

Value at Risk in Banks on the Financial Digitalization Phenomenon



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ABSTRACT: The purpose of this research is to measure risk, understand the function of risk management, and understand the effectiveness of implementing risk management in banks post the Covid-19 pandemic and the phenomenon of financial digitalization. The objects used in this research are banking companies listed on the Indonesia Stock Exchange during the research period 2020-2022. This research uses a sample of 42 banks are selected using a purposive sampling method. The research method used is measuring value at risk (VaR) using the historical simulation method. The results of the research show that the five banks that have the lowest level of risk are banks in the book IV category. The application of banking risk management to financial digitalization requires adaptability, innovation and inter-departmental cooperation. With a good approach, banks can mitigate emerging risks while optimizing the benefits of digital transformation in financial services.

KEYWORDS: Risk Management, Post Covid-19 Pandemic, Value at Risk, Historical Simulation Method, Stock Return

I. INTRODUCTION

Since 2010, around 200 global banks have been preparing to adopt digital technology with the aim of facing long-term changes. Out of this number, 46 banks are located in the Asia-Pacific region. At that time, they believed that in the next ten years, banking risk management would undergo unprecedented transformation and face entirely new risks (Sinamo, 2021).

In 2020, as the Covid-19 pandemic disrupted many economic and business sectors, stakeholders in the banking world argued that by 2025, or within the next five years, the role of risk in banking is likely to undergo a fundamental change compared to the past. This is attributed to the estimation that by 2025, more than half of the world's population, including in the Southeast Asia region, will transition to digital banking. Therefore, the banking sector must promptly take swift actions in adopting digital technology to evolve into digital banks with minimal risks (Ngamal and Perajaka, 2022).

The Covid-19 pandemic has resulted in restrictions on various activities, including financial transactions, prompting the public to better understand and adopt digital financial transaction methods. According to Widoatmodjo and Setyawan (2023), the banking industry is crucial in Indonesia because the deepening of the financial sector has not yet fully occurred massively in this country. The competitive trends in the banking sector have also shifted from traditional models to digital models. Therefore, the banking industry needs to adjust its services to meet customer needs. This has become a top priority in the banking world, achievable through digital innovation.

According to Astutik and Hastuti (2020), the current pandemic has prompted the public to shift towards digital transactions, leading to increased digitization in the financial industry and demanding improvements in risk management within financial institutions. Based on the Banking Statistics of Indonesia released by OJK, there were significant changes in banking transaction patterns in 2021 as a result of the Covid-19 pandemic. Transactions that were previously often conducted in branch offices have now shifted to digital methods, such as through mobile banking, internet banking, or AI-managed call centers. According to Bank Indonesia, electronic money transactions have surged from 2021 to 2023, as depicted in Figure 1.

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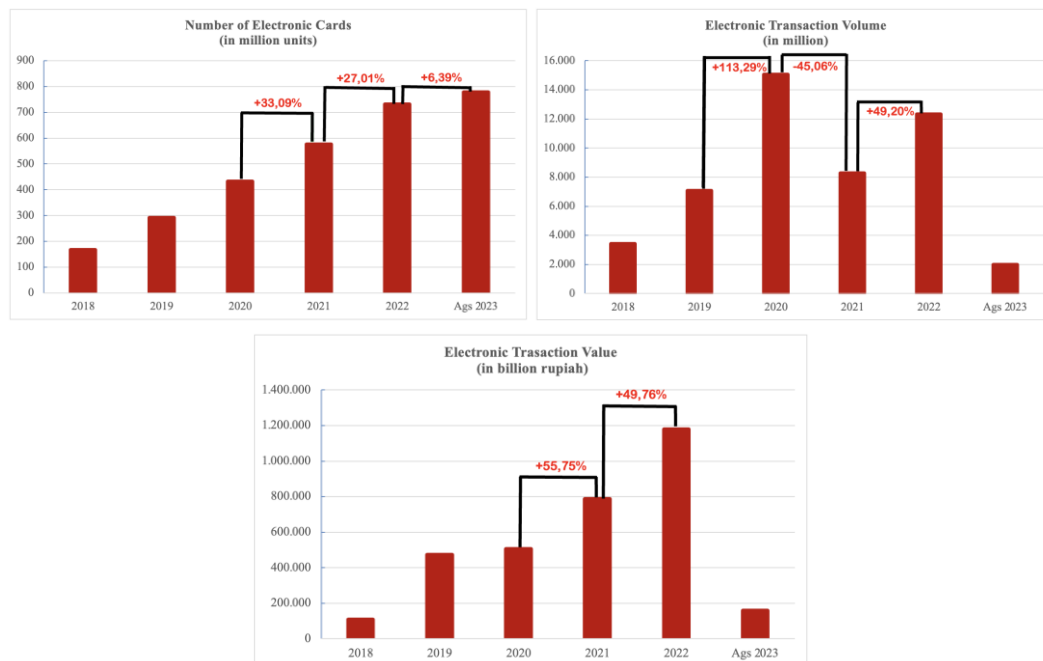


Figure 1. Number of Cards, Volume, and Value of Electronic Transactions
Source: Bank Indonesia Electronic Money Data

Based on the figure 1, it is evident that the number of electronic cards has shown an increase from 2018 to August 2023. Additionally, the volume of electronic transactions experienced the highest increase, reaching 113.29% in 2020 due to the COVID-19 pandemic. The value of electronic money transactions in 2022 reached IDR 1,177,797 billion. This reflects an increasing number of people engaging in electronic transactions. Despite facilitating many parties, electronic transactions also come with associated risks.

According to Article 3 of the Financial Services Authority Regulation (POJK) Number 6/POJK.03/2021 regarding Business Activities and Office Networks Based on Bank Core Capital, banks are categorized into four books. These are Book I (core capital up to less than one trillion rupiahs), Book II (core capital at least one trillion rupiahs up to less than five trillion rupiahs), Book III (core capital at least five trillion rupiahs up to less than thirty trillion rupiahs), and Book IV (core capital at least thirty trillion rupiahs).

Bank plays a crucial role in the economy, and risk management is essential for operational sustainability. Banks develop an efficient risk management framework free from external interference, establishing the level of risk they can tolerate and how far they are willing to accept risks. Subsequently, they design the necessary policies and procedures for risk management (Zaini, Seftiniara, and Saputri, 2022).

In the banking sector, the phenomenon of digitalization is inevitable. Banks are required to leverage technology to the fullest extent possible to keep up with the pace of digitization. The stability of the banking system encompasses the bank's ability to operate in a balanced manner under various economic conditions without relying on external resources to support it. In order to ensure this stability, regulatory bodies are increasingly focused on the development of reputable financial regulations and tools used in supervision, as well as the ongoing assessment of banks.

Based on Article 24 of the Financial Services Authority Regulation (POJK) Number 12/POJK.03/2021 concerning Commercial Banks, it is regulated that one of the requirements for becoming a digital bank is to have adequate risk management. Bank Indonesia encourages the transition to the digital era in the banking sector to strengthen the role of banks as primary institutions in the digital economy by implementing digital solutions. The shift to the digital financial realm also brings about risk consequences that need to be identified and addressed. This is certainly interesting to investigate in terms of how to measure a risk, the functions of risk management, and the effectiveness of implementing risk management in banks post the Covid-19 pandemic and the financial digitization phenomenon.

This research aims to measure a risk, understand the functions of risk management, and comprehend the effectiveness of implementing risk management in banks post the Covid-19 pandemic and the financial digitization phenomenon. The expected outcome of this research is that banks can enhance their resilience to crises and market changes by identifying risks more effectively and managing them efficiently. The research is intended to assist banks in developing products and services more aligned with consumer needs in the digital era while paying attention to risk management. Additionally, it is anticipated that this

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research will contribute to academic understanding and the advancement of knowledge in the fields of risk management, economics, and finance.

II. LITERATURE REVIEW

A. Definition of Risk and Risk Management

Risk is the possibility or potential occurrence of loss, uncertainty, or negative impact that may arise in a decision, action, or event. According to Triswandana and Armaeni (2020), risk is an unpleasant (harmful, hazardous) outcome originating from activities or work processes performed. Cahyolaksono, Mahardhika, and Zakaria (2021) argue that risk refers to the likelihood of events that may happen in the future and, if they occur, will result in negative consequences for an object. Not all risks can happen, or their consequences can be predicted with certainty. Therefore, more efficient risk management efforts are needed.

Risk management is defined as a practical action to identify, assess, control, and reduce risks (Padang et al, 2021). According to POJK number 18/POJK.03/2016, risk management is a set of methodologies and procedures used to identify, measure, monitor, and control risks arising from all of the bank's business activities.

B. Types of Risks in Banking

In the realm of banking, the stability and long-term viability of financial institutions are susceptible to various risks. According to POJK Number 18/POJK.03/2016, banking encompasses eight distinct types of risks: credit risk, market risk, liquidity risk, operational risk, compliance risk, legal risk, reputation risk, and strategic risk.

Credit risk emerges from the potential failure of a party to meet its obligations to the bank. This includes risks associated with debtor default, credit concentration, counterparty credit, and settlement. Banks confront credit risk when extending loans to individuals, companies, or entities.

Market risk pertains to fluctuations in the balance sheet and administrative accounts, involving derivative transactions, due to overarching changes in market conditions. It encompasses risks related to changes in option prices, as well as variations in the value of assets such as stocks, bonds, or commodities held by the bank. This includes interest rate risk, foreign exchange rate risk, and other market-related risks.

Liquidity risk arises when a bank is unable to meet its maturing obligations from available cash flow funding sources or high-quality liquid assets. In essence, it occurs when a bank lacks adequate resources (cash or easily marketable assets) to fulfill its maturing financial obligations, potentially leading to challenges in meeting customer withdrawals or other obligations.

Operational risk stems from deficiencies or malfunctions in internal processes, human errors, system failures, and external events impacting a bank's operations. This category encompasses risks associated with fraud, technological issues, legal challenges, and other day-to-day operational concerns.

Compliance risk materializes when a bank fails to adhere to statutory regulations, resulting in violations of rules, regulations, or laws. Such violations can lead to sanctions, fines, or legal actions against the bank. Legal risk, on the other hand, arises from legal claims or weaknesses in legal aspects, potentially affecting a bank's operations, reputation, and financial performance.

Reputation risk is linked to a decline in trust from stakeholders due to negative perceptions of the bank. It is associated with the public, customer, and stakeholder perception of the bank's image. Scandals or actions that tarnish the bank's image can adversely impact its business and erode customer trust.

Strategic risk originates from inaccuracies in making or implementing strategic decisions, as well as a failure to anticipate changes in the business environment. It encompasses risks associated with alterations in business strategy, innovation, and adaptability to market changes.

C. Value at Risk (VaR)

Value at Risk represents an approximation of the highest potential loss anticipated during a specified time frame under normal market conditions at a given confidence level (Maruddani and Purbowati, 2009). It serves as a risk measurement tool employed to gauge the maximum loss a portfolio might undergo within a defined period, considering a specific level of confidence. According to Kenton (2023), Value at Risk widely adopted by investment and commercial banks as a method to evaluate potential losses within their institutional portfolios, along with the associated probabilities. The computation of Value at Risk typically involves three primary methods; the parametric method (variance-covariance), the Monte Carlo simulation method, and the historical simulation method.

The parametric method applies the assumption that profits and losses follow a normal distribution. In this way, potential losses can be measured in terms of standard deviations from the mean. This method is most effective in measuring risk when the distribution is known and can be credibly predicted. However, it becomes less reliable when the sample size is very small. The

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Monte Carlo simulation method applies computational tools to simulate various return projections in hundreds or even thousands of iterations. In this analysis, the probability of losses, such as 5%, is then calculated, and its implications are revealed. The Monte Carlo method can be applied in various risk measurement contexts and relies on the belief that the probability distribution of risk factors is known.

The historical method involves analyzing the history of previous profits by arranging them from the worst loss to the greatest profit. It is based on the assumption that past experience in terms of profits will influence future outcomes. In the historical method, all value at risk, without exception, will have a negative sign, representing the maximum loss that will be experienced over a certain period with a certain confidence level.

III. RESEARCH METHODS

The form of this research is quantitative research. According to Sugiyono (2018, 13), quantitative research is based on concrete data, with research data in the form of numerical values that will be measured using statistics as a tool for calculation and testing, related to the examined problem to draw conclusions.

The object used in this research is banking companies listed on the Indonesia Stock Exchange (IDX) during the research period from 2020 to 2022. The sample selection method used is purposive sampling, which is a method of selecting samples based on specific criteria set by the researcher (Sekaran and Bougie 2020, 233). The research method used is the measurement of Value at Risk (VaR) using the historical simulation method. This research utilizes secondary data, including monthly closing stock prices and financial reports of banking companies listed on the Indonesia Stock Exchange. Based on the research by Wahdini and Rosha (2021), data analysis can be conducted through the following steps:

1. The calculation to obtain the value at risk can be determined as follows:

a. Finding the monthly stock return value using the following equation:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

Where :

R_{it} = return of stock i at time period t

P_{it} = closing price of stock i at period t

P_{it-1} = closing price of stock i at period t-1

b. Determining the confidence level and specified time period.

c. Calculating the maximum loss estimate at the α quantile confidence level from the empirical return distribution obtained in step (b), denoted as R^* .

d. Calculating the value at risk with a confidence level over a time period of t days using the following formula:

$$VaR = W_o R^* \sqrt{t}$$

Where :

W_o = initial investment (share capital of the company at period t)

R^* = α quantile value from the return distribution

t = time period

2. Formulating an explanation from the obtained value at risk results. Once VaR has been obtained, meanings can be derived, and conclusions can be drawn. With value at risk, banks and other market participants can allocate funds to address the predicted losses.

IV. RESEARCH RESULT

A. Description of The Research Object

The object used in this research is banking companies listed on the Indonesia Stock Exchange during the years 2020-2022. Through purposive sampling, 42 banks were obtained and utilized as the research object.

B. Descriptive Statistics

The observation data for each banking company during the period amounted to 36 data, with a total of 1,512 data overall. The highest stock return was obtained by PT Bank Bumi Arta Tbk at 3.052133, while the lowest stock return was recorded by PT Bank Jtrust Indonesia Tbk at -0.999860. The highest average stock return was achieved by PT Allo Bank Indonesia Tbk at 0.140468, whereas the lowest average stock return was observed for PT Bank Mayapada Internasional Tbk at -0.060630. The highest standard deviation was held by PT Bank Bumi Arta Tbk at 0.590429, while the lowest was owned by PT Bank OCBC NISP Tbk at 0.043820.

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C. Result of Calculation The Value at Risk

The calculation of monthly stock return is conducted after obtaining historical monthly closing stock price data from the website www.yahoofinance.com. The calculation of stock return is performed using Microsoft Excel 2021 with the assumption that the variance follows a normal distribution. Subsequently, a confidence level of 95% is determined with a time period of 30 days (1 month). Then, the calculation of the maximum loss estimate at the confidence level ($1-\alpha$) is carried out using α equal to 0.05. In the calculation of value at risk, the initial investment used is the average value of the share capital held by each banking company included in the sample during the period 2020-2022.

Table 1. Results of Value at Risk (VaR) Calculation

No	Stock Code	Name of Bank	VaR	Percentage of Investment
Bank with the lowest level of risk				
1	NISP	PT Bank OCBC NISP Tbk	-922.822.079.960	-32%
2	BBCA	PT Bank Central Asia Tbk	-767.111.402.498	-50%
3	BMRI	PT Bank Mandiri (Persero) Tbk	-5.900.099.776.993	-51%
4	BBRI	PT Bank Rakyat Indonesia (Persero) Tbk	-4.330.238.344.019	-61%
5	BTPN	PT Bank BTPN Tbk	-104.486.364.860	-64%
Bank with the highest level of risk				
1	MAYA	PT Bank Mayapada Internasional Tbk	-2.273.996.717.693	-194%
2	BCIC	PT Bank Jtrust Indonesia Tbk	-24.237.590.807.385	-192%
3	BBHI	PT Allo Bank Indonesia Tbk	-2.301.711.957.508	-184%
4	BBYB	PT Bank Neo Commerce Tbk	-1.358.689.262.436	-160%
5	BBKP	PT Bank KB Bukopin Tbk	-9.021.352.329.326	-155%

Based on the table above, it can be seen that the results of the value at risk calculations indicate that the bank with the highest risk level is PT Bank Mayapada Internasional Tbk with a risk percentage of -194% of the initial investment value and a value at risk of -IDR 2,273,996,717,694. Meanwhile, the bank with the lowest risk level is PT OCBC NISP Tbk with a risk percentage of -32% of the initial investment value and a value at risk of -IDR 922,822,079,960. The negative sign indicates the presence of losses and risks associated with the potential loss of investment or capital.

The table above illustrates risk measurement with value at risk using different initial investments based on the average values of each banking company's share capital. It can be interpreted that with a confidence level of 95%, the potential loss or risk of maximum investment or capital loss that a bank may experience in 1 month is reflected in the value at risk. Additionally, the calculation includes the percentage of potential loss or risk of investment or capital loss based on the initial investment value of each bank. From the results of the value at risk calculation, five banks with the highest risk levels fall into the categories of banks in books I to III. Meanwhile, the five banks with the lowest risk levels belong to the category of banks in book IV.

D. Implementation of Risk Management in Banking

From the above risk measurement results, banks need to implement effective risk management. Banking institutions should identify, measure, and understand the risks that may arise or be encountered. Subsequently, banks must develop risk management tailored to the company's circumstances.

In credit risk management, banks should identify and assess credit risks arising from lending to borrowers who may fail to meet their obligations. The development of credit policies containing risk assessment criteria and periodic credit quality monitoring needs to be implemented by banks. Banks can adopt credit scoring systems and monitor changes in economic conditions that may affect credit risk.

Market risk management involves managing risks arising from fluctuations in asset prices, interest rates, and exchange rates. The use of financial derivative instruments can be applied to protect banking institutions from undesirable market risks. Liquidity risk management aims to ensure that banking institutions have sufficient liquidity to meet financial obligations at any given time. Banks need to assess potential liquidity shortfalls and develop strategies to address challenging liquidity situations. In operational risk management, banks must identify, assess, and manage risks arising from process failures, system failures, people, or external events. The development of operational policies and procedures is necessary to reduce operational risks and enhance system resilience.

Banks need to ensure compliance with financial regulations and applicable rules. The implementation of effective compliance controls and monitoring of regulatory changes are crucial. Banks can conduct compliance audits periodically. Legal risk management involves identifying and addressing risks arising from potential legal conflicts or rule violations. Banks need to

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collaborate with legal teams to ensure compliance and mitigate legal risks, in addition to monitoring regulatory changes and carefully evaluating contracts.

In reputation risk management, banks need to identify factors that can harm the reputation of the banking institution, such as scandals or unethical business practices. Developing strategies to mitigate reputation risks and build a positive image is essential. Banks need to implement customer satisfaction surveys, monitor social media, and respond quickly to reputation issues. Strategic risk management involves identifying and evaluating risks that can affect the long-term goals of banking institutions. Banks need to pay attention to developing business strategies that consider potential risks and opportunities in the external environment. Banks need to implement scenario development, evaluate business strategies, and monitor changes in the business environment.

Furthermore, the phenomenon of financial digitization is crucial for banks. Banks need to minimize various potential risks in financial digitization. Banks need to understand risks associated with the shift toward digital financial services. This involves understanding cybersecurity risks, operational risks, reputation risks, and data-related risks. Banks must establish policies and procedures that support security and compliance in the digital environment. Banks need to implement cybersecurity policy formulations covering aspects such as data security, encryption, and risk mitigation actions.

V. CONCLUSION

The research results measuring risk using the value at risk method with historical simulation indicate that PT Bank Mayapada Internasional Tbk has the highest level of risk, with a risk percentage of -194% of the initial investment value and a value at risk of -IDR 2,273,996,717,694. On the other hand, PT OCBC NISP Tbk has the lowest risk level, with a risk percentage of -32% of the initial investment value and a value at risk of -IDR 922,822,079,960. The five banks with the highest risk are categorized as book I to III, while the five banks with the lowest risk fall into book IV.

Risk measurement with a confidence level of 95% shows the maximum potential loss or risk of investment or capital that banks may experience in one month, as indicated by the value at risk with the percentage of potential loss or risk of investment or capital over the initial investment value of each bank.

Banks need to implement effective risk management. The banking sector needs to identify, measure, and understand the risks it may face. Subsequently, banks should develop risk management strategies tailored to the company's circumstances. Implementing risk management in financial digitization requires adaptability, innovation, and collaboration across departments. With a sound approach, banks can mitigate emerging risks while optimizing the benefits of digital transformation in financial services.

Limitations of this research include the use of only a 3-year period from 2020 to 2022 and monthly closing stock price returns. The research focuses on 42 sampled banks, which may not fully represent the population of companies within the research period. Recommendations for future research include extending the research period to five years or more for better results. Additionally, using daily closing stock price returns and increasing the number of sampled companies would better represent the population of companies within the research period, possibly including non-banking companies.

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