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The Impact of Internet Banking Adoption on Banking Performance During the Covid-19 Pandemic

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Digitalization Investment;
Profitability;
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Abstract

This study aims to examine the influence digital banking adoption to profitability And financial stability banks in Indonesia, with a focus on the influence internet banking transactions, fee based income, digital assets, And investment in digital assets during COVID-19 pandemic. Although banking digitalization in Indonesia continues to increase, its impact on bank performance still varies. This study uses a quantitative approach quantitative with design panel data regression. The data used is secondary data. The results of the study show that internet banking transaction shave a significant impact on ROA, although the effect is negative, indicating that operational costs are high and initial investment in digital plat form can reduce profitability banks in the short term. Fee based income does not show a significant effect on ROA or Z-Score, which shows that its contribution to profitability and stability bank finances are limited. On the contrary, investment in digital assets have a positive impact onZ-Score, which shows that banks that invest more in digital infrastructure more stable in facing financial risks.

1. Introduction

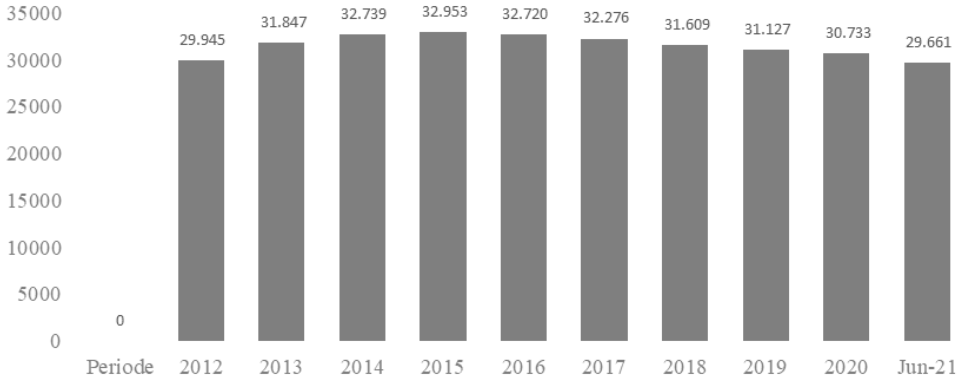
Currently, we can find several forms of digital products and services in Indonesian banking, including: Application Programming Interface (API) services that can integrate services provided by banks with applications created or owned by third parties, both transactional (payment features, fund transfers, electronic money, and unique codes for payments) and informational (transfer information and account information); Robo Advisory features through certain algorithms developed with the aim of providing several suggestions to customers or clients regarding variations in their investment portfolios through banks based on market conditions and customer risk profiles; trade finance transaction services by utilizing blockchain technology where all parties included in the blockchain are able to exchange the required data in real time so that a more efficient, easy, and secure global trade transaction process can occur, including in the context of the need for issuing letters of credit (L/C); as well as opening savings accounts and

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applying for loans without video calls with customer service because they have used artificial intelligence technology.

The banking evolution process in the last two years has become increasingly massive driven by the Corona Virus Disease Pandemic that began in Indonesia in the first quarter of 2020 and has shifted people's financial transaction habits from physical transactions to virtual transactions. Concrete evidence of the banking evolution process is reflected in the data on the decreasing number of Commercial Bank branch offices, namely from 32,953 offices in 2015 to 29,661 offices in June 2021.

Figure 1.
Development of the Number of General Bank Branch Offices in Indonesia



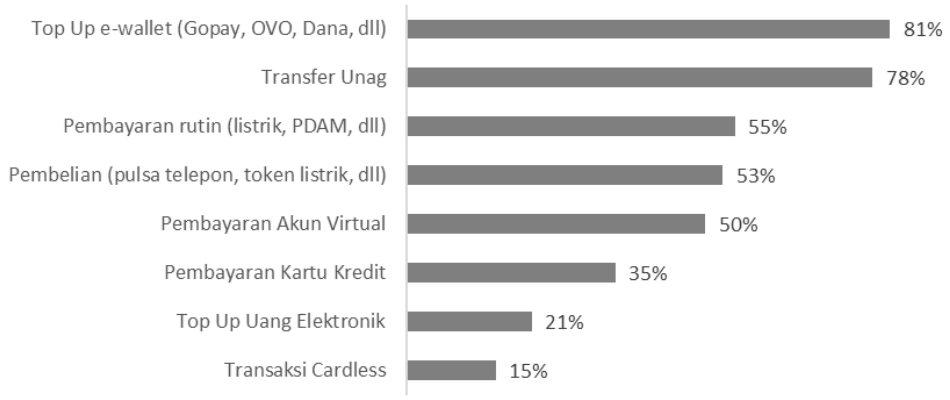
Source: Financial Services Authority (2021)

The trend of physical branch offices in the banking industry has changed significantly over the past few years. In 2012, there were 29,945 physical branches and the number increased to 31,847 in 2013. The increase reflects the growth of the banking industry in that year. In 2014, the number of physical branches continued to increase to 32,739, indicating continued banking expansion. However, in 2015 there was a smaller increase with the number of physical branches reaching 32,953. In 2016, this number decreased slightly to 32,720, possibly in an effort to optimize operations. The downward trend continued in 2017 with the number of physical branches becoming 32,276 and in 2018 to 31,609. The downward trend in the number of physical branches continued to decrease until 2019, 2020 and 2021.

This condition is inseparable from the Covid-19 pandemic which accelerated digitalization due to the policy of maintaining distance or working from home which caused the number of direct visits to physical branches to experience a significant decline. The Covid-19 pandemic has driven changes in banking transactions. A survey conducted by Inventure Indonesia with the Alvara Research Center (2020) showed that, the PandemicCovid-19has led to increased penetrationdigitalwhich is increasingly massive in the banking industry in Indonesia. During the pandemic, many people turned to digital banking services to avoid physical contact.

A survey conducted by Mark Plus in 2020 showed that the use of digital wallets was a type of service or product used by most bank customers during the Covid-19 Pandemic, the number was greater than money transfers which had been quite commonly used by the public since before the Covid-19 Pandemic.

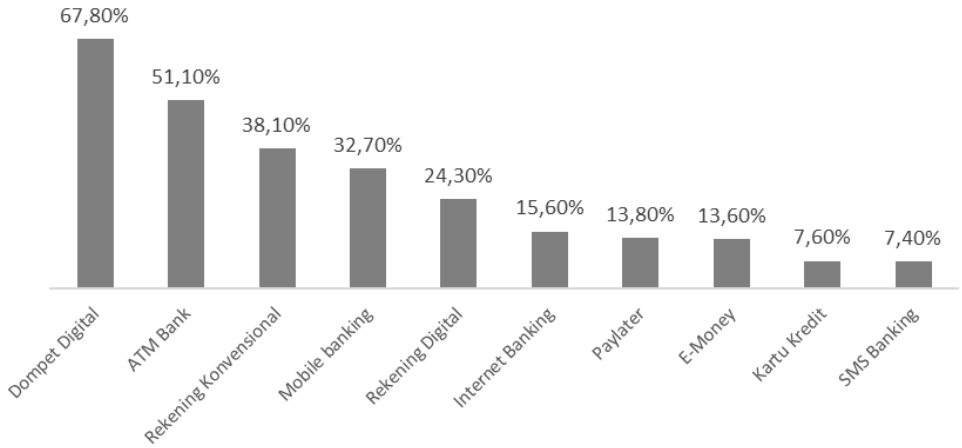
Figure 2.
Digital Banking Service Users in Indonesia During COVID-19



Source: Kata data (2022)

The use of digital banking services in Indonesia during the COVID-19 pandemic has increased significantly. Data shows that most people have adopted digital banking services such as e-wallet top-ups, money transfers, routine payments, purchases, and virtual account payments as the most common activities carried out digitally (Katadata, 2022). The results of a survey conducted by the Katadata Insight Center (KIC) in January 2022 confirmed this condition, where the use of digital wallets was higher than the use of bank ATMs and the number of digital accounts used was approaching conventional accounts (Katadata, 2022). This reflects the increasingly massive adoption of digital banking in Indonesia because people prefer the convenience, security, and flexibility offered by digital platforms in managing their finances. This change also reflects a major shift in consumer behavior towards digital technology as the primary way to access banking services and conduct daily financial transactions.

Figure 3.
Most Used Financial Uses Post COVID-19 (Period 6 – 12 September 2021)

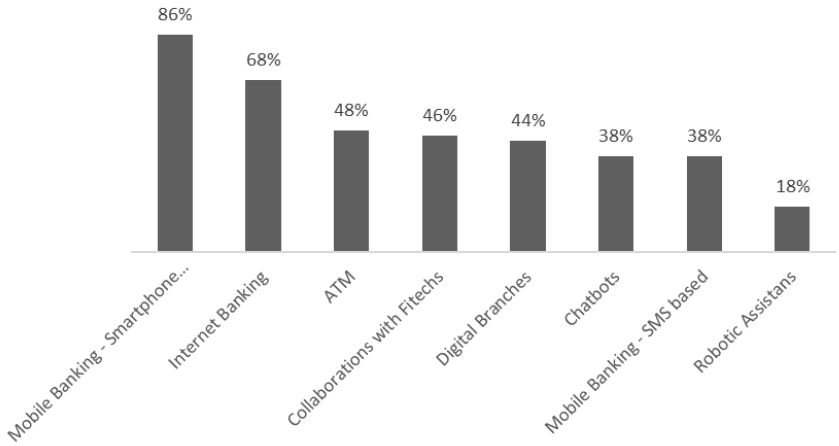


Source: OJK, 2021

The data above illustrates the level of adoption and use of various types of banking services in Indonesia. From these data, it can be concluded that the use of digital wallets has the highest adoption rate of 67.80%, which means that most people have switched to digital platforms in managing their finances. On the other hand, bank ATMs and conventional accounts are still used by most people, with adoption rates reaching 51.10% and 38.10%, respectively. The data on the use of banking services reflects significant changes in consumer behavior in terms of how they access and use banking services. The high adoption rates for digital wallets, digital accounts, and mobile banking indicate that people are increasingly adopting a more digital banking service model.

Changes in consumer behavior regarding the increasing adoption rate of digital banking in Indonesia have changed and shaped the mindset of executives from banking executives. The results of a survey by PWC Indonesia (2018) found that there has been a shift in the mindset of senior banking executives in Indonesia in designing future bank business development strategies, namely from a product-centric mindset (traditional bank) to a customer-centric mindset (digital bank). This is what drives the decision to make digitalization strategy part of the company's strategy where the two main objectives of the strategy are to improve customer experience and revenue growth.

Figure 4.
Components of Digital Banking Strategy Implemented by Indonesian Banking



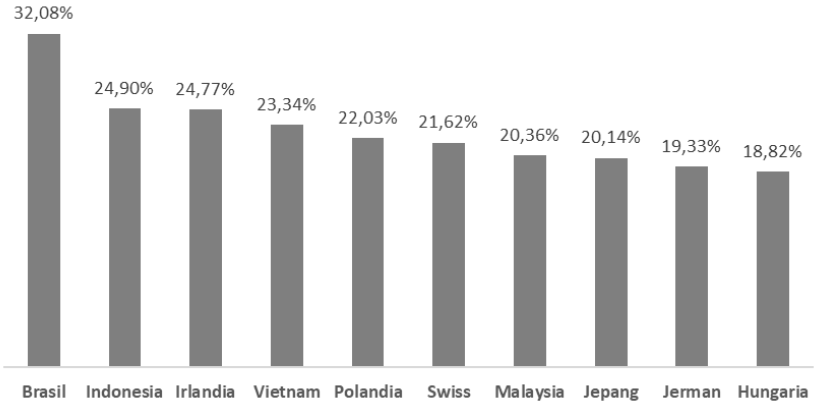
Source: Financial Services Authority (2022)

Based on the data indicates that 86% of these banks have sophisticated and fully functional mobile banking applications. This shows an awareness of the importance of providing banking services that are easily accessible via mobile devices that have become the main means for Indonesian people to make transactions. Along with that, the development of ATMs which used to be the main focus has now decreased to 51.1% in banking strategies. The development of digital branches and collaboration with fintech companies have also received similar attention in digital banking development strategies. The presence of digital branches allows banks to combine physical and digital elements to provide a more modern customer experience. Collaboration with fintech companies is a strategy used by 46% of these banks to expand their service reach and follow the trend of innovation in the banking industry.

Thus, senior banking executives in Indonesia have responded to changes in consumer behavior and demands for more digital banking services by allocating their resources in a more digital-centric direction. The Indonesian economy has great potential to absorb the flow of digitalization and the magnitude of the push for digital banking is influenced by various factors in the development of digital banks in Indonesia, which are reflected in 3 (three) main aspects,

namely digital behavior, digital opportunities and digital transactions. Digital behavior includes, among others, ownership of gadgets and use of applications on those gadgets (mobile apps).

Figure 5.
Countries with the Largest Digital Bank Users in the World

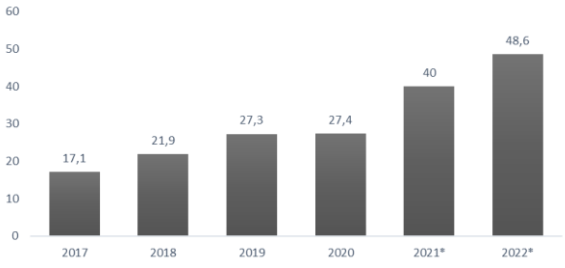


Source: Finder (2021)

Based on the data above, it shows the percentage of digital bank users in various countries, opening up insights into the level of adoption of digital banking services in various parts of the world. These three factors, digital behavior, digital opportunities, and digital transactions, have proven to be able to drive changes in the Indonesian banking landscape and make Indonesia the second largest digital bank user country after Brazil in October 2021, as per the results of a Finder.com survey with a percentage of users reaching 24.9% of the total population in Indonesia. The data above also shows that the level of adoption of digital banking services in Indonesia has reached a fairly significant level and continues to grow.

However, Indonesia still has the potential for further growth in terms of adoption of digital banking services, considering that there is still a significant difference when compared to countries such as Brazil which has an adoption rate of around 32.08%. Thus, this data provides a useful perspective in understanding Indonesia's position in the development of digital banking globally.

Figure 6.
Digital Banking Transaction Value in Indonesia



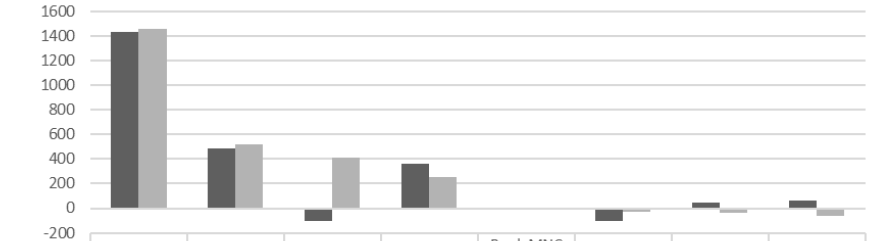
Source: Bank Indonesia (2022)

With the increasing number of users, it is certain that the number or value of digital banking transactions will also continue to increase. Data collected from Bank Indonesia shows a very

positive development in the value of digital banking transactions in Indonesia over the past few years. In 2017, the transaction value was 17.1 trillion rupiah and continued to increase to reach 27.3 trillion rupiah in 2019. In 2020, the transaction value remained high, at around 27.4 trillion rupiah. Even a significant spike in the 2021 projection and the 2022 projection with an estimated transaction value of 40 trillion rupiah and 48.6 trillion rupiah, respectively.

The increase in the value of digital banking transactions does not necessarily have an impact on the bank's financial performance. Individual bank data reports collected by DataIndonesia.id show that the performance of banks that are the parent companies of digital banks does not all produce positive performance, as reflected in several parent companies of digital banks that recorded losses in the last 2 (two) years.

Figure 7.
Net Profit for the Current Year of Digital Banks in Indonesia



	Bank BTPN Tbk (Jenius)	Bank UOB Indonesia (TMRW)	Bank DBS Indonesia (Digibank)	Bank KEB Hana Indonesia (LINE Bank)	Bank MNC Indonesia Tbk (MotionBanking)	Bank Jago Tbk (Jago)	Bank Digital BCA (Blu)	Bank Aladin Syariah Tbk (Bank Aladin)
Q3/2020	1432,51	489,98	-99,68	365,18	2,7	-105,71	41,82	58,48
Q3/2021	1456,63	517,47	413,2	253,08	5,77	-32,61	-38,15	-60,73

The data above is the current year net profit report of several digital banks in Indonesia, with figures given for two periods, namely the third quarter (Q3) of 2020 and Q3 of 2021. BTPN, one of the leading digital banks, recorded an increase in net profit from 1,432.51 billion rupiah in Q3 2020 to 1,456.63 billion rupiah in Q3 2021. Although the growth is relatively stable, this increase shows that BTPN is able to maintain its positive performance. UOB Bank also experienced an increase in net profit from 498.98 billion rupiah in Q3 2020 to 517.47 billion rupiah in Q3 2021, indicating that they have succeeded in optimizing revenue. In contrast, DBS Bank, which previously experienced a loss of -99.68 billion rupiah in Q3 2020, managed to turn its condition around to a profit of 41.38 billion rupiah in Q3 2021. This is a significant change and shows a meaningful improvement in performance.

Bank MNC recorded an increase in profit from 2.7 billion rupiah in Q3 2020 to 5.77 billion rupiah in Q3 2021, indicating positive growth although it has not reached a high figure. On the other hand, Bank Jago still recorded a loss, although it decreased from -105.71 billion rupiah in Q3 2020 to -32.61 billion rupiah in Q3 2021. This shows that further efforts are needed to achieve profit. Bank BCA Digital experienced a significant change from a profit of 41.82 billion rupiah in Q3 2020 to a loss of -38.15 billion rupiah in Q3 2021, reflecting a significant change in their financial performance. Meanwhile, Bank Aladin Syariah recorded a change from a profit of 58.48 billion rupiah in Q3 2020 to a loss of -60.73 billion rupiah in Q3 2021, indicating the challenges faced by Islamic banks in managing their financial performance.

This condition shows that there is a difference between the significant increase in the value of digital banking transactions and the financial performance of digital banks which is not always positive. This phenomenon is evident from the adoption of technology for digital banking and user behavior which is not always balanced, such as the use of digital services has not reached the stage of generating significant income for banks. It also appears that digital banking in Indonesia is still in its early stages where banks need to invest large amounts of money in

technology and marketing to build and promote their digital banking services which can cause high initial financial burdens before reaching breakeven or profitability.

The research gap revealed is the need for a deeper understanding of the contribution of the adoption of banking digitalization during the crisis period. Further analysis of the effect of technology investment on bank profitability is important to explore. Likewise, in-depth research on digital transactions that have the most impact on bank profitability and risk analysis related to the adoption of digitalization in achieving optimal performance are things that need to be considered further in subsequent research. The results of research on banking digitalization show complex dynamics in its influence on banking stability and efficiency in various countries. In India and the United States, the expansion of digital financial services based on the internet and mobile money has had different impacts. in India in the short term has a negative impact on efficiency and stability while in developed countries such as the United States digitalization helps improve both factors in both the short and long term. Other studies show a long-term equilibrium relationship between digital payment transactions and banking stability in Indonesia. Although as a country with the largest Muslim population does not show significant causality between digital payments and Islamic banking stability. Thus, this study makes an important contribution to understanding the implications of digital banking adoption on bank performance and stability in Indonesia during the post-pandemic transition period so that this study is entitled: "The Effect of Digital Banking Adoption on Banking Profitability and Stability Performance During the Covid-19 Pandemic Period".

2. Research Methodology

In this study, the authors apply quantitative method. The quantitative method is a research method based on the philosophy of positivism used to research a certain population or sample, data collection using research instruments, quantitative/statistical data analysis, with the aim of testing the established hypothesis (Sugiono, 2016). This study will use secondary data in the form of time series or annual time series data which includes. Digital Banking Transaction Ratio, Digital Banking Asset Investment, Total Digital Assets, ROA and Z Score.

The main data source comes from the Indonesian Banking Statistics available atwww.ojk.go.idand from the annual reports of the banks that are the samples, which can be accessed through the official websites of each bank. The population in this study is banks operating in Indonesia. Furthermore, sampling in the study used the purposive sampling technique, which is a technique for determining samples using certain considerations (Sugiyono, 2016). The use of the purposive sampling technique is based on considerations of its suitability in quantitative research and studies that do not generalize. This study uses panel data analyzed with Eviews 12 software. Panel data is a combination of time series and cross-section data. According to Baltagi (Gujarati and Porter, 2013).

3. Research Results and Discussion

Hypothesis Testing

1. Simultaneous Test (Test – F)

Simultaneous Test (F Test)used to test whetherindependent variablestogether have a significant influence onROA(Return on Assets) which measuresprofitabilitybank and banking stability Z-Score.

Table 1.
Results of Simultaneous Test of Digital Adoption on ROA

R-squared	0.213149	Mean dependent var	0.009415
Adjusted R-squared	0.174451	S.D. dependent var	1.779944
S.E. of regression	1.616989	Sum squared resid	159.4938
F-statistic	5.508063	Durbin-Watson stat	2.113905
Prob(F-statistic)	0.002054		

Based on the results Simultaneous Test (F Test) the value obtainedF-statisticis5.50which shows that the overall regression model is significant. This indicates that there is at least one independent variable that has a significant influence onROAbank. In other words, internet banking transactions, fee based income, and digital asset investment collectively make a significant contribution to explaining variation inROAbank. Value Prob(F-statistic) what is obtained is0.00which is smaller than the level of significance5% (0.05). This shows that we can reject the null hypothesis that all regression coefficients are zero. This means that the variables being tested—internet banking transactions, fee based income, And digital asset investment—simultaneously have a significant influence on ROA bank.

Table 2.
Results of Simultaneous Test of Digital Adoption against Z Score

R-squared	0.214943	Mean dependent var	-0.010258
Adjusted R-squared	0.176334	S.D. dependent var	0.527027
S.E. of regression	0.477941	Sum squared resid	13.93407
F-statistic	5.567124	Durbin-Watson stat	2.133195
Prob(F-statistic)	0.001922		

Based on the results Simultaneous Test (F Test) the value obtainedF-statisticis5.56 shows that the overall regression model is significant. This means that there is at least one independent variable that has a significant effect on Z-Score bank. In this case, internet banking transactions, fee based income, and digital assets (non-physical assets used to support banking digitalization) simultaneously provide a significant contribution in explaining variations in Z-Score bank, which shows stability bank. Value Prob (F-statistic) what is obtained is0.001 which is smaller than the level of significance5% (0.05) conclude that the variables tested—internet banking transactions, fee based income, and digital assets—has a significant influence onZ-Scorebank. Therefore, the regression model used in the study is proven to be relevant and can explain the influence between digital banking and banking stability.

2. Partial Test (t-Test)

The t-test is conducted to test the significance of the regression coefficient for each independent variable in the regression model. This test helps us to find out whether each independent variable (such as internet banking transactions, fee based income, and digital asset investment) has a significant influence onROA(Return on Assets). The results of the t-test will provide a value t-statistic and p-value for each variable tested.

Table 3.
Results of Hypothesis Testing on Profitability

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-60.93676	14.61690	-4.168924	0.0001
IB	-0.439319	0.186276	-2.358433	0.0216
FBI	-3.91E-05	0.000396	-0.098575	0.9218
INV_ASET	55.29061	12.57382	4.397280	0.0000

- The Influence of Internet Banking on ROA
  The test results show that internet banking transactions have a significant impact on ROA bank, with a p value of0.0216. The coefficient is negative (-0.49) shows that increasing transactions via internet banking actually tends to reduce the level of profitability bank.
- The Influence of Fee-Based Income on ROA
  fee based incomedoes not have a significant effect onROAbank, as indicated by the high p-value, namely0.9218. The coefficient is also very small and negative, indicating that fee-based income from digital services is not strong enough to have an impact on profitability bank.
- The Impact of Digital Asset Investment on ROA
  Investing in digital assets proven to have a positive and significant influence onROAbank, with a p-value of0.0000and a positive coefficient of55.29061. This means that the greater the funds allocated to develop digital infrastructure, the higher the level of profitability obtained by the bank.

Table 4.
Hypothesis Results on Banking Stability

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.621472	1.482798	-3.116724	0.0028
ASET	0.396188	0.089549	4.424253	0.0000
FBI	-8.13E-06	0.000116	-0.070078	0.9444
IB	-0.133847	0.054994	-2.433852	0.0179

- The Influence of Internet Banking on Z-Score
  Transactions via internet banking also has a significant influence onZ-Score, with a p-value of0.0179. However, the direction of the influence is negative (-0.13), which means that increasing digital transaction activity actually has the potential to reduce financial stability banks in the short term due to operational risks or failure to achieve scale efficiency.
- The Effect of Fee-Based Income on Z-Score
  Fee based incomedoes not have a significant influence onZ-Score, with a very high p-value, namely0.9444. This shows that although fee-based income is an alternative source for banks, in this model, it is not strong enough to explain changes in the level of financial stability bank.
- The Influence of Digital Assets on Z-Score
  Adigital sehas a positive and very significant influence onZ-Score, with a p value0.0000and coefficient0.396188. This means that the greater the proportion of digital assets (non-physical assets such as IT infrastructure and digital systems), the higher the financial stability bank. This shows that the digitalization of asset structure is able to strengthen the bank's resilience to external risks.

3. Coefficient of Determination Test

Coefficient of Determination (R-squared) used to measure the extent to which the independent variables in a regression model can explain the variation in the dependent variable. The valueR-squaredranges between0until1, where the higher the value, the greater the proportion of the variability of the dependent variable that can be explained by the independent

variables in the model.R-squaredprovides an overview of the quality of the regression models used in this study toROA(Return on Assets) andZ-Scorebank.

Table 5.
Results of Return on Assets (ROA) Determination Coefficient Test

R-squared	0.213149	Mean dependent var	0.009415
Adjusted R-squared	0.174451	S.D. dependent var	1.779944
S.E. of regression	1.616989	Sum squared resid	159.4938
F-statistic	5.508063	Durbin-Watson stat	2.113905
Prob(F-statistic)	0.002054		

R-squaredForROAis0.213149which shows that21.31%variations inROAbanks can be explained by the independent variables in this model, such as internet banking transactions, fee based income, and digital asset investment. Although this value is not very high, it shows that the regression model is able to explain a small part of the variation.ROA, which shows that there are other factors that influenceROAwhich are not covered in this model.

Table 6.
Results of the Z-Score Determination Coefficient Test

R-squared	0.214943	Mean dependent var	-0.010258
Adjusted R-squared	0.176334	S.D. dependent var	0.527027
S.E. of regression	0.477941	Sum squared resid	13.93407
F-statistic	5.567124	Durbin-Watson stat	2.133195
Prob(F-statistic)	0.001922		

R-squaredForZ-Scoreis0.214943, which shows that21.49%variations inZ-Scorebank can be explained by the independent variables in this model. Although this value is also relatively low, it still shows that the regression model contributes to explaining some of the variation in financial stability bank. However, bank stability also influenced by other factors not explained by this model.

4. Discussion

The Influence of Internet Banking Transactions on Banking Profitability (ROA)

The first hypothesis in this study tests the influence internet banking transactions to ROA (Return on Assets) bank. ROA is a ratio that measures the extent to which a bank can generate profits from its total assets. While internet banking transactions refers to the number and value of transactions made by customers through digital banking platforms, such as money transfers, bill payments, and other transactions using internet technology. Based on the resultst-test, obtainedp-valueas big as0.02which is smaller than0.05show that Hypothesis 1 is accepted. It means, internet banking transactions have a significant impact on ROA bank. However, even though the results are significant, regression coefficient. For internet bankingis-0.49 which shows a relationship negative between internet banking transactions and ROA.

Previous research provides relevant perspectives on these findings. Najwa Khairina (2022) in his research on digital banking in Indonesia found that although digital banking increase fee-based revenue, initial investment costs high can reduce ROA in the transition period. This is consistent with our findings, where negative coefficient indicates that although there has been an

increase internet banking transactions, initial cost high inhibits the increase profitability in the short term.(2021) also stated that although adoption internet banking can provide additional income in the long term, large expenditures on developing digital platforms can reduce ROA in the early period. The explanation of this phenomenon can be linked to the theory digital banking efficiency who stated that although digital banking provide long-term benefits, the large expenditure required to develop a digital banking platform—especially in the early stages—hinders profitability bank. Initial investment high in digital infrastructure and operating costs which is big for the maintenance of this digital platform can cause ROA decline al though there is potential revenue generated from fee-based transactions.

The Influence of Fee Based Income on Banking Profitability (ROA)

The second hypothesis in this study tests whet her fee based income have a positive impact on ROA (Return on Assets) bank. Fee based income refers to the income earned by banks from digital banking service fees, such as transaction fees, administration fees, and other fees related to the use of digital platforms by customers. Based on the resultst-test, markp-valueForfee based incomeis0.92 which is bigger than0.05show thatfee based incomedoes not have a significant influence onROAbank. Regression coefficient forfee based incomeis very small-3.91shows that although there is a relationship between fee based income And ROA the impact is very minimal.

Descriptive statistics show that fee based income have an average1.68withstandard deviation as big as 9.51 shows a significant variation between banks that generate high revenues through service fees and banks that generate lower revenues. With the value maximum reach 76.87 Some banks earn very large fee-based incomes while others earn much lower (minimum 0.0006). Previous research by Baker & Moles (2021) shows that even though fee based income can provide a more stable income, its contribution to ROA limited bank if the bank does not havediversification strategywhich is effective in generating revenue from other services. This is also in accordance with the results, where even though there isfee based income, its influence on ROA not significant.

Other research by The Legend of Zelda (2018) show that fee based income can improve profitability bank in the long term, but only if the bank can maximize fee-based services and have economies of scale which is quite large. Rosnita also emphasized that fee based income does provide a more stable income compared to interest-based income, but its impact onROAoften limited to smaller banks or those that are not yet able to manage digital operating costs efficiently.The Last Supper (2020) adding that large banks tend to be more successful in taking advantage offee based incomebecause they have stronger infrastructure and more channels to access fee-based services. However, small banks often face challenges in maximize income of the cost of this service, which has the potential to hinder ROA.

The Impact of Internet Banking Adaptation Investment on Banking Profitability (ROA)

The third hypothesis in this study tests whether investment in digital assets have a positive impact on ROA(Return on Assets) bank. Digital asset investment refers to funds allocated by banks to develop, maintain and update digital platforms, such as digital payment systems, banking applications and other IT infrastructure.ROA (Return on Assets)itself is a ratio that measures profitability bank by comparing net profit bank with total asset sow ned. The higherROA, the more efficient the bank is in using its assets to generate profits. Based on the resultst-test, p-value For digital asset investment(INV_ASSET) is0.0000which is much smaller than0.05show that Hypothesis 3 is accepted. Regression coefficient For digital asset

investmentis55.29061show that investment in digital assets has a positive and significant effect onROAbank. In other words, the bigger bank investment in digital technology development, the higher it isROAthat can be achieved by the bank.

Based on descriptive statistics digital asset investment shows an average of approx.212 billionwith standard deviationas big as3.95billionshowbig variationin valuedigital assetsbetween large and small banks shows that some banks havedigital assetswhich is very large while the valueminimumwhat is recorded is412 millionillustrates the existence of a very large difference indigital investment size between banks. This large variation suggests that large banks withdigital assetsthe larger ones tend to haveROAhigher, because it can utilize technology more efficiently to improvefee based incomeand reduceoperating costs.

Previous research provides an in-depth perspective ondigital asset investmentand its impact onprofitabilitybank.(2021)found thatinvestment in digital technologyhas a positive influence onprofitabilitybanks, because the use of new technologies helps improveoperational efficiencyand expandmarket coverage.Englishalso noted that banks that invest more indigital infrastructuretend to haveROAhigher, because it can manage costs more efficiently and offer more digital products to customers, which increasesfee based income. This research is in line with the findings, wheredigital asset investmentnot only improveefficiency, but also has the potential to improveprofitabilityin the long term. In addition,The Last Supper (2020)also shows that banks that invest indigital assetscan take advantage ofdigitalizationto offer more innovative services and improvemarket reach. By investing in more advanced technology, banks canreduce operational costs,improve customer experience, and in the endincrease ROA. This is in accordance with the results of this study which show thatinvestment in digital assetsnot only increases efficiency, but also has the potential to increaseROAin the long term.

The Impact of Internet Banking Transactions on Banking Stability

The fourth hypothesis in this study tests whetherinternet banking transactionshave a positive impact onZ-Score(bank financial stability).Z-Scoreused to measurethe bank's ability to avoid the risk of bankruptcyand its stability in the face of economic uncertainty. The higherZ-Score, the better the financial stability of the bank, while a lower value indicatesrisk of bankruptcyhigher.Internet banking transactionsrefer totransaction amount and valuewhich customers do through the platforminternet banking, such as transfers, bill payments, and other transactions conducted using digital technology. Based on the resultst-test,p-valueForinternet banking transactionstoZ-Scoreis0.01which is smaller than0.05, show thatHypothesis 4 is accepted. However, even though the results are significant,regression coefficientForinternet banking transactionsis-0.13shows the existence ofnegative relationshipbetweeninternet banking transactionsAndZ-Score.

It means even thoughinternet banking transactionsincrease,financial stabilitybank as measured byZ-Scoretends to decrease. This shows that even though the increasedigital transaction volumecan generate additional income,operational riskrelated todigital platformpotentially reducebank stability. Based ondescriptive statistics,internet banking transactionsshows an average of approx.3.15 billion, withstandard deviationas big as12.878 billionshows that some large banks have very large transaction volumes while the valueminimumwhat is recorded is1.4billionreflects the existence of significant differences inadoption of digital technologybetween large and small banks. This large variation suggests that although some large banks are able to take advantage ofinternet bankingto increaseincome,financial stabilitySmaller banks with low transaction volumes are at higher risk, which is reflected inZ-Scorethe lower one.

Previous research provides deeper insight intothe influence of internet bankingtofinancial stabilitybank.Kasri et al. (2022)in his research ondigital bankingfound that even thoughdigital banking adoptioncan reduce costs and improve operational efficiency,technology riskhigher levels can have a negative impact onfinancial stabilitybank. This study shows thatits vulnerability

to system disruptions or cyber attackscan cause a decreaseZ-Score, which reflects a decline in financial stability. This is relevant to the findings , where althoughinternet banking transactionsincreases, its influence onZ-Scorenaturenegative.The Legend of Zelda (2018)in his research also showed that even thoughdigital bankingprovide long-term benefits through efficiency and fee-based revenue, poorly managed digital platforms orweak risk policycan improveoperational riskwhich ultimately leads to lowerZ-Scoreand affect the financial stability of banks. The declineZ-Scorefound in this study are in line with these findings, wheredigital transactionassociated withstability declinefinance due to increasingsystem riskand operational uncertainties associated with digital banking platforms.

Besides that,Aijaz Syed et al. (2022) shows that inshort-term,digital service expansionlikeinternet bankingcan improvesystemic riskAndoperational disruption, which may contribute to a decreasestability. noted that although in the long term,digital bankingcan improveincomeAndstability,digital riskremains a major challenge inshort-term. This reflects the finding thatfinancial stabilitybigger bankaffected by digital operational risks, which is reflected in the declineZ-Score. Connectionnegativebetweeninternet banking transactionsAndZ-Scorecan be explained bytechnology riskhigher.Digital transactionsbring benefits in terms ofefficiencyAndfee based income, but along with the increasingtransaction volume, riskoperationalrelated to system disruptions, cyber attacks, or security issues are increasing.

The Influence of Fee Based Income on Banking Stability

The fifth hypothesis in this study tests whetherfee based incomehave a positive impact onZ-Score(bank financial stability).Fee based incomerefers to the income earned by banks from digital banking service fees, such as transaction fees, administration fees, and other fees charged to customers who use digital banking platforms.Z-Score, on the other hand, is used to measurefinancial stabilitybank and its ability to avoid the risk of bankruptcy. The higherZ-Score, the better the bank's financial stability, which indicates that the bank is more resilient to financial risks and economic uncertainty. Based on the resultst-test,p-valueForfee based incometoZ-Scoreis0.94 which is bigger than0.05, show thatfee based incomedoes not have a significant influence onZ-Scorebank. Regression coefficient forfee based incomeis very small and almost close to zero, indicating that although there is a relationship betweenfee based incomeAndZ-Score, its influence onfinancial stabilitybanks are not strong enough to cause significant change.Descriptive statisticsshow thatfee based incomehas an average of1.67withstandard deviationas big as9.51, which shows that there is a large variation between banks in terms offee based income. It shows that there is a huge difference between the banks that generatefee based incomevery high and lower. This large variation shows that even though there are some banks that earn very high fee-based income, their impact onZ-Scorevery limited.

Previous researchprovide a deeper understanding of influencefee based incometofinancial stabilitybank.Baker & Moles (2021)in his research on digital banking stated thatfee based incomeprovides more stable profits for banks, but its impact onZ-Scorelimited, becauseoperating costshigh to maintain digital banking services. noted that althoughfee based incomeprovide financial stability, if the bank does not have strong control over its operational costs,fee based incomewill not have a significant impact onfinancial stabilitybank. Research byThe Legend of Zelda (2018) also shows that even thoughfee based incomecan improvebank income,financial stabilitybetter requiresdiversification of income sourcesthe greater one.Fee based income, although providing a more stable income, is often not enough to improvebank stabilityin the short term if the bank does not manage operational risk well. The declineZ-Scorefound in this study are

in line with these findings, wheredigital transactionassociated withstability declinefinance due to increasingsystem riskand operational uncertainties associated with digital banking platforms.

Previous research byKasri et al. (2022)also observed thatfee based incomecan provide stability, but at a high cost associated with managementdigital platform. noted that although fee-based income provides long-term stability for banks, factors such asdigital operating coststhe tall andcyber security riskscan reduce its contribution toZ-Scorebank. This is in line with the findings showing that despite the existence of fee-based income, its influence on bank stability is limited by technology-related costs and risks. The explanation for this finding can be explained byoperating costsrelated to managementfee based income.

The Influence of Internet Banking Assets on Banking Stability

The sixth hypothesis in this study tests whetherdigital assetshave a positive impact onZ-Score(bank financial stability).Digital assetsrefer tonon-physical assetsowned by the bank, such asdigital platform,IT infrastructure, and digital payment systems that support banking operations.Z-Score, on the other hand, is used to measurefinancial stabilitybank and its ability to withstand the risk of bankruptcy. The higherZ-Score, the better the bank's financial stability, which indicates that the bank is more resilient to financial risks and economic uncertainty. Based on the resultst-test, markp-valueFordigital assetstoZ-Scoreis0.0000, which is much smaller than0.05, show thatHypothesis 6 is accepted.Regression coefficientFordigital assetsis0.396188, which shows thatdigital assetshas a positive and significant effect onZ-Score. This means that the biggerdigital assetsowned by the bank, the higher it isfinancial stabilitythat it has, which is reflected in the valueZ-Scorehigher.

Based ondescriptive statistics digital assetsshows an average of approx.2.12 trillionwithstandard deviationas big as3.95 trillionshows the existence ofbig variationin sizedigital assetsinterbank. Valuemaximumwhich reaches1.561 trillionshows that some banks havedigital assetswhich is very large, while the valueminimumwhat is recorded is4.12 millionillustrates the large difference in sizedigital investmentbetween banks. This large variation suggests thatbank with large digital assetstend to be more financially stable, which is reflected in the valueZ-Scorehigher.

Previous research provides relevant insights into the influencedigital assetstofinancial stabilitybank.(2021)in his research ondigital bankingfound thatinvestment in digital assetscan improvefinancial stabilitybank because of the digitalization of banking mechanisms forreduce operational costsand improve operational efficiency, which in turn strengthensZ-Score. This is in accordance with the findings, wheredigital assetsthe larger one is related tofinancial stabilityhigher. Research byBaker & Moles (2021)also noted that banks that havedigital assetsthe bigger ones, likedigital payment platformmore efficient and more integrated digital banking systems tend to havefinancial stabilitywhich is better. suggests thatinvestment in digital technologybank mechanism to improveoperational and reduceoperational risk, which finally fixesZ-Scorebank.

These findings confirm the results showing thatdigital assetshave a positive impact onfinancial stabilitybank. In addition,The Last Supper (2020)in his research showed that banks that invest more indigital assetscan manageriskbetter and offer more efficient services to customers.Investment in digital technologybank mechanism forexpand market reach, increaseoperational efficiency, and finallyimprove financial stability.

5. Conclusion

This study aims to examine the effect of internet banking transactions, fee-based income, digital assets, and investment in digital assets on ROA (Return on Assets) and bank financial stability as measured by Z-Score. Based on the test results, it can be concluded that internet banking transactions have a significant effect on ROA but the effect is negative. Although digital

transactions can increase the volume of fee-based income, high operational costs and initial investments required in managing the internet banking platform tend to reduce bank ROA in the short term, indicating that although digital banking provides opportunities to increase income in the long term, large investment costs in the early stages require time to have a positive impact on bank profitability. On the other hand, fee-based income does not show a significant effect on ROA or Z-Score, indicating that although fee-based income can provide more stable income, its contribution to bank profitability and financial stability remains limited. Fee-based income is more dependent on the quality of services offered by the bank and the ability to manage operational costs associated with providing digital services.

Internet banking transactions have a significant effect on the Z-Score but the effect is negative, reflecting that although digital transactions can increase revenue, higher system risks associated with digital platforms can reduce the bank's financial stability. Digital assets are shown to have a positive effect on the Z-Score, meaning that banks that invest more in digital technology tend to be more stable in facing financial risks. Larger digital assets allow banks to reduce operational costs, increase efficiency, and offer more services to customers, which ultimately strengthen financial stability. Internet banking transactions have a significant effect on the Z-Score but the effect is negative, reflecting that although digital transactions can increase revenue, higher system risks associated with digital platforms can reduce the bank's financial stability.

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