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Fintech Application on Banking Stability using Big Data of an Emerging Economy

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ABSTRACT: *The rapid growth and development of financial technological advancement (Fintech) services and innovations have attracted the attention of scholars who are now on a quest to analyse their impact on the banking sector. This study conducts several kinds of analyses to measure the effect of the fintech era on the stability of the Chinese banking sector. It uses Big Data and performs Pearson correlation and regression analysis on the fintech era's transition period to measure the impact of several explanatory variables— institutional regulation, government stability, bank credit to deposit ratio, and economic growth— on the outcome variables, which includes Nonperforming loans (NPLs) and its numerical measurement in relation to the mean score of the Big Data (Z-score). This study uses yearly Big Data from 1995-2018 and revealed that compared to the first wave of the fintech era, the second wave helped in the reduction of NPLs and the enhancement of financial stability in China. This study concludes that in the second wave of the fintech era, the explanatory variables mentioned above had a positive impact on NPLs and banking stability. This work helps comprehend fintech development in modern society and the importance of its disruptive forces in developing and developed countries.*

Keywords: *Banking stability; Fintech; Innovations; Big data; Nonperforming loans; Corruption; First wave; Interaction analysis.*

1. INTRODUCTION

Over the past few decades, the operations of the banking sector have changed. The effect of the financial crisis of 2007-2008 ensured that banks install several measures to prevent the instability of the banking sector. The banks also proposed other innovations for security from risks arising from situations. The development in financial technological advancement (Fintech) has greatly

improved the financial outreach tasks of the banking sector. Researchers refer to this advancement as the ‘Fintech Revolution’. Fintech originates from the ‘Financial Services Technology Consortium’, a Citi group project for the promotion of technological collaboration. Fintech is the integration of digital technologies with financial activities and services. The fintech revolution has greatly varied the conventional functions of banking services with the introduction of novel tasks like digital lending, crowdfunding, online payments, peer-to-peer lending, etc. These e-services collected from Big Data have added to the roles of non-banking financial services. The four principal areas of fintech are Artificial Intelligence, Blockchain, Cloud Computing and Big data. Big Data can be used to predict market changes and client investment, examine customer spending habits, enhance the detection of fraud and help in the creation of new marketing tactics. Some basic applications of fintech in real-time is the use of smartphones for mobile banking, borrowing, investing and dealing in cryptocurrency. The general aim of fintech is to make financial services more accessible and affordable to the general public. In recent times, fintech has been used to automate the processes of trading, insurance, risk management and other bank services. There even exists a subset of fintech that focuses on the insurance industry referred to as ‘insuretech’. As the use and adoption of fintech spreads, governments are slowly providing regulations to guide their transactions.

Despite the initial excitement of the development of fintech, it has faced several challenges. Data security is a primary challenge of fintech companies because of the threat of hacking, and the fear of leaking sensitive customer financial data. Fortifying their technology with multiple levels of defence would reduce this challenge. Another challenge of fintech companies is the high cost of starting up the company. The fintech revolution is believed by some researchers to be a double-edged sword— decreasing the cost of banking on one hand and increasing the cost of infrastructure to be set up for the development of fintech on the other. [1] opined that fintech lending greatly accelerates the chances of Non-Performing Loans (NPLs). As a result of the fintech revolution, fintech lending has had massive growth. It has provided better chances of affordable loans for individuals and households. [2] stated that the reason fintech increases NPLs is because of the low collateral requirement and the weak legal support in fintech. On the other hand, Magee J [3] argued that the possibility of a default fintech loan is relatively low compared to the traditional commercial bank because these loans are short-term and emphasize more on the retail segment than the commercial sector. These arguments are inconclusive about the effect of the fintech revolution on the performance of banks. Some studies have noted that the growing influence of fintech has made the banking sector more susceptible to competitive forces. For instance, the growth of fintech reduces banking market share, creates stricter regulations for bank functioning, and decreases profit margin. From these, we can infer that the competitive forces may have some negative impact on the banking sector, especially in developing countries.

Several scholars have explored the impact of the fintech revolution on the banking sector. [4] and [5] concluded that the fintech revolution negatively impacts the performance of banks by decreasing their market share and income. Other scholars, however, believe the fintech revolution has had positive impacts such as reduction of poverty, financial inclusion, assistance in sustainable development, and financial intermediation [6, 7].

In this paper, we explored the effect of the fintech era on the stability of the Chinese banking sectors by dividing the fintech era into two different timelines— the first wave of the fintech era and the second wave [8]. The following are reasons why China was used in our empirical analysis:

- China has the second-largest economy in the world.

- China operates a greatly diversified banking structure comprising private, public, and foreign banks.
- The fintech market in China is developing at a fast rate.

According to CCID Consulting, as of 2019, China's fintech sector had a market value of RMB 375.3 billion (US\$59.2 billion). Its fintech market size is projected to grow to RMB 543.4 billion (US\$85.7 billion) by 2022. For this empirical analysis, we computed Z-score on the country-level data to measure banking stability and other factors that may affect it. As a result of the non-availability of fintech data, the analysis was performed based on the fintech era rather than fintech variables. In this study, we conduct several kinds of analyses to measure the effect of the fintech era on the stability of the Chinese banking sector. The motivation of this work is to help comprehend fintech development in modern society and the importance of its disruptive forces in developing and developed countries.

This study is organized as follows: Section 2 discusses the empirical literature available on the subject matter. Section 3 explains the methodology and the empirical framework. Section 4 analyzes and discusses the results of the analysis. Finally, Section 5 presents the policy recommendations and concluding remarks.

2. LITERATURE REVIEW

2.1. Theoretical and Empirical Literature on the Evolution of Fintech and the Performance of the Financial Sector

Over the last few years, several researchers have investigated the impact of the digital transformation of financial services on the performance of the financial sector. [1] studied fintech's influence on the NPLs of the banking sector of 35 countries. He concluded that the evolution of fintech in the second wave negatively impacted the NPLs of banks. [9] explored the role of IT innovations on the NPLs of banks during the international financial recession. The study concluded that banks which use more IT services in their transactions have fewer NPLs. [10] revealed that Chinese fintech credit providers had a competitive advantage compared to regular commercial banks, thereby negatively influencing their performance and market share. [1] added that due to the cost-competitive advantage of fintech lenders, commercial banks reported that their earnings had an abnormal fluctuation. [11] opined that commercial banks are rapidly losing their share of bank loans due to the growth of peer-to-peer lending. This has caused them to resort to riskier lending practices to keep up with the competition from P2P lending. [12] examined the threats and opportunities of fintech services to the banking sector and concluded that the banking sector is facing stiff competition from non-banking financial organizations. The study also revealed that the majority of banking products are information-based, making them easily available to the fintech service providers and obstructing the business prospects of conventional banks. They concluded that a speedy adaptation of fintech services by the banking sector, in the long run, will improve the performance of the banking sector. [13] in agreement with the above, raised concerns regarding the supervision and regulation of fintech services by U.S. banking regulations. He argued that the challenges of misappropriation of banking data, lending disparities, and issues of disclosure could cause apprehension for the regulators in the long run.

Based on the above studies, we can confidently conclude that the growth and development of fintech cause pressure on traditional commercial banking. For instance, it results in a loss of market share owing to new competitors (particularly in simple savings, credit cards and payments); it leads to decreased revenue; increases the risk of fraud; destroys the face-to-face banker-customer

relationship and increases the reliance on financial services technology solutions. Other studies accentuated the positive impact of the fintech era on banking efficiency and performance. [14] argued that the growth of fintech services had minimal consequences on financial services, noting only a 1% loss in customer banking revenue in North America. [15] asserted that fintech businesses, as well as commercial banks, were pushing the financial industry forward. As a result of fintech, overall income had been greatly increased because of the democratization of access to finance and the reduced cost of transactions. The study also revealed that fintech had an essential role to play in the promotion of sustainable development in rural communities, the solutions for environmental challenges, the improvement of agricultural productivity, and the achievement of inclusive finance in China. [16] inferred that the operations of large commercial banks are mostly indifferent to fintech services. These banks have realized that the fintech era is here to stay and have begun adding financial digital services to sustain in the long run. [17] attributed China's high penetration rate of fintech services in its major economies to China skipping the phase between cash and digital payments, i.e., the credit card phase. They also attributed it to the decision of the Central Bank to allow big tech companies like Tencent and Alibaba to enter the financial space in 2014. [18] suggested that innovations in financial services complement the banking sector. Innovations in fintech help banks in the provision of consumer-centric products, and affordable financial transactions, and increase the financial sector outreach. The work of [19] and [20] supports the findings above.

We can infer from the information above that the impact of the fintech era on the performance of the banking sector is still debatable. Against the backdrop of the argument of the positive/negative effects of the fintech era on the banking sector, we revisited the nexus of the banking sector performance and the fintech era by examining how the fintech waves affect the stability of the Chinese banking sector.

2.2. Literature on the Determinants of the Stability of the Banking Sector

The stability of the banking sector is a core objective of the regulators and central banks to ensure the proper operation of the financial systems. The stability of the banking sector is very important because it could lead to the total collapse of banks, which would greatly obstruct economic development [21]. Various researchers have studied the determinants of the stability of the banking sector through the inclusion of macro-economic and bank-specific factors. [22] evaluated the effect of unemployment and economic growth on the stability of the banking sector. [23] studied the role of liquidity, lending practices, and profitability in a stable banking environment. [24] advocated the importance of institutional regulation in maintaining a stable banking environment. [25] studied the impact of banking concentration on the stability of banks. [26] and [27] explored the effects of competition on banking stability. [6] measured the impact of banking asset quality and the level of financial development on banking stability. [28] observed that the emergence of e-commerce firms such as Alibaba and JD.com have contributed to the rise of fintech in China. This is because most fintech firms are their financial subsidiaries which focus on third-party remittances and payments. China is largely expected to become the fastest-growing digital wealth management market in the world, with technology playing an essential role in that growth.

We can infer from the above that while numerous studies have analyzed the determinants of banking stability, there is no specific study that has examined how these determinants affected the stability of the banking industry during the different fintech eras. We attempted to answer the question— what is the role of the first and second wave of fintech in the stability of the banking sector? For a more comprehensive study, Z-scores and NPLs were included as proxies to measure

the stability of the banking sector. In previous studies, only either NPLs or Z-scores were used as proxies for the measurement of the stability of the banking sector [29-32]. The inclusion of both proxies will provide more robust estimates.

3. METHODOLOGY

In this section, we used the Z-score and percentage of NPLs to total loans as the proxy variables to measure the stability of the banking sector. Some other explanatory variables include economic growth rate, institutional legal framework, corruption, banking credit to deposit ratio, and government stability. For the measurement of the impact of the fintech era, we divided the total period of the study into the first wave and second wave as shown in Table 1. The [8] and [1] classification of the fintech era is used as a benchmark to determine if a particular year belongs in the first or second fintech wave.

The first wave of the fintech era was led by the evolution of commercial banks with fintech innovations. The second wave is characterized by more specialized and enhanced fintech lenders and institutions. We evaluated the stability of the Chinese banking sectors from 1995-2018, including the timelines of the two waves of the fintech era. The outcome variables and explanatory data were acquired from the International Financial Statistic Database from the International Monetary Fund. With the production of 8 fintech ‘unicorns’ worth \$214.6 billion in China, Chinese fintech has had two main objectives: to increase the economic potential of the banked and integrate remaining China’s unbanked. Jack Ma’s platform ‘Ant’ derives over 39% of its revenue from its lending platform, CreditTech which uses AI algorithms deemed too risky for conventional banks [33].

Table 1: The Phase of Fintech Evolution from the Study of Arner in [8].

Fintech Progression				
Evolution	First Wave		Second Wave	
Era	1866-1967	1967-2007	2008-Present	
Geography	Global / Developed countries	Global / Developed countries	Developed countries	Emerging / Developed countries
Key elements	Infrastructure / computerisation	Traditional / internet	Mobile / Start-ups / New entrants	
Shift Origin	Linkages	Digitalization	2008 Financial Crisis/Smartphone	Last Mover Advantage

Proposed Framework

Here, we highlight the proposed framework used to examine the determinants of the stability of the banking sector. The following equations were used to measure the influence of the determinants:

$$NPL_{i,t} = c + \beta_1 GDP_{i,t} + \beta_2 Cor_{i,t} + \beta_3 Ir_{i,t} + \beta_4 Bc_{i,t} + \beta_5 GS_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ZScore_{i,t} = c + \beta_1 GDP_{i,t} + \beta_2 Cor_{i,t} + \beta_3 Ir_{i,t} + \beta_4 Bc_{i,t} + \beta_5 GS_{i,t} + \varepsilon_{i,t} \quad (2)$$

Equations (1) and (2) were extended to include the analysis of the interaction. After including the fintech second wave interaction variable, the equation below was formulated:

$$NPL_{i,t} = c + \beta_1 GDP_{i,t} + \beta_2 Cor_{i,t} + \beta_3 Ir_{i,t} + \beta_4 Bc_{i,t} + \beta_5 GS_{i,t} + \beta_6 FIN2_{i,t} + \beta_7 GDP * FIN2_{i,t} + \beta_8 Cor * FIN2_{i,t} + \beta_9 Ir * FIN2_{i,t} + \beta_{10} Bc * FIN2_{i,t} + \beta_{11} GS * FIN2_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$ZScore_{i,t} = c + \beta_1 GDP_{i,t} + \beta_2 Cor_{i,t} + \beta_3 Ir_{i,t} + \beta_4 Bc_{i,t} + \beta_5 GS_{i,t} + \beta_6 FIN2_{i,t} + \beta_7 GDP * FIN2_{i,t} + \beta_8 Cor * FIN2_{i,t} + \beta_9 Ir * FIN2_{i,t} + \beta_{10} Bc * FIN2_{i,t} + \beta_{11} GS * FIN2_{i,t} + \varepsilon_{i,t} \quad (4)$$

Z-score is used to measure the stability of the banking sector, *NPL* represents the nonperforming loans to total loans. *Cor* describes the corruption index, *Lg* describes the legal and regulatory framework, and *BC* represents the bank credit to deposit ratio. *FIN2* describes the fintech second wave, *GS* represents government stability, and *i* stands for the country; *t* represents the period, ε shows the error term, and *c* is the constant.

In this analysis, we used five explanatory variables. Economic growth is included because prior literature states that growth in economic activities leads to increasing capital buffer and banking stability. More economic growth increases employment opportunities and income, thereby reducing debt obligations. Thus, we infer that there is a negative relationship between banking stability and economic growth.

The corruption index is included because countries with a higher level of corruption have higher chances of banking instability. Corruption causes internal conflicts and loan defaults and may impact banking stability [34]. The institutional regulatory index was included because the quality of institutional regulation increases organizational productivity and efficiency. We can thus infer that there is a negative relationship between the stability of the banking sector and institutional regulation. Next, we used the bank credit to deposit ratio as an independent variable because of the conclusion of previous studies that economic development can lead to investment opportunities and higher credit. Growth in credit distribution without proper supervision could affect banking stability. Supervision may improve the stability of the banking sector by increasing the bank profitability and capital buffer. [35] stated that a stable government enhances low economic policy certainty, which enhances a country's progress and leads to the stability of its various industries. From this, we can infer that there is a positive relationship between banking stability and government stability. *FIN2* is a binary variable using values 1 from 2008-2018 and 0 from 1995-2008. It is used to illustrate the impact of fintech's second wave on the stability of the banking sector. From this, we infer that *FIN2* has a positive effect on the stability of the banking sector. Technological innovations and the development of fintech products with adequate supervision could lower banking instability long term. Table 2 below illustrates the description of the variables and their expected relationship.

Table 2: Variables and their Probable Sign with the Dependent Variable.

Abbreviations	Probable Relationship	Dependent Variable
GDP	+	Countries growth rate
Cor	-	Corruption index
Ir	+	Institutional regulatory index
Bc	+	Bank credit to deposit ratio
Gs	+	Government Stability
FIN2	+	Fintech Second Wave

4. RESULTS

4.1.Descriptive Statistics

Table 3 below illustrates the descriptive statistics of the variables in the first and second waves of the fintech era. It shows that in the second wave, corruption (2.45), Z-score (16.64), the mean value of the GDP (6.75), and bank credit to deposit ratio (75.89) increased compared to those of the first wave. Government stability (7.22), NPLs (4.64), and institutional regulation (-0.33) fell in the second wave compared to the first wave. The descriptive statistics illustrate that the difference in the mean value of institutional regulation and government stability is scarce in the first and second waves.

Table 3: Descriptive Statistics.

Fintech First Wave					
Variables	Mean	Median	Maximum	Minimum	Std. Dev
GDP	6.24	6.86	8.84	3.80	1.95
Corruption	2.39	2.50	3.00	1.50	0.55
Institutional regulatory	-0.35	-0.35	-0.15	-0.55	0.10
Bank credit to deposit ratio	63.38	61.88	70.52	60.87	3.17
Government Stability	8.36	8.39	10.08	7.54	0.73
NPLs	9.11	9.60	14.7	2.70	4.36
Z-Score	14.92	15.27	17.55	10.58	2.19
Fintech Second Wave					
Variables	Mean	Median	Maximum	Minimum	Std. Dev
GDP	6.75	7.53	8.49	3.08	1.70
Corruption	2.45	2.50	2.50	2.00	0.15
Institutional regulatory	-0.33	-0.33	-0.16	-0.47	0.09
Bank credit to deposit ratio	75.89	75.71	78.22	73.34	1.64
Government Stability	7.22	7.81	8.41	5.33	1.18
NPLs	4.64	3.70	9.98	2.20	2.84
Z-Score	16.64	16.85	17.48	14.98	0.80

Figure 1 below depicts the bank Z-score for China from 1998-2016.

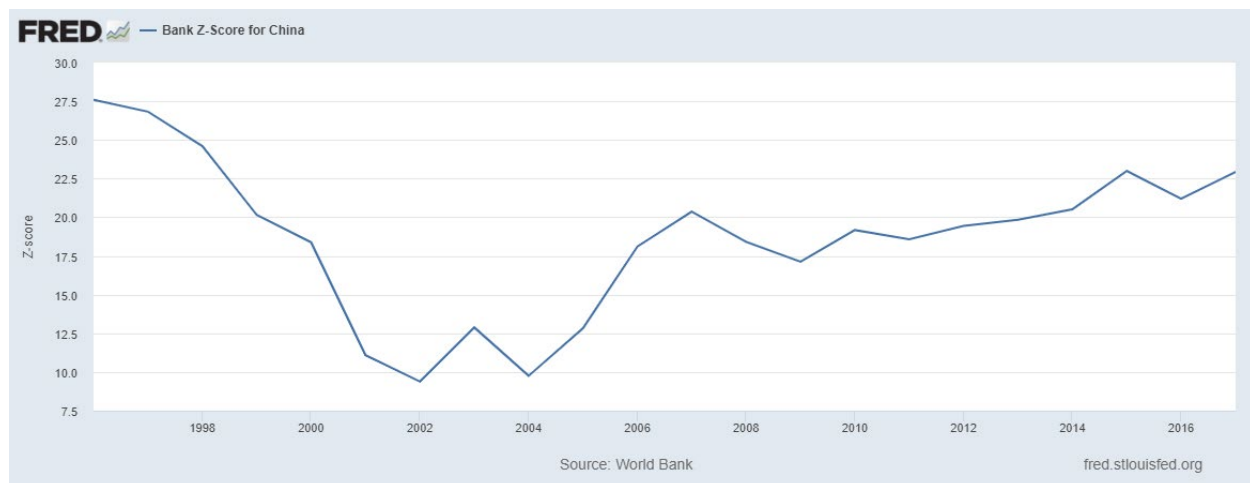


Fig.1. China Bank Z-score.

Table 4 below shows the China Z-score per year from 1996 to 2017.

Table 4: China bank Z-score per year.

Observation date	Z-Score
1996-01-01	27.60040
1997-01-01	26.82420
1998-01-01	24.59380
1999-01-01	20.16270
2000-01-01	18.38070
2001-01-01	11.08390
2002-01-01	9.38459
2003-01-01	12.88790
2004-01-01	9.75222
2005-01-01	12.82420
2006-01-01	18.11750
2007-01-01	20.36930
2008-01-01	18.41170
2009-01-01	17.12610
2010-01-01	19.17120
2011-01-01	18.57920
2012-01-01	19.43950
2013-01-01	19.83990
2014-01-01	20.51110
2015-01-01	22.99540
2016-01-01	21.19470
2017-01-01	22.93000

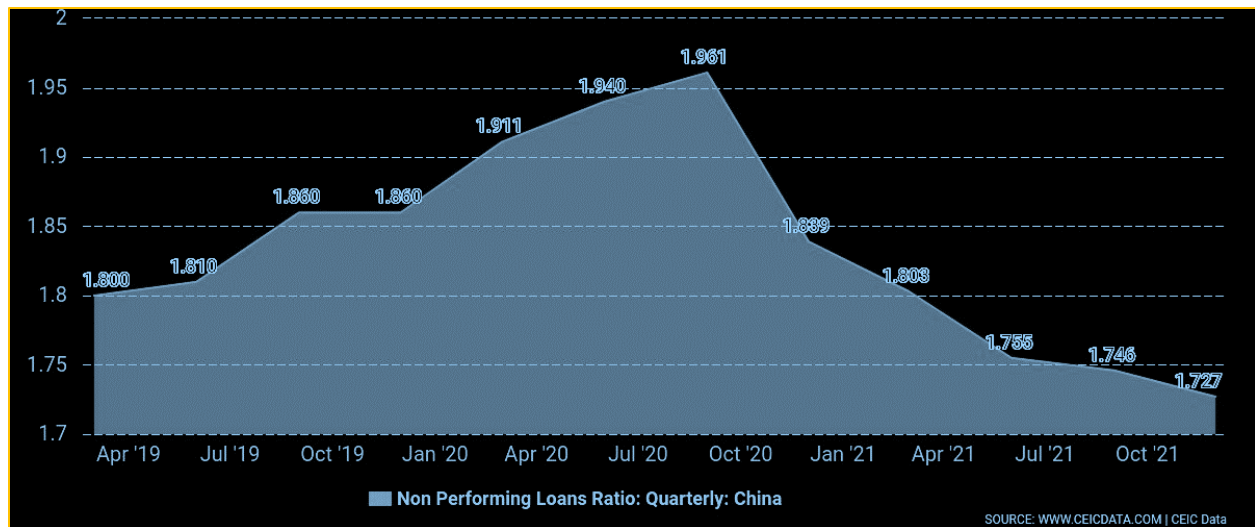


Fig.2. China's Quarterly Non-Performing Loans Ratio.

Figure 2 above shows that the ratio of NPLs in China was at 1.7% in December 2021, compared to the same 1.7% in the previous quarter. The data shows that it reached its peak of 12.4% in March 2005 and reached its lowest of 0.9% in September 2011 [36].

4.2. Correlation Analysis

We analyzed the correlation between the variables. Table 5 depicts the results of this analysis. The Pearson correlation coefficient illustrates that NPLs are negatively related to the second wave of the fintech era. The results also show that banking, government stability, and institutional regulation are negatively related to NPLs. In contrast, bank credit to deposit ratio and corruption are positively related to NPLs. The correlation results show that the Z-score (proxy of banking stability) is positively related to the second wave of the fintech era. Corruption and bank credit are negatively related to banking stability, and government stability and institutional regulation are negatively related to the banking Z-score. This means that the bank credit and corruption level causes banking instability, while fintech development, government stability and institutional regulation improve the stability of the Chinese banking sector.

Table 5: Correlation Analysis.

	NPLs	Z-Score	Cor	Ir	Bc	Gs	GDP	FIN2
NPLs	1.00							
Z-Score	-0.012*	1.00						
Cor	0.037**	-0.231*	1.00					
Ir	-0.164*	0.132***	0.121	1.00				
Bc	0.302*	-0.241*	0.532	0.219	1.000			
Gs	-0.262	0.321*	0.109**	0.421*	0.102	1.00		
GDP	-0.001**	0.021*	-0.219*	0.614**	0.812*	0.190***	1.000	
FIN2	0.121**	0.112*	0.009	0.112	0.213*	0.231*	0.113*	1.000

Ref: *, **, *** refer to the level of significance at 10, 5 and 1 percent, respectively.

4.3. Regression Analysis

Table 6 below illustrates the results of the regression analysis. It shows that corruption negatively impacts the banking Z-score (-0.837) and NPLs (0.816). This suggests that banking stability reduces with the increase of corruption. Based on the coefficient value of the variables, it is inferred that the banking stability (Z-score) increases and NPLs reduce with the increase in government stability (-0.379, 0.116), economic growth (-0.108, 0.784), and institutional regulation (-0.536, -0.176).

Table 6: Regression Analysis.

	Dependent Variable NPLs			Dependent Variable Z-Score		
	Coefficient (T-stat) (1)	Coefficient (T-stat) (2)	Coefficient (T-stat) (3)	Coefficient (T-stat) (1)	Coefficient (T-stat) (2)	Coefficient (T-stat) (3)
C	5.043(2.31)	5.613(3.02)	6.703(3.10)	4.013(2.01)	5.012(2.09)	8.109(3.18)
Cor	0.816(1.04)**	0.270(2.19)	0.516(4.17)	-0.837(2.79)*	0.374(1.09)	0.672(2.67)
Ir	-0.536(2.04)*	0.917(3.02)	0.178(2.56)	-0.176(3.17)*	0.293(2.71)	0.265(4.06)
Bc	0.208(1.19)*	0.261(1.17)	0.374(0.91)	-0.278(2.86)	0.207(2.78)	0.395(0.31)
Gs	-0.379(3.69)**	0.189(2.09)	0.311(3.45)	0.116(4.08)*	0.274(4.30)	0.180(2.05)
GDP	-0.108(2.78)*	0.501(5.17)	0.026(1.05)	0.784(3.62)**	0.215(2.04)	0.286(2.19)

FIN2		-7.105(-4.04)*	-7.375(-4.09)**		8.642(4.23)*	7.531(4.98)**
FIN2*Cor		-0.008(-2.02)**	-0.121(-1.02)**		-0.438(-3.92)**	0.298(4.22)**
FIN2*Ir		-0.014(-1.08)*	-0.324(-3.17)*		0.081(4.07)*	0.032(3.84)*
FIN2*Bc		0.319(3.19)*	0.053(2.91)*		0.074(2.86)*	0.025(2.70)*
FIN2*Gs		-0.618(-4.07)**	-0.028(-3.46)**		0.081(3.16)**	0.083(3.73)**
FIN2*GDP		-0.513(-3.01)*	-0.063(-2.41)*		0.381(4.21)*	0.211(3.11)*
R²	64.31	53.76	61.13	60.11	59.81	57.38
Adjusted R²	59.03	51.23	57.21	52.17	53.62	50.99
F-statistics	9.03	10.09	11.54	10.31	11.42	12.76
Prob(F-statistics)	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Ref: *, **, *** refer to the level of significance at 10, 5 and 1 percent, respectively						

4.4. Interaction Analysis

This analysis illustrates how the determinants of banking stability and NPLs react with the growth of the second wave compared to the first. The results show that the second wave increases the stability of the banking sector (Z-score), and reduced NPLs. FIN2 coefficient values are positive for Z-scores and negative for NPLs. This is because the growth in fintech services led to the increase in fintech lenders, thus decreasing the credit demands of traditional banks and NPLs. The growth in fintech services also enhanced the tracking and loan-monitoring services, which led to an improvement in the stability of the banking sector¹ and in reducing NPLs.

This analysis concluded that the second wave led to a reduction in corruption and improvement in government stability and institutional regulation, thus increasing the stability of the banking sector and reducing NPLs. The result shows that the explanatory variable's coefficient value is positive for Z-scores and negative for NPLs. Thus, we can conclude that in the second wave, the banking conditions in China improved. The NPLs are decreased, and banks are more stable than they were in the first wave. This is in line with the studies of [1] and [9]. By 2025, China aims to have a fair, green, intelligent and digitalized fintech sector which would improve its carbon peak and neutrality, rural revitalization, digital economy, and innovative development [37].

5. CONCLUSION

This study analyzes the impact of the fintech era on the stability of the Chinese banking sector and NPL. For this, the data was divided into the first and second waves of the fintech era following the work of Arner et al. [8]. The results of this analysis show that the second wave had a significantly positive effect on NPLs and the stability of the Chinese banking sector. The progress of the fintech

¹ <https://marketingtochina.com/fintech-china-take-part-financial-revolution/r>

revolution creates an enhanced tracking and monitoring environment. It also aids traditional banking through the provision of easy credit by fintech lenders. Fintech innovation allows for the creation of new investment opportunities. After this analysis, we recommend the following policies. Policymakers in developing countries should ensure the growth of fintech services as it helps to increase banking stability. Sufficient measures should be put in place to avoid the apprehension of fintech lenders, borrowers, and the public at large. Also, we suggest that banks use more monitoring services for fintech credit to monitor and control NPL. Initiatives need to be taken by banking officials to include fintech lenders in the provision of loans to private sector borrowers because of the risky nature of private sector loans. Banking officials also need to consider how the disruption of fintech lenders could negatively impact traditional banks. Policymakers need to incorporate fintech innovations for the evaluation of the borrowers' creditworthiness. While this study has its strengths, it also has its limitations. These limitations are the big data size [38] and the fact that this study only focuses on the Chinese banking sector in detail. However, these limitations are a possible future direction for this research.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The research has consent for Ethical Approval and Consent to participate.

CONSENT FOR PUBLICATION

The research has consent from all authors and there is no conflict.

AVAILABILITY OF SUPPORTING DATA

The supporting data can be provided on request.

COMPETING INTERESTS

There is no competing interest.

AUTHORS' CONTRIBUTIONS

Conceptualization by Fang Yin, Jincheng Zhou; Questionnaire by Xiong Yin and Xiaomei Jiao; Formal Analysis by Cresantus Biamba and Marvellous GodsPraise Iwendi; Investigation by Xiaomei Jiao and Ebuka Ibeke; Resources and Data collection by Xiong Yin and Fang Yin; Writing by: Jincheng Zhou and Fang Yin; Validation by: Ebuka Ibeke and Marvellous GodsPraise Iwendi, Cresantus Biamba; Funding Acquisition by Cresantus Biamba and Jincheng Zhou.

DECLARATION

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

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