AN ANALYSIS OF DECENTRALIZED FINANCE TOWARD INVESTOR ATTENTION AND FINANCIAL ASSET PERFORMANCE

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DECLARATION

I hereby declare that:

(1) This undergraduate research project is the end result of my own work, and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) The word count of this research report is 20070

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PREFACE

The preface sets the stage for the research conducted in the subsequent chapters. It introduces the reader to the main themes explored, including the relationship between social sentiment, decentralized finance (DeFi) market capitalization, and traditional bank performance metrics. The preface highlights the importance of understanding these dynamics in the context of the rapidly evolving financial landscape. It also outlines the structure of the study, promising a detailed examination of findings, implications, limitations, and recommendations for future research. Overall, the preface serves as a roadmap for navigating the research journey ahead.

ABSTRACT

As part of the requirements for earning a Bachelor of Economics (Hons) in Global Economics, this research is being turned in. "An analysis of decentralized finance toward investor attention and financial assets performance " is the title of this study. The research will be conducted using EViews 12 to shows the relationship between variable social sentiment on DeFi market capitalization will be test using Google trend as the main independent and 3 control variable , trading volume , active address , crypto volatility index by using Monthly data from April 2019 to February 2024 total of 59 Month . Next for panel data analysis, we will using ROE , NIM and ROA of bank in United State as dependent , and with 1 independent Defi (measure with TVL) , 4 control variable such as NPL , TA , OPX and CA by conducting Quarterly data from 2018Q3 - 2023Q4

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In Chapter One, we'll have seven sections. The research overview will help everyone get a basic idea of how decentralized finance (DeFi) affects financial assets performance and investor attention. It's like giving researchers a simple way to understand what's going on with investments and people's attention in the world of DeFi. And this chapter will share insights into the how the growth in defi will impact the size of traditional banks.

1.1 Research Background

To facilitate transactions and offer financial services, the conventional financial system relies on intermediaries like banks and other financial organizations. DeFi, on the other hand, does away with middlemen and let users to deal directly with one another , therefore it able to increasing the efficiency, accessibility, and transparency of financial services (Kerner, 2022).

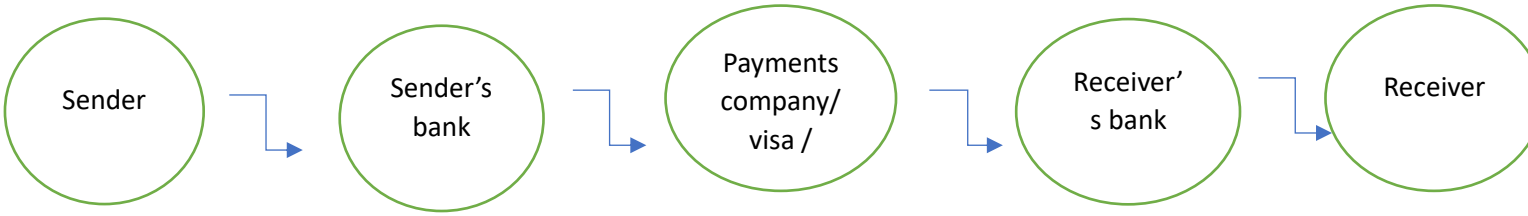
During the year of 3 –1- 2009 the launch of Bitcoin is the starting point of Defi. Even though the founder of bitcoin Satoshi Nakamoto have the idea to change the entire financial market structure, but the bitcoin system is not built to be functioning in the Defi Protocol and lacking a more complete financial operations. In the year 2014, with the built of Omni Protocol and the introduction of the first stable coin called as Tether (USDT) by Tether limited (Tether Ltd) , a Tether are peg with dollar and it 1:1 it could provide a trader with more stable assets with lesser volatility in the crypto ecosystem and enable them to do any transaction or purchase using USDT . Therefore, it created a bridge between traditional finance and decentralized networks (Kerner, 2022).

When time comes to 2015 vitalik has created Ethereum blockchain and with the innovation added with smart contract it allows all the developer to create a wide variety of decentralized app , the critical innovations made by vitalik was ERC-20 Roken standard . It allowed more public funding around the world throught a more easier creation on a new token in the Ethereum block chain which called as Initial Coin Offering (ICO) . According to the study from Tao and Peng (2023) , during the year of 2017 and 2018 there are over 10 Billion US raised with a total of 2000 Initial Coin Offering project .Among the successful projects are Tezos, a decentralized and open-source blockchain network that can execute peer-to-peer transactions and serve as a platform for deploying smart contracts raised 232 million USD; Blockstack, a decentralized computing network and ecosystem for decentralized applications raised about 52 million USD (Kerner, 2022).

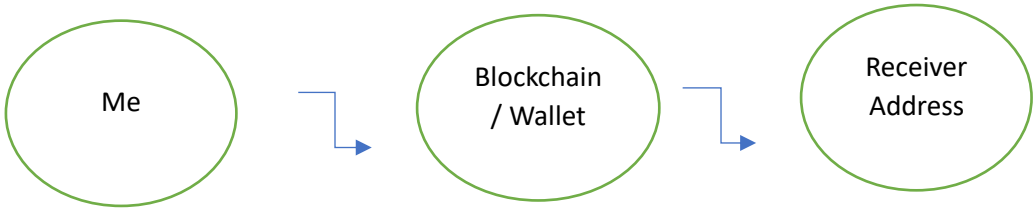
Furthermore, with the initial Coin Offering (ICO) boom , there are more investor and business man who looked defi as a good opportunity to developed and making investment . For example, Rune Christensen had launches MakerDAO a blockchain protocol on the Ethereum Mainnet it allows users to borrowing and lending crypto throught it's platform and DAI a stable coin also had introduced , it become a critical component in the financial system of decentralizations . In order to get DAI stable coin, a user will have to collateral its crypto assets such as ETH during the year of 2017 , and as the protocol are getting more famous it broadened its scope to accept more various cryptocurrency for people to obtaining DAI. The innovations does not stop there, in the year of 2018 Uniswap had launched, is the largest decentralized exchange for swapping cryptocurrency tokens on Ethereum and other popular blockchains it is the world's largest and most popular decentralized exchange, with over $1.5 trillion in trading volume and 250 million swaps. As of today, the Uniswap Protocol is the fifth largest application on Ethereum with over $4 billion in total value locked (TVL). The protocol consistently does billions in weekly trading volume and is the most popular decentralized exchange by volume on Ethereum mainnet, Polygon, Arbitrum, and Optimism (Kerner, 2022).

Since 2020, new protocols have continued to launch, and the DeFi space has seen interest and values rise and fall along with the larger crypto industry. More and more DeFi protocols are launching on non-Ethereum blockchains, attempting to take advantage of improvements that have been made to the preexisting smart contracts format. While it remains to be seen how successful DeFi will be going forward, interest in this movement has climbed rapidly in just a few short years (Reiff, 2023) . Another breakthrough was the concept of liquidity mining or yield farming, which exploded in 2020. This incentivized users to provide liquidity to DeFi protocols in return for rewards, typically in the form of governance tokens. This not only attracted more users but also established a way for them to actively participate in the governance of DeFi protocols, making the ecosystem more decentralized and robust (Kerner, 2022).

Traditional bank (Centralized Finance)



Decentralized Finance



Lastly , DeFi enables the delivery of a variety of financial services, including loan and borrowing, trading, insurance, and asset management, all without the need for middlemen. The use of smart contracts allows these services to be carried out automatically, without the need for manual involvement, lowering the risk of mistakes and fraud.

1.2 Problem Statement

Previous studies have analysed the performance of individual Decentralized Finance, but there is a lack of comprehensive research that compares the compare their performance of traditional financial assets in term of their ROE , ROA and NIM with Decentralized Finance . Therefore, this research able to provide an insight to inform investor to have a better understand the risk and the opportunity in the Defi Ecosystem and the impact the may faced by the financial system .

Furthermore, this research will be investigated the relationship between the Defi market cap and the impact of traditional assets (Bank) ROE , ROA and NIM . The result from the study able to help investor, stakeholder and people to know the potential risk and opportunities that may be arise for the financial assets . For example, investor could have a brief idea before they jump into DeFi ecosystem . But for traditional finance assets, banks may face with a potential risk since DeFi able to eliminate the use of intermediaries, provide a clearer transparency of transaction and a better security.

Moreover, since DeFi are still new in the current market and have a very high volatility such as a high drop and rise in the market in their price. Therefore, the investor attention toward the DeFi will also be part of the search. Nowadays social media have play an important role by spreading news and an important platform for the investor to express their emotions and voice . For example , a positive news will lead to people to pump a token price . In contrast, a negative news will cause investor to sell the token . Thus , this could lead to a price fluctuation in the short term period and lead to a market volatility . In addition, by using google trend as measurement to understand the DeFi i would allow investor to stay informed to make investment decision in the DeFi Space .

In summary, by analysis the relationship between impact of social sentiment (google trend) between the relationship with DeFi market cap . And the relationship between the impact Defi market cap toward traditional financial assets (bank's ROA , Roe and Nim) . Able to provide a comprehensive insight toward the stakeholder , investor and the policy maker on the Defi Ecosystem .

1.3 Research Questions

1. To what extent does investor attention impact the growth of DeFi market capitalization ?
2. How does the growth of DeFi cryptocurrencies affect traditional banks' profitability ?

1.4 Research Objectives

1. To analyze the impact of investor attention on the performance of DeFi growth, using and google trend as dependent and 3 control variable trading volume, CVI , total wallet address.
2. To examine the effects of Defi cryptocurrency market size on profitability of traditional banks in United State

1.5 Hypotheses of the Study

$$DEFI_{t-1} = \beta_0 + \beta_1 \mathrm{GT}_{t-1} + \beta_2 TV_{t-1} + \beta_3 \mathrm{AD}_{t-1} + \beta_4 \mathrm{CVI} + \varepsilon_{t-1}$$

Variables (independent)	**Hypothesis**
Social Sentiment	H0: There is no positive relationship between Social Sentiment and DeFi market capitalization . H1: There is positive relationship between Social Sentiment and DeFi market capitalization .

Variables (control variable)	Hypothesis
Total wallet address	H0: There is no positive relationship positive relationship between total wallet address and DeFi market capitalization H1: There is positive relationship between total wallet address and DeFi market capitalization
Transaction	H0: There is no positive relationship between Transaction and DeFi market capitalization H1: There is positive relationship between Transaction and DeFi market capitalization
CVI	H0: There is no positive relationship positive relationship between CVI and Defi Market growth. H1: There is positive relationship between CVI and DeFi market capitalization

$$ROE_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \ln \mathrm{OE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Variables (independent)	**Hypothesis**
Defi Market Growth	H0: There is no positive relationship between DeFi market capitalization with bank's return on equity H1: There is positive relationship between DeFi market capitalization with bank's return on equity
(control variable)	
Non-Performing Loan	H0: There is no positive relationship positive relationship between nonperforming loan and bank's return on equity H1: There is positive relationship between total non performing loan and bank's return on equity
Total Asset	H0: There is no positive relationship between total asset and bank's return on equity H1: There is positive relationship between total asset and bank's return on equity
Operating Cost	H0: There is no positive relationship positive relationship between operating cost and bank's return on equity H1: There is positive relationship between operating cost and bank's return on equity
Capital Adequacy	H0: There is no positive relationship positive relationship between capital adequacy and bank's return on equity H1: There is positive relationship between capital adequacy and bank's return on equity

$$NIM_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \ln \mathrm{OE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Variables (independent)	Hypothesis
Defi Market Growth	H0: There is no positive relationship between DeFi market capitalization . with bank's net interest margin H1: There is positive relationship between DeFi market capitalization with bank's net interest margin
(control variable)	
Non Performing Loan	H0: There is no positive relationship positive relationship between non performing loan and bank's net interest margin H1: There is positive relationship between total non performing loan and bank's net interest margin
Total Asset	H0: There is no positive relationship between total asset and bank's net interest margin H1: There is positive relationship between total asset and bank's return on equity
Operating Cost	H0: There is no positive relationship positive relationship between operating cost and bank's net interest margin H1: There is positive relationship between operating cost and bank's net interest margin
Capital Adequacy	H0: There is no positive relationship positive relationship between capital adequacy and bank's Net Interest margin . H1: There is positive relationship between capital adequacy and bank's net interest margin.

$$ROA_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \ln \mathrm{OE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Variables (independent)	Hypothesis
Defi Market Growth	H0: There is no positive relationship between DeFi market capitalization . with bank's return on asset H1: There is positive relationship DeFi market capitalization with bank's return on asset
(control variable)	
Non-Performing Loan	H0: There is no positive relationship positive relationship between non performing loan and bank's return on asset H1: There is positive relationship between total non performing loan and bank's return on asset
Total Asset	H0: There is no positive relationship between total asset and bank's return on asset H1: There is positive relationship between total asset and bank's return on asset
Operating Cost	H0: There is no positive relationship positive relationship between operating cost and bank's return on asset H1: There is positive relationship between operating cost and bank's return on asset
Capital Adequacy	H0: There is no positive relationship positive relationship between capital adequacy and return on asset. H1: There is positive relationship between capital adequacy and bank's return on asset

1.6 Significance of the Study

Many studies have done on decentralized finance, but very little studies looked at the effect of Decentralized Finance (DeFi) market capitalization toward the traditional bank's performance and how the investor attention able to boost the DeFi market capitalization . Therefore, by know the relationship between attention and DeFi market growth, it able to attract more investor to take part in their investment decisions. Social media such as google able to provide a necessary inform how many people search for the "DeFi" to know how the trend was is going on. Thus, it able to provide a clearer gauge market sentiment, potential risk, and opportunity for investor to make investment decision. In addition, when a defi project are more transparency and have a clearer whitepaper and roadmap it able to boost the confident of investor to take part in the DeFi project. Academic researchers able to use data from social media platforms like google trend to capture the social sentiment and the DeFi market capitalization. By know the engagement level in the google it able to predict the trend and the market movement of DeFi cryptocurrency overtime.

Furthermore, by have a clearer understanding on how DeFi market capitalization impact traditional bank performance in term of ROE, NIM and ROA . It able to provide insight for investor to adjust adjust in their portfolio allocation to minimize the risk they may faced. In addition, Investor also able to find opportunities related with the changes in Defi Market capitalization toward the Bank's performance. For example , if there are a positive relationship between DeFi and bank ROE and ROA . A bank may receive a more fund from the investor. Since it able to generate a long-term revenue and profit for them . But if there are a negative relationship with bank's NIM , investor will tend to pull out their investment or even diversify their investment. Additionally, the study's contribution to academic literature is essential for furthering our understanding toward the relationship between DeFi market capitalization and traditional banking performance, it able to give policymaker regard the potential of DeFi and it's competitiveness in the financial market and allow them to design an suitable policy to response .

1.7 Chapter Layout

1.7.1 Chapter 1

The five chapters comprising this study are structured with the background serving as the primary focus of the first chapter. In this context, the study delves into the analysis of decentralized finance (DeFi) concerning financial assets and investor attention. The paper primarily explores the various facets of DeFi and its impact on financial assets and investor behaviour. Within this chapter, subtopics such as research questions, objectives, problem definition, significance, and study hypotheses are discussed to provide a comprehensive understanding of the dynamics influencing decentralized finance in relation to financial assets and investor attention.

1.7.2 Chapter 2

To deepen our understand of decentralized finance and its impact on the finance asset (Bank's ROE , NIM , ROA) In chapter 2 the study will be reviewing the literature review that are related with the study . The literature review will identify the independent and control variables that impact the dependent variable . Furthermore , this chapter also will make a conceptual framework and develop hypothesis to know the relationship between the variable . study's analytical methodology, the chapter examines deeper into important theoretical models.

1.7.3 Chapter 3

In chapter 3 , the research method will using data collection , sample size calculations , samplings design and research instrument to provide a summary of the research report .

1.7.4 Chapter 4

The empirical findings are the main focus of Chapter 4's decentralized finance (DeFi) analysis on financial assets and investor attention. This chapter will be using time series data and panel data to evaluate and interpret the findings. .

1.7.5 Chapter 5

Chapter 5 of this study covers limitations and recommendations for future research, provides a comprehensive analysis of the findings in Chapter 4, and ensures consistency and accuracy compared to other studies conducted by other researchers. The goal of this section is to provide a comprehensive conclusion to the study into areas that may require improvement, exploration, and further exploration in the field of decentralized finance and its impact on financial institutions.

1.8 Conclusion

In conclusion, this study systematically examines the impact of decentralized finance (DeFi) on financial assets and investor attention. Through a well-organized five-chapter structure, the research covers background exploration, literature review, research methodology, empirical findings, and a comprehensive conclusion. The findings contribute valuable insights into the dynamics of DeFi, shedding light on its implications for financial assets and investor behaviour. Despite limitations, the study opens avenues for future research in this evolving field. The structured approach ensures a thorough investigation, providing a foundation for continued exploration and understanding of decentralized finance.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In this chapter the literature review will be furthermore study on the theoretical. conceptual framework and the dependent, independent and control variable relationship. By knowing the relationship between the dependent and independent it allows us to have a deeper understanding

2.1 Literature Review

2.1.1 TVL (Total Locked Value)

Investors utilize TVL in addition to market capitalization (e.g., the market cap) to assess the projects on the DeFi market. The money put into DeFi protocols goes toward lending, liquidity pools, and staking. The total value locked in a smart contract is represented by the value of the deposited assets. Stated differently, it denotes the total sum of money allocated to the DeFi protocol. As of August 2023, the expected market size for decentralized finance was $48.6 billion USD (Statista). It is notable that since 2021, when it peaked at about $250 billion USD (Statista), the scale of the decentralized financial sector has drastically decreased. In particular, the price fall of Terra (LUNA) and its stablecoin Terra USD (UST) had an impact on the DeFi market.

According to Metelski and Sobieraj (2022), a higher TVL of DeFi protocols translates into increased liquidity, popularity, and usability—all of which are indicators of the success of DeFi projects. An increase in TVL indicates a greater capital commitment to DeFi protocols, which results in substantial benefits and income for those involved in these protocols. Conversely, lower TVLs indicate

fewer money (liquidity pools) available, which translates into lower protocol revenues.

From the study of Metelski and Sobieraj (2022) it concluded that TVL, Total Revenue , And Gross Merchandise volume will have a positive impact toward the valuation of the defi protocol . All the beta coefficient shows their variables are positive and statistically significant. And among the variable the biggest variable that have the most impact toward the defi protocol is TVL. This is due to when there are more fund and resources get in to DeFi protocol, the better for the valuations. Since the TVL will reflecting to total value of money investing or funded into the smart contact of their protocol such as AAVE, MAKER DAO and UNISWAP, therefore higher number means there are higher valuation for the DeFi protocols.

Another study by Bhambhwani & Huang (2023) found a significant correlation between TVL and token value and the protocol audit that it receives. TVL decreases less in protocols with more auditors and better audit quality. This is due to the fact that better audits have the ability to boost the value of DeFi audits and boost investors' and users' trust in DeFi protocols.

Furthermore study from Şoiman et al. (2022) , by focusing on the15 leading DeFi token coin using Panel Ols , it shows that . When TVL growth it can positively predict the DeFi's return increase. This is because TVL on DeFi systems indicates the amount that is locked. According to the author's findings, the value (return) of the associated DeFi token increases in tandem with an increase in the value locked in the platform.

One of the major decentralized lending protocols, Compound (a decentralized, blockchain-based platform that lets you lend and borrow cryptocurrency), encountered a serious problem in September 2021 as a result of a typo in a suggested smart contract modification. This typo went unnoticed during review, leading to losses of around $80 million in COMP tokens. Despite efforts to fix the bug, further losses totalling approximately $147 million occurred when an individual refilled the vulnerable contract with reserved funds. This incident underscored the risks of smart contract vulnerabilities, even within mature governance processes, emphasizing the importance of thorough review and testing procedures. Therefore,

TVL as an important Indicator of Protocol Health**,** A decrease in TVL can indicate a loss of trust or confidence in a DeFi protocol following a security incident or misgovernance. In the case of the Compound incident, there was a significant 6.13% decrease in TVL, suggesting that investors and users withdrew their assets from the protocol in response to the incident therefore it will affect in the defi market size.

2.1.2 Social Sentiment

The impact of social media platforms like Twitter on Defi is significantly positively correlated. According to the author's findings, there is evidence that Defi are impacted by tweets, follower count, and positive remarks made on relevant social media posts. Given that Defi's market capitalization in our sample is low, any social media effort seems to bolster their significance from an investing standpoint. There will be more market uncertainty as the weekly variations in followers' tweets increase in number (Chousa et al., 2023) Subsequently, a different study by oiman et al. (2022) discovered that, when the term "decentralized finance" is used instead of "DeFi," google searches significantly affect only a portion of the DeFi token return. The results demonstrating a beneficial effect demonstrate that higher investor interest (measured by "DeFi" searches) results in higher token returns. Conversely, the author pointed out that the search for "decentralized finance" will negatively affect the DeFi market, i.e., higher investor interest (represented by "decentralized finance") will result in lower DeFi returns. The current high level of volatility and the immature stage of the DeFi market may provide some explanation for this. Another author used sentiment data from Stocktwits to research the sentiment of messages about the S&P 500 Index in order to examine how sentiment about the stock market affects Bitcoin volatility. He discovered that sentiment on the S&P 500 index in social networks had a positive and significant relationship with bitcoin volatility, that bitcoin could serve as a haven for investors, and that when developing investment strategies, investors should take social network sentiment about the stock market into account rather than market volatility. This implies that investors in Bitcoin are more "technological," and as a result, they focus more on the information provided by these media (López-Cabarcos et al., 2021). Additionally, Pavlyshyn et al. (2024) looked into how Twitter activity affected different parts of the DeFi project. They found a positive and significant relationship

between Twitter activity and the DeFi project, which can be attributed to the increased use of social media—particularly Twitter—by market participants as a tool for predicting and analysing market behaviour. They may be better able to comprehend current patterns, make wise decisions, and even predict future developments as a result of this. Furthermore, there is a noteworthy and robust positive association between the Google Trend indicators, which comprise monthly news searches and all web searches, and the volatility of Bitcoin. stated otherwise, increased attention in the form of Google searches correlates with higher levels of long-term volatility (Conrad, Custovic, & Ghysels, 2018). Neves (2020) uses a Google search (keyword bitcoin, bitcoin crash) from the year 2012 to February 2019 to investigate the relationship between the attractiveness variable and the value of the digital currency. The results of the study demonstrated a strong and positive correlation between Google searches and the price of bitcoin. Since it helps with financial decisions during times when there are a lot of news reports about the global issue. The demand for bitcoin will rise since decentralized technologies are more difficult to eradicate, offer more security, and are simpler to transfer internationally. Additionally, Sun et al. (2020) look into the relationship between the market return from January 2018 to August 2020 and the sentiment (measured by posts in Chain Node). The findings demonstrated a strong correlation between posts on social media and the cryptocurrency market. A stronger sentiment can result in a larger positive return for investors and people. Finally, there is no discernible correlation between Twitter sentiment and the movement of Bitcoin because, in the case of the China mining topic, price movement seems to reflect the negative sentiment surrounding the event, but for the other topics, price development does not seem to reflect the dominant sentiment.

2.1.3 Total Address / Active Address

The size of the eth mark cap was measured by Liu and Tsyvinski (2021) and Chen & Bellavitis (2020) using the total daily active address. An increase in the number of daily active addresses is correlated with favorable market trends. According to Bennett et al. (2023) there is a positive association between the returns of the digital asset and the growth in user activity, which implies increased adoption and

engagement with it.. However, to gain an improved understanding of the variables influencing Bitcoin's (BTC) price over time. The writer collected everyday information between December 19, 2011, and February 6, 2018. The estimate results indicate that the number of addresses and the price of Bitcoin have a positive and significant relationship. The price of Bitcoin tends to rise in tandem with the expansion of addresses. When it comes to payments, investors will favor decentralized methods over traditional ones (Guizani & Nafti, 2019). Aleksandr Bakhtiar (2023) By using current daily data of a sample of the top 100 cryptocurrencies covering the years 2010–2023, research builds on past studies to investigate the network effects and store of value attributes of a range of cryptocurrencies. The number of active wallet addresses has a positive and significant influence on most cryptocurrencies. The number of active wallet addresses have a positive and significant on most of the cryptocurrency token such as USDT , TUSD , SNX , MATIC , DOGE , ADA , XRP and BNB . This is due to the 8 cryptocurrency token has adopted proof of stake (when we stake BNB we able to farm BNB , if we stake USDT we able to farm USDT with a specific rate) . Therefore , it able to attract more investor to invest in these token . In contrast BUSD , DAI , ETC , ALGO , EOS and BSV have a negative relationship with active wallet active. This is due to the unique function of each token For instance, the stablecoins USD that support BUSD, DAI, and EOS have an infinite supply of tokens. ALGO, BSV, and ETC have limited supplies, however. As a result, investors have a range of options and approaches to choose from when purchasing a token on the market, depending on its features . Lastly , examine the study of bitcoin adoption dependent on network effect by collecting unique data from the bank of Canada’s bitcoin omnibus survey in the year 2017 & 2018 . Balutel et al. (2022) found there are a positive and significant relationship of network size (active user) able to increase the probability of Bitcoin Adtopion by 0.45 and 0.32 percentage points. Consequently, we discover that a larger network size directly raises the likelihood of adopting Bitcoin, suggesting that a strong willingness to adopt is linked to high peer acceptance of the cryptocurrency.

2.1.4 Crypto Volatility Index

The Crypto Volatility Index (CVI) is a measure of volatility in the cryptocurrency market. It functions similarly to the VIX in traditional markets, providing insights into the expected volatility of cryptocurrencies over a certain period.

Conrad, Custovic, and Ghysels (2018) gathered information spanning from May 2013 to December 2017 in order to investigate the cryptocurrency's long- and short-term volatility components. According to the findings, there is a negative and substantial correlation between the volatility of Bitcoin and the VIX, meaning that a higher VIX is associated with a lower volatility of Bitcoin over the long run. This is because consumers often purchase Bitcoin as a hedge against other financial assets like stocks, bonds, and other securities because it is thought of as a safe haven in a down market. Consistent with the initial research by Jareño et al. (2020), the findings indicated that the VIX index had a negative and significant influence on the return on Bitcoin. Due to the fact that Bitcoin is a valuable safe haven asset during a recession. The first primary component of the VIXs of 14 developing and developing equity markets was assessed in order to determine whether Bitcoin might be used as a hedge against global uncertainty. According to the findings, VIX has a strong predictive ability and a statistically significant negative correlation with the returns of the most important cryptocurrency (Bouri et al., 2017). Furthermore, the analysis shows that the volatility index (VIX) has a negative impact on the price of Bitcoin (BTC), proving that Bitcoin is not a safe haven from worry.. Because economic downside risks are highly liquid, Bitcoin may rise during low VIX times and decline during high VIX periods in order to protect losses. On the other hand, VIX may raise the price of Bitcoin. Consequently, BTC has a positive impact on VIX, indicating that the price of Bitcoin can be used as the primary indication for an in-depth analysis of the fear index. Investors can make the best investing selections based on market fear emotions when there is extreme global uncertainty and volatile market sentiment. In order to effectively engage in cryptocurrency speculation, the government may also take into account VIX in order to understand the trend of BTC (Su et al., 2022).

2.1.5 ROE , ROA , NIM

A study by Corbet et al. (2023) using a total of 36 Chinese banks examined how financial innovation affected bank performance (ROE, ROA, and NIM) in China between Q1 2015 and Q1 2020. The findings demonstrated a substantial and unfavourable correlation between fintech and banks' ROA, NIM, and ROE. Initially, banks face the risk of incurring significant expenses during the integration of new financial technology into their systems. The implementation of new technologies usually demands significant financial investments and procedural journals due to the advanced organizational structures and legacy technology systems of traditional banks. These factors might result in increased operational expenses and decreased bank profitability. Secondly, the industry's level of competition has increased due to the growth of Fintech companies. Highly competent fintech companies have the potential to undermine traditional banks' roles as intermediaries and reduce their profits by providing alternative financial services and taking market share away from them. The impact of the emergence of financial technology (FinTech) on bank performance in the Gulf Cooperation Council (GCC) region is examined in a study by Litimi et al. (2023). The generalized method of moments (GMM) approach is used to conduct the application on a panel dataset that includes annual observations of banks from 2012 to 2021. The results indicated a negative link between fintech and banks' ROE, ROA, and Nim as well.. The Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE) banks' profitability appears to be negatively impacted by the arrival of FinTech companies into the financial services sector, according to the negative impact of FinTech on ROA. Since the negative impact of FinTech on ROE suggests that the existence of FinTech businesses has an adverse effect on bank profitability, this could be the result of growing competition and the ability of FinTech companies to provide more innovative and efficient services.. Last but not least, the adverse effect of fintech on NIM implies that the introduction of these businesses into the financial services industry reduces the differential in interest rates that banks pay on loans and deposits. This could be due to a number of reasons, including a decline in market share or an increase in the expenses that banks bear in order to compete with fintech firms. This might be the result of increased rivalry lowering down interest rates or shifting consumer preferences in

favor of FinTech companies' alternative financial offerings. Furthermore, Wang et al. (2022) examine how fintech affects conventional financial intermediation. Using panel data from 2013 to 2019 from China's banking industry. The findings demonstrated a negative correlation between fintech and the traditional financial system with respect to nim, ROE, and ROA. Because fintech companies provide financial services similar to those of banks, fintech development puts traditional banks under pressure from competitors and regulatory arbitrage opportunities. The negative coefficient suggests that bank profitability as determined by ROA tends to decline as fintech development rises. Since fintech companies provide alternative financial services, fintech expansion may intensify competition in the financial sector and perhaps result in margin compression for banks. Dasilas & Karanović (2023) have conducted another study that looks at the effect of financial technology (FinTech) on bank performance using data from the UK banking industry between 2010 and 2019. The outcome demonstrated a strong and favourable correlation between fintech implementation and bank NIM. Bank customers can now take use of a greater choice of creative and affordable products and services, including digital payments, alternative financing, and personal loans, thanks to the adoption of fintech.Al-Mashhadani and Almashhadani (2023) examined the effect of FinTech on banking performance using a quantitative approach and a sample size of 19 UAE institutions. According to the report, there is a substantial correlation between banks' return on assets and return on equity when Fintech is used.. Applying more fintech technology enables an organization to perform better than its competitors by improving customer satisfaction and service delivery. A second study from Siska (2022) uses quantitative descriptive analysis and Bank Syariah to look at how Fintech services might impact banks financial performance. The results demonstrate a significant and favorable correlation between Fintech services and bank ROA and ROE. When an Islamic bank begins to use fintech services, it may make life easier for its customers, which draws in more business and boosts profitability. On the other hand, Kurniawati's (2023) research looked at how fintech and banks collaborated and how that affected the performance of Indonesian listed banks. Declared that the partnership between fintech and banks has no appreciable effect on the ROA and ROE of the bank. Next, the study sample of Putri et al. (2019) included 17 FinTech products from 16 Indonesian enterprises. The findings

indicated that there is no significant association with ROE but a positive and significant relationship with ROA. This is because fintech has emerged as the best economic option; so, by integrating fintech with the established banking system, the entry barrier can be lowered. The study by Naser et al. (2024) looks into how bank-level advances in Financial Technology (Fintech) affected the performance of banks in the Kingdom of Bahrain between 2012 and 2021.The findings demonstrated a strong and favourable correlation between fintech and bank ROA. When a bank begins to use Fintech, it not only helps them save money on operating expenses and minimize credit risk but also allows them to grow their customer bases. In addition , A study by Monika, Azam, and Teguh (2021) that used panel data analysis of ten Sharia commercial banks from 2017 to 2019 revealed a favourable and substantial relationship between the growth of Fintech and the return on assets (ROA) of private Islamic commercial banks. Because Fintech able to provide a new product line, new technology creation and a new stream of revenue for bank. It also allows a bank to expend to a new market. In contrast, Fintech development have negative relationship on Shariah commercial bank of state owned . This is due Fintech are still considered as disruption by Shariah Commercial bank. The author had expounded how fintech impact bank profitability by collect data of commercial Bank Of China in the year of 2011 to 2022. The use of fintech and banks' profits are positively and significantly correlated. A bank's return will gradually rise as more fintech technology is used by a company. In the early stage in adopting fintech it may cause lose in profitability in a bank but in the long run banks could utilize the beneficial of fintech such as able to lower the transaction cost and optimizing customer experience (Lv, Du, & Liu, 2022) . Moreover, Wang & Nor (2022) studied the innovation of fintech and the connection between fintech and profitability of traditional banks. It selects ten statistical data from traditional banks from 2012to 2019 the research showed that there are fintech are greatly impact a banking ROE . Thus it have a positive and significant relationship. Additionally, a study by Mugabe (2022) examined the possibility of a long-term relationship between the performance of South Africa's banking industry and financial technology (FinTech) companies over the years 2000 to 2021. The findings indicate a negative and significant relationship between FinTech and NIM. According to the negative coefficient, in the presence of FinTech, banks may be offering depositors lower

returns on their funds, leading to a reduction in NIM. This could be due to increased competition from FinTech firms offering alternative financial services at lower costs, thus pressuring traditional banks to reduce interest margins to remain competitive. According from the study of Grassi, Lanfranchi, Faes, and Renga (2022) , by using primary research such as reading literature review , book article and academic papers. There are a significant between the growth of defi with bank profitability , This is due to Defi able to eliminate the intermediaries transaction cost therefore able to provide a cheaper cost compare to traditional banking system . Moreover. Traditional banks can boost their profitability by adopting or collaborating with DeFi technology to improve their procedures. Collaboration with DeFi platforms can help traditional banks gain liquidity and access to new markets. Improved market access enables banks to provide a wider selection of investment alternatives to their clients, thus improving profitability. Study from Ahmed (2024) also found there are an positive relationship with defi grow and traditional bank profitability. This is due to , Ahmed (2024) The rise of DeFi creates a competitive environment for traditional banks to innovate and adapt. Banks that integrate DeFi technologies into their operations can differentiate themselves in the market, offering new and improved services to customers. In contrast , study from Alamsyah, Kusuma, and Ramadhani (2024) by using primary study and rereviewed existing study that are close related with Defi and TradFi . There is negative relationship between the grow of defi and the traditional bank profitability, when defi are growth means the traditional banking profitability will have a drop. Defi platform able to offer a lower cost and higher interest rate for the individual as a result it able to attract more individual to use their platform, in contrast for traditional bank it will aim for a more a higher and the procedure to apply for a loan are more complicated .

2.1.6 ROE- NPL

A panel regression method is used in the study by Kadioglu & Ocal (2020) to analyze a quarterly data set that includes 1809 observations from 55 Turkish banks during the first quarter of 2005 and the third quarter of 2016. The findings

demonstrated a strong negative correlation between non-performing loans and bank ROE, meaning that a greater NPL could result in a lower ROE. This suggests that because non-performing loans are not repaid on time, banks do not receive interest revenue from them. The inability to collect interest on non-performing loans immediately lowers a bank's ROE in Turkey, as interest income constitutes a substantial source of revenue for banks. Additionally The study by Vellanita, Arimbawa, and Damayanti (2019) supported the idea that there is a negative and significant association between NPL and ROE, i.e., that a bank's ROE will decline as its NPL value increases. This is because a bank may see a worsening of its credit as a result of a greater NPL, which will force banks to absorb losses from their ongoing operations. Furthermore, Jamali & Haneef (2020) investigate the impact of non-performing loans on the return on equity of the Bank of Pakistan. The results showed that there is a major negative impact on the bank's return on equity. Banks are exposed to more risk due to non-performing loans, which could result in losses. This suggests that banks are exposed to more credit risk when borrowers default on their loans, which hurts their bottom line. The outcome is a decline in return on equity (ROE), a measurement that measures a bank's profitability in relation to its equity.

2.1.6 ROE- Total Asset

Vu & Nguyen (2013) looked examined the relationships between total assets and ROE using data from 465 listed banks in Vietnam between 2007 and 2010. The findings Total assets and ROE have a positive and substantial link. ROE often rises in tandem with an increase in total assets. This is because there is evidence to support the idea that higher returns for equity holders can be derived from broader asset bases. Additionally, using total assets, Riaz & Mehar (2013) measured the return on equity (ROE) of 32 Pakistani banks from 2006 to 2010, and their findings indicated a positive and substantial association between the two variables. A bank's ratio tends to rise as its overall assets rise. Economies of scale and length may help larger banks by enabling them to spread their fixed expenses across a greater asset base. Profitability and efficiency may rise as a result. Larger banks may also be more profitable since they have access to more resources and a broader range of

revenue sources. Additionally, Hossain & Ahamed (2015) look into the top 15 local banks from 2012 to 2016 to determine the relationship between total asset and bank ROE. The findings show that total assets and return on equity have a favourable connection. The return on equity will rise in tandem with an increase in total assets. The benefits of economies of scale may extend to larger banks with higher total assets. By distributing their fixed expenses across a greater number of assets, they may increase productivity and profitability. Their increased profitability from a given level of equity could result from their efficiency, which could lead to a greater ROE.

2.1.7 ROE- Operating Cost

In order to better understand how operating costs affect a bank's return on equity, Riadi (2018) sued 26 Indonesian banks between 2010 and 2014. The findings show that operational expenses and ROE have a negative and significant relationship; when operating expenses rise, ROE tends to decrease. This is because keeping a strong ROA requires careful control of operating expenses. When operating expenses are excessive relative to total assets, it diminishes the profitability of the bank's asset base. This inefficiency indicates that the bank is not efficiently utilizing its assets to generate earnings. Consequently, ROA decreases because a significant portion of the assets' income is consumed by operating costs, leaving less income to be generated as profit. Moreover , Rahman, Hamid, & Khan (2015) investigate the25 banks in Bangladesh found there are insignificant relationship between operating expenses with ROA The insignificance of OPEX in explaining ROE could be attributed to the fact that ROE measures the profitability of equity investment, and operating expenses alone may not directly affect the return generated for equity holders

2.1.8 ROE- Capital Adequacy

With a focus on 39 commercial banks in India, Ramesh 2019 seeks to establish the bank-specific variables that impact each bank's performance from 2009 to 2017..with using Capital Adequacy impact on Bank’s Roe . The results showed there are positive and insignificant relations with these variables, this is due to

Different banks may have different business models, with varying degrees of reliance on equity financing. Banks with different business models may experience different effects of CAR on ROE. In contrast, Vellanita, Arimbawa, & Damayanti (2019) conducted a study on the relationship between Capital adequacy and ROE , by collecting quarterly data from the year of 2014 to 2014 in PT BCA , the data has indicate a very strong and significant positive effect on capital adequacy toward ROE . Which mean, higher capital adequacy higher the ROE value. When a bank have a higher capital adequacy, it mean a bank able could have a lot of capital to continue operational activities and able to carry on risk if a bank face liquidity. Hersugondo, Anjani, and Pamungkas (2021) examined Indonesia's annual financial statements from 2015 to 2019 and discovered a negative and substantial association between CAR and RO. The return on equity tends to drop as the capital adequacy ratio rises, according to the significant negative association between CAR and ROE. This is especially true in model 5 without control variables. This could be explained by the possibility that, as banks issue more shares to raise capital, greater capital levels could dilute shareholders' equity. As a result, there may be a decline in the return on equity, which is determined by dividing net income by shareholders' equity.

2.1.9 NIM- NPL

According to Audos and Solis (2009), who examined net interest income in the Mexican banking sector from 1993 to 2005, the NPL ratio—or credit risk—has a favourable impact on the NIM ratio. A positive sign in the variable indicates that the bank is risk averse, meaning it stays away from risky situations like credit and interest rate risk. To obtain a bigger margin, the bank will establish a higher interest rate. On the other hand, Alnabulsi, Kozarević, & Hakimi's study from 2023 on the connection between NPL and bank profitability used NIM as a measure for 74 banks in the Middle East and North Africa from 2005 to 2010. It revealed a substantial and negative relationship between NPL and NIM. Because bank asset interest income makes up an important part of net income, low asset quality has a negative impact on bank profitability . Additionally, Endri, Marlina, and Hurriyaturrohman (2020) look on what factors affected Nim at Indonesia Bank from 2008 to 2018.The findings indicate that NPL has a negative and substantial impact on the bank's NIM.

This implies that the NIM of banks falls as the proportion of non-performing loans rises. Depositors may demand higher premiums or interest rates because of high non-performing loan (NPL) ratios, as a way of offsetting the perceived risk of holding their money in banks with higher loan default rates. As a result, banks could have to give deposit interest rates that are higher, which could lower their NIM.

2.1.10 NIM- Total Asset

The impact of a bank's total assets on its net interest margin (NIM) was investigated by Budhathoki et al. (2020). Using data gathered from 2010 to 2017 from 28 commercial banks in Nepal, the author discovered a positive and substantial association between total assets and Nim. NIM will rise in tandem with overall asset growth. A larger bank would have more assets and capital funds for the traditional lending business, which would eventually increase interest revenue and raise the bank's net interest margin (NIM). This would account for the study's findings. In contrast , Hossain & Ahamed (2015) , investigate the bank ‘s NIM with total assets in Bangladesh from the year of 2012 to 2016 . The author found there are no significant relationship between each other since the P value are more then 0.05 . The study focuses on the banking sector of Bangladesh, where banks engage in diverse activities beyond traditional lending. Fee-based services, trading, and investment banking activities may contribute differently to NIM, making the direct relationship between total assets and NIM less significant . Furthermore , The study of Helhel (2015) indicates that asset size, represented by the bank asset to total banking sector asset ratio (BATA), is not statistically significant in influencing the profitability metrics (ROE, ROA, and NIM) of Georgian commercial bank .Asset size reduces the cost and processing time of information collected, indicating potential economies of scale. However, it's possible that these economies of scale are already captured in other variables or that the scale of variation in asset size among Georgian commercial banks is not substantial enough to significantly impact profitability.

2.1.11 NIM- Operating Expenses

The factors influencing the net interest margin in the Mexican commercial banking system from 1993 to 2005 are examined by Audos & Solis (2009). Approximately 92% of the assets in the Mexican commercial banking system throughout the study period are represented by the 289 yearly observations from 43 commercial banks that make up the sample. Additionally, there is a positive correlation between operating costs and net interest margin, suggesting that banks with higher costs typically charge higher margins to offset their operational expenses Additionally, Nassar, Martinez, and Pineda (2014) discovered a strong and positive correlation between operating expenses and NIM. In banks, inefficient management and organizational structures are usually reflected in higher operational expenses. greater interest margins may be required by banks with greater operating costs in order to pay for their expenditures and stay profitable . However, operating expenses do not significantly impact NIM because NIM focuses on the difference between interest income and interest expenses, which is influenced by a number of factors including the bank's interest rate spread and operating efficiency. This is in contrast to Rahman, Hamid, and Khan's (2015) investigation of 25 banks in Bangladesh, which found an insignificant relationship between operating expenses and NIM

2.1.12 NIM- Capital Adequacy

Hersugondo, Anjani, & Pamungkas (2021) found there are negative and significant relationship between CAR and NIM by analyse the annual finance statement commercial and private bank in Indonesia from the year of 2015 to 2019 , increase in the capital adequacy could decrease in the net interest margin . This could be attributed to the nature of capital adequacy requirements. Banks with higher CARs might need to hold more capital in low-yielding assets, such as cash or government securities, to meet regulatory requirements. As a result, their portfolio's share of higher-yielding assets, such loans, may decline, lowering their NIM. In order to investigate the relationship between capital adequacy and NIM, Kakilli Acaravci & Çalim (2013) conducted three models. The first model is a stated owned bank. The results indicate that capital adequacy, or the ratio of equity to total assets, is positively correlated with profitability as measured by NIM. Using a privately

owned bank as a sample, the author found a positive and significant relationship between CA and NIM. Finally, the author discovered a negative and substantial link between CA and NIM in the foreign bank utilizing model 3. Which indicate that, when CA increase it will lower foreign bank NIM . The author claims that there is a negative correlation between the equity to assets ratio and the total revenue dependent variable because higher equity to assets ratios reduces after-tax earnings by lessening the tax shield that interest payments provide, and lower capital ratios should result in higher bank revenues. It follows that both positive and negative effects on profitability are anticipated for this variable.

2.1.13 ROA- NPL

Study from Singh, Basuki, & Setiawan (2021) had taken data from 2015 to 2019 with total of 74 banks , to determine the influence of bank specific factor busing using NPL as dependent and ROA as independent , when ROA increase NPL will also increase . Therefore, ROA is positively correlated with NPL. This means that as ROA increases, NPL tends to increase as well. This could indicate that more profitable banks may be taking on riskier loans or may be less stringent in their lending practices, leading to a higher incidence of non-performing loans. Conversely, Tangngisalu et al. (2020) uses secondary panel data for the years 2015-2019, utilizing NPL as independent variables and ROA as dependent variables from the ten local listed banks on BEI-IDX. The study's findings indicate that NPL and ROA had a negative and statistically significant relationship. This suggests which a higher level of non-performing loans in bank loan management corresponds to a lower level of bank income as reflected through Return on Assets, though the relationship is not obviously direct. The stability of finance will be governed by NPL. If a balance is established in the variables' values or amounts, the decrease in non-performing loans is going to be regulated. Moreover , study from Anggriani & Muniarty (2020) by using Quantitative research approach to record the data of NPL and Bank’s ROA of Bank Central Asia (BCA) Tb in year of 1974 until the year 2018 , and all the data are collected based on documentation and literature study . The authors found that , there are negative relationship but no significant on NPL will impacting Bank’s ROA This suggests that the level of bank income shown through ROA will decrease as the number of non-performing loans in bank loan

administration, as measured by the NPL, increases. This is due to PT. Bank Central Asia's size and market position within the banking industry could influence its ability to manage non-performing loans. Larger banks with established reputations and extensive resources may have a competitive advantage in dealing with credit risk compared to smaller institutions. Furthermore, Liyana & Indrayani (2020) used Banks Listing on the Indonesian Stock Exchange from the year 2019 to the year of 2013 to study relationship between NPL and ROA , the result from the study showed there are negative significant Between NPL and roa . This is due to high NPL can increase credit interest rates, which can cause low demand for credit and able to lower a bank's ROA

2.1.14 ROA – Total Asset

Using the log of total assets as an independent variable and return on assets (ROA) as a dependent variable, Al-Omar & Al-Mutairi (2008) examine the effects of bank-specific factors on banks' profitability in the Kuwaiti banking sector for the years 1993–2005. Larger banks tend to be more profitable when measured by total assets, according to the data, which reveal that the coefficient for the log of total assets is positive and significant with ROA. This aligns with the notion of scale efficiency, where larger banks have the potential for higher profits. Furthermore Iman, Sukmana, Ghifara, & Wardhana (2022) aim to investigate the Islamic bank's ROA at Indonesia from a time frame of of 2016 to the year of 2020 by using Total Assets to test the relationship with ROA . The results align with the previous author which indicate there are a positive relationship between Total assets and ROA of Islamic bank that's mean, Growing in size will provide the bank with a greater portion of its overall assets, which will affect the profitability of Islamic commercial banks. Additionally, the profitability will not be much impacted if the overall assets are little. Furthermore Vu & Nguyen (2013) , has used 465 listed bank in Vietnam from the year of 2007 to 2010 to examine the relations between total assets and ROA . The results shows The relationship between total assets and ROA is negative. An increase in total assets, particularly through credit financing, is associated with a decrease in ROA. his negative relationship suggests that as firms acquire more assets, their ability to generate profits from those assets diminishes, indicating inefficiencies in asset utilization.

2.1.13 ROA – Operating Expenses

(Santika et al., 2022) , the study had collected data from banking industry listed in IDX from the year 2016 to 2020 to investigate the correlation between operating expenses and bank's ROA . It showed that total operating expense have a positive and significant relationship with bank's ROA. This means that as operating expenses increase, the return on assets also increases. This finding suggests that banks with higher operating expenses can generate higher returns on their assets, indicating efficient utilization of resources to generate profits. In contract Riadi (2018) investigate operating expenses toward the impact bank's ROA by suing 26 banks in Indonesia from the year of 2010 – 2014. The findings show that operating expenses and ROA have a negative and significant relationship; when operating expenses rise, ROA tends to decrease. ROA .Higher operating expenses imply greater costs incurred by the bank to generate profits. When operating expenses are high relative to total assets, it indicates that the bank is less efficient in managing its costs. This inefficiency leads to a reduction in the return earned on shareholders' equity, as more of the earnings are consumed by expenses rather than contributing to profits. Moreover, Rahman, Hamid, & Khan (2015) investigate the25 banks in Bangladesh found there are insignificant relationship between operating expenses with ROA .This mean OPEX not significantly impact ROA because it represents the profitability of assets relative to the expenses incurred in generating that profitability.

2.1.13 ROA – Capital Adequacy

Anggriani & Muniarty (2020) also The population of this study was all subjects at PT. Bank Central Asia (BCA), Tbk for 44 years, namely 1974-2018 with a total sample of 9 years, namely 2010-2018. The sampling method is a purposive sampling method, found there are relationship between Capital Adequacy with

Bank's ROA. When Capital Adequacy increase, bank's ROA also will increase . This mean , Capital adequacy able to increase a bank profits .

Furthermore , study from Hallunovi & Berdo (2018) found there are positive relationship between capital adequacy and bank's ROA by using annual report for a 7 years (2008 – 2015) . Because a bank with strong capital can pursue goals more effectively and can deal with issues emerging from unanticipated losses more quickly and adaptably, it can increase profitability. Therefore, it is shown by the data examined in this study that capital adequacy has significance for profitability. In contrast , Liyana & Indrayani (2020) used Banks Listing on the Indonesia Stock Exchange from the year 2019 to 2013 to study relationship between CAR and ROA , the result showed a negative and significance relationship of capital adequacy and bank's ROA are required by government regulations to keep the Capital Adequacy Ratio (CAR) at a specific level in order to guarantee stability. Compliance with these regulatory standards may lead banks to prioritize capital adequacy over maximizing returns on assets. Thus, banks might hold more capital than necessary to meet regulatory requirements, which could constrain their ability to generate higher returns, resulting in a negative impact on ROA. The study by Tangngisalu et al. (2020) examined the Capital Adequacy Ratio of Return On Assets in ten conventional banks listed on the Indonesia Stock Exchange, finding no significant relationship. The study used secondary panel data for the years 2015-2019 in the form of capital adequacy as independent and ROA as dependent from the ten local listed banks on BEI-IDX in the year of 2020. Because banks prioritize bank survival over short-term profits and make prudent investments with their capital, the Capital Adequacy Ratio has little impact on bank profitability. Hersugondo, Anjani, & Pamungkas (2021) found there are negative and significant relationship between CAR and NIM by analyse the annual finance statement commercial and private bank in Indonesia from the year of 2015 to 2019 , It is implied that changes in the capital adequacy ratio have little effect on the return on assets of banks in the majority of models since there is no substantial correlation between CAR and ROA.. This could be due to the fact that ROA is influenced by various other factors, such as operational efficiency, asset quality, and interest income, which might overshadow the impact of changes in capital adequacy.

2.2 Review of Relevant Theoretical Models

Based on noise trader theory , an investor will ignore all the expert and fundamental support in making investment decision . The noise are consider as " sentiment" for example social media , news and even rumor that are appear in the wall street market . Therefore , the investor's investment decision will be influence by the positive and negative decision . If there are good news , the price will be driven up . But in contrast , if there are the bad news the price of bitcoin will sharp . Furthermore , the financial market will be in inefficiencies as it able to manipulate by certain people . It able to help them to create opportunity to exploit the market . And after the price of financial asset get deep they will bought back the lower level . Which will cause volatility activity in financial market (Kyriazis et al., 2023) .

Zhao et al (2022) emphasize that with the advancement of fintech such as the growth of Decentralized finance it able to deterioration of the traditional banking system . Based on the disruptive innovations theory, fintech development such as defi able to reduce the profitability and revenue of a traditional banking . Fintech development such as defi has the potential to increase bank expenses and decrease bank profitability, which would ultimately lower bank capital, weaken bank Recovery toward adverse shocks, and lower bank incentives to generate liquidity. Next, it also could Secondly, Fintech can increase the risks of banks. Applying advanced technologies, such as big data and artificial intelligence, can increase operational risks in the banking sector. The issues such as app security and data security are becoming new security challenges for banks. Defi can provide a more efficient and cheaper alternative to banks' business, and thus they are more attractive to some clients. As a result, banks may lose their clients to competitors, which can increase banks' credit risk. Increased operational and credit risk can trigger liquidity shortages for banks. Thirdly, Fintech companies are likely to generate crowding-out effects on the traditional banking sector encroach on the bank's traditional business areas and ultimately influence liquidity creation of banks. Fintech companies can weaken the intermediary role of banks, divert deposits and

threaten lending business from banks. Fintech businesses have the potential to undermine banks' function as middlemen, drain off deposits, and threaten bank lending.

BeFi theory is the need for financial markets to be designed in such a way that the behavioural factors that influence investor decisions are accounted for. For example, financial markets can be designed to be more transparent, which can help investors to make more informed choices. Additionally, they can be designed to be more user-friendly, thereby reducing the information overload that can lead to suboptimal decision making. DeFi seeks to satisfy much of this criterion, where one of its key advantages is the provision of a new and innovative way of conducting financial transactions. TradFi systems rely on intermediaries, gating, and transaction cost “tolls” to facilitate transactions. However, DeFi offers the collapsing of costs, improved efficiency, and added transparency through peer-to-peer, borderless exchange.

From a TradFi perspective, the growth of DeFi could lead to increased competition for traditional banks. DeFi platforms offer decentralized financial services without the need for intermediaries, potentially disintermediating traditional banking services such as lending, borrowing, and trading. This could erode the market share and profitability of traditional banks.

NextBeFi suggests that investors' decisions are influenced by cognitive biases and emotions. The adoption of DeFi platforms may be driven by factors such as the fear of missing out (FOMO), excitement about new technologies, and the desire for autonomy and control over one's finances. Traditional banks may need to adapt their offerings and marketing strategies to appeal to customers who are drawn to the user-friendly and transparent nature of DeFi platform.

Also , BeFi highlights the importance of building platforms and financial solutions that take into account the emotional and cognitive aspects that influence investor behavior. Transparency, effectiveness, and user-friendliness are often top priorities for DeFi platforms, which may attract customers looking for alternatives to

traditional banking. To properly compete with DeFi platforms, traditional banks may need to improve their digital services and streamline processes.

Furthermore, compared to traditional trust-based interactions with financial institutions, DeFi systems rely on trust in code and smart contracts. According to BeFi theory, investor behavior is affected by the investor's transparency and credibility. To compete with the transparency of DeFi platforms while maintaining consumer confidence, traditional banks may need to improve their digital security and transparency procedures.

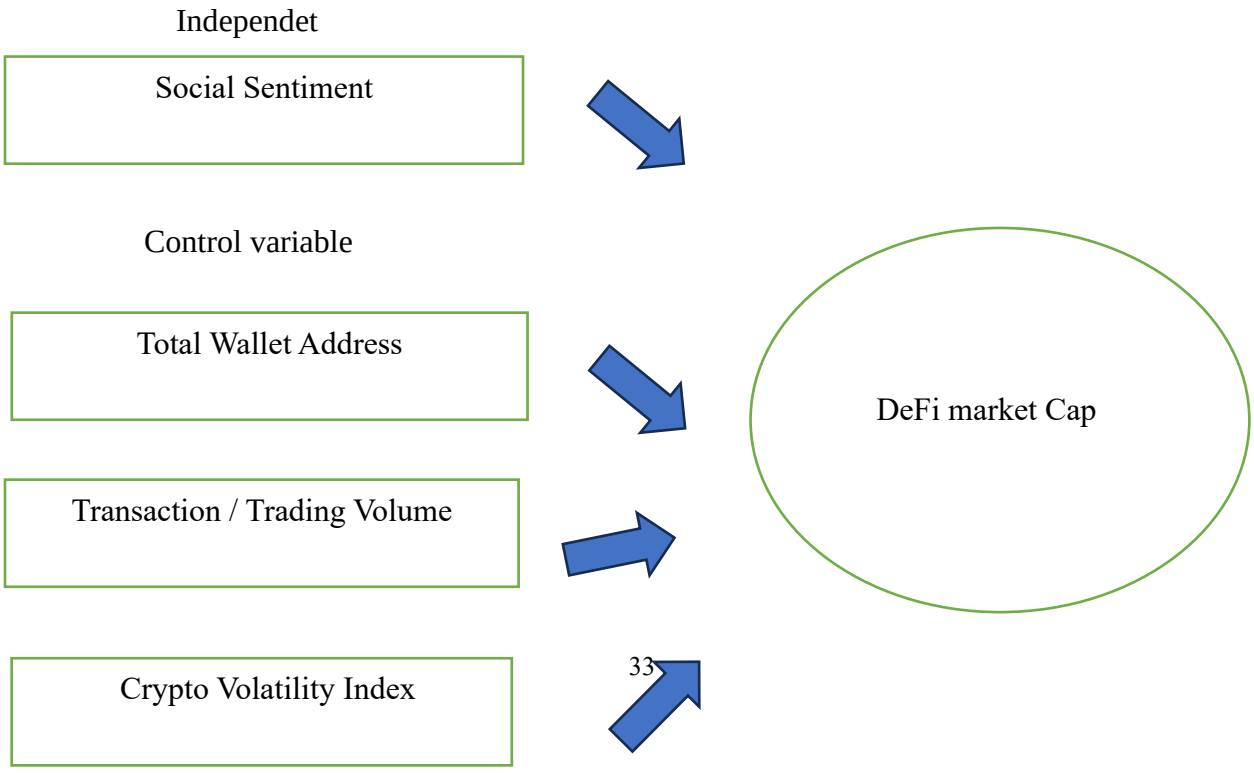
In summary, the expansion of DeFi has the potential to disrupt the existing banking industry by offering alternative financial services that cater to investors' emotional and cognitive biases. It may be necessary for traditional banks to modify their methods, products and risk control procedures in order to remain competitive in the changing financial environment created by DeFi.

2.3 Proposed Conceptual Framework

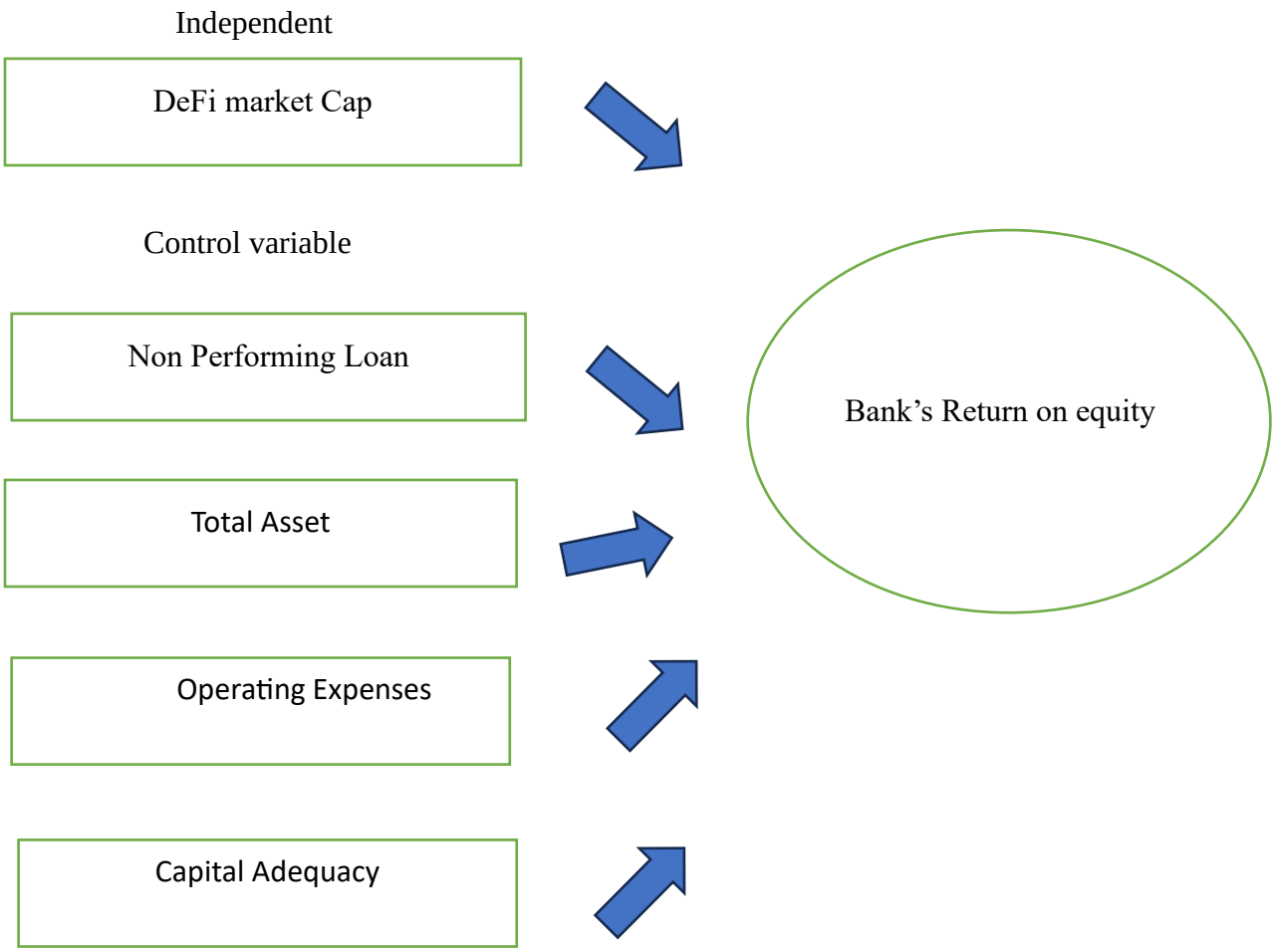
Figure 2.1: Proposed Conceptual Framework

$$DEFI_{t-1} = \beta_0 + \beta_1 \mathrm{GT}_{t-1} + \beta_2 TV_{t-1} + \beta_3 \mathrm{AD}_{t-1} + \beta_4 \mathrm{CVI} + \varepsilon_{t-1}$$

Source: Developed from the research

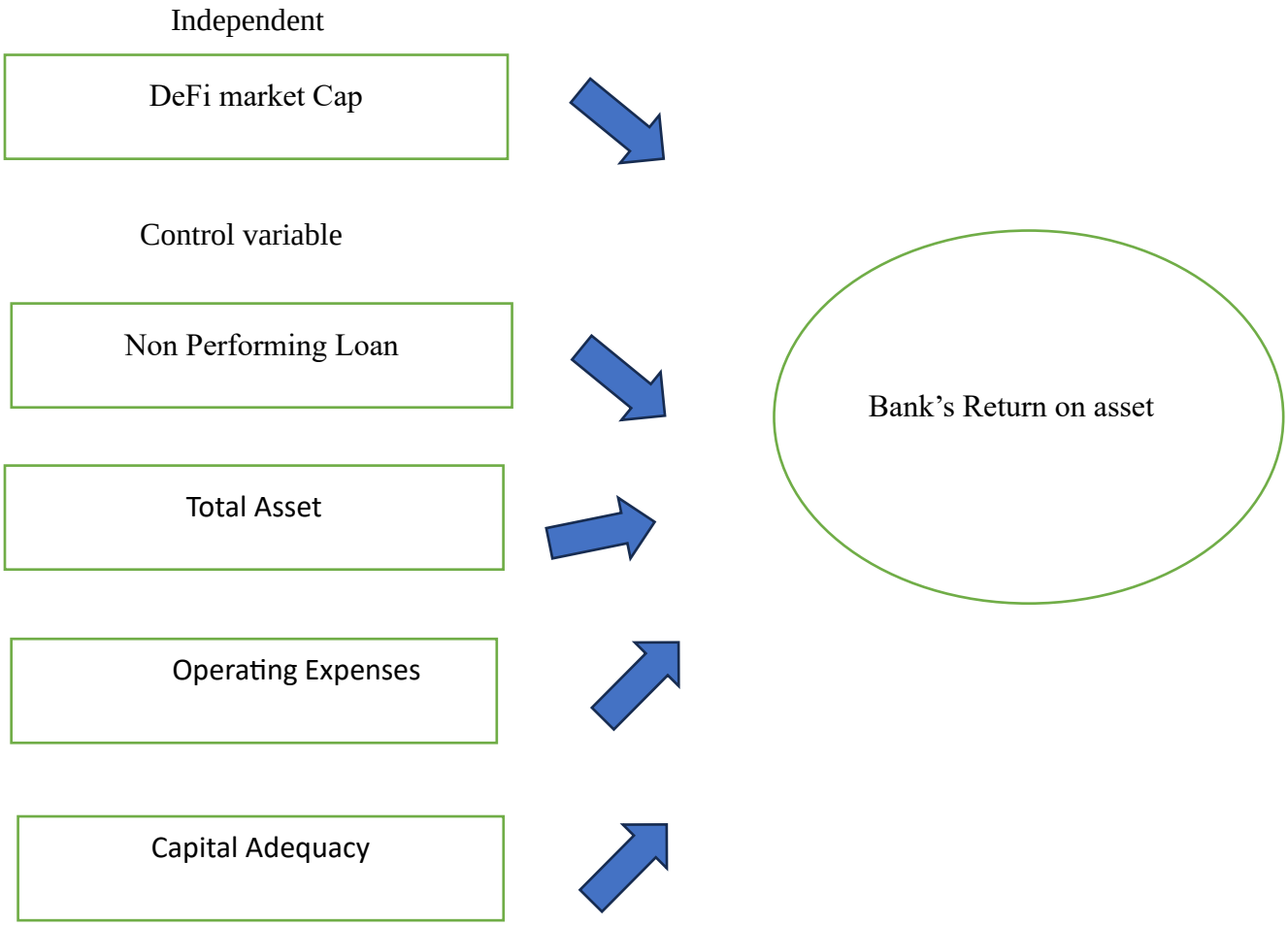


$$ROE_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \mathrm{lnOE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$



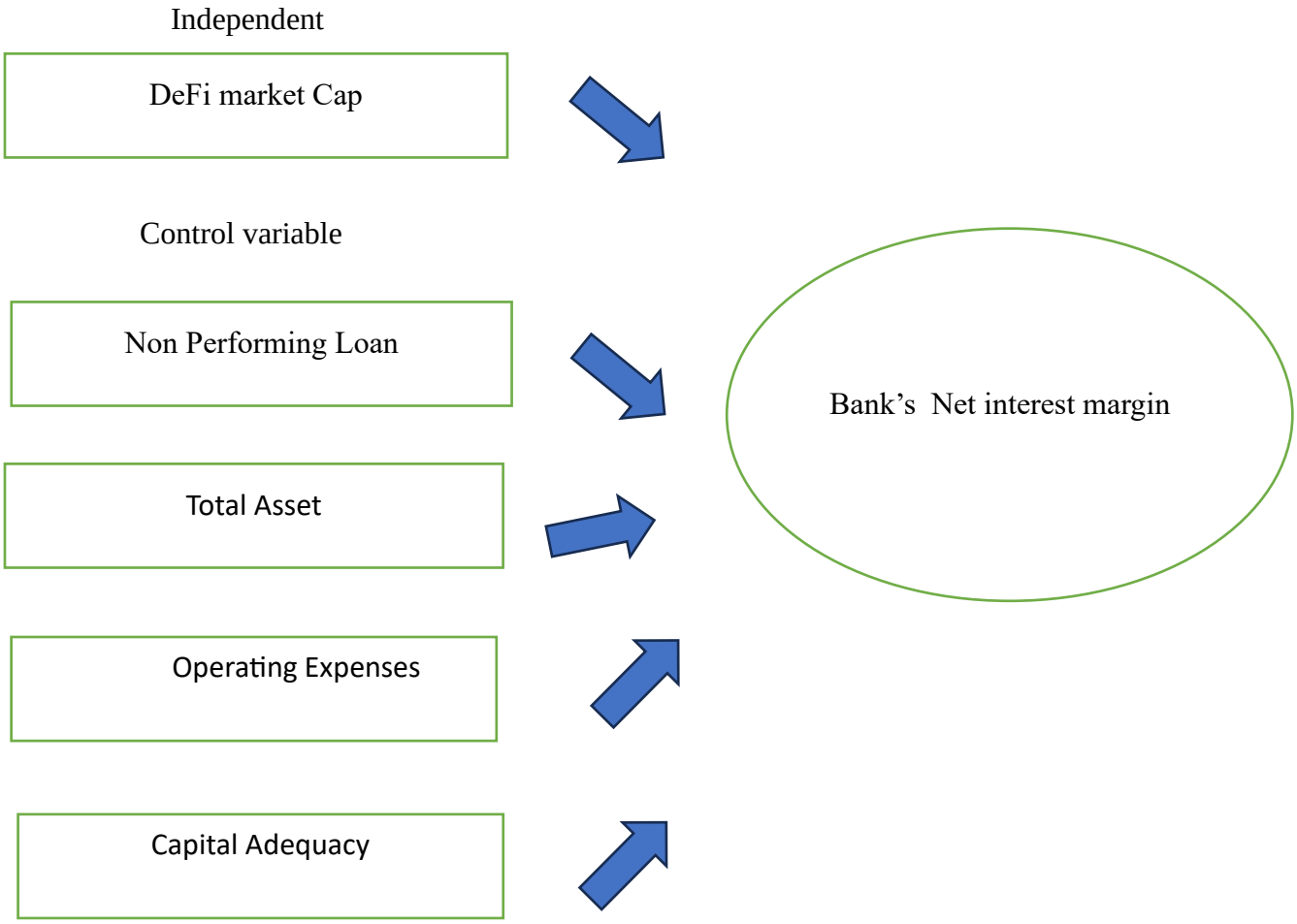
Source: Developed from the research

$$ROA_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \mathrm{lnOE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$



Source: Developed from the research

$$NIM_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \mathrm{lnOE}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$



Source: Developed from the research

2.4 Hypothesis Development

$$DEFI_{t-1} = \beta_0 + \beta_1 \mathrm{GT}_{t-1} + \beta_2 TV_{t-1} + \beta_3 \mathrm{AD}_{t-1} + \beta_4 \mathrm{CVI} + \varepsilon_{t-1}$$

Independent Variable

H1: There is a relationship between the Google Trend (GT) and DeFi Market Capitalization (DeFi)

Control variable.

H2: There is a relationship between Trading Volume (TV) and DeFi Market Capitalization (DeFi)

H3: There is a relationship between Active Address (AD) and DeFi Market Capitalization (DeFi)

H4: There is a relationship between the Crypto Volatility Index (CVI) and DeFi Market Capitalization (DeFi)

$$ROE_{it} = \beta_0 + \beta_1 \text{DEFI}_{it} + \beta_2 \text{NPL}_{it} + \beta_3 \text{TA}_{it} + \beta_4 \text{OPX}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Independent Variable

H1: There is a relationship between the DeFi Market Capitalization (DeFi) and Bank Return On Equity (ROE)

Control variable.

H2: There is a relationship between Trading Volume (Non Performing Loan) and Bank Return On Equity (ROE)

H3: There is a relationship between Active Address (Total Asset) and Bank Return On Equity (ROE)

H4: There is a relationship between the Operating Expenses (OPX) and Bank Return On Equity (ROE)

H5 : There is relationship between Capital Adequacy (CA) and Bank's Return On equity.

$$ROA_{it} = \beta_0 + \beta_1 \text{DEFI}_{it} + \beta_2 \text{NPL}_{it} + \beta_3 \text{TA}_{it} + \beta_4 \text{OPX}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Independent Variable

H1: There is a relationship between the DeFi Market Growth (DeFi) and Bank Return On Asset (ROA)

Control variable.

H2: There is a relationship between Trading Volume (Non-Performing Loan) and Bank Return On Asset (ROA)

H3: There is a relationship between Active Address (Total Asset) and Bank Return On Asset (ROA)

H4: There is a relationship between the Operating Expenses (OPX) and Bank Return On Asset (ROA)

H5 : There is relationship between Capital Adequacy (CA) and Bank's Bank Return On Asset (ROA)

$$NIM_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 \mathrm{OPX}_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Independent Variable

H1: There is a relationship between the DeFi Market Growth (DeFi) and Bank Net Interest Margin (NIM)

Control variable.

H2: There is a relationship between Trading Volume (Non-Performing Loan) and Bank Net Interest Margin (NIM)

H3: There is a relationship between Active Address (Total Asset) and Bank Net Interest Margin (NIM)

H4: There is a relationship between the Operating Expenses (OPX) and Bank Net Interest Margin (NIM)

H5 : There is relationship between Capital Adequacy (CA) and Bank's Net Interest Margin (NIM)

2.5 Conclusion

The chapter includes many prior studies to explore the connection between independent and dependent variables. The study framework and hypotheses were created based on the reviewed past works. Chapter 3 will explain this research paper's methodology research and analysis in chapter 2.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter will provide an overview of the study's research design, data collection strategy, sample plan, research instrument, and data analysis methods.

3.1 Research Design

3.1.1 Quantitative Research

Quantitative research involves gathering and scrutinizing numerical data to characterize, forecast, or manage variables of interest. It serves to investigate causal connections between these variables, predict outcomes, and apply findings to broader populations. The primary aim of quantitative research is to assess predetermined theories or hypotheses, ultimately confirming or refuting them based on collected data. Researchers employ quantitative data analysis to examine datasets longitudinally, detecting trends and patterns. This method finds extensive application in disciplines such as psychology, economics, sociology, and marketing (Sreekumar, 2024) . The step included, theory > Hypothesis > Research Design > Data Collection > Data analysis > Present results .

3.2 Data Collection Method

Data collection methods are the specific ways researchers gather information for their studies. These methods outline how data is collected, what kinds of data are sought, and the steps taken to ensure data accuracy and reliability. Depending on the research topic and goals, different techniques may be used to collect data.

3.2.1 Secondary Data

Secondary data refers to information that has been previously collected through primary sources and is made available for researchers to utilize in their own studies. It is data that has already been gathered in the past for various purposes. Researchers may have initially collected this data for a specific project but have since shared it for use by other researchers. Alternatively, the data may have been collected without a specific research agenda, such as in the case of national census data. Data classified as secondary for one research project might be considered primary for another, particularly when it is being reused. This distinction arises because the data serves as primary information for the initial research and secondary information for subsequent studies that use it. Common sources of secondary data include books, personal records, journals, newspapers, websites, and government archives. Compared to primary data, secondary data is more readily available and requires less effort and resources to access and use. The proliferation of electronic media and the internet has further facilitated access to secondary data sources (Busayo.Longe, 2020) .

3.3 Research Instrument

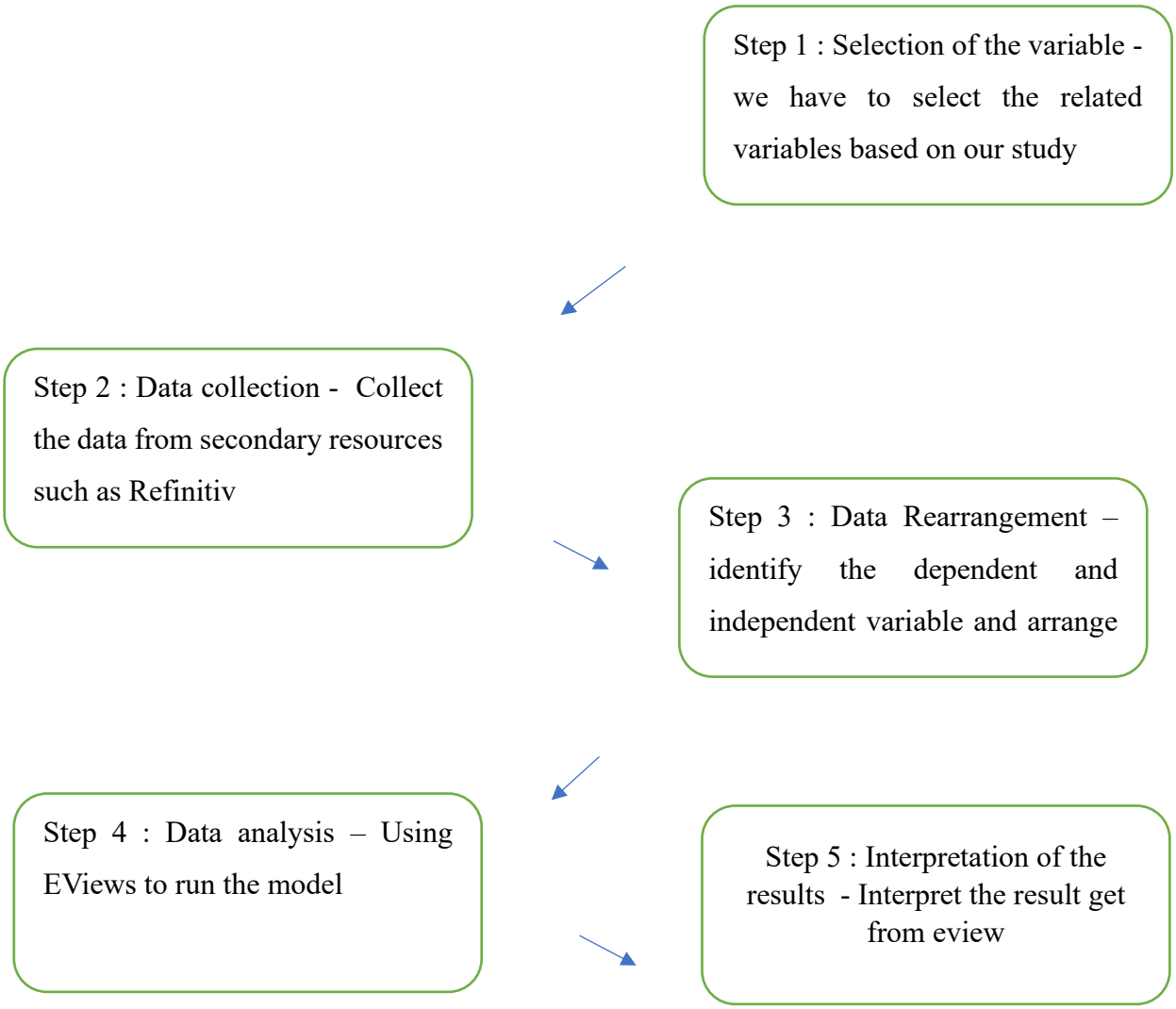
EViews is a software tool designed for Windows-based computers, offering advanced capabilities for data analysis, regression modelling, and forecasting. It allows users to swiftly develop statistical relationships from their data and utilize these relationships to predict future values. Its versatility makes it valuable across various domains including scientific data analysis, financial analysis, macroeconomic forecasting, simulation, sales forecasting, and cost analysis. Originally stemming from the Time Series Processor software for larger computers, EViews evolved from its precursor, MicroTSP, which debuted in 1981. While initially developed by economists and primarily used in economics, EViews is not limited to economic time series and can handle sizable cross-section projects as well. EViews simplifies data entry by providing intuitive visual interfaces for inputting data from the keyboard or disk files, creating new data series, displaying and printing data, and conducting statistical analyses. It leverages modern Windows software features, allowing users to navigate operations using standard Windows menus and dialogs. Results are presented in windows and can be manipulated using familiar Windows techniques.

Furthermore, EViews offers a robust command and batch processing language for users who prefer more advanced control over their analyses. Commands can be entered and edited directly in the command window, and users can create and store command sequences in programs to document research projects and execute them later

3.4 Data Processing

The social sentiment on DeFi market growth will be test using Google trend as the main independent and 3 control variable , trading volume , active address , crypto volatility index by using Monthly data from April 2019 to February 2024 total of 59 Month . Next for panel data , we will using ROE , NIM and ROA as dependent , and with 1 independent Defi , 4 control variable such as NPL , TA , OPX and CA by conducting Quarterly data from 2018Q3 - 2023Q4 Sample size , 155 Observation , 3410 .

3.4.1 Data Processing Flows



Source: Developed from the research

3.5 Model Estimation

3.5.1 Econometric Model

$$DEFI_{t-1} = \beta_0 + \beta_1 \mathrm{GT}_{t-1} + \beta_2 TV_{t-1} + \beta_3 \mathrm{AD}_{t-1} + \beta_4 \mathrm{CVI} + \varepsilon_{t-1}$$

Monthly data from April 2019 to February 2024 total of 59 Month

SOURCES OF DATA

Variable	Desciption	Type	Souces
DEFI	Defi Market Cap	Dependent	https://defillama.com/dexs
GT	Google Trend	Independent	https://trends.google.com /trends/
TV	Trading Volume	Control Variable	https://defillama.com/dexs
AD	Active Wallet Address	Control Variable	https://dune.com/big_number /bitcoinwallets
CVI	Crypto volatility Index	Control Variable	https://www.investing.com /indices/crypto-volatility-index-historical-data

Dependent

DEFI = Defi Growth Measurement using Total Locked Value (All Chain)

Independent

GT = Refer to google trend , Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular.

Control variable

TV = Trading volume , by using Top 20 projects in Exchanges (DEX) based on monthly trading volume since launch

AD = Active Wallet Address (included with all chain)

CVI = Crypto Volatility , "A higher CVI indicates that the market expects greater price fluctuations in cryptocurrencies. In contrast, some traders might see lower CVI levels as a sign of stability and potential consolidation in the market.

Panel Data Analysis

$$ROE_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 OPX_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

$$NIM_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 OPX_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

$$ROA_{it} = \beta_0 + \beta_1 \mathrm{DEFI}_{it} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{TA}_{it} + \beta_4 OPX_{it} + \beta_5 CA_{it} + \varepsilon_{it}$$

Quarterly data from 2018Q3 - 2023Q4 Sample size :155 Observation :3410

SOURCES OF DATA

Variable	Desciption	Type	Souces
ROE	Return On Equity	Dependent	Refinitiv
ROA	Return On Assets	Dependent	Refinitiv
NIM	Net Interest Margin	Dependent	Refinitiv
DEFI	Defi Market Cap	Independent	https://defillama.com/dexs
NPL	Non Performance Loan	Control Variable	Refinitiv
TOASS	Total Asset	Control Variable	Refinitiv
OE	Operating Expenses	Control Variable	Refinitiv
CA	Capital Adequacy	Control Variable	Refinitiv

Dependent

ROE = Return on equity (Net Income before Preferred Dividends - Preferred Dividend Requirement) / Average of Last Year's and Current Year's Common Equity * 100)

NIM = Net interest margin (NIM) is a measure of the difference between the interest income generated by banks or other financial institutions and the amount of interest paid out to their lenders (for example, deposits), relative to the amount of their (interest-earning) assets.

ROA = Return On Assets , calculated by dividing a company's net income prior to financing costs by total assets.

Independent

DEFI = Defi Growth , Measurement using Total Locked Value (All Chain)

Control variable

NPL = Non-Performing Loans is a Banking industry measure of a bank's total non-performing loans for a period of time. A loan is non-performing when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons to doubt that payments will be made in full.

TA= Total Assets is anything tangible or intangible that is capable of being owned or controlled to produce value and that is held to have positive economic value is considered an asset. Simply stated, assets represent ownership of value that can be converted into cash.

OE = Operating expenses are the costs associated with running a business on a day-to-day basis. These expenses are essential for keeping the business operational and can include items such as rent, utilities, salaries and wages, office supplies, insurance, maintenance, and more

CA= Capital Adequacy , It is used to measure the level of potential losses that can be absorbed by common shareholders and holders of other qualifying instruments with equity characteristics in the occurrence of a market stress. Applicable to Insurance, Banks, Investment Trust and Other Financial companies.

3.6 Time series data

Time series data refers to a collection of observations on the values of a variable at different points in time. These observations can be taken at regular intervals, such as daily, weekly, monthly, quarterly, annually, or even less frequent intervals like every five or ten years. With advancements in technology, particularly high-speed computers, we can now collect data at extremely short intervals, such as real-time stock prices. In the field of econometrics, time series data is extensively used. However, analyzing time series data presents challenges, and one common assumption made in empirical work is that the underlying time series is "stationary." Stationarity loosely means that the mean and variance of the time series do not systematically change over time (Porter & Gujarati, 2008)

3.7 Unit root test

Time series analysis relies heavily on unit root tests, such as the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. These tests are useful in identifying the properties of stationarity or non-stationarity in a time series data. As it forms the basis of many time series models and assumptions, stationarity is a key notion in time series analysis. Analysis and modelling are frequently made simpler by stationary data or data that may be converted into a stationary form. To determine whether a time series variable is stationary, the ADF and PP tests are used. The null hypothesis of non-stationarity can be disproved if the ADF statistic drops below a predetermined threshold, indicating that the series exhibits stationarity. The PP test assumes that the regression model's errors have variable variances (heteroscedasticity), whereas the ADF test assumes constant variance (homoscedasticity), and this is an essential distinction between the two tests. The precise qualities of the

3.8 Var Model

A vector autoregressive method (VAR model) is an unrestricted vector autoregression (VAR) designed for use with stationary series that are known to be cointegrated The VAR approach is based on a simultaneous system in that all variables are considered endogenous In VAR, modeling the value of a variable is expressed as a linear function of the lagged values of that variable and all other variables included in the model. In the VAR, main objective is to develop a model primarily for forecasting and modelling purposes (Porter & Gujarati, 2008).

3.9 Granger Causality Test

H_o : X no Y

H_A: X Granger Y

If H_A: is accepted, F-test's p value is less than (<) α 0.05 level.

If H_A: is rejected, F-test's p value is greater than (>) α 0.05 level

H_A: is accepted, the two variables are stationary and linear combination between the variables.

It is called the co-integrated and long-term equilibrium relationship between the variables. Granger causality, a statistical concept based on prediction, is assessed using Engle-Granger tests to determine if two variables are co-integrated, with X said to "Granger-cause" Y (X ➞ Y) when F-tests from X to Y show a p-value significantly below the 0.05 level, indicating a stationary and linear combination indicative of a co-integrated, long-term equilibrium relationship between the variables (Porter & Gujarati, 2008).

3.10 Panel Data Analysis

The panel data technique is closely related to the cross-sectional approach as it associates with specific variables through the span of a certain duration, typically over time, and with a distinct rhythm. Beyond this data type, at the analytics. can get the data correlated, make some predictions about the future and also learn of the way these variables are related under investigation. Panel data comprises, for example, yearly incomes and ages. body conditions of people surveyed for several years' demographics can be illustrated. Researchers can investigate The relationship between factors, counting the age effects on the employment level or earnings. series, by having a detailed view of the subject on example statistics (Porter & Gujarati, 2008).

3.11 POLS

The POLS technique is used to determine the parameters for the linear equation. situation in which all data are collected or inputted at one central location from many parties or sources. This approach allows you to make the judgement that all groups obtains the same situation with links. The use of a dataset requires taking into account the subsets to which members of the groups belong. as time goes on and with diverse cross-sectional units (for instance, people, businesses or nations), panel data is largely based on POLS.In order to find a relationship between the independent and dependent variables, it is necessary to build a single regression model. is essential to ensure each group of data is used; the absence from the dataset of any disparities between the cross-sectional units.

3.12 The Fixed Effect Model

In econometrics, the Fixed Effects Model is a commonly employed method that takes individual-specific effects or unobserved heterogeneity into account,

especially in panel data analysis. Its purpose is to correct for time-invariant features of individual units (people,businesses, nations) that could skew regression analysis's predicted coefficients (Porter &Gujarati, 2008)

3.13 The Random Effects Model

In econometrics, the Random Effects Model is a frequently employed method that takes individual-specific effects or unobserved heterogeneity into account, especially in panel data analysis. Though it handles the effects that are unique to each individual differently, it is comparable to the Fixed Effects Model. Individual-specific effects are considered to be random variables in the Random Effects Model, meaning they have no correlation with the independent variables.

3.14 Descriptive Analysis

Descriptive analysis, one of fundamental techniques in data analysis paradigms, acts as a tool that provides authoritative explanations and in depth understanding of the data. understanding explanation for the data. familial level is given to the population or sample as well as to identify any of forms or relationships. an implication that gives rise to data problems is some form of inconsistency that erodes the data integrity. Among the key advantages of descriptive analysis is its capacity to. both quantitative and qualitative data seek to be addressed in the study. Quantitative data is a term used for the information that is.

3.15 Correlation Analysis

In correlation analysis, a s statistical technique is used for evaluating the strength of the association between two datasets. that involve two or more factors. The correlation strength and the direction are the indications revealed by the correlation coefficient. for the association of two/outlawed quantitative variables. of correlation between socioeconomic status and various health outcomes, including the lifespan duration. while is the analysis type that show us how strong or weak is the association between the two variables using the correlation coefficient. finance to

examine the relationship between stock prices and interest rates(Porter & Gujarati, so called, 2008)

3.16 Residual Cross Sections

The residual cross-section test is a diagnostic tool in econometrics used to evaluate regression models in panel data analysis. It examines the differences between observed and predicted values (residuals) across different cross-sections (individual units) to detect potential issues like heteroscedasticity or model misspecification. By analysing these patterns, researchers can identify whether the regression model assumptions hold consistently across all units, helping to ensure the validity and reliability of their results (Porter & Gujarati, 2008).

3.17 Heteroscedasticity (Breusch Pagan Godrey test /white test)

When the variability of the residuals—the differences between the observed and projected values—in a regression model is not constant across all levels of the independent variables, this is referred to as heteroscedasticity in the context of regression analysis. In other words, the values of the predictors cause a consistent change in the variance of the errors. Heteroscedasticity can produce statistical conclusions and forecasts that are erroneous (Porter & Gujarati, 2008).

3.18 Scale measurement

3.18.1 Normality Test

Ho: Residuals are normally distributed.
HA: Residuals are not normally distributed

Decision:

- Reject Ho: (There is not normally distributed); Prob.value ⩽ Critical α 0.05 Value.
- Do not reject Ho: (There is normally distributed; Prob.value > Critical α 0.05 Value

normality tests assess whether a dataset conforms to a normal distribution. These tests evaluate the null hypothesis that the data are drawn from a population with a normal distribution. If the null hypothesis is rejected, it indicates that the data likely do not come from a normally distributed population. However, if the null hypothesis is not rejected, it doesn't necessarily imply that the data are definitively normally distributed. Instead, the most one can conclude is that the data could possibly originate from a normally distributed population. In other words, the test doesn't provide a definitive confirmation of normality but rather suggests that there is not sufficient evidence to reject the assumption of normality. It's important to remember that normality tests provide insight into the plausibility of the assumption of normality but do not prove it conclusively (Statistics.com: Data Science, Analytics & Statistics Courses, 2013) .

3.18.2 VIF

Substant multicollinearity may be observed if the correlation coefficient between the two independent variables is more than 0.8. EViews 12 may calculate the correlation coefficients between two independent variables in absolute value. Finally, multicollinearity is likely if the tolerance (TOL) is close to zero and the variance inflation factor (VIF) is around 10.If the sample size of the research is small or infinite (n<100), all of the hypothesis testing requires the error terms to be normally distributed, then it is crucial to identify whether there is error dispersion among the error terms. If the error terms are discovered to not be normally distributed, then all hypothesis testing approaches will be invalid .

3.19 Inferential Analysis

3.19.1 R squared

R-squared serves as a measure of how well the independent variables in a linear regression model explain the variation in the dependent variable. It quantifies the proportion of the variance in the dependent variable that is predictable from the independent variables. Expressed on a scale from 0 to 100%, R-squared helps gauge the strength of the relationship between the model and the dependent variable (Frost, 2024) .

3.19.2 Adjusted R square

Adjusted R-squared is an improvement over R-squared, particularly valuable in multiple regression analyses. It adjusts for the number of predictors in the model, preventing R- squared from artificially increasing with the addition of more variables, even if they don't significantly enhance the model's explanatory power. This adjustment guards against overfitting, ensuring a more reliable measure of the model's goodness of fit by penalizing unnecessary complexity (Bhandari, 2024b) .

3.13 Conclusion

This chapter demonstrates how the methodology used in this study provides a rigorous framework for evaluating the intricate interplay between social sentiment & Defi . And Demarked Growth toward Bank’s performance in term of ROE , ROA, NIM . It providing findings that lead to a better understanding of these key dynamics in the Defi Ecosystem . The fourth chapter will analyze and evaluate the test results.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

In this chapter we will be conduct test using EViews 12 to shows the relationship between variable social sentiment on DeFi market capitalization will be test using Google trend as the main independent and 3 control variable , trading volume , active address , crypto volatility index by using Monthly data from April 2019 to February 2024 total of 59 Month . Next for panel data , we will using ROE , NIM and ROA as dependent , and with 1 independent Defi , 4 control variable such as NPL , TA , OPX and CA by conducting Quarterly data from 2018Q3 - 2023Q4

4.1 Time Series Data

4.1.1 Unit Root Test

Table 4.1.1: Unit Root Test

Variables	ADF Statistics		PP Statistics	
	Level	1st Diff	Level	1st Diff
Defi _MIL	-9.1051***	-5.5854***	-1.3137	-5.5041***
GT	-2.2249**	-7.6768***	-2.0323**	-9.4894***
TV_MIL	-2.0489**	-9.0282***	-1.8775*	-9.4355***
AD	-1.6262*	-6.0222***	-1.3573	-5.9992***
CVI	-2.9689**	-6.0174***	-3.0278**	-11.3070***

By comparing level and 1st Diff of ADF statistics , we able to know the value of Defi_mil , GT , TV _ MIL , AD and CVI have a more significant with at $\alpha > 5$ *** to at level . And for PP statistic result are similar with ADF statistics the value of 1st Diff Defi_mil , GT , TV _ MIL , AD and CVI are more significant at $\alpha > 5$ compared to at level . Therefore. The evidence from both tests consistently shows statistical significance for the first difference, indicating stationarity and no unit root test .

4.1.2 Descriptive Analysis

Table 4..1.2 : Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max	Observation
DEFI	53517.05	52154.98	326.2800	182217.0	59
GT	42.0169	27.0456	3.0000	100	59
TV	64548.03	57165.28	0.01737	192890	59
AD	2223.081	1967.860	3.1260	7533.67	59
CVI	77.0658	20.6093	38.4038	126.8044	59

The captured data are used to perform the descriptive analysis. The central tendency in this analysis is represented by mean, minimum and maximum amounts. And the analysis's variability is tested using the standard deviations. With a total of 59 observations, Defi _Mil have a mean of 53517.05 and a range of min 326.28 to max 188217 . Next GT , which refer to google trend a measure to test whether defi_mil is impacted by the social sentiment have 59 observations , mean of 42.0169 , standard deviation of 27.0456 and min 3.00 to max 100 . Furthermore, TV (trading volume in DEX) has mean of 64548.03 standard deviation of 57165.28 and min 0.01737 to max 192890 . Moreover , AD refer to active address in Defi ecosystem has mean of 2223.081 and standard deviation of 1967 .86 with min of 3.126 to 7533.67 . Lasty , CVI refer to cryptocurrency volatility index has a mean of 77.0678 and standard deviation of 20.6993 with a range of 38.4038 to 126.8044 .

4.1.3 Correlation Analysis

< 0.20 = Almost negligible relationship

0.20 – 0.40 = Low correlation

0.40 – 0.70 = Moderate correlation

0.70 – 0.90 = High correlation

> 0.90 = Very high correlation

	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
DEFI_...	1.000000	0.037977	0.015389	-0.193365	0.316317
GT_1D...	0.037977	1.000000	0.322470	0.287110	0.324531
TRADI...	0.015389	0.322470	1.000000	0.382937	0.636955
CVI_1...	-0.193365	0.287110	0.382937	1.000000	0.247802
ACTIV...	0.316317	0.324531	0.636955	0.247802	1.000000

Table 4..1.3: Correlation Analysis

As the table above , we able to see that there Difi_1diff , GT_1DIFF , TradingV_1DIFF , CVI_1Diff and ActiveA_1diff don't have high correlation which < 0.7 . And, in this table only CVI_1Diff and ActiveA_1diff have the highest value 0.06369 but it still in moderate correlation. Therefore, we assume that there is no multicollinearity between independent variables.

4.1.4 VAR

Table 4.1.4: VAR

Vector Autoregression Estimates
Date: 04/12/24 Time: 15:40
Sample (adjusted): 2019M06 2024M02
Included observations: 57 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DEFI_1DIFF	GT_1DIFF
DEFI 1DIFF(-1)	0.177610	9.31E-05
	(0.17977)	(0.00015)
	[0.98796]	[0.61260]
GT_1DIFF(-1)	-51.05894	-0.080560
	(156.034)	(0.13189)
	[-0.32723]	[-0.61082]
TRADINGVOL MIL 1...	-0.179153	2.70E-05
	(0.11188)	(9.5E-05)
	[-1.60129]	[0.28519]
CVI_1DIFF	-236.1837	0.202120
	(166.262)	(0.14053)
	[-1.42055]	[1.43823]
ACTIVEADD_THS_1DI...	12.56048	0.003607
	(4.69911)	(0.00397)
	[2.67295]	[0.90812]
C	867.8496	0.539848
	(2063.51)	(1.74419)
	[0.42057]	[0.30951]
R-squared	0.225313	0.172633
Adj. R-squared	0.149363	0.091519
Sum sq. resids	1.22E+10	8712.204
S.E. equation	15462.94	13.07010
F-statistic	2.966605	2.128265
Log likelihood	-627.5431	-224.2182
Akaike AIC	22.22958	8.077832
Schwarz SC	22.44464	8.292890
Mean dependent	1596.220	0.771930
S.D. dependent	16765.64	13.71263
Determinant resid covariance (dof adj.)		4.08E+10
Determinant resid covariance		3.27E+10
Log likelihood		-851.7612
Akaike information criterion		30.30741
Schwarz criterion		30.73753
Number of coefficients		12

$$\text{Defi}_{1\text{Fiff}_{t-1}} = 867.85_{\ t-1} - 51.06\ \text{GT}_{1\text{DIFF}_{t-1}} - 0.1791\ \text{TRADINGVOL}_{\text{MIL}_{t-1}} - 236.184\ \text{CVI}_{1\text{Diff}_{t-1}}$$

(0.4206) (-0.327) (-1.6013 *) (-1.4206)

$$+\ 12.5065\ \text{ACTIVEADD}_{1\text{DIFF}_{t-1}} +\ 0.178\ \text{DEFI\_1DIFF}_{\ t-1} + \varepsilon_{it}$$

(2.673**) (0.988)

R2 = 0.2253

Adjusted R2 = 0.1493

Based on the VAR model of Defi_1Diff results , the explanatory variables accounted for about 22.5% of the variation in the Defi_1Diff equation .

Estimations reveal that the explanatory variables name TRADINGVOL_MIL , ACTIVEADD_1DIFF were the most important explanatory variables to explain Defi_1diff , are statistically significant at α 0.10 % and α 0.05 % respectively . however ACTIVEADD_1DIFF was the most important variable in the model .

Therefore, a 1 unit increase in TRADINGVOL_MIL on average, has a negative effect on decreasing in the Defi market capitalization by -0.1791 unit statistically significant at α 0.10% holding constant with other variables.

Therefore, a 1 unit increase in ACTIVEADD_1DIFF on average, has a positive effect on increase in the Defi market capitalization by 2.673 unit statistically significant at the level α 0.05 %.holding constant with other variables.

$$GT_{1DIFF\,t-1} = 0.5398_{t-1} - 0.000093\ \text{DEFI 1DIFF}_{t-1} + 0.000027\ \text{TRADING VOL 1DIFF}_{t-1}$$

(0.3095) (0.61260) (-0.61082)

$$+0.2021\text{CVI}_{t-1} + 0.004\ ACTIVEADD_{1DIFF_{it}} - 0.0806_{t-1} + \varepsilon_{t-1}$$

(1.4382) (0.90812)

R-squared = 0.17263

Adjusted r-squared = 0.0915

Based on the VAR model of GT_1Diff results , the explanatory variables accounted for about 17.26% of the variation in the GT_1Diff equation . And there are no variables that are significant at α 0.01 %, α 0.05% and α 0.1 %. That mean there are no Variable impact GT_1Diff in this equation.

4.1.5 VAR Residual Serial Correlation LM test

Table 4.1.15: Var Residual Serial Correlation LM Test

Lag	LRE*Stat	df	Pro	RAO F-stat	df	Prob
1	6.911799	4	0.1406	1.772538	(4,96.0)	0.1407

H0 : Residual are no autocorrelation

HA : Residual are autocorrelation

Decision : H0 : Residual is no autocorrelation

Decision based on the table above , we do not reject H0 : there is no serial autocorrelation problem since 0.1407 > α 0.05

4.1.6 Granger Causality Test

Table 4.1.6: Granger Causality Test

Dependent Variable : DEFI 1 DIFF			
Excluded	Chi-sq	df	Prob
GT 1 DIFF	0.107079	1	0.7435
Dependent Variable : GT 1 DIFF			
Excluded	Chi-sq	df	Prob
DEFI 1 DIFF	0.375273	1	0.5401

GT_1DIFF causes DEFI_1DIFF 0.7435 > α 0.05 NS

There is also not a variable GT_1DIFF Granger causes a variable DEFI_1DIFF.

Therefore , there is not cointegrated and also not a long-term equilibrium relationship between GT_1DIFF & DEFI_1DIFF . Means that Google Trend will not affecting Defi market capitalization in the long run .

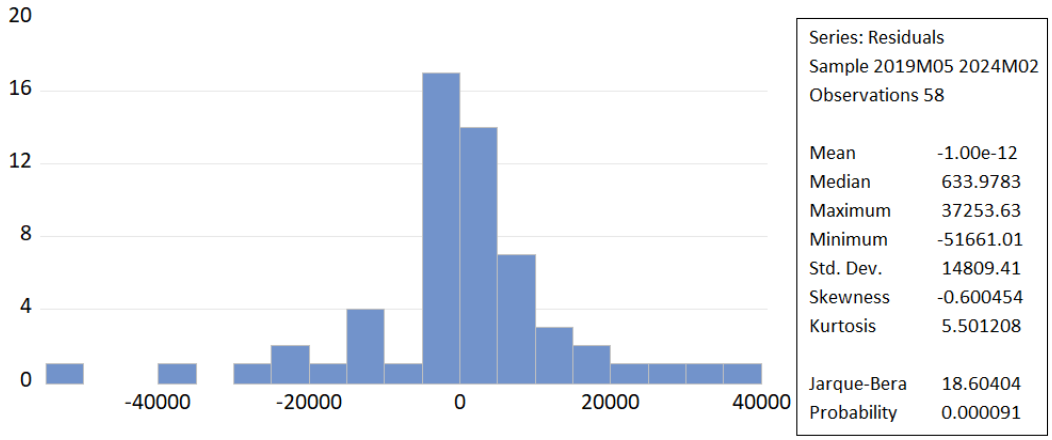
DEFI_1DIFF causes GT_1DIFF 0.5401 > α 0.05 NS

There is also not a variable DEFI_1DIFF Granger causes a variable GT_1DIFF.

Therefore , there is not cointegrated and not a long-term equilibrium relationship between DEFI_1DIFF & GT_1DIFF. Meaning that DeFi market cap will not affecting Google trend in the long run .

4.1.7 Residual Autocorrelation

Table 4.1.7: Residual Autocorrelation



Source: Eviews12

H_o : Residuals are normally distributed.

H_A : Residuals are not normally distributed.

Decision : H_A : Residuals are not normally distributed

The probability 0.000091 < α 0.05 therefore , residual are not normally distributed

4.1.8 Heteroscedasticity (Breusch Pagan Godfrev)

Table 4.1.8: Breusch Pagan Godfrev

F statistic	1.8673	Prob . (4.53)	0.1318
OBS r squared	7.1286	Prob Chi square (4)	0.1292
Scaled Explained ss	13.3968	Prob Chi square (4)	0.0095

H_0: Residuals are no heteroscedasticity.

H_A: Residuals are heteroscedasticity

Decision : Do not reject H0

The p value is 0.1318 > α 0.05 then do not reject H_0 There is no heteroscedasticity in this regression .

4.1.9 Heteroscedasticity (white test)

Table 4.1.9: white test

F statistic	1.5489	Prob . (4.53)	0.1347
OBS r squared	19.4442	Prob Chi square (4)	0.1487
Scaled Explained ss	36.5414	Prob Chi square (4)	0.0009

H_0: Residuals are no heteroscedasticity.

H_A: Residuals are heteroscedasticity

Decision : Do not reject H0

The p value is 0.1347 > α 0.05 then do not reject H_0 There is no heteroscedasticity in this regression .

4.1.10 VIF

Table 4.1.10: VIF

Ho: Residuals are not multicollinearity

HA: Residuals are not multicollinearity

Variable	VIF	DECISION
GT_1DIFF	VIF = 1.1929	Since VIF (1.1929) < VIF (10) do not reject $H0$.Thus, residuals have no multicollinearity
TradingVol_MIL1diff	VIF = 1.8742	Since VIF (1.8742) < VIF (10) do not reject $H0$.Thus, residuals have no multicollinearity
CVI_1DIFF	VIF = 1.2152	Since VIF (1.2152) < VIF (10) do not reject $H0$.Thus, residuals have no multicollinearity
ACTIVEADD_1DIF	VIF = 1.7299	Since VIF (1.7299) < VIF (10) do not reject $H0$.Thus, residuals have no multicollinearity

Since , GT_1DIFF , TradingVol_MIL1diff , CVI_1DIFF and ACTIVEADD_1DIF the value of are < 10 therefore there are no multicollinearity problem in this regression .

4.2 Panel Data Analysis

4.2.1 Descriptive data (ROE , NIM , ROA)

Table 4.2.1 Descriptive data (ROE , NIM , ROA)

Variable	Mean	Std. Dev	Min	Max	Observation
ROE	0.1055	0.0502	-0.2170	1.1258	3410
NIM	0.0352	0.0182	-0.1390	0.2810	3410
ROA	0.0115	0.0047	-0.0229	0.0854	3410
DEFI	0.0455	0.0508	2.4900	0.1742	3410
NPL	0.0241	0.0993	0.0000	1.6689	3410
TA	0.0084	0.0390	0.0000	0.3954	3410
OPX	0.0391	0.1924	-0.0159	2.6856	3410
CA	0.0125	0.0026	0.0000	0.0307	3410

The captured data are used to perform the descriptive analysis. The central tendency in this analysis is represented by mean, minimum and maximum amounts. And the analysis's variability is tested using the standard deviations . With 3410 observation ROE has mean of 0.1055 , and the range of -0.2170 to 1.1258 with standard deviation of 0.0502 . Next , NIM have mean of 0.0352 with range of -0.1390 to 0.2810 and standard deviation of 0.00182 . ROA have 0.0115 mean and range from -0.0229 to 0.0854 with standard deviation of 0.0047. Furthermore, the only independent DEFI have mean of 0.0455 and range from 2.4900 to 0.1742 and standard deviation of 0.0508 . Next is the control variable part , NPL has mean of 0.0241 range from 0 to 1.6689 . TA have mean of 0.0084 range from 0 to 0.3954 , OPX have mean of 0.0391 range from -0.0159 to 2.6856 and lastly CA have mean of 0.0125 from range 0 to 0.0307 .

4.2.2 Correlation Analysis (ROE)

Table 4.1.2 : Correlation Analysis (ROE)

< 0.20 = Almost negligible relationship

0.20 – 0.40 = Low correlation

0.40 – 0.70 = Moderate correlation

0.70 – 0.90 = High correlation

> 0.90 = Very high correlation

	ROE	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
ROE	1.000000	0.100289	0.024307	0.043259	0.054366	-0.011387
DEFI ...	0.100289	1.000000	0.027514	0.019132	0.004228	0.017221
CV1 ...	0.024307	0.027514	1.000000	0.891117	0.747281	0.048839
CV_2...	0.043259	0.019132	0.891117	1.000000	0.928455	0.070797
CV3_...	0.054366	0.004228	0.747281	0.928455	1.000000	0.062734
CV4_...	-0.011387	0.017221	0.048839	0.070797	0.062734	1.000000

From the table we able to see that the correlation between CV1_NPL and CV_ 2 are 0.89111 and it's had a high correlation between each other . Furthermore , CV1_NPL also have high correlation with CV3 OPX at 0.7473 . Moreover , CV2_TO and CV3_OPX have a very high correlation at 0.9285 . Therefore , the data have multicollinearity problem .

4.2.3 Correlation Analysis (NIM)

Table 4.2.3 : Correlation Analysis (NIM)

	NIM	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
NIM	1.000000	-0.076726	-0.094685	-0.108934	-0.096196	-0.111328
DEFI ...	-0.076726	1.000000	0.028695	0.020717	0.005997	0.014199
CV1 ...	-0.094685	0.028695	1.000000	0.888958	0.746237	0.046246
CV_2...	-0.108934	0.020717	0.888958	1.000000	0.927689	0.069482
CV3_...	-0.096196	0.005997	0.746237	0.927689	1.000000	0.061006
CV4_...	-0.111328	0.014199	0.046246	0.069482	0.061006	1.000000

Next , CV1NPL & CV_2 TA have a high correlation at 0.8889 . Furthermore , CV1_NPL also have high correlation with CV3 OPX at 0.7462 . Lastly , there are also a very high correlation between CV3 OPX with CV2 TA at the level of 0.927689. Therefore , the independent have multicollinearity problem .

4.2.4 Correlation Analysis (ROA)

Table 4.2.4 : Correlation Analysis (NIM)

	ROA	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
ROA	1.000000	0.027682	-0.049602	-0.050184	-0.032028	0.061573
DEFI_...	0.027682	1.000000	0.028383	0.019936	0.005054	0.015703
CV1_...	-0.049602	0.028383	1.000000	0.889012	0.746673	0.047043
CV_2...	-0.050184	0.019936	0.889012	1.000000	0.928444	0.069712
CV3_...	-0.032028	0.005054	0.746673	0.928444	1.000000	0.061405
CV4_...	0.061573	0.015703	0.047043	0.069712	0.061405	1.000000

Next , CV1NPL & CV_2 TA have a high correlation at 0.8890 . Furthermore , CV1_NPL also have high correlation with CV3 OPX at 0.7466 . Lastly , there are also a very high correlation between CV3 OPX with CV2 TA at the level of 0.9284. Therefore , the independent have multicollinearity problem .

4.2.5 Model Selection (ROE , NIM , ROA)

Table 4.2.4 : Model Selection (ROE)

Variable	POLS	FEM	REM
DEFI	0.1001**	0.1001**	0.8664**
	(0.0169)	(0.0169)	(0.0061)
NPL	-0.02069	-0.02069	0.0011
	(0.0217)	(0.0217)	(0.0212)
TA	-0.0044	-0.0044	0.1471

	(0.098)	(0.098)	(0 . 1657)
OPX	0.0230*	0.0230*	-0.04935*
	(0.01364)	(0.01364)	(0.0286)
CA	-0.3124***	-0.3124***	1.2108**
	(0.3262)	(0.3262)	(0.4733)
Number of Group	3368	3368	3368
R- squared	0.01403	0.01403	0.3358
Adjusted R squared	0.01257	0.01257	0.3029
Cross section F		0.0000	
Hausman test			0.1045

Source : Own Data collection via EViews 12

Note: *p<0.01, **p<0.05, ***p<0.1

1. Choosing between pols and Fixed effects

   Ho: POLS is preferred

   HA: FEM is preferred

   Decision : Reject Ho since , fem model is lower then 0.00 < α 0.005 . Therefore we choose FEM model .

2. Choosing between fixed and random model

   Ho : REM is preferred

   HA : FEM is preferred

   Decision : Do no reject Ho , REM Hausman test 0.1045 > α 0.05 . Therefore, we choose REM model .

   Elaboration of REM Model

   ROA have a positive and significant relationship with DeFi market capitalization . With 1 % increase in the DeFi market capitalization will increase a bank ROE by 0.8664 units with statistically significant the level

0.05% , holding other variables constant . Furthermore , 1% increase in the operating cost of will lead lower down a bank ROE by 0.04935 units at 0.10% , holding other variables constant . Moreover , 1 % increase in the capital adequacy could lower down a bank ROE by 1.208 units at the level of 0.05% . Based on the result NPL and TA shows insignificant with bank ROE .There are total of 3368 Observation and r2 of 0.3358 and adjusted r squared of 0.3029 .

Table 4.2.5 : Model Selection (NIM)

Variable	POLS	FEM	REM
DEFI	-0.0263 ***	-0.0263 ***	-0.0267***
	(0.0006)	(0.0006)	(0.0026)
NPL	0.0036	0.0036	-0.0013
	(0.0076)	(0.0076)	(0.0038)
TA	0.0714 **	0.0714 **	-0.0587
	(0.0348)	(0.0348)	(0.0307)
OPX	0.0034	0.0034	0.0100
	(0.0048)	(0.0048)	(0.0052)
CA	-0.7136***	-0.7136***	0.0318
	(0.1176)	(0.1176)	(0.0881)
Number of Group	3406	3406	3406
R- squared	0.02819	0.02819	0.8289
Adjusted R squared	0.0267	0.0267	0.8205
Cross section F		0.000	
Hausman test			0.5488

1. Choosing between pols and Fixed effects

   Ho: POLS is preferred

   HA: FEM is preferred

   Decision : Reject Ho since , fem model is lower than 0.00 < α 0.005 . Therefore, we choose FEM model .

2. Choosing between fixed and random model

   Ho : REM is preferred

   HA : FEM is preferred

   Decision : Do no reject Ho , REM Hausman test 0.5488 > α 0.05 . Therefore, we choose REM model .

   Elaboration of REM Model

   Defi have a negative and significant level at 0.01% which mean a decrease in Defi could have an increase in bank's Net interest margin . In contrast a increase in Defi will cause a decrease in bank's net interest margin . 1% increase in the Defi market capitalization will lead to decrease in the bank NIM by -0.0267% with statistically significant at the level of 0.05%, holding other variables constant.

   Throught the finding , NPL , TA , OPX and CA are all insignificant . Therefore , the variable is not sensitive to bank NIM Lastly , there are total of 3406 observations , r2 of 0.8289 and adjusted r2 of 0.8205 .

Table 4.2.6 : Model Selection (ROA)

ROA

Variable	POLS	FEM	REM
DEFI	0.0027*	0.0027*	0.0079 **
	(0.0016)	(0.0016)	(0.0005)
NPL	0.0012	0.0012	0.0005
	(0.0020)	(0.0020)	(0.0020)
TA	-0.0236**	-0.0236**	-0.02475**
	(0.0091)	(0.0091)	(0.0159)
OPX	0.0030 **	0.0030 **	-0.0055**
	(0.0012)	(0.0012)	(0.0027)
CA	0.1178***	0.1178***	0.313578***
	0.0003	0.0003	(0.0453)
Number of Group	3386	3386	3386
R- squared	0.0093	0.0093	0.3080
Adjusted R squared	0.0078	0.0078	0.2739
Cross section F		0.000	
Hausman test			0.0023

1. Choosing between pols and Fixed effects

   Ho: POLS is preferred

   HA: FEM is preferred

   Decision : Reject Ho since , fem model is lower than 0.00 < α 0.005 .

   Therefore, we choose FEM model .

2 .Choosing between fixed and random model

Ho : REM is preferred

HA : FEM is preferred

Decision : Reject Ho , REM Hausman test value 0.0023 < α 0.05 . Therefore , we choose FEM model .

Elaboration of FEM Model

Defi have a positive and a significant level at 0.10% which mean a increase will lead to an increase in the bank's ROA . In contrast , a decrease in defi will cause a decrease in bank's profitability . 1% increase in the DeFi market capitalization will lead to increase in the bank ROA by 0.0079 units with statistically significant at the level of 0.05% , holding other variables constant.

Furthermore , 1% increase in the TA will lead to a decrease of bank ROA by 0.0236 units statistically significant at level of 0.05% . And 1 % increase in the OPX will lead to decrease in the bank ROA by 0.0030 units statically significant at the level 0.05 % holding other variables constant. 1 % increase in the CA will lead to decrease in the bank ROA by 0.1178 units statically significant at the level of 0.05% , holding other variables constant There are total of 3386 observation , R2 0.0093 and adjusted R2 0.0078 .

4.2.6 Normality test for (ROE , NIM , ROA)

Table 4.2.6 : Normality test for ROE , NIM , ROA

H_o : Residuals are normally distributed.

H_A : Residuals are not normally distributed.

	Normality Test		
	ROE	NIM	ROA
Jarque - Bera	539499.4	543975.4	136921.2
Probability	0.000	0.000	0.000
Decision	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .

Soo , we able to conclude that ROE , NIM and ROA don't have normality problem as their p value is 0.000 < α 0.05 .

4.2.6 Residual Autocorrelation (ROE , NIM , ROA)

Table 4.2.7 : Residual Autocorrelation

Residual					
	Breusch-Pagan LM	**Pesaran Scaled LM**	**Pesaran CD**	Probability	Decision
ROE	34439.59	145.6615	109.0108	0.000	Reject H0 , P value 0.00 < α 0.05
NIM	65593.94	347.3089	139.9613	0.000	Reject H0 , P value 0.00 < α 0.05
ROA	36388.51	158.2760	114.9138	0.000	Reject H0 , P value 0.00 < α 0.05

H_o: Residuals are no autocorrelation

H_A: Residuals are autocorrelation

We able to conclude that ROE , NIM and ROA have serial autocorrelations due to the probability of Breusch-Pagan LM, Pesaran Scaled LM and Pesaran CD are 0.00 < α 0.005 . Therefore , we need to reject Ho , there is serial correlation .

4.3 Conclusions

This chapter encompasses descriptive analysis, scale measurement, and inferential analysis as its primary components. The EViews 12 software is utilised to execute all of the obtained outcomes. The subsequent chapter (Chapter 5) will include a comprehensive discussion of the study's findings, conclusions, limits, suggestions, and other pertinent material.

CHAPTER 5: DISCUSSION, CONCLUSION, AND IMPLICATIONS

5.0 Introduction

In this chapter will provide and summarize the main conclusions and makes links between social sentiment (Google Trend) toward Defi market capitalization and the impact of Defi market capitalization toward bank performance in term of ROE , NIM and ROA . There will be detailed summary statistical analyses to clarify the relationship between the variables. Also, the detailed exploration of the implications of these findings includes a discussion of the managerial implications for policymakers. The chapter also identifies the study's shortcomings and makes recommendations for further research directions.

5.1Major Finding Discussions

The results of the regression finding are not significant with existing study which the results showed there are no relationship between social sentiment with the DeFi market capitalization. The DeFi market may be relatively efficient in incorporating information from social sentiment into asset prices. If market participants quickly react to social media discussions and sentiment, the impact on market growth may be short-lived or already priced in, leading to a lack of significant correlation between social sentiment and market growth, furthermore , DeFi market capitalization may be driven more by fundamental factors such as protocol adoption, technological developments, regulatory changes, and user activity within decentralized finance platforms. While social sentiment can influence short-term price movements, these fundamental factors may have a more significant and sustained impact on long-term market growth compared to social sentiment. Furthermore , there are a positive relationship between active address and defi market growth , it indicates that when there is more user using defi , the growth of

defi will increase . A large network size directly increases the probability of adopting Bitcoin, growth in user activity suggests heightened adoption and engagement with the digital asset, contributing to a positive correlation with its returns an increase in the growth of address tend to have an increase in the price of BTC indicating that high Bitcoin adoption among peers is associated with a high propensity to adoption. When there is more active user / active address it able to allow more investor to take part in the cryptocurrency and lead more capital flow into defi ecosystem . In addition , trading volume has no significant relationship with defi growth ,this is due to Abnormal trading volume could arise in response to regulatory concerns or announcements affecting the DeFi sector. Regulatory uncertainty or changes in regulatory frameworks could trigger significant trading activity as market participants adjust their positions in response to policy developments. Lastly , crypto volatility index have no relationship with defi market grow , the cryptocurrency volatility index may reflect overall market volatility across various digital assets, including those outside the DeFi sector. DeFi market growth, on the other hand, may be driven by specific factors such as adoption rates, technological advancements, regulatory developments, and user activity within decentralized finance protocols. As a result, the overall cryptocurrency market volatility may not directly correlate with the growth of the DeFi sector.

5.1.1 Defi Market Cap toward bank ROE, NIM & ROA

The results based on chapter 4 are defi market growth are positive and significant with ROE& ROA which are align with the existing study . When banks apply more fintech technology it allows the banks to provide a better service and increase customer satisfaction therefore increase the performance of the banks .The finding proves that there are a positive relationship and significant between Fintech services and Bank' ROA & ROE . And able to allow their customer to have more convenient , therefore attract more customer and increase in their profitability .Fintech able to become the best economic solution , therefore by combing fintech to traditional banking system it allows to reduce in the barrier of entry . After a bank start to adopting Fintech, it allow them to expand their customer bases, they able to reduce

credit risk and save in their operational costs .Fintech able to provide a new product line , new technology creation and a new stream of revenue for bank . It also allows a bank to expend to a new market. ROE When a firm utilize more fintech technology , it will eventually increase in a bank's ROE . In summary, In the early stage in adopting fintech it may cause lose in profitability in a bank but in the long run banks could utilize the beneficial of fintech such as able to lower the transaction cost and optimizing customer experience.

NIM

The statistical analysis constantly reveals a negative and insignificant between Defi market growth and NIM . Furthermore , the rise of Fintech enterprises raises the competitive environment in the industry. Fintech highly skilled can offer substitute financial services and take market share away from conventional banks, threatening their roles as traditional banks' intermediaries and decreasing their earnings when defi are growth means the traditional banking profitability will have a drop . Defi platform able to offer a lower cost and higher interest rate for the individual as a result it able to attract more individual to use their platform , in contrast for traditional bank it will aim for a more a higher and the procedure to apply for a loan are more complicated. In the presence of FinTech, banks may be offering depositors lower returns on their funds, leading to a reduction in NIM. This could be due to increased competition from FinTech firms offering alternative financial services at lower costs, thus pressuring traditional banks to reduce interest margins to remain competitive.

5.1.3 NPL , TA ,OPX , CA on bank's ROE &ROA

The finding regression showed there are no relationship between NPL and ROE . Banks may have diverse revenue streams or alternative sources of income that offset the impact of non-performing loans on their ROE. For example, income from fee-based services, investment banking activities, or other financial products may

contribute significantly to overall profitability, reducing the reliance on interest income affected by NPL .Next , the finding based on chapter 4 showed there are no significant between TA and ROE as well . Some banks might engage in financial engineering strategies to manipulate their balance sheets and artificially inflate asset sizes. In such cases, the reported total assets may not accurately reflect the bank's actual operational capacity, affecting the relationship with ROE . In addition , the results showed there are a negative relationship between OPX (operating expenses) with ROE (Return On Equity) and it consistent with existing study , when operating expenses increase it will tend to lower down ROA Higher operating expenses imply greater costs incurred by the bank to generate profits. When operating expenses are high relative to total assets, it indicates that the bank is less efficient in managing its costs. This inefficiency leads to a reduction in the return earned on shareholders' equity, as more of the earnings are consumed by expenses rather than contributing to profits. Moreover , the finding show there are a positive and significant relationship between CA (capital adequacy) and ROE (Return On Equity) When a bank have a higher capital adequacy , it mean a bank able could have a lot of capital to continue operational activities and able to carry on risk if a bank face liquidity and higher capital levels might lead to a dilution of shareholders' equity, as banks issue additional shares to raise capital. Consequently, the return on equity, which is calculated as net income divided by shareholders' equity, might decrease.

5.1.4 NPL , TA ,OPX , CA on bank’s NIM

The regression finding showed there are no relationship between NPL and NIM The impact of changes in NPLs on NIM may not be immediately reflected in regression results due to time lags. It could take time for changes in NPL levels to manifest in the bank's financial performance metrics, especially if banks implement proactive measures to address emerging credit risks gradually. Furthermore, the regression finding showed there are no relationship between NPL and Total assets which algin with existing study banks engage in diverse activities beyond traditional lending. Fee-based services, trading, and investment banking activities may contribute differently to NIM, making the direct relationship between total assets and NIM less

significant and Asset size reduces the cost and processing time of information collected, indicating potential economies of scale. Moreover , The regression finding showed there are no relationship between NPL and Operating Cost operating expenses not significantly impact NIM because NIM focuses on the difference between interest income and interest expenses, which are influenced by various factors including the bank's interest rate spread and operating efficiency In addition ,The regression finding showed there are no relationship between capital and NIM The bank's business model and strategic priorities can impact its NIM. Banks focused on fee-based income or non-interest revenue streams may have different NIM dynamics compared to those primarily reliant on net interest income. Therefore, the relationship between capital and NIM may vary depending on the bank's business model

5.2 Implications of the Study

Trading volume have a significant relationship with Defi market growth . therefore, policymaker should Provide a clear and consistent regulatory guideline for DeFi projects and participants. A unclear policy will make people confuse make and create a more uncertainty for the people who want to participant in the DeFI space . But with applying " DeFi Awareness Program" it allow policymaker to educate and inform the investor and the publics such as utilizing the workshop , conferences , interest based material cooperation and even academic establishment .

Additionally, there is a strong and positive correlation between the growth of the Defi Market and active addresses. Tax incentives may be provided to encourage investment in DeFi initiatives that promote financial inclusion and community development. For example, officials may offer tax credits or deductions for donations made to DeFi projects that assist socioeconomic empowerment or help marginalized populations. DeFi developers and enterprises may also be given financial benefits, such as exemptions from some taxes or a decrease in the overall tax burden, in order to encourage innovation and commercial development in the decentralized finance industry.. A tax subsidy can be introduced by the policymaker to encourage the local people and developer have financial inclusion by investing

in Defi . For example , by providing tax reduction and subsidiaries such as entrepreneur and developer who are adopting DeFi could have 20 % of tax reduction and indirect supported by the policy maker . It able to allow more people to jump into DeFi ecosystem and start to be adopting it . Since it is more convenient and able to grow their business faster .

Furthermore , ROE , NIM and ROA also significant with the Defi Market capitalization . This is due to there are a lot of advantages of adopting the use of DeFi in the conventional banking system . Therefore, policymaker should encourage the use of DeFi in the traditional banking system . Such as encouraging in partnership , develop alliance parentship or even have collaboration with fintech company. By having collaboration with Defi , traditional could have a better transparency and stronger security system . And since Defi able to remove the intermediaries of banking system , it able to provide a higher interest rate and more convenient payment processes . For example , a bank may only able to 3% of interest but after adopting the use of DeFi , it may offering 3.5% and it also convenient for us to send money to our sibling or friend that are corner in the world . Therefore , it may contribute to a country economy growth and introduce a another finance type of service to the people

On the other hand , there are significant between operating cost and capital adequacy with ROE & ROA . Therefore , policy maker should implement effective a cost cutting strategies for all the banks to help them lowering their operating expenses and boost their profits . And in order to keep a high capital adequacy of bank , policymaker could provide a guideline to help the bank in practicing their cost manager, or even encourage applying the use of advancement technology such as ai to help a firm have enough reserve to due with uncertainty and face with uncertain losses that might occur in the future .

5.3 Limitations of the Study

5.3.1 Less Social Media Measurement

Even though Google Trend is a well-known and useful tool to detect the current trend , but it its difficult and hard to , judge and capture the specific market changes of Defi movement if we only use Google Trends as the only measurement . Even though Google Trend provided us a specific search term such as " Defi" or " Decentralized Finance" it allow us to know how much the public search in certain period . However, it still lacks some precise and clear report for the investor and public to refer if they need it . For instance, such as such as the news headline , report , the discussion from the investor in other social media that discussing about DeFi project . As a result, whereas Google Trends offers a wide picture of public interest, it might not have the specificity required to carry out comprehensively sentiment analysis inside the DeFi ecosystem . And this is important for the investor and the public to make investment or even step into DeFi ecosystem.

5.3.2 Lack of Data

This study's main limitations are the data's temporal scope, which runs from December 2018 to December 2023. Decentralization is an area of rapid development in the financial industry recently, so it is difficult for us to capture its precise data . Since it's data only captured start from 2018 until now before that the data are not that much. Furthermore , as DeFi develops, more and more protocol and new projects appear. And the latest won't be updated too once the project launched and it might require month or even half and a year to wait for the project to become stabilize then we able to capture the data .

5.3.3 Focusing on Specific Country

The study's exclusive focus on the United States limits the generalizability of its conclusions toother nations with different market, regulatory, and economic environments. Since we are only investigating the impact of DeFi in all the United States bank , we may ignore the world financial inclusion between traditional finance and DeFi . Therefore , if we study on the worldwide impact, we able to recognize the changes in the whole global financial ecosystem and allow us to provide a more details and comprehensive insight to another researcher

5.4 Recommendations for Future Research

5.4.1 Include more related social media as variable

Even though Google Trend is a well-known and indicator to capture the current movement of DeFi , but It still not enough to identify the fluctuations in the DeFi Ecosystem . Therefore, the future research could include other social indicators such as Reddit , Twitter , Telegram to have a more precise and clear investigation . These platform are mostly likely used by the crypto due to it's less in restriction and DeFi investor or developer will use this advantages to looking for opportunity and making investment after analysis using those engagement in the social media . For example, before a project launched the team will create forum , AMA (ask me anything) and provide some airdrop for the participants in the tweeter to boost their engagement . Thus Reddit , twitter and Telegram are reliable tools to determine the Defi Market .

5.4.1 Quantitative Analysis

Since the DeFi as measure by TVL data are only available from the year 2018 until the year of 2024 , future researcher could create a quantitative analysis such as creating google form , interview and survey . Moreover, the quantitative research will be targeting the financial background student and employer that are in banking

service . By doing quantitative research we able to collect more opinion and give the participant to voice out their point of views or even experience , and their consequences on the development of DeFi Lastly , This allows us to have a deeper understanding of their view on the DeFi future growth and how the pros and cons of DeFi and not limited using qualitative data

5.4.1 Cross Nation / Global Research

Since , the research only specific on how the DeFi impacting the bank in United State therefore the data and research only might be applicable in United State . To further extend and have a more widen research . Future research could aim to investigate in Europe , Aasen or even global bank around the world on how could Defi play an important roles in traditional bank ecosystem . Therefore , it will allow reader to have a deeper insight toward the bank's reaction by the expansion Of DeFi .

5.5 Conclusion

To summarize , the research is study on how the social sentiment impacting decentralized finance. Also the rise of Defi impacting the performance in the United State bank in terms of ROE , NIM and ROA . Based on the research , there are no relationship between social sentiment band DeFi market cap which measured by Google Trend data and Total Locked Value . This is due to social emotion will only have a short term impact toward the crypto price . Next , there are also a positive and significant relationship between active address and Defi market cap , when there are more user adopt the use of DeFi , there will be more people jump into DeFi ecosystem therefore will lead to increase in the user base .

Furthermore , Trading volume and Defi market cap are insignificant . That means , the market may be manipulated by certain " Whale" which manipulated the trading lead confusion in the market . In addition , there is no significant of crypto volatility with DeFi Market Cap . On the other hand , another research indicate ROE , ROA have a positive and significant relationship . Because, when banks start to adopt the

use of Fintech they could able to lower their operating cost , and earn a more higher profitability .

However, DeFi market growth showed a negative and insignificant relationship with net interest margin (NIM). This suggests that the rise of DeFi platforms may pose a competitive threat to traditional banks, leading to reduced interest margins as they face increased competition from alternative financial services providers offering lower costs and higher returns.

The implications of these findings for policymakers include the need to provide regulatory clarity, promote financial inclusion, encourage collaboration between DeFi and traditional banking sectors, and incentivize efficiency improvements and prudent risk management practices among banks. However, this study has several limitations, including the exclusive use of Google Trends data, the temporal scope of the data, and the focus on a specific country (the United States). Future research could address these limitations by integrating additional data sources, conducting qualitative research, and conducting cross-country comparisons to provide a more comprehensive understanding of the dynamics between social sentiment, DeFi market growth, and bank performance metrics.

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Appendixes

Appendix 1 Unit Root Test Result

Variables	ADF Statistics		PP Statistics	
	Level	1st Diff	Level	1st Diff
Defi _MIL	-9.1051***	-5.5854***	-1.3137	-5.5041***
GT	-2.2249**	-7.6768***	-2.0323*	-9.4894***
TV_MIL	-2.0489**	-9.0282***	-1.8775*	-9.4355***
AD	-1.6262*	-6.0222***	-1.3573	-5.9992***
CVI	-2.9689**	-6.0174***	-3.0278**	-11.3070***

Appendix 2 Descriptive Data

GR

	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
Mean	1571.599	0.775862	1519.309	0.175226	59.61707
Median	164.8550	1.000000	5.959110	-1.823900	3.294500
Maximum	48166.00	58.00000	93739.94	41.98000	2477.772
Minimum	-64060.00	-42.00000	-77802.00	-32.17680	-1430.456
Std. Dev.	16618.98	13.59185	28118.71	15.08728	606.0930
Skewness	-0.694125	0.667011	-0.093348	0.764893	1.163061
Kurtosis	7.391697	8.340139	5.509761	3.685943	7.792808
Jarque-Bera	51.26776	73.21701	15.30658	6.792676	68.58948
Probability	0.000000	0.000000	0.000474	0.033496	0.000000
Sum	91152.72	45.00000	88119.92	10.16310	3457.790
Sum Sq. Dev.	1.57E+10	10530.09	4.51E+10	12974.68	20938881
Observations	58	58	58	58	58

Appendix 3 Correlation Analysis

	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
	DEFI_1DIFF	GT_1DIFF	TRADINGV...	CVI_1DIFF	ACTIVEAD...
DEFI_...	1.000000	0.037977	0.015389	-0.193365	0.316317
GT_1D...	0.037977	1.000000	0.322470	0.287110	0.324531
TRADI...	0.015389	0.322470	1.000000	0.382937	0.636955
CVI_1...	-0.193365	0.287110	0.382937	1.000000	0.247802
ACTIV...	0.316317	0.324531	0.636955	0.247802	1.000000

Appendix 4 Var

Vector Autoregression Estimates
Date: 04/12/24 Time: 15:40
Sample (adjusted): 2019M06 2024M02
Included observations: 57 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DEFI_1DIFF	GT_1DIFF
DEFI_1DIFF(-1)	0.177610	9.31E-05
	(0.17977)	(0.00015)
	[0.98796]	[0.61260]
GT_1DIFF(-1)	-51.05894	-0.080560
	(156.034)	(0.13189)
	[-0.32723]	[-0.61082]
TRADINGVOL MIL 1...	-0.179153	2.70E-05
	(0.11188)	(9.5E-05)
	[-1.60129]	[0.28519]
CVI_1DIFF	-236.1837	0.202120
	(166.262)	(0.14053)
	[-1.42055]	[1.43823]
ACTIVEADD THS 1DI...	12.56048	0.003607
	(4.69911)	(0.00397)
	[2.67295]	[0.90812]
C	867.8496	0.539848
	(2063.51)	(1.74419)
	[0.42057]	[0.30951]
R-squared	0.225313	0.172633
Adj. R-squared	0.149363	0.091519
Sum sq. resids	1.22E+10	8712.204
S.E. equation	15462.94	13.07010
F-statistic	2.966605	2.128265
Log likelihood	-627.5431	-224.2182
Akaike AIC	22.22958	8.077832
Schwarz SC	22.44464	8.292890
Mean dependent	1596.220	0.771930
S.D. dependent	16765.64	13.71263
Determinant resid covariance (dof adj.)		4.08E+10
Determinant resid covariance		3.27E+10
Log likelihood		-851.7612
Akaike information criterion		30.30741
Schwarz criterion		30.73753
Number of coefficients		12

Appendix 5 Var Residual Serial Correlation LM Test

VAR Residual Serial Correlation LM Tests
Date: 04/12/24 Time: 18:17
Sample: 2019M04 2024M02
Included observations: 57

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	6.911799	4	0.1406	1.772538	(4, 96.0)	0.1407

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	6.911799	4	0.1406	1.772538	(4, 96.0)	0.1407

*Edgeworth expansion corrected likelihood ratio statistic.

Appendix 6 Var Granger Causality

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 04/12/24 Time: 22:38
Sample: 2019M04 2024M02
Included observations: 57

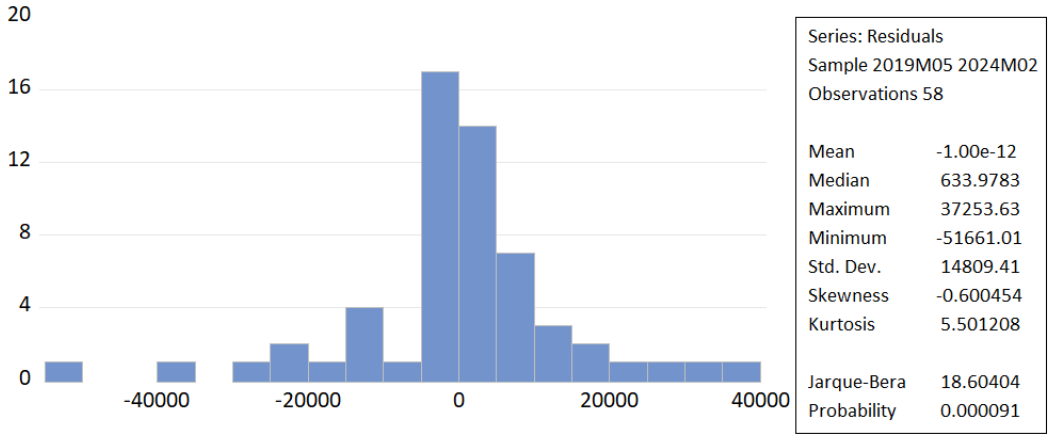
Dependent variable: DEFI_1DIFF

Excluded	Chi-sq	df	Prob.
GT_1DIFF	0.107079	1	0.7435
All	0.107079	1	0.7435

Dependent variable: GT_1DIFF

Excluded	Chi-sq	df	Prob.
DEFI_1DIFF	0.375273	1	0.5401
All	0.375273	1	0.5401

Appendix 7 Residual Autocorrelation



Appendix 8 Heteroskedasticity (Breusch Pagan Godfrey)

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.856734	Prob. F(4,53)	0.1318
Obs*R-squared	7.128647	Prob. Chi-Square(4)	0.1292
Scaled explained SS	13.39683	Prob. Chi-Square(4)	0.0095

Appendix 9 Heteroskedasticity (white test)

Heteroskedasticity Test: White
Null hypothesis: Homoskedasticity

F-statistic	1.548965	Prob. F(14,43)	0.1347
Obs*R-squared	19.44422	Prob. Chi-Square(14)	0.1487
Scaled explained SS	36.54142	Prob. Chi-Square(14)	0.0009

Appendix 10 VIF

Variance Inflation Factors
Date: 04/09/24 Time: 21:16
Sample: 2019M04 2024M02
Included observations: 58

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GT_1DIFF	26632.89	1.192925	1.188983
TRADINGVOL_MIL_...	0.009780	1.874203	1.868652
CVI_1DIFF	22091.05	1.215341	1.215174
ACTIVEADD_THS_...	19.48713	1.746954	1.729922
C	4111773.	1.011073	NA

Appendix 11 descriptive data (ROE , NIM , ROA)

Variable	Mean	Std. Dev	Min	Max	Observation
ROE	0.1055	0.0502	-0.2170	1.1258	3410
NIM	0.0352	0.0182	-0.1390	0.2810	3410
ROA	0.0115	0.0047	-0.0229	0.0854	3410
DEFI	0.0455	0.0508	2.4900	0.1742	3410
NPL	0.0241	0.0993	0.0000	1.6689	3410
TA	0.0084	0.0390	0.0000	0.3954	3410
OPX	0.0391	0.1924	-0.0159	2.6856	3410
CA	0.0125	0.0026	0.0000	0.0307	3410

Appendix 12 Correlation analysis (ROE , NIM , ROA)

	ROE	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
ROE	1.000000	0.100289	0.024307	0.043259	0.054366	-0.011387
DEFI ...	0.100289	1.000000	0.027514	0.019132	0.004228	0.017221
CV1_...	0.024307	0.027514	1.000000	0.891117	0.747281	0.048839
CV_2...	0.043259	0.019132	0.891117	1.000000	0.928455	0.070797
CV3_...	0.054366	0.004228	0.747281	0.928455	1.000000	0.062734
CV4_...	-0.011387	0.017221	0.048839	0.070797	0.062734	1.000000

	NIM	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
NIM	1.000000	-0.076726	-0.094685	-0.108934	-0.096196	-0.111328
DEFI_...	-0.076726	1.000000	0.028695	0.020717	0.005997	0.014199
CV1_...	-0.094685	0.028695	1.000000	0.888958	0.746237	0.046246
CV_2...	-0.108934	0.020717	0.888958	1.000000	0.927689	0.069482
CV3_...	-0.096196	0.005997	0.746237	0.927689	1.000000	0.061006
CV4_...	-0.111328	0.014199	0.046246	0.069482	0.061006	1.000000

	ROA	DEFI_VAL...	CV1_NPL01	CV_2_TOT...	CV3_OPE...	CV4_CAPI...
ROA	1.000000	0.027682	-0.049602	-0.050184	-0.032028	0.061573
DEFI ...	0.027682	1.000000	0.028383	0.019936	0.005054	0.015703
CV1_...	-0.049602	0.028383	1.000000	0.889012	0.746673	0.047043
CV_2...	-0.050184	0.019936	0.889012	1.000000	0.928444	0.069712
CV3_...	-0.032028	0.005054	0.746673	0.928444	1.000000	0.061405
CV4_...	0.061573	0.015703	0.047043	0.069712	0.061405	1.000000

Appendix 13 Model Selection (ROE , NIM , ROA)

Variable	POLS	FEM	REM
DEFI	0.1001**	0.1001**	0.8664**
	(0.0169)	(0.0169)	(0.0061)
NPL	-0.02069	-0.02069	0.0011
	(0.0217)	(0.0217)	(0.0212)
TA	-0.0044	-0.0044	0.1471
	(0.098)	(0.098)	(0．1657)
OPX	0.0230*	0.0230*	-0.04935*
	(0.01364)	(0.01364)	(0.0286)
CA	-0.3124***	-0.3124***	1.2108**
	(0.3262)	(0.3262)	(0.4733)
Number of Group	3368	3368	3368
R- squared	0.01403	0.01403	0.3358
Adjusted R squared	0.01257	0.01257	0.3029
Cross section F		0.0000	
Hausman test			0.1045

DEFI	-0.0263 ***	-0.0263 ***	-0.0267***
	(0.0006)	(0.0006)	(0.0026)
NPL	0.0036	0.0036	-0.0013
	(0.0076)	(0.0076)	(0.0038)
TA	0.0714 **	0.0714 **	-0.0587
	(0.0348)	(0.0348)	(0.0307)
OPX	0.0034	0.0034	0.0100

	(0.0048)	(0.0048)	(0.0052)
CA	-0.7136***	-0.7136***	0.0318
	(0.1176)	(0.1176)	(0.0881)
Number of Group	3406	3406	3406
R- squared	0.02819	0.02819	0.8289
Adjusted R squared	0.0267	0.0267	0.8205
Cross section F		0.000	
Hausman test			0.5488

Variable	POLS	FEM	REM
DEFI	0.0027*	0.0027*	0.0079 **
	(0.0016)	(0.0016)	(0.0005)
NPL	0.0012	0.0012	0.0005
	(0.0020)	(0.0020)	(0.0020)
TA	-0.0236**	-0.0236**	-0.02475
	(0.0091)	(0.0091)	(0.0159)
OPX	0.0030 **	0.0030 **	-0.0055**
	(0.0012)	(0.0012)	(0.0027)
CA	0.1178***	0.1178***	0.313578***
	0.0003	0.0003	(0.0453)
Number of Group	3386	3386	3386
R- squared	0.0093	0.0093	0.3080
Adjusted R squared	0.0078	0.0078	0.2739

Cross section F		0.000	
Hausman test			0.0023

Appendix 14 Normality test (ROE , NIM , ROA)

Normality Test			
	ROE	NIM	ROA
Jarque - Bera	539499.4	543975.4	136921.2
Probability	0.000	0.000	0.000
Decision	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .	Reject H0 , the P value is 0.000 < α 0.05 . Therefore , there is not normally distributed .

Appendix 14 Residual autocorrelation(ROE , NIM , ROA)

Residual					
	Breusch-Pagan LM	**Pesaran Scaled LM**	**Pesaran CD**	Probability	Decision
ROE	34439.59	145.6615	109.0108	0.000	Reject H0 , P value 0.00 < α 0.05

NIM	65593.94	347.3089	139.9613	0.000	Reject H0 , P value 0.00 < α 0.05
ROA	36388.51	158.2760	114.9138	0.000	Reject H0 , P value 0.00 < α 0.05