundness(-2)		0.670 (1.680) [0.1681]		0.826 (3.125) [0.0353]
Total banks 'financial soundness(-3)				0.500 (2.933) [0.4490]
Total banks 'financial soundness(-4)				0.571 (2.549) [0.261]
Official exchange rate	0.320 (1.572) [0.1381]	0.617 (1.151) [0.3137]		
Official exchange rate(-1)	0.335 (2.440) [0.0906]	0.256 (2.535) [0.0689]		
Official exchange rate(-2)	0.244 (2.585) [0.0611]	0.181 (2.865) [0.0619]		
Official exchange rate(-3)	0.333 (2.745) [0.0243]	0.858 (2.735) [0.0688]		
Official exchange rate(-4)	0.512 (2.430) [0.0291]	0.010) (1.300) [0.2633]		
Official exchange rate*size^2	-0.456 (-4.568) [0.0003]	-0.439 (-3.326) [0.0076]		
Non-official exchange rate			0.122 (1.914) [0.0648]	0.947 (3.844) [0.0487]
Non-official exchange rate(-1)				0.125 (2.873) [0.0474]
Non-official exchange rate(-2)				0.121 (2.650) [0.0582]
Non-official exchange rate(-3)				0.978 (3.565) [0.0287]
Non-official exchange rate(-4)				0.748 (6.165) [0.0000]
Non-official exchange			-0.456	-0.297

rate*size^2			(-2.496) [0.0494]	(-4.026) [0.0363]
Size		0.408 (2.383) [0.0209]		1.346 (2.936) [0.0478]
Liquid asset to total asset		0.402 (3.264) [0.0047]		0.389 (3.258) [0.0352]
Loans to total asset		0.892 (3.375) [0.0409]		0.0214 (3.279) [0.0063]
Due to banks to total liability		-0.213 (-2.302) [0.0775]		-0.540 (-2.535) [0.0457]
Investment deposit to total liability		-0.263 (-2.508) [0.0662		-0.550 (-2.766) [0.1096]
Interest incomes to total income		0.420 (3.118) [0.0259]		0.626 (3.397) [0.0297]
Inflation		-0.550 (-2.888) [0.0446]		-0.331 (-2.1349) [0.0166]
Economic growth		-0.729 (-2.663) [0.0562]		-0.316 (-2.305) [0.0217]
Stock price index		-0.196 (-2.384) [0.0756]		-0.218 (-5.286) [0.0000]
C	0.703 (5.556) [0.0001]	3.871 (3.713) [0.0560]	0.677 (5.868) [0.0000]	5.689 (5.314) [0.0000]
R-squared	0.564	0.936	0.1818	0.941
F-statistic[Prob]	2.596 [0.0609]	3.484 [0.0173]	1.555 [0.0297]	1.707 [0.0433]
Durbin-Watson stat	2.114	2.329	1.982	2.413
Breusch-Godfrey Serial Correlation LM Test				
F-statistic	0.658 [0.535]	29.099 [0.3032]	0.743 [0.4888]	36.965 [0.1038]
Obs*R-squared	2.176 [0.3368]	21.269 [0.8643]	1.814 [0.4036]	21.420 [0.3731]
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-stat	0.398 [0.8875]	0.645 [0.7669]	0.435 [0.7300]	0.5083 [0.8327]
Obs*R-squared	3.657 [0.8182]	16.124 [0.5150	1.463 [0.6907]	18.225 [0.5074]
Scaled explained SS	1.343 [0.9872]	1.295 [0.9295]	0.740 [0.8636]	0.3551 [0.3091]
Ramsey RESET Test				
t-stat	0.610 [0.5524]	2.195 [0.1156]	1.377 [0.1836]	2.371 [0.2541]
F-stat	0.372 [0.5524]	4.821 [0.1156]	1.897 [0.1836]	5.6222 [0.2541]
Likelihood ratio	0.620 [0.4307]	21.082 [0.3906]	2.265 [0.1323]	41.589 [0.4938]
Observation	22 after adjustment	22 after adjustment	25 after adjustment	22 after adjustment

Note: TableB1 reports the regression results of Eq.(1). Sample is total banking network. Size is log of total asset. Ownership is dummy variable that it is 1, if bank is private own banks and 0 otherwise. : In all regressions, maximum dependent lags is 4 and it is selected automatically. Number models evaluated is 20. Model selection method is Akaike info criterion (AIC). Size, Liquid asset to total asset, Loans to total asset, Due to banks to total debt, Investment deposit total debt, Interest incomes to total income, Inflation, Economic growth, Stock price index are fixed repressors in all regressions and they are selected based on theories, literature and significant. Official exchange rate and non-official exchange rate are dynamic regressors in Panel A and B of TableB1 respectively.

Table B2. Quantile Method estimation results

		Panel B: Non-Official exchange rate			Panel A: Official exchange rate	
6	5	4	3	2	1	
Q75	Q50	Q25	Q75	Q50	Q25	Quntile method
3.203 (2.646) [0.0426]	1.044 (2.533) [0.060]	3.203 (2.646) [0.042]	2.116 (2.520) [0.015]	2.744 (2.522) [0.095]	2.58 (1.931) [0.021]	c
			5.585 (5.165) [0.0000]	3.501 (2.556) [0.086]	5.66 (7.731) [0.0000]	Official exchange rate
			-2.216 (-1.656) [0.202]	-1.472 (-2.721) [0.048]	-2.32 (2.830) [0.025]	Official exchange rate*size^2
2.546 (2.930) [0.039]	2.657 (1.900) [0.089]	2.540 (2.935) [0.039]				Non-official exchange rate
-9.457 (-2.924) [0.0368]	-6.488 (-2.935) [0.026]	-9.450 (-2.924) [0.036]				Non-official exchange rate*size^2
0.232 (2.394) [0.069]	0.171 (1.915) [0.0930]	0.232 (2.394) [0.0698]	0.111 (2.475) [0.041]	0.023 (2.085) [0.033]	0.42 (2.043) [0.065]	Size
-0.027 (-2.112) [0.011]	0.012 (2.547) [0.059]	-0.027 (-2.112) [0.011]	0.008 (2.427) [0.075]	0.014 (3.597) [0.059]	-0.50 (-2.168) [0.068]	Liquid asset to total asset
0.0198 (3.050) [0.060]	0.010 (2.272) [0.048]	0.019 (-3.050) [0.060]	0.057 (2.016) [0.087]	0.016 (2.385) [0.075]	0.85 (3.184) [0.009]	Loans to total asset
-0.078 (-4.207) [0.043]	-0.059 (-1.712) [0.257]	-0.078 (-3.207) [0.043]	0.011 (2.189) [0.052]	-0.020 (-2.304) [0.065]	-0.96 (-3.044) [0.0034]	Due to banks to total liability
-0.026 (-3.227) [0.023]	-0.016 (-2.917) [0.0719]	-0.026 (-2.227) [0.023]	-0.019 (-2.757) [0.061]	-0.021 (-3.934) [0.065]	-0.35 (-2.947) [0.017]	Investment deposit to total liability
0.016 (3.11) [0.008]	0.087 (2.620) [0.0543]	0.016 (2.116) [0.008]	0.002 (2.198) [0.045]	0.019 (2.140) [0.089]	0.26 (3.060) [0.0008]	Interest incomes to total income
-0.168 (-2.602) [0.052]	-0.015 (-2.344) [0.034]	-0.039 (-2.054) [0.057]	-0.013 (-2.659) [0.020]	-0.018 (-2.095) [0.092]	-0.14 (-2.557) [0.035]	Inflation
-0.157	-0.286	-0.157	-0.026	-0.040	-.41	Economic growth

(-2.634) [0.034]	(-3.120) [0.005]	(-4.634) [0.034]	(-3.740) [0.0713]	(-3.163) [0.064]	(-2.838) [0.036]	
6.346 (3.216) [0.031]	5.243 (2.139) [0.050]	6.175 (3.389) [0.001]	7.197 (3.146) [0.085]	8.440 (3.013) [0.089]	4.25 (5.531) [0.0000]	Stock price index
0.701	0.631	0.510	0.523	0.415	0.841	Pseudo R-squared
8.231 (0.041)	6.195 (0.062)	8.231 (0.041)	18.319 (0.074)	13.763 (0.046)	8.319 (0.004)	Quasi-LR statistic Prob(Quasi-LR stat)
0.350 (0.839)	2.688 (0.260)	2.982 (0.225)	2.585 (0.274)	1.206 (0.547)	1.48 (0.475)	Normality Test: Jarque-Bera (Probability)
0.296 (0.585)	0.306 (0.579)	0.296 (0.585)	0.396 (0.528)	0.384 (0.535)	5.55 (0.108)	Ramsey Test: QLR L- statistic(probability)
0.294 (0.587)	0.304 (0.581)	0.284 (0.587)	0.391 (0.531)	0.380 (0.537)	4.78 (0.0287)	QLR Lambda- statistic(Probability)
26	26	26	26	26	26	Observations

Notes: TableB2 presents the estimations results for Eq.(1) applying the Quantile method. Dependent variable is $soundness_{it}$ that *i* is total financial soundness. Panel A and B exhibits the results controlling for official exchange rate and non-official exchange rate respectively. All regression include bank-level and macroeconomic control variables. $official\ exchange\ rate_t$, and $official\ exchange\ rate * size_{it}$^2 point direct and indirect effect of official exchange rate, respectively. Also, $non - official\ exchange\ rate_t$ and $non - official\ exchange\ rate * size_{it}$^2 represent direct and indirect effect of non-official exchange rate, respectively. Columns (1), (2) and (3) show direct effect of official exchange rate. Indirect effect of official exchange rate is demonstrated in columns (4), (5) and (6). Columns (7), (8) and (9) represent direct effect of non-official exchange rate. Indirect effect of non-official exchange rate is indicated in columns (10), (11) and (12). T statistic is in parentheses. Prob. Is in []. Pseudo R-squared, Quasi-LR statistic (Prob (Quasi-LR stat)), Normality Test: Jarque-Bera (Probability), Ramsey Test: QLR L-statistic (probability), QLR Lambda-statistic (Probability) are reported.

Bibliographic information of this paper for citing:

Ahmadyan, Azam (2026). Impact of Exchange Rate Fluctuations on the Financial Soundness of Iranian Banks: The Role of Bank Size and Soundness Levels. *Iranian Journal of Finance*, 10(1), 63-118.