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HOW FINTECH SERVICES AFFECT CAPITAL STRUCTURE IN BANKING: EMPIRICAL EVIDENCE FROM BANKS IN ASIAN COUNTRIES

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ABSTRACT

In the banking sector, Fintech technologies have grown in significance as they provide more efficient ways to interact with customers and collect hard data (i.e., codifiable information) to support lending decisions. This research examines how Fintech services affect the banks' capital structure. Specifically, it analyzes financial leverage ratios and online banking services in Asian countries. Quantitative research employs panel data linear regression models (Pooled OLS, FEM, REM, and GMM) with data from banks across 10 Asian countries over 5 years (2018-2022). Findings reveal a negative relationship between the number of Fintech service users and financial leverage ratios. Specifically, increased utilization of Fintech services like Internet Banking reduces banks' debt reliance, thereby reducing financial leverage ratios. Fintech not only improves operational efficiency and reduces information asymmetry, but also contributes to a sustainable restructuring of banks' capital structures.

KEYWORDS: Fintech services, capital structure, financial leverage, bank lending.

1. INTRODUCTION

The rapid development of financial technology (Fintech) has substantially altered the landscape of the global banking sector. Fintech infiltrates the financial marketplace and provides analogous or supplementary services to vie with those rendered by traditional banks (Temelkov, 2018). As articulated by Arner et al. (2015), Fintech has revolutionized the operational modalities of conventional financial services by harnessing big data networks, artificial intelligence, blockchain technology, and cloud computing. These technological innovations not only enhance operational efficiency but also pose challenges to established banking frameworks, engendering new dynamics within the financial system's architecture. With its growing role as either a complement or alternative to traditional banking and finance, Fintech is still the focus of discussion in numerous research articles (Cole et al., 2019; Hodula, 2022). In particular, Schueffel (2016) research underscores Fintech as a pivotal facilitator of financial inclusion, broadening access to financial services while concurrently diminishing operational expenditures. Likewise, Goldstein et al. (2019) and Lee & Shin (2018) contend that Fintech catalyzes competitive market dynamics, compelling traditional banks to adopt more flexible and customer-centric approaches. Moreover, Fintech enterprises not only disrupt conventional banking offerings but also cultivate prospects for collaboration via the open banking paradigm (Gomber et al., 2017).

Fintech services, particularly emerging technologies such as digital banking and online lending platforms, have engendered novel opportunities for banks to procure capital from non-traditional sources. This could lead to a change in banks' leverage ratios, as they may be able to reduce their reliance on traditional sources of debt, while simultaneously enhancing their capability to garner capital from individual investors or non-bank entities. Research conducted by Murinde et al. (2022) elucidates that Fintech not only alters the modalities of service delivery but also changes the financial structure of banks, as these institutions take advantage of technological advancements to minimize capital costs and capital structure optimization. Concurrently, Fintech innovations may exert an influence on the capital costs incurred by banks. Previous research (Kumari & Devi, 2022) have demonstrated that banks employing sophisticated technologies can curtail operational expenses and augment business efficacy, which may consequently result in a reduction in the cost of capital pertinent to banks' financial determinations. Furthermore, the integration of new technologies within banks enhances their capacity to assess and predict risks, thereby improving capital management and optimizing financial strategies amid the intensifying competition from Fintech businesses.

In the Asian context, the adoption of Fintech is particularly vigorous, propelled by rapid technological progress, extensive mobile penetration, and favorable regulatory environments. As noted by Jagtiani & Lemieux (2018), Asia is experiencing a pronounced transition from traditional banking paradigms to digital banking frameworks, characterized by the robust engagement of Fintech firms in global financial markets. Nations such as China, India, and Singapore have witnessed a remarkable surge in investments directed toward Fintech initiatives, thereby establishing themselves as global hubs of financial technology (Chishti, 2016). Additionally, Southeast Asian nations, including Thailand, Malaysia, and Vietnam, are formulating Fintech solutions explicitly tailored for the mobile market, thereby contributing to enhanced financial growth and improved accessibility to banking services (Morgan, 2022). Nevertheless, the proliferation of Fintech services may also engender challenges for banks in sustaining a stable capital structure. Banks may face greater pressure from Fintech rivals as the market becomes more competitive and traditional financial services cease to maintain their absolute dominance. This will impact banks' capital raising strategies and may change their capital structure in the future.

However, there currently exists a paucity of empirical data regarding the influence of financial technology on the capital structure of banking institutions. Prior scholarly investigations have predominantly concentrated on the operational impact of Fintech in the evolution of the financial economy. Specifically, Claessens et al. (2018) examine the contribution of Fintech in promoting alternative financing solutions, Guo et al. (2020) analyze digital payment systems, and Demirgüç-Kunt et al. (2020) investigate the Fintech-related aspects of credit accessibility in underrepresented regions. Consequently, a research gap persists concerning the influence of Fintech on critical financial metrics, including leverage, capital costs, and capital diversification. In order to address this gap, the paper examines how Fintech services affect capital structure in banking systems in Asia. Through the examination of this relationship, the research provides a broader explanation of the overarching effects of Fintech on the financial ecosystem. Concurrently, it contributes to providing policy recommendations to regulators and offers strategic counsel to banking entities as

they navigate the complexities of this digital transformation epoch.

The research focuses on commercial banks in 10 Asian nations. The analysis spans for 5 years, from 2018 to 2022, to ensure the update and coverage of changes in banks' capital structure in the face of the rapid development of Fintech services in the region. Data are collected from audited financial statements, international banking databases, and macroeconomic statistical sources related to the financial industry. Quantitative methods are employed to analyze panel data using various estimation techniques such as Pooled OLS, FEM, REM, GMM, to evaluate factors influencing capital structures under the influence of Fintech services. Control variables include bank size, working capital, profitability, and macroeconomic conditions in each region in Asia. This research methodology enables a thorough and credible evaluation of Fintech's impact on the capital structures of banks in Asia.

The paper is organized as follows: after introduction which is provided in Section 1 above, theoretical framework and literature review is carried out in Section 2. Data and methodology are explained in Section 3. Results and discussion are shown in Section 4. Final section is Conclusions and implications.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Theoretical Framework

First, agency cost theory (Meckling & Jensen, 1976) to describe that conflicts of interest among shareholders, managers, and creditors can affect decisions regarding capital structure. In instances where banks excessively utilize debt, creditors may exhibit apprehension regarding the potential adoption of high-risk strategies by the bank aimed at maximizing short-term profits, thereby heightening the probability of bankruptcy. In contrast, an overreliance on equity by banks may lead to conflicts of interest between shareholders and managers, as managers are motivated to maximize personal gain rather than increase bank value.

Second, Modigliani & Miller (1958) were the pioneers in proposing the optimal capital structure theory. Within this theory, the authors illustrated that, in a hypothetical scenario devoid of taxation, the valuation of a firm remains uninfluenced by the debt-to-equity ratio. Modigliani & Miller (1963) amended their theory to incorporate the effects of taxation. The utilization of debt financing can augment the firm's value owing to the benefits of tax deduction on interest expenditures. In the banking sector, this theory indicates that banks might enhance their utilization of debt to capitalize on tax advantages, provided that the costs associated with financing and the risk of insolvency are maintained at acceptable levels.

Third, Pecking Order Theory, proposed by Myers & Majluf (1984), posits that firms exhibit a propensity to prioritize financing sources in the following hierarchical order: retained earnings, debt, and finally issue shares. This comes from the problem of asymmetric information, wherein external investors may misinterpret the true valuation of the bank, resulting in elevated costs for equity issuance relative to other funding sources.

Finally, Trade-off Theory (Kraus & Litzenberger, 1973), posits that firms should equilibrate tax-saving arising from debt, a decrease in agent cost, bankruptcy, and financial costs. Within the banking domain, this theory suggests that banks may embrace elevated levels of debt to exploit tax incentives, as long as the risk of bankruptcy remains at a manageable level.

2.2 Overview of Capital Structure

Banks meet their financial needs by using equity or by borrowing. Therefore, capital structure is understood as the distribution of debt and equity in the total capital of a bank. Capital structure plays an important role in optimizing the cost of capital and managing financial risks (Modigliani & Miller, 1958). According to Myers & Majluf (1984), investors who want to finance new investments will apply for auto finance first, then debt and finally share certificates while forming the capital structure. Capital structure affects the bank's cost of capital representing the long-term debt of investors and the return on equity (Allen et al., 2015). For the banking industry, capital structure has specific characteristics compared to other industries, because banks depend largely on loans from customer deposits and interbank borrowing.

2.3 Overview of Fintech in Banking

Financial technology (Fintech) has significantly transformed the banking sector by incorporating digital advancements to optimize efficiency, enhance accessibility, and bolster security within financial services. Fintech within the banking domain pertains to the implementation of technologies such as artificial intelligence (AI), blockchain, big data, and cloud computing to improve banking operations, diminish operational costs, and enhance customer experiences. Specific examples of technological innovations applied in financial services include crowdfunding, peer-to-peer (P2P) lending, automated payment and money transfer, personal financial management tools,

investment management strategies, insurance offerings, and risk management (Dorfleitner et al., 2017). The increasing use of the Internet and mobile devices to deliver financial services has also driven structural changes in the financial market (Chaikovskyi & Kovalchuk, 2020). Safiullah & Paramati (2024) contend that the emergence of Fintech enterprises does not negatively impact the financial stability of banks; rather, it engenders a healthy competitive environment that motivates banks to enhance their services and broaden financial inclusion. Additionally, the evolution of Fintech has a great influence on banking risks, help banks easily deploy risk assessment models. Furthermore, it can also reduce credit risk, market, and operational risks by gathering multidimensional information through various channels (Mansour, 2024). Although Fintech facilitates heightened competition and innovation, it concurrently introduces financial difficulties for traditional banks. Fintech companies are disrupting traditional payment processors and money transfer services by offering faster, cheaper, and more convenient alternatives such as digital payments, peer-to-peer lending platforms, and blockchain-based payment networks (Regmi et al., 2021). Robo-advisors and automated investment platforms present challenges to traditional asset management firms by delivering algorithmically-driven investment advisory and portfolio management services at reduced costs. Moreover, by leveraging advanced technology and data analytics, Fintech lenders are capable of offering accelerated loan approvals, lower interest rates, and more personalized lending solutions compared to traditional banks (Berg et al., 2022). These Fintech innovations are fundamentally reshaping the traditional banking paradigm, compelling banks to acclimatize to the swiftly transforming financial environment.

2.4 Diagnostic Design Principles

The development of Fintech services has had a significant influence on banks' capital structures. In the epoch of Fintech, capital structures are no longer exclusively reliant on traditional financial sources but are diversified through innovative funding alternatives provided by financial technology firms (Gai et al., 2018). Claessens et al. (2018) assert that the emergence of Fintech has instigated profound alterations in the funding models of banks by intensifying competition within the lending arena and diminishing reliance on traditional credit intermediation. This phenomenon is particularly salient in developing regions, where Fintech innovations frequently address the deficiencies left by conventional financial systems (Demirgüç-Kunt et al., 2020). Fintech not only helps improve operational efficiency and lowers transaction costs, thereby increasing profitability and decreasing reliance on traditional loans (Wang et al., 2021). On the other hand, Fintech lending and blockchain platforms offer non-traditional capital sources, aiding banks in capital structure diversification (Thakor, 2020). The integration of artificial intelligence (AI) and big data in risk management has improved transparency and capital allocation capabilities, reshaping banks' capital structures. Indeed, according to Zhou & Li (2024), Fintech can promote adjustments in capital structures. Fintech helps banks balance their asset allocation structure, thereby mitigating risks in a countercyclical manner (Yu, 2024). In this view, Fintech not only improves financial performance but also helps banks manage risks better through Big Data analysis and AI application. This leads to diminished reliance on traditional capital sources, enhancing operational flexibility and profitability. However, Suhardjo et al. (2024) found that there is no significant difference in financial leverage between the application of Fintech by banks and traditional banks. This indicates that although Fintech may enhance bank operational facets, it is not enough to make a significant difference in the capital structure or the financial leverage. This contradiction opens up an important dialogue within the Fintech and banking sectors. Consequently, this research proposes the following expectation:

Hypothesis: Fintech services are negatively (-) related to the capital structure of banks.

2.5. Literature Review

The accelerated evolution of Fintech has influenced and significantly reshaped the banking sector, engendering novel opportunities and challenges that compel traditional banks to undergo adaptation and transformation. Claessens et al. (2018) conducted an analysis of the magnitude and dynamics of global Fintech credit markets, underscoring that although Fintech enhances financial accessibility, it also raises policy and regulatory dilemmas. Thakor (2020) examined the interplay between Fintech and traditional banking, elucidating that Fintech not only furnishes alternative financial services but also catalyzes innovation within the banking system, thereby influencing business models and competitive dynamics within the industry.

Previous studies have also examined the role of Fintech in augmenting financial efficiency, competitiveness, and accessibility. Chaikovskyi & Kovalchuk (2020) assessed the advantages associated with the advancement of Fintech in the

banking sector, accentuating its pivotal role in digital transformation, automation, and customer-centric improvements. In a similar vein, Safiullah & Paramati (2024) analyzed the repercussions of Fintech enterprises on banking stability, positing that while Fintech enhances efficiency and accessibility, it also intensifies competition and increases risks associated with cybersecurity and market volatility.

Additionally, Girardone et al. (2024) investigated the nexus between Fintech credit and firms' cost of capital, arguing that alternative lending mechanisms, such as P2P lending, are fundamentally altering traditional capital accessibility. Nonetheless, their inquiry predominantly concentrated on capital accessibility rather than the transformations in the capital structure of financial institutions. Zhou & Li (2024) discussed the dynamic adjustment of capital structures under the influence of financial innovations, recognizing that Fintech influences financial decision-making but is not directly related to the bank's capital structure.

Although these researches furnish valuable insights into Fintech's influence on banking operations, financial stability, and credit allocation, there has been no specific research that thoroughly explored the relationship between Fintech and capital structure in the banking sector. Consequently, the present study endeavors to examine the implications of Fintech on banks' capital structures, thereby contributing to the redress of this lacuna in the extant literature.

3. DATA AND METHODOLOGY

3.1. Research Data

According to Findexible (2021), 10 Asian countries are ranked among the top 70 leading countries in Fintech development, namely: Singapore, China, Japan, Korea, Taiwan, Indonesia, Malaysia, Philippines, Thailand, and Vietnam. These countries represent the remarkable development of Fintech and rapid technological adoption in the financial and banking sector, therefore, these countries were chosen as the research scope for data collection. The research utilizes a bank list from these countries, focusing on annual revenue and total balance sheet figures. The data were limited by selecting only banks with complete accounting information over the entire research period, while eliminating observations that were not economically meaningful based on accounting information. Additionally, observations with errors like invalid asset values, negative natural logarithm of total assets. Tangible and Intangible Assets evaluate asset structure through operational years, or zero revenue are discarded. The resulting sample comprises 484 observations from 2018 to 2022, avoiding the disruptive effects of the COVID-19 pandemic. Using panel data helps reduce variation across subjects and over time, thereby reducing estimation bias.

3.2. Data Description

Dependent variable: BANKDEBT is used to represent the capital structure in banks as it reflects the financial leverage ratio - a key factor crucial for evaluating financial risk and profitability. Capital structure pertains to how a company finances its assets and operations through equity and debt. Banks optimize their capital structure to balance the cost of debt (lower because interest is tax deductible) and equity (more expensive but provides stability) (Gropp & Heider, 2010). Proper capital structure planning enhances capital efficiency and responsiveness to market fluctuations (Taani, 2013). An elevated debt ratio correlates with increased net profitability and profit margins (Abor, 2005).

The independent variable: FINTECH denotes the quantity of users engaging with banking Fintech services, such as Internet Banking. Schueffel (2016) characterizes Fintech as "a new industry that applies technology to improve financial activities," highlighting both innovation and the enhancement of existing services through technology. Philippon (2016) defines Fintech as "an innovation that changes the way financial institutions deliver services while increasing the transparency and efficiency of financial markets." Gomber et al. (2017) assert that Fintech is "a field integrating information technology, financial services, and innovation to enhance performance and user experience." These analyses demonstrate that Fintech not only alters institutional operations but also enhances consumer access to services, prioritizing transparency, convenience, and user focus. Additionally, Fintech plays a key role in promoting comprehensive finance by providing modern financial services to previously underserved groups.

Control variables: In this research, control variables are designed to assess and analyze the effects of various determinants on banks' capital structure. CASHHD measures the ratio of cash and cash equivalents to total assets, reflecting the bank's liquidity level. ROA signifies profitability by calculated as EBIT divided by total assets. WC illustrates short-term financial capacity via the ratio of working capital to total assets. SIZE denotes the bank's magnitude, expressed as the their ratios to total assets. Age, expressed as the logarithm of operational years, indicates the years

of operation. SalesGrowth measures the revenue growth rate over time, pertinent for predicting capital requirements, as increasing revenue often requires banks to expand their capital. Branch indicates local and international number of bank branches presence by measuring branches per 1,000 residents, critical because Fintech development may vary across regions, influencing the adoption of financial technology at individual bank branches. GDP represents real economic growth in the banks' home countries, reflecting the overall economic context of each country. Lastly, the dummy variable Emerging Market distinguishes banks in emerging markets (value = 1) from others (value = 0), clarifying the specific impact of this region in the research.

Table 1. Description of variables

	Variables	Symbol	Measure
		Dependent variables	
1	Capital structure	BANKDEBT	$\frac{\text{Liabilities}}{\text{Total assets}}$
		Independent variables	
2	Fintech services	FINTECH	$\frac{\text{Total number of bank customer using Internet Banking x 1000}}{\text{Population at provincial level}}$
		Control variables	
3	Cash holding ratio	CASHHD	$\frac{\text{Cash and cash equivalents}}{\text{Total assets}}$
4	Return on Asset	ROA	$\frac{\text{EBIT}}{\text{Total assets}}$
5	Working capital ratio	WC	$\frac{\text{Working capital}}{\text{Total assets}}$
6	Bank size	SIZE	Logarithm (Total assets)
7	Tangible Asset Ratio	Tangible	$\frac{\text{Tangible Asset}}{\text{Total assets}}$
8	Intangible Asset Ratio	Intangible	$\frac{\text{Intangible Asset}}{\text{Total assets}}$
9	Years of operation	Age	Logarithm (Age)
10	Sales Growth	SalesGrowth	$\frac{Sales_t - Sales_{t-1}}{Sales_{t-1}}$
11	Branch Density	Branch	$\frac{\text{Total Bank Branches at provincial level x 1000}}{\text{Population at provincial level}}$
12	Economic growth	GDP	$\frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$
13		Dummy	- 1 if the bank is headquartered in the emerging market. - 0 if the bank is headquartered in other.

3.3. Research Model and Data Processing Methods

The primary aim of this research is to examine the influence of Fintech services on the capital structure of banking institutions within the Asian region; consequently, we propose the subsequent model:

$$BANKDEBT_{i,} = \beta_0 + \beta_1 FINTECH_{i,t} + \beta_2 Control_{i,t} + \varepsilon_{i,t}$$

In which:

- BANKDEBT: dependent variable measuring the capital structure of the bank
- β_0: intercept coefficient.
- β_1, β_2: estimated coefficients of the variables in the model, including independent variables and control variables.
- i,t: represent the order of banks and year.
- $\varepsilon_{i,}$: random error.
- FINTECH: independent variable measuring the level of banks applying Fintech.
- Control variables such as: Cash Holdings, ROA, Working Capital, Size, Tangibility, Intangibles, Age, Salesgrowth, Branch, GDP, Dummy.

The research utilized quantitative methods combined with Ordinary Least Square (OLS) and software like Microsoft Excel and STATA to process and check data. Nonetheless, OLS's limitations may lead to biased estimates due to its inability to reflect individual bank characteristics. To address this issue, the research deployed Fixed Effects Models (FEM) and Random Effects Models (REM). The FEM model allows the separation of fixed effects over space and time, helping to increase the accuracy of the results. In contrast, the REM model assumes that the individual characteristics of each bank are random and uncorrelated with the independent variables, thereby treating the residual as an additional explanatory variable. The Hausman test is used to identify the more appropriate model between FEM and REM. When facing the problem of endogenous variables, the research uses the GMM estimation method of Hansen (1982), based on the

recommendation of Doytch & Uctum (2011). This method not only helps to solve the endogeneity problem but also effectively handles the phenomena of heteroscedasticity and autocorrelation, thereby improving the reliability and accuracy of the research results.

4. RESULTS AND DISCUSSION

Table 2 provide an overview of the diversity and variation in factors affecting capital structure with 484 observations. It can be seen that Asian banks exhibit notable disparities in capital structure and the level of Fintech utilization.

Table 2. Descriptive statistic

Variable	Obs	Mean	Std. dev.	Min	Max
BANKDEBT	484	0.907	0.104	0.545	1.662
FINTECH	484	127.013	147.493	0	840.88
CASHHD	484	0.082	0.094	0.00005	0.619
ROA	484	0.112	0.89	0.0001	11.844
WC	484	-3.044	72.407	-1592.71	0.607
SIZE	484	7.077	1.739	4.309	9.913
Tangible	484	0.013	0.021	0.001	0.247
Intangible	484	0.007	0.023	0	0.283
Age	484	1.67	0.269	1	2.233
SalesGrowth	484	39.833	280.026	-0.999	4398.634
Branch	484	0.009	0.021	0	0.189
GDP	484	0.04	0.054	-0.095	0.299

Source: *Author's analysis*

The dependent variable, BANKDEBT, indicates that the surveyed Asian banks have an average of over 1 USD of assets corresponding to 0.907 of liabilities. The average number of people using online banking services (FINTECH) is 12.7013%, accompanied by a large standard deviation (147,493). This means that on average, each bank has about more than 12% of the population using online services, reflecting significant technological advancement yet disparity among banks. Developed nations like China and Japan show high ratios, contrasting with lower figures in less developed regions, reflecting the economic and technological conditions of each region. On average, banks maintain 8.2% of total assets in cash (CASHHD) and achieve a return on assets (ROA) of 11.2%, indicating quite good business performance in major Asian banks. The average net working capital (WC) is -3,044, revealing a tendency for banks to hold more debt than current assets. The average bank size (SIZE) stands at 7,077, considered relatively high. The proportions of tangible and intangible fixed assets are 1.3% and 0.7% of total assets, respectively, suggesting that banks seem to invest little in fixed assets. The average years since listing (AGE) is 1.67 years, with a branch density (BRANCH) of 0.009. Furthermore, the representative macro variable, GDP, has an average value of 4%.

Based on the table 3, it is possible to evaluate how the variables are correlated with each other. Most variables exhibit correlation coefficients below 0.8, indicating the absence of serious multicollinearity. Consequently, all variables are deemed appropriate for model inclusion. To further validate this, a VIF test was performed to ascertain whether the multicollinearity occurs or not.

Table 1. Correlation coefficient matrix

	BANKDEBT	FINTECH	CASHHD	ROA	WC	SIZE	Tangible	Intangible	Age	SalesGrowth	Branch	GDP
BANKDEBT	1											
FINTECH	-0.048	1										
CASHHD	0.011	-0.245	1									
ROA	0.035	-0.052	0.194	1								
WC	-0.178	0.026	0.014	0.005	1							
SIZE	0.169	0.405	-0.364	0.028	0.027	1						
Tangible	-0.352	0.108	-0.127	-0.03	0.019	0.04	1					
Intangible	-0.348	-0.077	-0.015	0	0.007	-0.191	0.853	1				

Age	-0.001	0.163	-0.368	0.173	0.046	0.311	0.164	0.055	1			
SalesGrowth	0.075	-0.042	-0.047	0.119	0.006	0.162	0.039	-0.022	0.14	1		
Branch	-0.005	0.112	0.152	-0.03	-0	0.038	-0.077	-0.051	-0.155	-0.029	1	
GDP	-0.048	-0.083	-0.001	-0.08	-0.04	-0.166	-0.066	-0.036	-0.158	-0.006	-0.072	1

Source: *Author's analysis*

Table 2. Test for multicollinearity

Variable	VIF	1/VIF
Intangible	4.75	0.21
Tangible	4.7	0.213
Dummy	3.1	0.323
CASHHD	2.81	0.355
SIZE	1.87	0.535
Age	1.38	0.725
ROA	1.35	0.738
FINTECH	1.33	0.751
Branch	1.31	0.764
GDP	1.09	0.917
SalesGrowth	1.07	0.935
WC	1.01	0.994
Mean VIF	2.15	

Source: *Author's analysis*

The VIF (Variance Inflation Factor) test employed in the table evaluates potential multicollinearity among model variables. Results indicate that no variable exceeds a VIF index of 10, thus affirming the absence of multicollinearity. This finding aligns with initial correlation coefficient matrix analyses. Hence, the model fulfills the requisite conditions.

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Table 3. Panel regression model selections

Hausman test		Modified Wald test	
chi2(8)	= 17.23	chibar2(97)	= 4.2e+07
prob > chi2	= 0.028	prob > chibar2	= 0.000

Source: *Author's analysis*

Table 4. Diagnostic tests

Wooldridge test for autocorrelation	
F(1, 96)	= 6.977
Prob > F	= 0.010

Source: *Author's analysis*

Based on the test results, the FEM model was chosen due to the Hausman test p-value < 0.05 (p-value = 0.021). However, the Modified Wald test indicated heteroscedasticity (p-value = 0.000) and the Wooldridge test showed autocorrelation (p-value = 0.010). Both of these issues can distort the analysis results, affecting the accuracy and reliability of the model. In addition, the model may also have endogeneity. Consequently, to enhance the reliability of the results, the authors employed the GMM estimation method to address these issues. Hence, GMM results will be the final results used for this research.

Table 5. Summary of regression results

	Pooled OLS	FEM	REM	GMM
BANKDEBT L1.				0.665***
				-39.41
FINTECH	-0.00007	0.00004	-0.00003	-0.00004***
	(-1.71)	-0.52	(-0.63)	(-6.32)
CASHHD	-0.041	0.11	-0.048	0.163***
	(-0.54)	-0.65	(-0.44)	-9.96
ROA	-0.004	0.001	-0.001	-0.003***
	(-0.68)	-0.11	(-0.15)	(-15.16)
WC	-0.0002***	-0.0002***	-0.0003***	-0.0003***

	(-4.31)	(-5.56)	(-5.89)	(-20.62)
SIZE	0.011**	-0.230**	0.008	0.007***
	-3.13	(-3.17)	-1.41	-13.46
Tangible	-1.415**	-0.327	-0.854*	-0.192***
	(-3.30)	(-0.47)	(-2.02)	(-4.58)
Intangible	-0.301	-0.005	-0.652	-0.072*
	(-0.76)	(-0.01)	(-1.62)	(-2.41)
Age	-0.002	0.479	-0.006	0.032***
	(-0.10)	-1.81	(-0.20)	-10.66
SalesGrowth	0.00002	0.000004	0.000009	0.004***
	-1.16	-0.36	-0.75	-7.72
Branch	-0.331	0.086	-0.344	-0.425***
	(-1.42)	-0.03	(-0.81)	(-3.85)
GDP	-0.081	-0.002	-0.032	-0.058***
	(-0.98)	(-0.04)	(-0.53)	(-20.88)
Dummy	-0.053	0	-0.059	0.013***
	(-1.56)	(.)	(-1.10)	-4.91
_cons	0.922***	1.724***	0.944***	0.189***
	-15	-4.88	-9.95	-10.14
Number of obs	484	484	484	387
Number of instruments				86
Number of groups				97
P-value	0	0	0	0
R-squared	0.209	0.107	0.072	
Wald chi2			60.13	4.83E+09
AR1				0.017
AR2				0.915
Hansen test				0.313

*Note: *,**,*** represent significance levels of 5%, 1% and 0.1% respectively; t-stat values are presented inside parentheses.*

Source: Author's analysis

In general, the regression analysis indicates that the utilization of Fintech services exhibits a negative correlation with the capital structure of banking institutions, thereby supporting the initial hypothesis and previous research (Girardone et al., 2024). This finding implies that an augmentation in the adoption of Fintech services enhances the capability to manage cash flows, optimize credit and asset allocation, ultimately assisting banks in employing their existing capital with greater efficacy. This diminishes the reliance on debt financing, thereby steering the bank's capital structure towards a more sustainable trajectory. This trend can be elucidated through three primary reasons: (1) Fintech facilitates the optimization of operational expenditures and increase service income, consequently reducing the need for debt; (2) Banks are able to diversify their capital acquisition strategies by leveraging digital platforms, rather than relying on loans. Research conducted by Boot et al. (2021) and Phan et al. (2024) indicates that innovations such as blockchain technology, crowdfunding, and P2P lending facilitate banks and financial institutions in accessing non-traditional funding sources, thereby diminishing their reliance on conventional debt; (3) Fintech improves risk assessment capabilities, mitigates information asymmetry (Chen et al., 2022), and thus enables banks to function with greater efficacy without using excessive financial leverage.

In relation to the theoretical framework, this research also extends and adds some new aspects. Firstly, the Agency Cost theory posits that the utilization of debt can serve as a mechanism to regulate managerial behavior. However, Fintech can help banks manage risks better, thereby decreasing reliance on debt as a control tool. Innovations such as blockchain facilitate the recording of transactions in a transparent and immutable fashion, consequently diminishing the risk of fraudulent activities and conflicts of interest among stakeholders (Philippon, 2016). Furthermore, Fintech platforms enhance the monitoring capabilities of shareholders and creditors, thereby contributing to the reduction of agency costs within the banking sector. Nonetheless, Fintech may also engender novel conflicts of interest, particularly between traditional banking institutions and independent Fintech enterprises, thereby posing new challenges to financial governance. Secondly, according to the Modigliani-Miller (M&M) theory, in an idealized market scenario, capital structure does not influence the valuation of an enterprise. However, in the context of Fintech development, non-traditional funding channels are changing banks' funding decisions. Consequently, this evolution may diminish the applicability of M&M's theory in elucidating the capital structure determinations of modern banking entities. Thirdly, the Pecking Order theory underscores that enterprises prioritize

internal financing over debt. In the Fintech landscape, research has indicated that Fintech can change this priority. Research conducted by Chen et al. (2022) demonstrates that Big Data analytics and artificial intelligence (AI) tools enable banks to efficiently gather and analyze financial data, thereby mitigating the degree of information asymmetry between banks and investors. This development may prompt banks to reassess the viability of equity issuance as a financing avenue, rendering it more attractive than previously perceived. Furthermore, the advent of decentralized fundraising platforms, such as Initial Coin Offerings (ICOs) or Security Token Offerings (STOs), is transforming the capital-raising methodologies of banks, thereby influencing funding decisions in accordance with the traditional pecking order theory. Finally, the Trade-off theory posits that enterprises will strategically weigh the benefits of debt (tax benefits) and bankruptcy costs. Empirical results indicate that Fintech simultaneously engenders novel avenues for capital procurement, such as asset tokenization, which enables banks to secure funding without necessitating an increase in their debt ratios. Thus, the development of Fintech can alter the equilibrium between the benefits and costs of using debt utilization in the capital structure of banking institutions.

Besides, it can be seen that banks in emerging markets tend to use more debt than other banks. The reason may come from the fact that banks here are limited in their own capital, so they have to rely on debt to finance their operations. In addition, although Fintech is developing, the level of technology application in these markets may not be high enough to replace traditional capital mobilization channels. This finding implies that the influence of Fintech on capital structuring is heterogeneous across areas, with banks in emerging markets still relying more on debt relative to banks situated in developed markets.

In addition, the research revealed that various factors exhibit a positive correlation with the capital structure of banking institutions, encompassing cash holdings, bank size, years since listing, and sales growth. This result implies that banks characterized by large scale, high cash holdings, long-term operations, and high sales growth are inclined to utilize higher levels of financial leverage to support their operational activities (Bukair, 2019; Khaki & Akin, 2020). On the contrary, elements that demonstrate a negative correlation with the capital structure include return on assets, working capital, tangible assets, intangible assets, branch density, and economic growth (Antoniou et al., 2008; Nguyen et al., 2020). Banks exhibiting elevated profitability, ample working capital, a large proportion of tangible or intangible assets, and an extensive branch network are generally less reliant on debt financing. In particular, within an economic growth environment (high GDP), banks tend to augment their equity capital, resulting in a reduction of financial leverage ratio. Collectively, this difference reflects the flexible financial strategy of banks based on their capital mobilization capacity, operating efficiency and economic conditions.

5. CONCLUSIONS AND IMPLICATIONS

5.1. Conclusions

In the context of increasingly modern and innovative banking, Fintech services have become an important factor in promoting changes in the capital structure of banks. Currently, research on this topic is still limited. Consequently, this study empirically investigates the effects of Fintech on the capital structure of banks across 10 Asian nations from 2018 to 2022. The selection criteria for these nations based on similarities features and banking system evolution. The GMM analysis indicates that Fintech utilization improves banks' capital structure in a more sustainable direction by decreasing financial leverage. In addition, banks in emerging markets tend to use higher financial leverage. The research also found that cash holdings, bank size, years of operation, and sales growth were positively correlated with capital structure, while factors such as return on assets, working capital, tangible and intangible assets, branch density, and economic growth were negatively correlated with capital structure. The results of this research elucidate the influence of Fintech services on the capital structure of Asian banks, providing a foundation for subsequent research.

5.2. Managerial Implications

First, banks should promote the application of Fintech in business operations, particularly in the realm of digital financial services such as Internet Banking and electronic payment systems. This not only serves to enhance operational efficacy but also aids in the optimization of the capital structure towards a more sustainable paradigm, thereby diminishing reliance on financial leverage. Second, for banks operating in emerging markets - where there is a tendency to use high financial leverage - managers need to be more cautious in their capital mobilization strategies. Strengthening risk management and the adoption of Fintech can serve to mitigate financial risks while simultaneously

enhancing access to capital at reasonable costs. Third, policymakers can consider issuing regulations to support banks in integrating Fintech to improve financial stability and promote sustainable development of the banking industry. Finally, banks should invest in research and development (R&D) to fully harness the advantages of Fintech, which will facilitate enhanced competitiveness and flexible adaptation to fluctuations in the global financial marketplace.

5.3. Limitations and Future Directions

Nonetheless, the research still has some limitations. Firstly, the research is confined to banks in 10 Asian nations, potentially constraining the applicability of the research results. Secondly, obtaining data regarding Internet Banking clientele is quite difficult in some developing nations, resulting in a limited sample size. Lastly, the analysis neglects a thorough examination of the COVID-19 pandemic from 2020 to 2021, hindering a complete understanding of how this extraordinary event may influence the interplay between Fintech elements and banks' capital structures amid a period of important economic disruption.

Future research could broaden the scope of the study to include more countries, particularly those with advanced Fintech sectors like Europe and North America, enhancing generalizability and providing a holistic perspective. Second, subsequent studies might focus on acquisition of detailed data regarding customer behavior concerning Internet Banking and other digital financial services, facilitating a deeper comprehension of Fintech's influence on banks across diverse economic contexts and developmental levels. Finally, further research could consider the long-term effects of the COVID-19 pandemic on the banking and Fintech sectors. Analyzing the post-pandemic landscape could elucidate how banks have modified their capital strategies and technological applications to adapt to the new business environment.

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