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Exploring the Mediating Role of Financial Stability in the Relationship Between FinTech and Bank Performance: Evidence from the MENA Region

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Abstract

This study examines the impact of FinTech and financial stability on bank performance in the MENA region. Using a sample of 100 commercial banks from the MENA region over the period from 2010 to 2022, we apply hierarchical regression models to test several hypotheses. Our results show that FinTech significantly enhances both Return on Assets (ROA) and Return on Equity (ROE), suggesting that financial innovation improves bank performance by expanding service offerings, enhancing risk management, and optimizing resource allocation. Moreover, the study finds that financial stability plays a key role in boosting bank performance, supporting the idea that stable financial environments contribute to the profitability of banks. The mediation analysis reveals that financial stability fully mediates the relationship between FinTech and bank performance, indicating that the positive effect of FinTech on performance is largely channeled through improved financial stability.

Keywords: *FinTech, Bank Performance, Financial Stability, MENA Region, Mediation Effect.*

Introduction

Innovation and technology play an undeniable role in the financial sector of the Fourth Industrial Revolution (Wang et al., 2021). The emergence of big data, blockchain, artificial intelligence, and other advanced technologies in financial organizations has significantly impacted financial markets worldwide. Financial technology (FinTech) innovation has both benefited and disrupted the financial sector. As historical financial entities, banks have been affected by FinTech in two ways: "external FinTech" and "banking FinTech" (Cheng & Qu, 2020). External FinTech primarily refers to the rise of FinTech firms, whereas banking FinTech refers to innovative technology adopted by traditional banks.

FinTech firms have emerged due to the integration of new technology into business models. They generally target specific segments of the financial institutions' value chain (Elsaid, 2021) and have achieved significant success in niche markets. Through low-cost, unlimited services and time-saving capabilities (Lee & Shin, 2018), FinTech firms can provide more personalized services based on big data analysis. Faced with the threat of being replaced, banks may experience declining profitability and adopt riskier measures. Given this controversial perspective, there has been a surge of empirical studies and theoretical publications on the impact of FinTech on traditional financial institutions.

The topic of FinTech and banking has gained prominence in recent years. However, existing research on the impact of FinTech on banking performance remains inconclusive, making it crucial to determine how to assess and quantify FinTech development and its influence. To date, most articles focus on the theoretical analysis of this issue (Anagnostopoulos, 2018; Elsaid, 2021; Thakor, 2020). Regarding empirical research, several studies rely on the dataset collected by Cornelli et al. (2020), which focuses exclusively on credit FinTech—a form of external FinTech—while overlooking other types (Nguyen et al., 2021). Most empirical papers analyze the external FinTech effect on banks, such as Jagtiani & Lemieux (2018), Wang et al. (2020). In contrast, few studies focus on banking FinTech due to the challenges of data collection and measuring the degree of banking FinTech adoption.

Regarding banking performance analysis, many studies measure it only in terms of efficiency (Lee et al., 2021; Wang et al., 2021), profitability (Phan et al., 2020), or stock prices (Li et al., 2017). "Everyone talks

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about financial innovation, but (almost) no one empirically tests hypotheses about it" (Frame & White, 2004).

This study aims to quantify banking FinTech and examine its influence on banking performance using the CAMEL rating system and text-mining analysis. The research question of this study is:

What is the impact of FinTech adoption on banking performance in the presence of financial stability?

To address this question, we have set the following objectives: First, to examine the effect of FinTech on banking performance. Then, we introduce financial stability as a mediating variable to explain this relationship.

Literature Review and Hypothesis Development

Bank FinTech refers to financial innovation developed by banks in their own products or services without collaborating with non-banking FinTech companies or startups. It is important to note that in the banking sector, there are three stages of financial innovation (Cheng & Qu, 2020). Before 2010, the most representative product of innovative banking was online banking. From 2011 to 2015, mobile banking became an extension of online banking. Since 2015, emerging technologies such as big data and distributed technology (Wang et al., 2021) have become popular. This latter period has seen the emergence of innovative FinTech companies. Despite the rise of FinTech innovation worldwide and the growing interest in FinTech, little is known about how it will disrupt the existing banking sector and its financial business models (Chen et al., 2019).

The "innovation-growth" and "innovation-fragility" hypotheses offer opposing views on the influence of financial innovation. Lee et al. (2021) conclude that the "innovation-growth" perspective suggests a beneficial effect of FinTech companies on banking performance, as financial innovation can expand the range of banking services, enhance banks' risk-sharing capabilities, and improve resource allocation efficiency. Additionally, FinTech has benefited from minimizing transaction costs and mitigating the problem of information asymmetry caused by geographical limitations (Grennan & Michaely, 2021). Conversely, according to the "innovation-fragility" hypothesis, financial innovation can increase banks' risk tolerance, leading to over-lending in financial markets and the occurrence of financial crises (Lee et al., 2021). This hypothesis posits that FinTech is negatively related to banking performance. Traditional banks are generally unable to meet loan demand due to stringent regulations (Zhao et al., 2022), allowing shadow banks and FinTech lenders to thrive, thereby reducing the market share of traditional financial institutions (Buchak et al., 2018). Empirical findings on the impact of FinTech on banks remain mixed.

To maintain their market share, banks seek to improve by leveraging FinTech benefits. Emerging technologies can benefit banks by reducing operational costs and increasing service speed (Wang et al., 2021) in line with the "innovation-growth" view. However, banks' main competitive advantage over FinTech firms is customer trust. The application of innovative technology and exposure to uncertain outcomes may cause customers to lose confidence in banks, leading to a decline in bank profitability. Empirical evidence suggests that banking profitability can be affected by the growth of FinTech companies (Nguyen et al., 2021; Phan et al., 2020; Zhao et al., 2022). FinTech companies will take market share from banks, reducing their earnings capacity. However, DeYoung (2005) finds that the profits of exclusively online banks increase rapidly due to the learning effect and economies of scale. Furthermore, banks will benefit from the digitization of banking operations in various ways, including improving customer relationships and creating new value chains and business models (Elsaid, 2021). The concept of technological spillover supports the idea that financial innovation can help commercial banks modernize services and transform businesses, leading to increased profits and productivity.

H1: Bank Fintech Positively Affects Bank Profitability.

Existing empirical studies examine the role of internal and external factors in determining banking performance. Internal factors include bank-specific characteristics, while external factors are represented

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by industry-specific and macroeconomic fundamentals. Following previous studies (Bourke, 1989), some existing studies have focused on determining bank profitability at the country level (Perera & Wickramanayake, 2016). Other studies assess bank profitability across countries (Bougatef, 2017; Dietrich & Wanzenried, 2014; Robin et al., 2018). Existing studies have identified key factors such as bank size, age, efficiency, labor productivity, capital ratio, and deposit growth as determinants of bank performance.

Although liquidity is not a new phenomenon in financial literature, there is no universally accepted definition. Adler (2012) argues that the lack of a consensus definition stems from the fact that the concept of liquidity arises from different economic perspectives. Liquidity can be defined in terms of the ease with which a security can be traded (market liquidity) and the ease of obtaining financing to trade a security (funding liquidity). This research will consider both market and funding liquidity. Ideally, market and funding liquidity are complementary, as the easier it is to trade securities, the easier it is to obtain funds to trade them. This literature review aims to summarize the impact of liquidity on bank performance, emphasizing the need to consider liquidity as both a cost and a risk, and its impact on net interest margin, return on equity (ROE), return on assets (ROA), and economic value added (EVA). In other words, investors should be compensated for holding illiquid assets and for a security's sensitivity to liquidity shocks.

There is a very limited number of studies specifically conducted to examine the impact of liquidity on banking performance. Surprisingly, most of these few studies have focused on manufacturing firms. Therefore, most of the reviewed studies primarily investigated determinants of bank profitability, with liquidity being one of those determinants. Some authors have found a positive relationship, some have found a negative relationship, while others have found both results or no relationship at all. The debate is ongoing. Bourke (1989), in his study on banking performance across twelve countries in Europe, North America, and Australia, found evidence of a positive relationship between liquid assets and bank profitability. These findings seem counterintuitive, as one would expect illiquid assets to have a higher liquidity premium and thus yield higher returns. Kosmidou, et al., (2005) found that the ratio of liquid assets to customer and short-term funding is positively related to ROA and is statistically significant. Furthermore, they found a significant positive relationship between liquidity and bank earnings. Kosmidou et al., (2008) examined determinants of Greek bank performance during the EU financial integration period (1990–2002) using an unbalanced panel dataset of 23 banks and found that less liquid banks have a lower ROA. This is consistent with previous findings, such as Bourke (1989), who discovered a positive relationship between liquidity risk and bank profitability.

Larger banks benefit from a greater number of borrowers, economies of scale, and diversification, leading to lower financing costs and, consequently, higher profits (Elsas et al., 2010). On the other hand, an opposing view suggests that an increase in bank size results in higher marketing, operational, asymmetric information, and bureaucratic costs, leading to a negative relationship between profitability and size (Barros et al., 2007). In the existing empirical literature, some studies find a positive relationship between bank size and profitability. Bougatef (2017) and other strands of literature provide evidence of a negative effect of size on profitability (Singh & Sharma, 2016). Thus, the effect of size on profitability remains ambiguous.

H3: Bank Size Is a Crucial Factor in Explaining Variations in Its Performance

NPLs have been considered one of the main causes of the global financial crisis (2007-2009), which damaged the U.S. economy and the economies of many other countries (Adebola, et al., 2011). they agrees that non-performing loans have been widely used as a measure of asset quality among lending institutions and are often associated with bankruptcies and financial crises in both developed and developing countries. Despite continuous efforts to control bank lending activities, NPLs remain a major concern for international and local regulators (Boudriga et al., 2009). Therefore, it is necessary to design mechanisms to control NPL levels to prevent potential financial system failures.

Sohaimi (2013) examined the relationship between liquidity risk and financial performance measures of commercial banks in Malaysia over 16 years from 2007 to 2012 using secondary data. The study used deposits, cash reserves, liquidity deficits, and NPLs as independent variables. The findings showed that liquidity risk significantly affects bank capital and reserves. NPLs were an important factor in intensifying

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liquidity risk, as they had a negative relationship with deposits, cash reserves, and the liquidity gap, thereby negatively affecting financial performance. The study concluded that NPLs should be closely monitored to maintain a healthy liquidity position for banks.

Arif & Nauman Anees (2012) studied liquidity risk and the performance of the banking system in Pakistan, focusing on conventional banks. They collected primary data through unstructured interviews and secondary data from annual reports of 22 banks over six years (2004-2009) and used a correlation research model. The study found that NPLs negatively impact bank profitability since they indicate the presence of credit risk, which can quickly turn into a severe liquidity crisis. Banks should, therefore, monitor their long-term borrowers and concluded that liquidity risk can be mitigated by reducing NPLs.

Ozurumba (2016) examined the impact of NPLs on the performance of selected commercial banks in Nigeria over the period 2000-2013. The study used secondary data obtained from the annual reports and financial statements of selected banks and analyzed them using the ordinary least squares method and ratio analysis. The results indicated that NPLs have an inverse relationship with bank performance, measured by ROE, meaning that an increase in NPLs leads to a decline in ROE. The study concluded that the impact of NPLs on banks cannot be underestimated, as they pose a fundamental threat to the very existence of banks as business entities. Secondary data for a five-year period (2011-2015) revealed that NPLs had a significant negative effect on bank performance. The study also found that bank performance improved between 2011 and 2015 due to a significant reduction in NPLs during the same period. It recommended that commercial bank management should assess the creditworthiness of their clients and implement stringent lending policies to ensure that loans are granted to those with the ability to repay. Additionally, moral hazards such as insider loans and information asymmetry should be minimized to reduce the incidence of NPLs, as they influence financial performance and the stability of banks by reducing interest income and, consequently, financial performance.

H4: Non-Performing Loans Have a Negative Effect on Bank Performance.

The debt-to-equity ratio is widely used and receives considerable attention in the existing literature. It is measured by the total value of debt over time divided by the total value of equity in the company's balance sheet. The debt-to-equity ratio indicates the proportion of debt and equity financing a company employs. Regarding the key agency cost hypothesis in agency theory, a higher financial leverage value leads to a reduction in agency costs. In this context, Berger and Di Patti (2002) found that an increase in the leverage ratio leads to lower agency costs and higher firm performance, holding all other factors constant.

Other studies, such as Njeri & Kagiri (2013) and Kuria & Omboi (2015), report a significant positive correlation between financial performance measures (ROE and ROA) and financial leverage over time. However, some studies suggest a significant negative association between financial leverage and key performance indicators, as noted by Zeitun et al., (2007) and Awunyo-Vitor & Badu (2012). The relationship between these factors has shown mixed results in terms of firm value and financial leverage, as indicated in studies by Hadlock & James (2002). These studies demonstrated a significant association between leverage and financial performance, given that financial leverage increases the cost of debt, such as interest expenses.

Kyereboah-Coleman (2007) investigated whether high debt levels have a positive link with the performance of microfinance institutions in Sub-Saharan Africa. On the other hand, various studies focusing on specific states or countries have provided a negative association between financial leverage and firm value, such as Abor (2007) in South Africa and Ghana, and Onaolapo & Kajola (2010) in Nigeria. Some studies also provide evidence of a significant negative relationship between return on equity and financial leverage.

For instance, Al-Taani (2013) analyzed the impact of key capital structure factors on the performance of 12 banks operating in Jordan and listed on the Amman Stock Exchange (ASE) from 2007 to 2011. The study found that the leverage ratio of these banks was a significant determinant of key profitability factors, such as net interest margin. Al-Taani (2013) also explained that financial leverage had an insignificant association with return on capital employed and net profit margin.

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H5: Debt Has a Negative Effect on Bank Performance

The application of FinTech, such as cloud computing in banking operations, is cost-effective and flexible for use in consumer payments and customer relationship management (Fuster et al., 2019). Studies on the impact of FinTech on financial stability are relatively scarce due to the limited availability of FinTech data. A recent study by Fung et al. (2020) analyzed the impact of FinTech on financial stability using FinTech regulatory sandboxes as an exogenous shock to FinTech innovations. Their findings suggest that FinTech promotion reduces financial fragility in emerging markets, while shocks to FinTech innovations have no effect on fragility. Based on these findings, the present study covers the period preceding the 2008 financial crisis and complements Fung et al. (2020) by using alternative FinTech measures to study its impact on financial stability.

Simultaneously, the development of FinTech could potentially create competition and increase participation in emerging markets (Feyen et al., 2021). Greater competition would reduce the market power of traditional players, thereby improving efficiency and leading to more diversified activities. Furthermore, FinTech fosters competition by enabling consumers to compare products and service offerings (OECD, 2018). Existing literature has shown that both financial stability and fragility can result from increased competition, with no clear consensus emerging. Competition leads to stability when it encourages innovation, diversifies portfolios, and enhances efficiency (Goetz, 2018).

The competition-fragility hypothesis holds in cases where competition reduces market power, profit margins, and franchise value, leading to increased instability (Albaity et al., 2022). On the other hand, a higher degree of market power or concentration is associated with higher risk due to increased loan exposure, a higher probability of default, and moral hazard problems (Caminal & Matutes, 2002). Consequently, no empirical studies have considered the three subjects together: FinTech, competition/concentration, and financial stability. Our study aims to fill this gap in the literature.

Hypothesis H6: FinTech has a significant effect on financial stability.

The drivers of bank profitability appear to have a clear association with the stability of the banking sector (Ali, 2015). The "margin effect," according to Martinez-Miera and Repullo (2010), suggests that reducing interest payments on loans decreases bank profits, thereby increasing banking risk. The eventual effect of greater competition on stability is determined by the priority of strategic concerns.

Tabak, et al., (2015) examined the drivers of commercial bank stability in Brazil over 11 years. Their research indicated that Return on Assets (ROA) enhances banking stability. However, Tan and Anchor (2016), in their study on the link between performance and banking system stability in China between 2003 and 2013, discovered that stability and ROA have a significant and adverse relationship.

Thus, based on empirical evidence found in the literature regarding the relationship between bank performance and stability, the following hypothesis can be formulated:

Hypothesis H7: Financial stability enhances the financial profitability of banks.

Methodology

Model

The estimation of the grouped OLS model works under the assumption "that there are no groups or individual effects among the sample data included." While the panel data model includes observations for the same cross-sectional units over time (multiple periods), there may be cross-sectional effects on each company or a group of companies. To address this issue, several techniques are available in practice, although econometric techniques such as fixed effects and random effects panel models are widely used as important models to avoid such problems. The fixed effects model assumes "the individuality of each company or cross-sectional unit included in the sample by allowing the intercept to vary for each company,

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but still assumes that the slope coefficients are constant across companies." While the random effects model assumes "the coefficients under the assumption that the individual or group effects are not correlated with other explanatory variables and can be formulated." It estimates that some of the omitted variables may be fixed over time but vary across panels, while others may be constant across panels but fluctuate over time. In these situations, the random effects model regression can be applied. Based on these arguments, this study decided to perform only fixed and random effects models and avoided the grouped model due to the nature of the panel data, as stated above.

Data

Data for this study were obtained from the "TheGlobalEconomy" databases. Data on macroeconomic and socio-economic variables were obtained from WDI. The empirical analysis covers 100 commercial banks from 17 countries from the MENA region for the period 2000 to 2022.

Variable Measures

Return on Assets (ROA)

Return on assets is an indicator of profitability. ROA is a measure of a bank's ability to efficiently generate profits using its assets. ROA is simply net income relative to total assets. ROA represents the percentage earned on total assets.

Return on Equity (ROE)

Return on equity is also a profitability indicator that measures the effectiveness with which banks use the money invested by shareholders and how much profit they generate from that shareholder money. ROE is net income relative to total equity. ROE represents the percentage earned on equity.

Liquidity

Liquidity is the bank's ability to calculate the amount of its short-term assets to cover its short-term liabilities. Liquidity is a crucial issue for banks because if they do not have sufficient current assets, it could lead to the risk of insolvency. In this study, liquidity quality will be measured by liquid assets to total assets.

Indeed, the following table contains the measures of the different variables used in this study.

Table 1. Measures of Variables

Variable	Measures	Expected Signs
Dependent Variables		
Return on Assets (ROA)	Net income/Total assets	
Return on Equity (ROE)	Net income/Total equity	
Independent Variables		
FinTech (ATMs)	An automated teller machine (ATM) is a computerized telecommunications device that provides customers of a financial institution with a secure method to conduct financial transactions in a public space without a human employee or bank teller.	+
Financial Stability	Z-score	+
Bank-Specific Variables		

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Liquidity (Liq)	The amount of its short-term assets to cover its short-term liabilities	+
Bank Size (size)	Ln of total assets	±
Risk (NPL)	Non-performing loans/Total loans	-
Leverage (Lev)	Debt ratio, Total liabilities divided by total assets	-
Macroeconomic Variables		
Inflation Rate (INF)	Annual variation in the consumer price index	±
GDP Growth Rate (GDP)	Rate of growth of the Gross Domestic Product	±

Result and iscussion

Tableau 2. Descriptives Statistics

VARIABLES	Mean	Std. Dev.	Min	Max
ROA	1.623659	1.160659	-2.59	13.09
ROE	14.63213	9.37372	-66.47	77.71
ATMS	26.60909	21.96906	0	81.21
ZSCORE	22.92811	13.22385	.02	66.63
LIQ	42.31433	23.84918	9.78	130.42
NPL	6.605714	4.787132	1.08	21.14
TAILLE	66.93367	40.99595	4.15	235.36
LEV	44.10293	29.0244	1.56	138.86
INF	5.14858	11.63594	-10.1	154.8
GDP	8.913188	1.088864	6.588569	11.20495

The data reported in Table 2 show that the average bank performance is 1.623659% for ROA and 14.63213% for ROE, respectively, with a maximum of 13.09% for ROA and 77.71% for ROE, and a minimum of -2.59% for ROA and -66.47% for ROE. This shows that while some banks report a negative return on equity, others generate up to approximately 77% on equity. This result should not be surprising given the composition of the banks in the sample.

Correlation Matrix

Serial correlation biases the standard errors and leads to less efficient results. Therefore, it is important for the researcher to identify whether there is serial correlation in the idiosyncratic error term. Several tests for serial correlation have been developed; however, the Wooldridge (2002) test is considered easier to implement and requires few assumptions. Since it is based on "fewer assumptions, it should be less powerful than more strongly parameterized tests, but it should be more robust" (Drukker, 2003). This study relies on the Wooldridge (2002) test in panel data models to test for autocorrelation between the residuals. The null hypothesis of this test is that the residuals are not autocorrelated, and it is accepted if the p-value is greater than 5%.

Tableau 3. Correlation

	ATMS	ZSCORE	LIQ	NPL	SIZE	LEV	INF	GDP
ATMS	1.0000							
ZSCORE	0.4258	1.0000						

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LIQ	-0.4382	-0.4076	1.0000					
NPL	-0.4363	-0.2137	0.4234	1.0000				
TAILLE	0.3994	0.2191	-0.4455	-0.4218	1.0000			
LEV	0.4778	0.4896	-0.5342	-0.4273	0.5010	1.0000		
INF	0.0643	0.2297	-0.2977	0.0678	-0.1305	-0.0949	1.0000	
GDP	0.2007	-0.1723	-0.3149	-0.3190	0.1913	0.1316	0.3374	1.0000

The correlation results presented in the table above show that the correlation coefficients between the independent variables are all below 0.5. Indeed, the issue of autocorrelation between the variables does not exist. It can be noted that a positive correlation indicates that the variables vary in the same direction; on the other hand, a negative correlation shows a variation in the opposite direction.

Results and Interpretations

In this subsection, we will present the results based on various tests conducted as well as our Panel Regression. We interpret the impact of FinTech and financial stability on bank performance. In the second step, we introduced financial stability (Z-score) as a moderating variable between FinTech and bank performance, in the presence of bank-specific control variables and macroeconomic variables.

The Effect of FinTech and Financial Stability on Bank Performance

To identify the relationship between FinTech and bank performance in a stable financial environment, we will use linear regression technique. To this end, the regression model proposed below allows for the validation of the hypotheses presented above. In fact, these hypotheses help explain the existence of a stable financial environment in the relationship between FinTech and bank performance, which can help banks invest in new financial technologies. The following equations represent this relationship:

$$ROAit = \beta_0 + \beta_1 ATMs_{it} + \beta_2 liq_{it} + \beta_3 NPL_{it} + \beta_4 Taille_{it} + \beta_5 Lev_{it} + \beta_6 PIB_{it} + \beta_7 Inf_{it} + \varepsilon_{it} \quad (1)$$

$$ROEit = \beta_0 + \beta_1 ATMs_{it} + \beta_2 liq_{it} + \beta_3 NPL_{it} + \beta_4 Taille_{it} + \beta_5 Lev_{it} + \beta_6 PIB_{it} + \beta_7 Inf_{it} + \varepsilon_{it} \quad (2)$$

$$ROAit = \beta_0 + \beta_1 Z\text{-}score_{it} + \beta_2 liq_{it} + \beta_3 NPL_{it} + \beta_4 Taille_{it} + \beta_5 Lev_{it} + \beta_6 PIB_{it} + \beta_7 Inf_{it} + \varepsilon_{it} \quad (3)$$

$$ROEit = \beta_0 + \beta_1 Z\text{-}score_{it} + \beta_2 liq_{it} + \beta_3 NPL_{it} + \beta_4 Taille_{it} + \beta_5 Lev_{it} + \beta_6 PIB_{it} + \beta_7 Inf_{it} + \varepsilon_{it} \quad (4)$$

The Effect of FinTech and Financial Stability on Bank Performance

To identify the relationship between FinTech and bank performance in a stable financial environment, we will use linear regression techniques. To this end, the proposed regression model below allows us to validate the hypotheses presented above. In fact, these hypotheses help explain the existence of a stable financial environment in the relationship between FinTech and bank performance, which can help banks invest in new financial technologies. The following equations represent this relationship:

Next, we will use hierarchical regression models to test all the research hypotheses (H1, H2, H3, H4, H5, H6, and H7). To verify these hypotheses, we need to test the existence of a mediating effect. The verification of this effect is done by constructing three models. According to Baron and Kenny (1986), four conditions must be met to verify a complete mediating effect of M in the X-Y relationship:

- **Condition (1)**: The variable X must have a significant impact on variable Y.
- **Condition (2)**: The variable X must have a significant impact on M.
- **Condition (3)**: The proposed mediating variable M must significantly influence variable Y when the influence of variable X on Y is controlled.
- **Condition (4)**: The significant influence of variable X on Y must disappear when the effect of M on Y is controlled statistically.

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The treatment of mediating variables must follow the approach of Baron and Kenny (1986). In fact, this approach, which aims to test the mediating effect, is done through hierarchical multiple regression. The term "statistical mediation" or simply "mediation" refers to a causal chain in which it is assumed that the effect of one or more independent variables is transmitted to one or more dependent variables via third variables. In the simplest case, the term mediation is used to indicate that the effect of an independent variable (X) is transmitted to a dependent variable (Y) through a third mediating variable (M). Therefore, statistical mediation refers to a causal sequence such as X → M → Y (MacKinnon et al., 2007). A mediating variable is very useful in helping to understand the mechanism by which a cause (independent variable) produces an effect (dependent variable) (MacKinnon et al., 2007). Thirty-five years have passed since the publication of the influential work of Baron and Kenny (1986) on how to identify mediating variables (M) in the relationship between two variables (X-Y). Building on the work of Judd and Kenny (1981), Baron and Kenny (1986) explain the meaning of statistical mediation and propose a simple method that seemingly allows for identifying mediating variables using sequential fitting from multiple linear regression models.

According to the results of the estimations, as shown in the table below, Model 1 expresses the direct relationships between FinTech and bank performance on one hand, and financial stability and performance on the other. These results represent the first and third steps of the Baron and Kenny (1986) approach. In fact, the result shows that FinTech has a positive and significant effect at the 1% threshold (ROA: $\beta = 0.74421$, $p < 1\%$) (ROE: $\beta = 0.5552294$, $p < 10\%$). Similarly, the result shows a high explanatory power ($R2 = 0.4892$; 0.6680). The overall quality of the model is statistically acceptable ($F = 54.03$ at $p < 1\%$; $F = 113.51$ at $p < 1\%$) for both the ROA and ROE models. In fact, these results allow us to validate our first hypothesis. Our results are consistent with the works of (Wang et al., 2021) and (Elsaid, 2021). Indeed, we can say that FinTech plays a crucial role in improving bank performance, suggesting a beneficial effect of FinTech firms on bank performance, as financial innovation can expand the range of banking services, strengthen banks' risk-sharing capabilities, and improve resource allocation efficiency.

Similarly, our results show that bank-specific variables such as liquidity and size have a positive and significant effect at the 1% threshold on bank performance for both ROA and ROE, as shown in the table below. This allows us to verify our hypotheses H2 and H3, respectively. Our results confirm the findings of (Robin et al., 2018) who showed that internal factors of banks significantly affect their performance improvement. Our results also show that macroeconomic factors play a predominant role in improving bank performance. These results are consistent with the works of (Ayaydin & Karakaya, 2014) who found a negative association between inflation and bank profitability.

For the relationship between financial stability and bank performance, as shown in the table below, the results show that the overall quality of the model is statistically significant at the 1% threshold and that FinTech has a positive and significant effect at the 1% and 5% thresholds on ROA and ROE, respectively, as shown in the table below ($\beta = 13.15317$, $p < 1\%$; $\beta = 1.647863$, $p < 5\%$). In fact, we can say that the third condition of Baron and Kenny's approach is satisfied. This allows us to validate our seventh hypothesis (H7). Our results are consistent with the works of Almaqtari, et al., (2019), who found that financial stability is an essential determinant in improving bank performance.

Table 5. Direct Effect of FinTech and Financial Stability on Bank Performance

	Fintech				**Stability**			
	ROA		**ROE**		**ROA**		**ROE**	
	Coef.	**P>|t|**	**Coef.**	**P>|t|**	**Coef.**	**P>|t|**	**Coef.**	**P>|t|**
ATMS	0.74421	0.000***	0.5552294	0.068*				
ZSCORE					13.15317	0.000***	1.647863	0.045**
LIQ	0.3392937	0.037**	0.0228019	0.007***	0.1039649	0.378	0.0018884	0.839

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NPL	-0.1031859	0.897	-0.0128241	0.757	-0.0318054	0.342	-0.0419943	0.835
TAILLE	0.1715375	0.042**	0.0425447	0.000***	-0.0080184	0.125	-0.0157821	0.699
PIB	0.1238465	0.028**	0.0135281	0.000***	-0.9287713	0.201	-0.0423575	0.412
LEV	-3.793381	0.000***	-0.1437029	0.000***	-14.36593	0.000	-0.0676076	0.934
INF	-11.39487	0.000***	-0.0189627	0.178	-0.0393098	0.293	-0.0019746	0.518
R^2	0.4892		0.6680		0.6680		0.6892	
F	54.03 0.000***		113.51 0.000***		113.51 0.000***		642.83 0.000**	

*** : significant at the 1% level, ** : significant at the 5% level, * : significant at the 10% level

Table 6. The Impact of Fintech on The Financial Stability of Banks

ZSCORE	**Coef.**	**t**	**P>|t|**
ATMS	0.6973654	3.63	0.000***
LIQ	-0.0033422	-1.11	0.267
NPL	-0.0512063	-0.10	0.922
TAILLE	0.0029582	0.04	0.971
LEV	-0.1139944	-4.86	0.000***
INF	0.000013	0.01	0.989
GDP	0.0202482	1.10	0.272
R^2	0.1885		
F	5.45 0.0001***		

*** : significant at the 1% level, ** : significant at the 5% level, * : significant at the 10% level

The results from the table above represent the second step in the approach of Baron and Kenny (1986), which aims to demonstrate the existence of a relationship between FinTech and financial stability. The results show that the overall model quality is statistically significant at the 1% level and that FinTech has a positive and significant effect at the 1% level on the financial stability of banks, as shown in the table below (β = 0.6973654, t = 3.63, p <1%). Indeed, we can say that the second condition of Baron and Kenny's approach is verified. This allows us to validate our sixth hypothesis (H6). Our results confirm the works of (Feyen et al., 2021), which showed that the development of FinTech could potentially create competition and increased participation in emerging markets, thereby improving financial stability.

Mediating Effect of Financial Stability between FinTech and Bank Performance

Now, the final condition of Baron and Kenny's approach must be verified, i.e., the effect of the predictive variable FinTech on the dependent variable (bank performance, ROA, and ROE) should not be significant once financial stability is introduced as a potential mediator. The results from the table below show that the coefficient associated with FinTech becomes non-significant, whereas it was significant during the first step

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of Baron and Kenny's (1986) approach. Indeed, the results show that FinTech has no significant effect when financial stability is introduced as a mediating variable in its relationship with performance. Therefore, financial stability mediates completely between FinTech and performance. These results allow us to verify the final step of Baron and Kenny's approach.

Table 7. Mediating Effect of Financial Stability between FinTech and Bank Performance

	ROA			**ROE**		
	Coef.	**Z**	**P>|z|**	**Coef.**	**t**	**P>|t|**
ATMS	0.0294731	0.99	0.323	0.2676029	0.37	0.710 n.s
ZSCORE	0.4044545	2.62	0.009***	0.0522531	5.39	0.000***
LIQ	0.1133044	0.72	0.469	0.0587769	4.14	0.000***
NPL	0.007669	0.26	0.798	0.1119556	0.41	0.687
TAILLE	0.0050833	0.54	0.591	-0.1609271	-1.02	0.315
LEV	-16.3379	-4.58	0.000***	-0.8253066	-2.86	0.005***
INF	0.0171542	0.80	0.422	0.0032993	1.32	0.188
GDP	-1.116627	-2.37	0.018	-0.0348137	-0.64	0.523
R2	0.2033			0.2104		
F	34.99 0.000			8.75 0.000		

*** : significatif au seuil de 1%, ** : significatif au seuil de 5%, * : significatif au seuil de 10% n.s : non significatif

Conclusion

This study aims to theoretically and empirically demonstrate the mediating role of financial stability in the relationship between FinTech and bank performance. The study is based on a sample of 17 MENA region countries over the period from 2000 to 2022. The results show that financial stability plays a mediating role between FinTech and bank performance. Furthermore, the findings provide substantial theoretical and practical contributions to the literature on technological innovation, financial stability, and performance. First, it elaborates on the link between FinTech and bank performance, as well as the mediating role of financial stability. Second, it is the first study to integrate FinTech, financial stability, and bank performance into a single research model in the context of banking institutions in an emerging economy. Finally, the study indicates how banking institutions in developing markets can use financial technologies in the presence of financial stability to improve the overall performance of the banking system.

The aim of this research is to analyze the impact of FinTech adoption and applications on bank performance through financial stability as a mediating variable. Indeed, in our analysis, we used panel data and conducted a Hausman test to choose between a fixed effects or random effects model. This study started by discussing the motivation, then reviewed theories and studies to establish the state of the art on this subject, designed the empirical study, presented the regression model results, and finally discussed contributions and future research directions. The results suggest that the adoption of financial technology in banks is significant and can improve the performance of banks in various ways. This study also finds that for MENA region banks, financial innovation has a positive influence, thus supporting the innovation-growth vision. Similarly, our results showed that financial stability mediates between FinTech and bank performance in the presence of bank-specific variables such as liquidity, size, non-performing loans, and leverage. We also included macroeconomic variables in our estimations.

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Contributions and Implications

The topic of the impact of FinTech adoption on banks is quite new. This study enriches current knowledge in three ways. First, this research uses ATMs to measure FinTech, offering a deeper examination of the subject. Second, one of the most challenging aspects of this type of research is data collection, as we worked with the MENA region where FinTech is still not highly developed. Unlike existing literature that focuses only on the impact of FinTech development, this research attempted to introduce financial stability as a mediating variable in explaining this relationship. In terms of implications, the findings of this study revealed the benefits of adopting FinTech in the banking system. The "innovation-growth" vision is also supported by the results, and it is recommended that banks focus more on the development of financial innovation and FinTech to improve their performance.

Limitations and Suggestions for Future Research

One limitation of this study is that it does not distinguish between different types of FinTech applications. To extend the research, future studies could analyze different categories of FinTech and test whether their relationship with banks is heteroscedastic. Therefore, future research could expand the analysis by including FinTech dimensions and determining whether their influence on banks is similar. Another limitation lies in the lack of additional information about the banks. Third, this research only collected data from 17 countries in the MENA region. Future research could broaden the sample size and explore the impact using a comparative analysis based on different countries. Finally, several other components could be included to complement the interaction between FinTech and banks. For example, the use of banking regulation as a moderator. Additionally, the impact of the COVID-19 pandemic on this relationship could also be evaluated in future studies

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