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THE IMPACT OF DIGITAL PAYMENT ON BANKING STABILITY

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ABSTRACT

Previous studies provides conclusions regarding the relationship between digital payments and banking stability in a particular country. Therefore, this research wants to see how the growth of digital payments impacts banking stability in 110 countries in the world from 2017 – 2022. This study explores the relationship between digital payments and banking stability using a panel data regression model. Digital payment transactions are proxied by the payment penetration ratio (PPR) while banking stability is proxied by the country's Z-score. This research found a negative correlation between digital payment transactions and banking stability in data from 110 countries. This is possible because of the risks arising from digital payment transactions. Overall, these findings support policies to increase secure payment transactions for banking stability.

KEYWORDS *Digital Payment, Banking Stability, Panel Regression*

INTRODUCTION

A payment system is a set of rules, structures, and measures used to transfer funds to meet obligations arising from economic activity. As the era advances, the digital flow increases, global payment systems evolve rapidly, and the potential for the future of digitalization also increases. Payment mechanisms must always meet the needs of the public for a fast, secure, and efficient transfer of funds as people's lives progress.

The researchers acknowledge that efficient payment infrastructure will improve the efficiency of financial markets and the financial system as a whole, increase consumer confidence, and facilitate transactions of goods and services (Humphrey et al., 2006).

As described by Fama (1980), banks are intermediaries. But the Internet has changed the way financial service providers perform their roles. This fundamentally changes the nature of the most important banking in providing services to its

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citizens. Consequently, in order to compete in the ever-expanding digital landscape, banks must adapt. The banks of the future, both old and new challenging banks, will have to cope with the transformation of liquidity, data, trust, competition, and the digitization of financial services.

Digital financial inclusion bridges modern innovative technologies that seek to facilitate banking operations by leveraging remote access to financial services through electronic devices (e.g. smartphones, laptops, iPads, tablets, etc.) using an internet connection. (Brooks, 2008; Jegerson & Hussain, 2022).

The application of digitalization in banking requires electronic devices with internet connections, where societies can transform into a world of non-cash banking. Over the years, the implementation of digitalization has spread rapidly in the financial sector as almost 50% of the population comes from developing countries that use mobile phones. (World Bank Group, 2013). Aware of its importance and benefits, more than 80 countries around the world are implementing digitization into their financial services systems, thereby improving national well-being and overall development. (Katakan et al., 2019). Given that innovations for digitalization in banking are still new in the financial sector, in the area of banking finance, studies on its impact on banking financial stability are still rare. (Ghassan & Guendouz, 2019).

In a study (Hassan et al., 2012) stated that effective payment services are crucial to helping banks establish longer relationships with their clients, both individuals and corporations. (Berger et al, 2006) states that technological developments have enabled the banking industry to flourish more widely. Later (Columba, 2009) stated that these digital payment transactions could help banks reduce labor costs and handle cash.

The worldwide pandemic of COVID-19 first occurred in late 2019 in Wuhan, China and was declared a pandemia by the World Health Organization (WHO) on March 11, 2020. It interferes with all aspects of human life, confusing academics and policymakers around the world and looking for ways to mitigate its negative effects. To prevent the spread of the COVID-19 virus, the government has a policy of social restriction, lockdown, and quarantine. The banking, tourism, manufacturing, sports and recreation sectors, as well as many other sectors are affected by the closure of the economy (Dzulhidayat, 2022).

This COVID-19 pandemic has made people more aware of the importance of technology. Before the pandemic, all activities were carried out face-to-face or in-person, but with the epidemic, people were forced to do their business online or online. One of the real consequences of this pandemic is the acceleration of public adoption in using digital banking (Broby, 2021). By doing so, digital payment transactions (Hassan et al., 2012) make payment transaction more efficient, which in the study (Berger et al, 2003) is claimed to provide better banking performance so that profitability increases. Research (Humphrey et al. 2006) states that using digital payment will save costs, and (Zhang et al.; 2019) explains that using the promotion of digital payment can facilitate economic transacciones that secure capital acquisition to enhance the circulation and growth of money that influence the banking stability projected by Z-score.

Based on that, this research is interesting because of the rapid development of digitalization and makes the world race to implement digital transactions, but limited research is done on each country. The study tries to analyze the impact of digital payment transactions on banking financial stability with samples in 110 countries around the world from 2017 to 2022. In the last six years of this study, there are the first three years of the state before the COVID-19 pandemic, and the last three years data at the time of the occurrence of the Covid-19 epidemic. The control variables used are the rate of inflation, the amount of money in circulation, interest rates, GDP growth, the Financial Institutions Index and the Financial Markets Index, as well as the dummy variable at the moment of the covid-19.

Theoretical Review

There Are Many Concepts Of banking stability, according to experts, among which there is a common concept that bank stability refers to the absence of system failure in a financial system. Banking stability also refers to the resilience of the banking system to economic pressure and turmoil (Shaikh & Anwar, 2023). With a stable banking system, resources can be allocated efficiently, financial risks can be assessed and managed, and movements of rill or financial assets can be avoided, thus affecting monetary stability or employment rates. (Goodhart & Segoviano Basurto, 2009).

In a study conducted by (Chiaramonte et al., 2015), investigated the assessment of banking stability in Europe by taking samples in 12 countries during the period 2001 – 2011 using Z-score. As well as the study (Ghassan & Guendouz, 2019), also used Z-scores to assess banking performance in Saudi Arabia. The results of these studies showed that the ability of Z-Score to identify events yields good results and is more effective than other methods.

The study uses Z-score data from the World Bank, such as the research carried out by (Beik et al., 2023; Chiaramonte et al, 2015; Phan et al. 2020) because the frequency of Z-scores data in annual scores, already corresponds to the data required for this study. When a bank has a high Z-score indicates that the bank has high stability, and vice versa, if a country has a low Z-score, then its banking stability is also said to be low (Phan et al., 2022). The Z-score also measures the ability of the bank's capital and assets to cover the volatility of its return. (Chiaramonte et al., 2015).

Research (Banna et al., 2021) found that the integration of the digital financial system improved banking stability and reduced the likelihood of failure to pay. In terms of law, the implementation of digital infrastructure can result in better regulatory control of financial activity. (Naumenkova et al., 2019). Due to the faster and more effective digital transformation of banking, banking digitalization enables more economic transactions (such as buying goods) and finance (opening new account on bank).

This study refers to (Zhang et al., 2019), where the penetration ratio of payments can be calculated from the volume of the number of digital payment transactions divided by the GDP of the country. The greater the digital acceptance, the larger the transaction facilitated by digital channels and instruments (both bank and non-bank) the higher the ratio.

Research carried out (Beck et al., 2016) stated that digital innovation has a significant negative impact on bank performance and stability, this right due to the rise of digital innovation there are some risks from the development of such innovation. Whereas according to (Kasri et al. 2022) digital payment transactions have a significant positive impact on the stability of banks, this is because the banking sector benefits and benefits from digital transaction as long as its obstacles can be overcome.

Based on the theory of empirical research that has been carried out by previous research, then the single hypothesis of this research:
H_1: Digital payment transactions affected bank stability

RESEARCH METHOD

In this study will discuss how developments in digitalization will affect banking stability. The variable that is the subject of this study is banking digitization represented by the penetration ratio of payments (PPR) and banking stability projected with Z-score. External factors such as the limitation of scope at the time of the pandemic can affect the process of using digitized payments, so the COVID-19 pandemics became a dummy variable in this study. In addition, it also used the control variables in this study, Inflation, Broad Money, Interest Rate, GDP Growth, Financial Institutions Index and Financial Markets Index which data is obtained from the World Bank and IMF.

Table 1. Table Variable

Variable	Definition	Data Source
Penetration ratio of payments (PPR)	Digital Payment Transactions (Volume of payment transactions per GDP).	Author's calculation
Z-score	Banking Stability	World Bank
Inflation	Seeing how the prices of goods and services usually increase gradually over a certain period of time.	World Bank
Broad Money	Development of the amount of money in circulation.	World Bank
Interest Rate	Interest rates on money market instruments that reflect short-term financial market conditions	IMF
GDP Growth	The annual percentage growth rate of Gross Domestic Product (GDP) is based on market prices, calculated using fixed local currency values.	World Bank
Financial Institutions Index	Compilation of data measuring the proportion of bank loans to the private sector as a percentage of GDP.	IMF

Financial Markets Index	Compilation of data measuring the relationship between various financial market indicators and GDP.	IMF

Source: Author

This research uses data from 110 countries in the world and wants to see how digital payments affect banking stability. Because the data used is country panel data from 2017 to 2022, the panel regression research method is used. With the following equation:

$$Zscore = \beta_0 + \beta_1 PPR_{i,t} + \sum \gamma_n Kontrol + e_{i,t}$$

Z-score as financial stability, PPR or payment penetration ratio as a proxy for digital payment transactions. Then there are several control variables, inflation, broad money, interest rates, GDP growth, Financial Institutions Index and Financial Markets Index as well as the COVID-19 pandemic dummy variable.

There are three different methodologies that can be used for the purpose of analyzing panel data. Three alternatives are available: Pooled least square method, fixed effect method, and random effect. To get the most accurate research model in processing the panel data in the study, there are several test models that could be performed. The first is the Chow test to choose between a fixed effect model or a common effect model used in the research. The second is the Hausman test to determine whether it is better to use a Fixed Effect or a Random Effect model. The third is the Lagrange Multiplier (LM) test that is used to select between common effects or random effects.

The Chow test aims to determine the most suitable fixed effect or common effect model for estimating panel data. The chow test hypothesis is:

H_0 : *Common Effect Model*

H_1 : *Fixed Effect Model*

If the Chi-Square probability is > 0.05 then H_0 is accepted and H_1 is rejected, i.e. research is better using a common effect model.

The Hausman test aims to determine the model of random effect or fixed effect that is best suited to estimate panel data. The hausman test hypothesis is:

H_0 : *Random Effect Model*

H_1 : *Fixed Effect Model*

If the cross-section probability is > 0.05 then H_0 is accepted and H_1 is rejected, that is, the study is better using a random effect model.

The Langrange Multiplier (LM) test aims to determine the model of random effect or common effect that is best suited to estimate panel data.

H_0 : *Common Effect Model*

H_1 : *Random Effect Model*

If the Breusch-Pagan probability is > 0.05 then H_0 is accepted and H_1 is rejected, that is, the study is better using a common effect model.

RESULT AND DISCUSSION

In this study, data was taken from the World Bank, IMF and Statista. Out of 189 countries that have data in the world bank, the researchers used 110 countries that had complete data from 2017 to 2022 as research material. These countries were then divided into developed and developing countries. Out of a total of 110 countries surveyed, there are 18 countries that fall into the category of developed countries. According to the World Bank, a country is said to be a developed country if the country has a minimum income of $11,906 USD.

This research uses Stata 17 to process data. The data used in this study are data from 110 countries in the world that are qualified to have complete data from 2017 to 2022. From the data on the volume of digital payment transactions and GDP processed using excel to obtain the ppr value, research was then carried out to determine whether the Z-score that represents banking stability has an influence on the Payment Penetration Ratio (PPR) that is represented for digitization.

In Table 2, this is presented in the form of a presentation. Table 2 explains that Z-score is a proxy for bank stability, PPR is the penetration ratio of payments, Inflation is the rate of inflation, JUB is the amount of broad money, IR is the Interest Rate, FI is the Financial Institutions Index, FM is the financial market Index and GDPG is GDP Growth.

Table 2. Deskriptive Statistic

	Z-score	PPR	Inflasi	JUB	IR	FI	FM	GDPG
All Country								
Mean	9,6083	0,1515	6,6338	4,1345	4,9201	0,3297	0,2179	2,7854
Maximum	36,6661	14,5155	171,2055	86,0313	52,4367	0,9333	0,8998	57,8002
Minimum	1,0035	0,0002	-3,2333	0,0043	-26,4100	0,0650	0,000	-29,1000
Std. Dev	8,8785	0,9747	12,0819	10,2036	8,0396	0,2127	0,2504	5,7320
Developing Country								
Mean	9,0477	0,1739	7,4462	4,8692	5,4347	0,2642	0,1446	2,8632
Maximum	34,6223	14,5155	171,2055	86,0313	52,4367	0,7408	0,7351	57,8002
Minimum	1,0035	0,0002	-3,2333	0,0246	-26,4100	0,0650	0,0000	-29,1000
Std. Dev	8,1120	1,0645	13,0097	11,0075	8,5363	0,1491	0,1818	6,0659
Developed Country								
Mean	12,4736	0,0372	2,4814	0,3794	2,2898	0,6645	0,5927	2,3878
Maximum	36,6661	0,1165	13,7954	2,2452	12,9350	0,9333	0,8998	11,8059
Minimum	1,0193	0,0015	-2,0933	0,0043	-19,3621	0,2630	0,0536	-8,6124
Std. Dev	11,6927	0,2108	2,5775	0,5090	3,8068	0,1700	0,2156	3,5620

Source: Author

The model selection process for this thesis involves consideration and comparison of three different models. The three alternatives available are the common effect model approach, the fixed effect method, and the random effect method. The author uses the chow test to determine the most appropriate model between the common effects model or fixed effects model. Then perform a

Legrange Multiplier test to determine a model between a common effect model or a random effect model.

Table 3. Regression Model Test

Test	Result		
	All Country	Developed Country	Developing Country
Chow	0,19	0,17	0,06
Hausman	0,20	0,14	0,24
LM	0,00	0,00	0,00

Source: Author

Continuing the next step, this section explains the results of the regression carried out in this study. Table 4 shows the results of the regression analysis which shows variables that have a correlation and do not have a correlation with the Z-score or financial stability and other control variables.

Table 4. Regression

	All Country	Developed country	Developing country
	Koefisien (std. error)	Koefisien (std. error)	Koefisien (std. error)
PPR	-0,16###	1,64	-0,14###
	(0,02)	(22,25)	(0,02)
FI	-1,07	-23,95	-5,15
	(4,88)	(11,44)	(5,42)
FM	1,09	10,21	2,13
	(3,15)	(6,26)	(3,59)
Inflasi	0,01*	-0,01	0,01
	(0,01)	(0,02)	(0,00)
GDP G	0,1	0,02	0,01
	(0,01)	(0,03)	(0,01)
JUB	-0,03	0,5	-0,27
	(0,02)	(1,25)	(0,02)
IR	0,01	-0,46	0,01
	(0,01)	(0,04)	(0,01)
D_covid	-0,33**	-1,15**	-0,18*
	(0,17)	(0,57)	(0,19)

*significant at 10%
** significant at 5%
*** significant at 1%
significant at 5% but negative

Discussion

Based On The results of the descriptive statistics in Table 2, we can see that the average Z-score of the countries included in the sample of this study was 9.6%.

Further research can be seen when the researchers separated the samples of the developed and the developing countries, for the mean Z-score in the countries that belong to the category of the advanced country value was 12.47% whereas in the country which belonged to the development country category was 9.04%. The Z-scores in countries in the category the developed country have higher values, this can be understood as the financial stability of the banking in the developed countries is more stable than in the development countries. This is possible because developed countries have better access to technology, capital or the quality of their human resources. As in a study (Chiaramonte et al., 2015) that stated Z-score proved to be more effective when banking business models were more sophisticated than the big and commercial banks in the European countries where the research was conducted.

The results of the Payment Penetration Ratio (PPR) for the income of all countries show an average of 0.15%. Where the average value of the penetration ratio of payments in developed countries is greater than in developing countries by 0.03% and 0.17%. For the highest percentage of penetrations of payment there is in the developing country, which is 14.51% in the country of Antigua and Barbuda located on the American continent. Like the research that was done (Zhang et al., 2019).

In 2020, according to data from the World Bank, the inflation rate of the countries increased, while in the developed countries the average inflation was 2.48% with a maximum of 13.79%. In the study (Bousrih, 2023) said inflation increased in 2020 is one factor due to the presence of the COVID-19 pandemic. The amount of Broad Money (JUB) or broad money divided by the GDP of the data of all countries has an average of 4.13%. The developed countries have an average value of the amount of cash circulated at 0.37% compared with the developing countries that have the average of the volume of money in circulation at 4.86%.

The interest rate or interest rate has the highest value of 52.43% in the developing world with the average interest rate in the emerging world of 5.43%. From the above descriptive analysis can be seen if there is a negative interest rate, this is done by the central bank of a country to make people invest more to stimulate the economy. The FI is the Financial Institutions Index with an average of 0.32 per cent on the sample of all countries. With the highest score of 0.93 per cent in Japan that belongs to the country category Bank-Based, and the lowest rating of 0.065 per cent is found in Thailand that falls into the category of market-based countries. Whereas for the Financial Market Index (FMI) it has a median of 0.21 per cent where the maximum value is 0.89 per cent that is the country of the United States that is belonging to the category developed country and its lowest score is 0 in the category developing country.

GDP growth for all the sample countries was 2.78%. Whereas the highest figure of growth of GDP 57.8% was in Guyana. The country of Guyana is the country with the fastest GDP increase in the world, most of its GDP development is driven by profits from the oil production and export sectors. The lowest GDP growth of -29.1% was in Ukraine due to invents resulting from the war with Russia.

Based on the calculations of the study as seen in Table 3, all the results suggest that the study is better using random effect models. Based on the results of the

regression test that was first conducted for all countries, the results were stated to be significant at a rate of 5%. This suggests that the penetration ratio of payments that proxy digital payment transactions has an impact on the Z-score or financial stability. For tests in all countries the coefficient value of 0.16 is a negative value meaning for all sample countries the penetrating ratio has a negative relationship with banking stability. This also applies to samples of data for developing countries that have a probability value below 0.05 which means influenced at a significant rate of 5% with a negative factor of 0.14 which is consistent with the research carried out (Beck et al., 2016) which shows the negative impact of innovation developments on performance and bank vulnerability. This negative correlation result may be due to some negative impact from digital payment developments. Among them are security risks, where with the expansion of digital payment transactions at the moment can occur leakage of customer data and cyber attacks, this can threaten the confidence of customers and the stability of their banks. Besides, there is also operational risk, which with the failure of this digital operational process can interfere with banking stability. Thus, the evolution of digital transaction payment needs to be tackled with appropriate policies and regulations. Industry actors and regulators must ensure that digital development does not sacrifice security and stability in transactions.

Besides, inflation on the sample of all countries also has a significance at the rate of 10%, which means it also has an influence on the value of financial stability. In addition to the relationship between digital payments and financial stability, in studying the impact of digital payment volumes on financial Stability, several variables have to be included to control other factors affecting financial stabilities. Research (Babihuga, 2007) found that inflation had no significant relationship to capital, asset quality, and profitability. This conclusion was adopted by (Schou Zibell et al., 2023), who found inflation did not have a significant relationship with capital adequacy and credit problems. However, it has significant negative links in developed countries, but has significant positive links in developing countries in Latin America. There is an opinion that high inflation is claimed to be a form of ‘macroeconomic mismanagement’ thus affecting the banking sector. On the other hand, low inflation rates can also lower nominal income and cash flows, thereby affecting financial institutions.

On this study for variables that control GDP growth, the amount of money in circulation, and interest rates have no significant influence. This study uses the COVID-19 dummy variable because the data used in this study in 2020 until 2022 is at the time of the Covid-19 pandemic. Where in the study (Kamal & Souparnika, 2021) stated that COVIDA-19 has an impact on digital payment transactions, the research results are in line with the results of this study, where the CVID-19 Dummy Variable has significant correlation results. This is due to the limitation of face-to-face interaction, which forces the public to do everything online. With the use of digital payment transactions, more and more funds are coming in and out of control by the bank, which has an impact on the stability of the bank.

CONCLUSION

This research empirically provides information that digital payment transactions have an impact on financial stability in banks. Payment transactions are projected with the penetration ratio of payments (PPR) and financial stability is projected by the Z-score of the country.

The conclusion of this study is that the penetration ratio of payments (PPR) has a correlation with the Z-score, or it can be said that digital payment transactions have an influence on the value of financial stability in the sample of all countries and developing countries. Such risks include security risks, where with the expansion of payment transactions can threaten customer confidence due to cyber attacks and data leaks as well as operational risks affecting bank stability.

With digital payment transactions that have an impact on banking stability, banks must maximize this relationship and remain cautious in the evolution of the digital payment era to good relationships and stability.

The results of the research that has been carried out are basically aimed at multiplying empirical analysis of how digital payment transactions affect bank stability. From the analysis there are some insights that are expected to provide additional insights and considerations for the parties concerned as well as developments for future research, for investors or bankers, this research is expected to be used to make assessments especially in the digital payment sector so that it can help in making decisions to develop secure and efficient digital payment transactions. And for policymakers and regulators, this research is expected to be used to make appropriate policies and push for digital developments that can correlate well and safely for banking stability in the country.

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