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FOREIGN EXCHANGE RISK AND BANK PERFORMANCE: EVIDENCE FROM MENA BANKS

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ABSTRACT

We provide evidence on the inverse association between foreign exchange risk and the financial performance of banks in the Middle East and North Africa (MENA) region. The analysis is based on data collected from 135 banks from 14 countries over the period from 2015 to 2019. The results reveal a negative correlation between foreign exchange (FOREX or FX) risk and both bank performance measures considered. This suggests that banks with higher exposure to risk tend to exhibit lower performance in the MENA region. The study recommends that banks should regularly assess and project their foreign exchange exposure to minimise the associated foreign exchange risks. Furthermore, the findings underscore the importance of establishing appropriate frameworks and policies for prompt reporting and recording of foreign exchange losses. We highlight the importance of bank management to focus on developing effective financial instruments and techniques to hedge against foreign exchange risk, particularly in relation to profit and loss of banks in the MENA region. Ultimately, these measures will contribute to enhancing the financial performance of banks operating in the MENA region. In addition, results suggest that monetary policy should be primarily considered in supervising banks that are reliant on foreign funding for risk hedging.

Keywords: Foreign exchange, Bank risk; Bank profitability; MENA; bank

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1. INTRODUCTION

Foreign exchange (FOREX or FX) risk pertains to the vulnerability of a company's financial strength to the potential impact of fluctuations in foreign exchange rates. These fluctuations have

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been a significant concern for investors, analysts, managers, and shareholders ever since the elimination of the fixed exchange rate system of Bretton Woods in 1971 (Abor, 2005; Mugi, 2015). The risk arises from the possibility that adverse fluctuations in exchange rates can lead to either increased or decreased profits, which in turn indicate improvements or declines in the firm's financial performance (Engel & Wu, 2018, Haider et al., 2018; Funso & Lawal, 2020). Exposure, on the other hand, refers to contracted, projected, or contingent cash flows whose exact magnitude is uncertain at present and depends on the value of foreign exchange rates (Slimani & Ben Allem, 2018; Rogoff, 1996; Al-Gasaymeh et al., 2019; and Qiang et al., 2019). Risks are defined as anything that can pose obstacles to attaining specific objectives, internal or external factors, and unexpected variability of turbulence in returns (Holton, 2004; Fatemi & Fooladi, 2006, Bhattacharya et al., 2023). Banks also seem prone to any risk resulting from uncertainty in the economy (Abbassi & Bräuning, 2023). Determining the appropriate level of capital is crucial to mitigate risks and adequately compensate for the risks taken.

Foreign exchange involves the conversion of one country's currency into another country's currency through financial institutions such as banks, investors, and governments (Al Smadi et al., 2020; Brigham & Ehrhardt, 2005; Ahmed, 2015, Abina, 2023), and this will lead to additional uncertainty or variability in a firm's cash flows that can be attributed to fluctuations in currency exchange rates. These fluctuations expose companies to foreign exchange risk particularly as economies become more open and international trade continues to expand, increasing companies' exposure to exchange rate fluctuations (Shuabiu et al., 2021; and Avutswa, 2020). Foreign exchange risk arises when there is an unforeseen fluctuation in the exchange rate, causing a change in the amount of domestic currency required to repay FOREX-denominated debt (Ogoe, 2019; Bitar, 2021).

The measurement of foreign exchange risk involves calculating the ratio of net foreign currency exposure (assets minus liabilities) to total assets (Oxelheim & Wihlborg, 1995; Gachua, 2011). Individuals and businesses engaged in international transactions should be aware of the risks associated with currency fluctuations. If the customer's commercial contracts are not expressed in domestic currency or fixed at an agreed exchange rate, there is exposure to exchange risk. Although it is impossible to eliminate all risks, individuals and companies can effectively anticipate and manage adverse exchange rate outcomes. This can be achieved by understanding typical foreign exchange risks, demanding transactions in hard currency, diversifying appropriately, and employing hedging strategies (Rahman & Hoque, 2015).

Generally, companies face three types of foreign exchange risk, which are translation exposure (accounting exposure), transaction exposure (commitment exposure), and economic exposure (operational, competitive, or cash flow exposure) (Dufey & Srinivasulu, 1983; Guay & Kothari, 2003; Christoffersen et al., 2012; Shaheen, 2013; and Almsaeed, 2020). Managing foreign exchange risk is aimed to protect the value of currency inflows, investments, and involves making decisions that aim to minimise or eliminate the negative impact of currency fluctuations (Agbeja et al., 2016; Pilbeam, 2018)). Various financial instruments (Greuning, & Bratanovic, 2020) are available to firms as mitigation tools to manage the effects of foreign currency rate fluctuations, commonly known as hedging techniques.

Hedging is a means of safeguarding against potential losses, and it involves implementing strategies to offset or reduce the risk of loss on assets or liabilities denominated in a foreign

currency (Denbee et al., 2016). Besides, hedging is also an investment activity that seeks to protect against future price risks by taking offsetting positions (Oxelheim, 1995; Marshall, 2000; Bekaert & Hodrick, 2009; Gachua, 2011; Ahmed, 2015; Kim & Sheen, 2018; Pellegrino et al., 2023). Some hedging techniques can be implemented within the firm without involving any market-based financial instruments. These techniques provide firms with options to mitigate foreign currency risk and protect their financial positions. There are several other methods available for mitigating foreign exchange risk, including forward contracts, cross-currency swaps, options, leading and lagging, netting, and value changes.

The MENA region has emerged as a rapid developing area and a major player in the global economy. Positioned between Europe and Asia, it benefits from abundant natural resources, particularly oil, making it one of the world's wealthiest regions. Additionally, it is home to prominent Islamic banks such as Al Rajhi Bank, Qatar National Bank, and National Bank of Egypt. In the aftermath of the global financial crisis of 2007-2008, regulators and bank management have become increasingly concerned about the risks that could potentially undermine financial performance and result in substantial losses for banks. The role of banking institutions is crucial in fostering economic development by facilitating businesses, promoting trade, allocating funds efficiently, and implementing government monetary policies. Banking is also one of the foundations for economic growth and national stability to improve public finances (World Bank, 2020; Nguyen et al., 2020 and Al-Tahat & AbuNqira, 2016).

However, the inability of banks to meet their intermediation obligations introduces a vulnerability in the financial system. It also raises uncertainty in the economy. The variations of different risks faced by banks, could bring a challenge for banks to identify and manage them. However, by improving the risk management process will solve the problem. The management of foreign exchange risk exposure is typically handled through the implementation of various strategies based on a company's management policies, intuition, and past experiences (Kiptisya, 2017). Focusing on foreign exchange risk is somehow important considering the active foreign transactions in the MENA region. Considering the above concerns, it is crucial to thoroughly examine and understand the management of foreign exchange risk and its impact on the financial performance of banks in the MENA region.

This research aims to contribute to the existing literature by assessing the influence of foreign exchange risk on the financial performance of MENA banks. The investigation of the nexus between foreign exchange risk and bank performance particularly in the MENA region where the Islamic banks are located is important to addressing some poverty dimensions captured in the first Sustainable Development Goal (SDG) of elimination of poverty. The study is structured as follows: the subsequent section provides an overview of the empirical and theoretical perspectives derived from previous research, followed by a discussion on data sources in the research methodology section. Following section presents the empirical findings, and the concluding section summarises the key implications and offers recommendations for future research. By addressing these aspects, this study addresses a research gap and enhances our understanding of the relationship between foreign exchange risk and the financial performance of banks in the MENA region.

2. LITERATURE REVIEW

2.1 Prospect Theory

The theory that implies the relationship between foreign exchange risk and bank performance is prospect theory. Prospect theory, a behavioral economics concept, proposes that people focus their actions on anticipated advantages and costs rather than on final results. When applied to the context of foreign exchange rates and bank performance, the theory suggests that banks may react differently to changes in exchange prices depending on their perception of gains or losses. Almaqtari et al. (2018) emphasised the significance of foreign exchange rates as a predictor of bank profitability. This is consistent with the prospect theory, as banks may see fluctuations in exchange rates as potential gains or losses that could affect their total profitability. Previously, Gabaix and Maggiori (2013) examined the impact of fluctuations in currencies on balance sheets and how this can affect the compensation that financiers demand for bearing currency risk. These changes in compensation can in turn affect both the level and volatility of exchange rates. This phenomenon exemplifies the concept of gains and losses in prospect theory, wherein banks may modify their level of risk exposure in response to perceived gains or losses resulting from fluctuations in exchange rates.

Furthermore, the relationship between expectation formation and the risk attitude regarding the exchange rate can be significantly influenced by the changing risk-profit elasticity, as demonstrated by the investors' feature that is derived from the psychological factors emphasised in the prospect theory (Zhang & Li, 2021). Finally, the prospect theory argues that banks may respond to foreign fluctuations in exchange rates based on their anticipated profits and losses, which can have an impact on their performance. Understanding how banks assess risks and benefits in the context of fluctuations in exchange rates provides insights into how prospect theory drives banking decision-making. Thus, it is hypothesised that banks' responses to changes in foreign exchange rates are driven by how they perceive potential gains and losses. These perceptions, in turn, affect the banks' performance. It is hypothesised that banks that view changes in foreign exchange rates as opportunities for profit would have better performance, whereas banks that view these changes as possible losses will have worse performance.

2.2 Empirical Findings

The impact of foreign exchange risk on bank profitability has yielded diverse and inconclusive findings (Mitra, 2017; Cohen, 2018; Pradita & Geraldina, 2019; Moyo & Tursoy, 2020; Madugu et al., 2020). Numerous studies have focused on investigating foreign exchange risk, and their results highlight a common concern in organisational foreign exchange risk management regarding the centralisation or decentralisation of management (Prindl, 1976). A centralised risk management system is often recommended due to its potential to incur lower costs from a risk perspective. However, it is important to note that this approach may have drawbacks, such as a lack of autonomy in certain units. Most studies indicate that foreign exchange risk is considered a significant risk requiring effective management. Research conducted by Marshal (2000), Abor (2005), and Avdjiev et al. (2019) emphasise the importance of foreign exchange risk management in large firms and banks across regions such as Britain, America, and Asia.

Other cohorts of studies were conducted on risk management, primarily focusing on the impact of financial performance on different entities (Tafri et al., 2009; Mogga, et al., 2018). Study by Olivia et al. (2022) highlights the importance of banks which are actively involved in foreign transactions to monitor any potential of foreign exchange risk as this may significantly affect banks' profitability, especially for large banks. This is in accordance with previous findings by Gounopoulos et al. (2013) where currency exchange negatively affects equity performance of bank. This is due to the fact that increases in exchange rate reduce the ability of banks to increase equity acquisition. However, the impact is not significant for small banks as they are not actively involved in foreign transactions. Increases in exchange rate is driven by an increase in profit. This shows that the exchange rate management significantly affects the performance of banks.

Banks play a pivotal role in the Iranian economy according to Keshtgar et al. (2020). While examining the determinants of bank's performance in Iranian, it is found out that volatility in the exchange rate plays a significant role. Studies by Gachua (2011), Mbubi (2013), Runo (2013), and Ahmed (2015) suggest that foreign exchange risk has both short-term and long-term effects on financial performance, more specifically on profitability (Habibnia, 2013; Bilgili et al., 2021). The influence of exchange rates on banks can be indirect, affecting factors such as foreign competition, loan demand, and overall banking conditions. A negative effect may be because of collateral for loans being affected by fluctuations of the foreign exchange rates. Fluctuations in the foreign exchange rate may directly bring uncertainty to banks' un-hedged foreign assets and liabilities (Wong et al., 2009). Runo (2013), He et al. (2014), Ammar and Boughrara (2019), and Salem et al. (2021) conducted similar research and discovered a negative relationship between foreign loans (used as a proxy for foreign exchange risk) and earnings for large US commercial firms. They also found insignificant results on foreign exchange towards firm performance. For instance, Ding (2012) found that foreign exchange volatility did not have a significant impact on the performance of the model.

3. RESEARCH METHODOLOGY

3.1 Data and Sample

This research examines the correlation between foreign exchange risk and the financial performance of MENA banks. The analysis utilises data gathered from 135 commercial banks across 14 countries in the MENA region spanning the years 2015 to 2019. The selection of 2015 as the initial year aligns with a significant period characterised by currency fluctuations against major global currencies. Data on foreign exchange risk and control variables were sourced from the Bank focus database, while annual GDP data for MENA countries was obtained from the World Bank database. Table 1 presents a tabulation of the sample for five years. There are 541 banks in the Middle East, accounting for 81.85 % of the total observations, and 120 banks in North Africa, accounting for 18.15% of total observations. The highest number of banks, with 80 (11.85 %), is from the UAE, whereas Palestine has the least (25 banks, or 3.7 %) with a total of 675 observations a year for the analysis. For the types of bank in the MENA region so far, there are 44 Islamic banks and 91 conventional banks.

Table 1: Tabulation of Region and Countries in MENA

Region	**Freq.**	**%**	**Cum.**
Middle East	541	81.85	81.85
North Africa	120	18.15	100.00
Total	**661**	**100.00**	
Countries	**Freq.**	**%**	**Cum.**
Bahrain	50	7.56	7.56
Egypt	45	6.81	14.37
Iraq	60	9.08	23.45
Jordan	55	8.32	31.77
Kuwait	50	7.56	39.33
Lebanon	30	4.54	43.87
Morocco	30	4.54	48.41
Oman	40	6.05	54.46
Palestine	25	3.78	58.25
Qatar	41	6.20	64.45
Saudi Arabia	55	8.32	72.77
Syria	50	7.56	80.33
Tunisian	50	7.56	87.90
UAE	80	12.10	100.00
Total	**661**	**100.00**	

3.2 Model and Measurements

To demonstrate the association between foreign exchange risk and financial performance, we estimate the following multivariate regression.

$$FP_{it} = \beta_0 + \beta_1 FOREX_{it} + \beta_2 LNBSIZE_{it} + \beta_3 AGE_{it} + \beta_4 LNGDPit + B_5 REGION_{it} + \beta_6 COUNTRY_{it} + \mathcal{E}_{it} \quad (1)$$

Where:
FP = banks' financial performance proxied by ROA and ROE.
FOREX = Foreign currency gain / Total assets
LNSIZE = bank size proxies by the natural logarithm of total assets
AGE = bank age, natural log of years since the firm operates in
LNGDP = country's annual gross domestic product
REGION = dummy (1= Middle East region; 2=North Africa region)
COUNTRY = dummy variable
YEARS = dummy variable of years of observation
ß0 = the intercept
Ɛ = the error term.

Our dependent variables FP were proxied by two financial ratios, which are ROA and ROE. ROA was measured as the ratio of net income to total assets. This ratio captures a bank's ability to generate income from asset utilisation (Zarrouk et al., 2016; Alzoubi, 2018) as a higher ROA indicates that banks can utilise their resources efficiently (Guillen et al., 2014). Meanwhile, ROE was measured as the net income ratio to total equity. High ROE indicates banks' ability to

generate profit by utilising shareholders' capital efficiently (Zarrouk et al., 2016, El-Ansary & Al-Gazzar, 2021).

Regarding our independent variable foreign exchange risk, measuring and managing exchange rate risk exposure is important for reducing a firm's vulnerabilities from significant exchange rate movements, which could adversely affect profit margins and the value of assets. Also, this relationship depended on other factors like foreign capital inflows, global crisis, and the perception of the national economy. However, according to output by Oxelheim (1995), Marshall (2000), Gachua (2011), Ahmed (2015), and Kim and Sheen (2018), we measure foreign exchange risk by foreign currency gain to total assets.

For the control variable, we choose the banks' level of control, which is the bank's size (LNSIZE) and bank's age (AGE). LNSIZE was measured using a natural log of total assets and AGE was measured by years of bank operations. For country-level control, we choose the country's GDP as macroeconomic indicators of countries in MENA. LNGDP was measured as the sum of gross value added by all resident producers in the country (in USD billion). The Bank's regional location (REGION) and the bank's country of operations (COUNTRY) were assigned as dummy variables. For REGION, the variable is assigned 1 if the banks are located in the Middle East and 2 if the banks are located in North Africa. For COUNTRY, each country was assigned a dummy variable from 1 to 14. Table 2 presents the summary description of all variables used in this study.

Table 2: Variable Description

Variable	Measurement	Abbreviation	Data Sources
Dependent variable			
Financial performance	ROA= Net Income to Total Assets	ROA	Bankfocus
	ROE= Net Income to Total Equity	ROE	Bankfocus
Independent variables			
Foreign exchange risk	Foreign exchange risk = Foreign currency gain to Total assets	FOREX	Bankfocus
Controlling variables			
Bank' Size	Natural logarithm of total assets	LNSIZE	Bankfocus
Banks' age	Years since the firm constitution	AGE	Bankfocus
Country's economic performance	Natural logarithm of Annual Gross Domestic Product	LNGDP	World Bank
Bank's regional location	Bank' regional location Measure using dummy variable of banks' location in MENA region	REGION	Bankfocus
Bank's country	Country where each bank operated	COUNTRY	Bankfocus
Additional control variable (Heckman two stage)			
Financial Leverage	Total liabilities to total assets	LEVERAGE	
Bank's Type	Dummy variable for bank's type, denote as 1 for islamic and 0 for conventional bank	BANK_TYPE	

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis

Table 3 presents the descriptive statistics of all continuous variables. The mean (median) value of ROA was 1.13 % (1.107 %). For ROE, the mean (median) value was 2.043 % (2.111 %). The negative minimum value of both ROA and ROE indicates inability of banks in making profit or utilising their assets efficiently. High maximum value of ROE showing that banks manage to generate returns from shareholders investments. Regarding the foreign exchange risk indicator, foreign exchange has a mean (median) value of 0.784 % (0.2 %). As for controlling variables, bank size (LNSIZE) has a mean (median) value of 15.622 (15.617). Meanwhile, bank age (AGE) has a mean value of 40.729 years. The oldest bank in MENA has an age of 76 years. while the youngest bank operating in MENA has an age of 5 years. Regarding LNGDP, MENA countries have a mean (median) value of 4.658(4.741) or USD 185.211 billion (USD 109.711 billion). Lastly, for the financial leverage (LEVERAGE) the mean (median) value is 0.927 (0.991) %. Based on the data provided, there is variation in MENA banks based on its ability and exposure to the risk.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis	vif
ROA	661	1.113	1.107	1.337	-4.683	8.503	0.000	0.000	
ROE	661	2.043	2.111	2.354	-7.598	13.082	0.020	0.000	
FOREX	661	.784	.2	1.497	.003	10.849	0.000	0.000	2.16
LNSIZE	661	15.622	15.617	1.782	11.432	19.374	0.060	0.000	2.71
LNGDP	661	4.658	4.741	1.127	2.522	6.705	0.942	0.000	1.32
AGE	661	40.729	43	18.274	5	76	0.376	0.000	1.37
LEVERAGE	661	.927	.991	.334	-.741	2.183	0.000	0.000	1.05

Table 4 presents the correlation matrix of all variables. Foreign exchange has a negative correlation with ROA and ROE. This indicates that banks with high exposure to risk also have lower performance. Banks with high foreign exchange indicate that they are burdened with high-risk foreign currency gain, thus making them inefficient in generating profit (Mrindoko, et. al., 2020). Regarding controlling variables, LNSIZE have positive correlation with performance measures (ROA and ROE). This indicates larger banks have more resources that allow them to generate better performance. LNGDP also have positive correlation with both ROA and ROE, which implied that countries economy conditions have influences on banks performance. Regarding the multicollinearity issue, both ROA and ROE representing financial performance are highly correlated with each other. Nevertheless, this is not a big issue since these three variables were regressed separately. In addition, the variance inflation factor (VIF) value of all independent variables was less than 5, therefore, each independent variables have weak correlation with each other.

Table 4: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ROA	1.000								
(2) ROE	0.975***	1.000							
(3) FOREX	-0.232***	-0.208***	1.000						
(4) LNSIZE	0.143***	0.106***	-0.704***	1.000					
(5) LNGDP	0.075*	0.064*	-0.336***	0.444***	1.000				
(6) AGE	0.030	0.027	-0.313***	0.417***	0.022	1.000			
(7) LEVERAGE	0.075*	0.066*	-0.012	0.069*	0.094**	-0.103***	1.000		
(8) COUNTRY	0.006	-0.143***	0.001	0.155***	0.154***	0.005	0.061	1.000	
(9) REGION	0.040	0.055	-0.096**	-0.029	-0.011	0.199***	0.055	-0.002	1.000

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

4.2 Multivariate Regression Analysis

Table 5 provides the findings of multivariate panel data analysis, where ROA and ROE were regressed on foreign exchange, LNSIZE, AGE, LNGDP, REGION, COUNTRY, and YEARS. We tested using three basic panel models, namely Ordinary Least Square (OLS), Fixed effect, and Random effect models. For the OLS model, foreign exchange is shown to have a negative association with both ROA and ROE at 1 % significance level (p<.01), which is also similar to both fixed and random effect models. This finding affirms the hypothesis that banks with high exposure to foreign exchange risk will have lower profitability. The Hausman test shows that fixed models are more appropriate compared to OLS and random models, as p-value < 0.05. Therefore, fixed effect models are a more appropriate model for this study.

The findings presented in this study are consistent with the findings of previous studies conducted by Parlak and İlhan (2016), Bahjat (2022), Pouraghajan (2012), Ahmed (2015), Gachua (2011), Mbubi (2013), and Runo (2013). Other studies, such as Hasanov et al. (2018) and Bayramov (2017), have also provided evidence of a negative relationship between foreign exchange risk and banks' profitability. Ibrahimov (2016) found a similar negative association between foreign exchange risk and banks' profitability. Additionally, Al-Homaidi et al. (2018) discovered a negative impact of foreign exchange risk on ROA and ROE, indicating that a decline in local currencies compared to the US dollar significantly reduces banks' profitability in local markets. These findings collectively suggest that foreign exchange risk has an adverse influence on the profitability and financial performance of MENA banks.

Table 5: Panel data analysis using OLS, Fixed effects and Random effects model

	Fixed		**Random**	
	(1)	**(2)**	**(3)**	**(4)**
VARIABLES	**ROA**	**ROE**	**ROA**	**ROE**
FOREX	-0.932***	-1.462***	-0.600***	-0.955***
	(0.0848)	(0.150)	(0.0625)	(0.109)
LNSIZE	0.435**	0.844**	-0.120*	-0.186
	(0.189)	(0.333)	(0.0705)	(0.123)
LNGDP	-1.261***	-2.676***	-0.154*	-0.224
	(0.438)	(0.773)	(0.0829)	(0.145)
AGE	-0.0649**	-0.100*	-0.0103**	-0.0175*
	(0.0322)	(0.0568)	(0.00521)	(0.00911)
COUNTRY	Included	Included	Included	Included
REGION	Included	Included	Included	Included
Constant	3.562	6.554	4.476***	7.748***
	(3.033)	(5.357)	(1.055)	(1.847)
Observations	661	661	661	661
Number of Banks	133	133	133	133
R-squared	0.344	0.316	0.317	0.2817
F-test	68.73***	60.55***	116.77***	102.48***
Model selection test				
Breusch and Pagan Lagrangian multiplier test (Chi2 = 148.97; p-value = 0.000)				
Hasuman test (Chi2 = 115.22; p-value = 0.000)				

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

4.3 Robustness and Additional Analysis

For the sake of the robustness of the findings, we apply several estimation techniques. First, we analyse the model using Driscoll and Kraay's robust estimations models, to address the issues of heteroscedasticity, autocorrelation, and serial dependence that commonly occurs in panel data models (Gonçalves, 2024; Hoechle, 2007). This approach is a nonparametric covariance estimator that produces consistent heteroskedastic and autocorrelation standard errors that are robust, which is similar to the Newey and West's (1987) finding. Adjusting the estimated standard error in this way guarantees that the estimator of the covariance matrix is consistent, independently of the cross-sectional dimension N (i.e. also for $N \rightarrow \infty$). Thus, Driscoll and Kraay's approach eliminates the shortcoming of other large T covariance matrix estimators that typically become inappropriate when the cross-sectional dimension N of the micro econometric panel becomes large. Table 6 shows that foreign exchange is also inversely associated with both ROA and ROE at 1 % significance level (p<.01).

Table 6: Driscroll and Kraay's Robust Estimations Regression Model

	(1)	(2)
VARIABLES	**ROA**	**ROE**
FOREX	-0.345***	-0.531***
	(0.0476)	(0.0854)
LNSIZE	-0.0143	0.00398
	(0.0742)	(0.125)
LNGDP	-2.232***	-4.149***
	(0.385)	(0.658)
AGE	-0.000641	-0.00289
	(0.00230)	(0.00462)
COUNTRY	Included	Included
REGION	Included	Included
Constant	9.343**	17.23**
	(2.229)	(3.839)
Observations	661	661
R-squared	0.284	0.275
F-test	110.70	75.77
Number of groups	133	133

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

The endogeneity problem in this study was related to selection bias due to the likelihood that performing banks were more likely to have lower risks. Hence, banks that were exposed to high foreign exchange risk might have been self-selected into the sample. To address the concern of endogeneity, we used a two-stage least square estimation technique (2SLS). However, the limitation of conducting 2SLS is identifying the appropriate instrument variable (Dam & Scholtens, 2012). Therefore, we followed Majumder and Li (2018), using a lagged one-year risk indicator for their 2SLS analysis. Our study used a lagged one-year of FOREX and BANK_TYPE as an instrument. The Hansen J statistic shows that the instrument used is valid as the p-value is larger than 5 percent ($p > 0.05$). Both Arellano-Bond first order and second order autocorrelation (AR(1) and AR(2)) shows that there is no first-order or second-order autocorrelation in the first-differenced errors. In order to obtain unbiassed estimation models, we applied a two-step dynamic panel System-Generalised Method of Moments (GMM). The GMM models provided similar findings with 2SLS and main analysis in table 7. The findings of 2SLS also yield similar results as the main findings. Meanwhile, in GMM estimators models, FOREX have a negative association with ROA at 5 % level ($p<.01$) and ROE at 10 % level ($p<.10$).

For further analysis, we applied Propensity Score Matching (PSM) developed by Rosenbaum and Rubin (1983) as shown in Table 8. Banks with high foreign exchange were matched to a set of control firms with low foreign exchange based on the characteristics with the closest forecast propensity score through logistic regression in the first stage (1st column). In the second stage, the OLS model was analysed by matching the weighted interference of logistic regression and providing unchanged results of the association between FOREX and FP.

Table 7: Two-Stage Least Square Estimation (2SLS) and Two-Step System Generalise Method of Moment (GMM) Estimators to Address the Concerns on Endogeneity

	First stage	**Two stage least square (2SLS)**		**Two-staged GMM estimators**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**FOREX**	**ROA**	**ROE**	**ROA**	**ROE**
L.FOREX	0.961***				
	(0.0244)				
BANK_TYPE	-0.0408				
	(0.0590)				
FOREX		-0.121**	-0.226**	-2.381***	-0.526*
		(0.0562)	(0.101)	(0.710)	(0.278)
LNSIZE	-0.0706***	0.0872*	0.0890	-3.172***	-0.0459
	(0.0219)	(0.0504)	(0.0908)	(0.880)	(0.175)
LNGDP	-0.0189	0.0284	0.0552	1.780***	0.0638
	(0.0250)	(0.0553)	(0.0996)	(0.685)	(0.108)
AGE	-1.70e-05	-0.000544	0.000254	-0.00577	-0.00401
	(0.00161)	(0.00337)	(0.00607)	(0.0500)	(0.00596)
COUNTRY	Included	Included	Included	Included	Included
REGION	Included	Included	Included	Included	Included
Constant	1.270***	-0.345	0.431	44.54***	3.105
	(0.319)	(0.760)	(1.367)	(12.19)	(2.970)
Observations	528	528	528	528	528
F-test	777.76***	4.32**	3.28**	-	-
Wald chi2	-	-	-	32.08***	28.60***
R-squared	0.823	0.089	0.072	-	-
Hansen J	-	1.018	2.770	2.79	3.15
p-value (Chi2)	-	0.3130	0.096	0.799	0.677
Difference (Hansen test)	-	-	-	2.14	1.46
p-value (Chi2)	-	-	-	0.343	0.483
AR(1) z	-	-	-	-0.29	-0.24
p-value	-	-	-	0.605	0.816
AR(2) z	-	-	-	-1.48	-1.45
p-value	-	-	-	0.669	0.416

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

Table 8: Propensity Score Matching

	First stage logistic	OLS - PSM
	(1)	(2)
VARIABLES	FOREX	ROA
FOREX		-0.190***
		(0.0312)
LNSIZE	-2.848***	1.009***
	(0.314)	(0.0683)
LNGDP	-0.0500	-0.498***
	(0.221)	(0.0774)
AGE	0.0255*	-0.00850***
	(0.0136)	(0.00312)
COUNTRY	Included	Included
REGION	Included	Included
LEVERAGE	-1.815**	
	(0.812)	
Constant	43.31***	-13.82***
	(4.497)	(1.099)
Observations	661	661
R-squared		0.652
Psuedo R-squared	0.7336	
F-test		203.93
LR-Chi2	528.21	

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

5. CONCLUSIONS AND RECOMMENDATIONS

This study focused on assessing how financial and foreign exchange risk impacted the financial performance of banks in the MENA region between 2015 and 2019. Given the numerous challenges faced by the MENA region, including geopolitical crises, fluctuations in oil prices, and political issues, banks in this area encounter difficulties in improving their performance due to the emergence of external institutional forces that contribute to a more volatile market. Consequently, the financial market in the MENA region is highly competitive, leading banks to take unwarranted risks, which ultimately leads to subpar performance. The findings of the study revealed a significant negative relationship between foreign exchange risk (measured by foreign exchange risk divided by total assets) and the financial performance of MENA banks. These results highlight the need for the development of appropriate frameworks and policies for timely reporting and recording of foreign exchange risk. Banks' management should establish and implement relevant policies that enable them to obtain prompt information regarding the underlying causes of foreign exchange risk, while also establishing comprehensive budgeting systems to address currency risk projections. Additionally, the study emphasised the importance of having a system in place to handle currency risk projections, advocating for training of board members and management staff in foreign exchange risk management within banks. Furthermore, investments should be made in acquiring suitable foreign exchange risk management software to ensure swift detection, analysis, and reporting of risk events, facilitating timely decision-making by management.

We conducted robust pooled estimations to examine the impact of foreign exchange risk on the financial performance of banks, specifically looking at measures such as return on assets (ROA) and return on equity (ROE). However, it is important to note several limitations in our findings. First, our analysis solely relies on accounting-based measures for foreign exchange and performance, and future studies should consider incorporating market-based measures of risk-related indicators to further explore the relationship between foreign exchange risk and performance. Second, our study is based on a relatively short period of five years, which may have influenced the results. Conducting a long-term analysis, spanning over 20 years or more, would be beneficial as it would capture significant events such as pandemics, economic crises, changes in banking policies, and other macroeconomic factors that could impact the behaviour and response of banks towards foreign exchange risk, particularly in the MENA region.

The study suggests that it is crucial to consider foreign exchange risk management in order to enhance the return on assets and overall performance of banks. Policymakers should strive to gain a comprehensive understanding of the risks impacting foreign exchange markets within the banking sector to improve capital investments and maximise the banks' returns, thereby enhancing their overall performance. Additionally, the study recommends that banks should engage in foreign exchange trading, as it offers opportunities for high returns, particularly considering the significant investment capital involved in capital projects. To achieve this, banks' management should establish appropriate structures and mechanisms that enhance returns on capital and assets, thereby maximising the profitability of banks.

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