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P2P lending: how does it affect Indonesian bank's profitability?

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Abstract

Purpose – The emergence of peer-to-peer (P2P) lending in Indonesia is expected to increase financial inclusion by allowing more individuals to access formal financial services. Even with its rapid development, only a few studies have empirically investigated its impact on Indonesian banking profitability. This study aims to investigate the effect of liquidity and credit risk on the profitability of Indonesian conventional banks before and after (P2P) lending and whether P2P lending weakens or strengthens the impact.

Design/methodology/approach – This study uses data from Indonesian conventional banks listed on the Indonesian Stock Exchange. The data are analyzed using a dynamic panel data model of the system generalized method of moments (SYS-GMM) and moderated regression analysis.

Findings – The results indicate that credit risk positively affects banks' profitability. P2P lending significantly weakens the impact of credit risk on banks' profitability.

Research limitations/implications – The P2P lending is measured as a dummy variable since we do not have access to a higher measurement scale data of P2P lending in Indonesia.

Practical implications – The findings indicate that the intensive competition after the presence of P2P lending put pressure on banks to implement risk management better. This implies that banks should practice sound risk management to maintain their profitability, especially in responding to technology-driven increased competition from P2P lending providers.

Originality/value – This is the first study that focuses on banks' liquidity and credit risk after the presence of P2P lending and the enactment of the bank prudential risk management regulation in Indonesia.

Keywords P2P lending, Risk management, Liquidity, Credit risk, Profitability

Paper type Research article

1. Introduction

Fintech, known as a technology that offers innovative and novel financial service products, has developed globally (Agarwal and Zhang, 2020). The technological transformation affects financial intermediaries by offering information innovation, referring to data and information processing that affects distribution (Boot *et al.*, 2021). Based on the theory of financial intermediation, financial institutions play a crucial role in maintaining economic stability by gathering funds from the public and redistributing them as credit. They generate profits

JEL Classification — C12, C13, C33, C36, G01, G35, Q05

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through interest margins and their ability to efficiently perform this intermediation function directly influences their effectiveness in supporting economic growth. Banks as financial intermediaries faced with various threats following the global crisis and disruption due to retail fintech rivalry with customer-focused platform-based competitors (Vives, 2019).

The development of peer-to-peer (P2P) lending markets commenced in developed countries. Some factors such as efficient financial sector and effective law enforcement contributed to its development (Jiang *et al*., 2021). The German P2P lending fintech industry is growing rapidly and competes with several traditional banks (Renner, 2016). Similarly, the rapid growth of the American fintech industry on P2P lending platforms has penetrated traditional finance in any locations (Wolfe and Yoo, 2017). Fintech-based financial institutions have made traditional financial institutions serve their customers sub-optimally in several Asian countries (Parameshwar *et al*., 2019). For example, P2P lending offers financial innovation at the forefront of financing in China, as a country with the largest population in the world (Bruno *et al*., 2017). The success of the Chinese fintech industry is due to technological advances and government support (Fang *et al.*, 2014). Further, due to consumers' demands and support, P2P lending has enormous potential in Vietnam, where consumers have numerous alternatives to banks and other financial institutions. The Vietnamese government supports this sector despite current regulations that restrict P2P lending (Uyen and Ha, 2017).

Based on the information obtained from the Financial Services Authority (FSA (2019)), other financial services institutions explained that companies in Indonesia's fintech P2P lending sector were present in 2015. Although left behind in several other countries, this industry has developed significantly. Its presence is driven by the development of information technology and online loans in several countries, as well as the low access to loans at financial service institutions. Online loan services are used to fill the gap in the need for financing in Indonesia and open access to financing other than banking services or other funding institutions. According to data from the FSA, as of March 2022, there were 102 licensed fintech lending companies. However, few studies have attempted to investigate the alleviation of financial exclusion by banks after the presence of P2P lending in Indonesia.

Several studies explain that P2P lending disrupts the performance of the banking industry (Roure *et al.*, 2018; Wolfe and Yoo, 2017; Abubakar and Handayani, 2018; Tang, 2019; Phan *et al*., 2020). In Indonesia, P2P lending is an IT-based direct lending and borrowing service in Rupiah (IDR) currency between creditors and debtors (POJK No.77 POJK.012016). Banks operate in a highly regulated industry, where FSA and Bank Indonesia (BI) regulate and monitor their activities. According to Suryono *et al*. (2021), fintech P2P lending issues in Indonesia related to user education, consumer protection, privacy of user data, reducing fraudulent activity and stepping up the monitoring of illegal P2P lending (including by fortifying laws and leveraging associations' influence). Phan *et al*. (2020) explained that there is very little information regarding whether fintech companies have an impact on the banking sector. A recent study by Saiedi *et al*. (2020) shows that the impact of P2P lending on the banking sector may arise from consumers' distrust of banking services. Based on the distrust mindset from social psychology, the findings show that a higher level of distrust in banks resulted in a higher participation in P2P lending.

Our study aims to fill this gap. This situation motivates us to focus on banks' liquidity and credit risk and how it affects their profitability, which reflects the financial performance of conventional banks in Indonesia before and after P2P lending. Besides, we examine the role of credit risk in strengthening or weakening the impact of liquidity on profitability before and after P2P lending. In addition, we investigate whether the effect of banks' liquidity and credit risk weakens due to the presence of P2P lending. In short, this study aims to investigate the effect of liquidity and credit risk on the profitability of Indonesian conventional banks before and after (P2P) lending and whether P2P lending weakens or strengthens the impact. To increase the accuracy of our findings, we employ the System Generalized Methods of Moments (SYS-GMM).

Focusing on the Indonesian context is important since fintech development in Indonesia is massive (335 fintech companies registered as a member of the Indonesian Fintech

Association/AFTECH until January 2022). However, Indonesia's P2P lending borrower accounts distribution varied widely between regions. Java recorded the highest number of borrower accounts, with Jakarta showing the highest growth of 283.35% during the 2019–2020 period (Putri *et al*., 2023). On the other hand, data from the Indonesian financial service authority show a low level of financial literacy amidst the increased percentage of financial inclusion. In addition, while the government highly regulates the banking industry, the regulation of P2P lending as a new phenomenon in the financial industry is lagging behind. Thus, it is interesting to focus the study on Indonesia, where rapid financial inclusion through fintech and P2P lending is not balanced with financial literacy, hence creating potential risk for consumers.

We find that credit risk negatively affects a bank's profitability before the inclusion of P2P lending. In addition, P2P lending negatively weakens the relationship between credit risk and banks' profitability. Our study implies that as the activities of banks experience lower credit risk after P2P lending, Indonesian conventional banks may accrue lower credit risk by implementing stringent risk management practices. This prudential management shows banks' effort to maintain consumers' trust, thus reducing consumers' shifting to P2P lending.

Our study contributes to the literature by providing empirical evidence on the alleviation of financial exclusion by Indonesian banks after the presence of P2P lending in Indonesia in terms of bank liquidity and credit risk. The findings support the social psychology distrust mindset where banks try to maintain their customers' trust by providing prudential management. In addition, this research provides managerial implications regarding commercial banks' efforts to deal with the presence of P2P lending companies that are considered as banks' competitors.

This study confirms the theory of intermediation where banks and fintech providers may increase the effectiveness of serving their customers in channeling funds by focusing on their specific market share. Practically, this study implies that Indonesian banks should adopt effective prudential risk management strategies to maintain their performance, especially in responding to technology-driven increased competition by P2P lending providers. Implementing robust risk management practices can help mitigate liquidity and credit risks when competing with P2P lending providers. Furthermore, partnerships between banks and P2P lending platforms are expected to enhance financial inclusion for unbanked communities while ensuring prudent management. From a regulatory perspective, closer collaboration between the Indonesian Central Bank and the FSA is essential for creating a fair competitive environment within the financial sector. Additionally, strengthened cooperation among financial regulators will enhance consumer protection and promote financial literacy.

2. Theoretical framework and hypothesis development

2.1 Theory of financial intermediation

The financial intermediation theory emphasizes financial institutions' role as intermediaries between parties with surplus funds and those needing funds. In this theory, intermediary institutions, such as banks and finance companies, function to reduce transaction costs and overcome the problem of asymmetric information that is often an obstacle in direct transactions between individuals (Allen and Santomero, 1997; Gurley and Shaw, 1956). The main function of financial institutions is to facilitate payments, maintain financial stability and support monetary policy. By collecting funds from the public and channeling them back through credit, financial institutions contribute to economic stability and gain profits through interest margins. The more effective these institutions are in carrying out their intermediation function, the better their performance in supporting the economy.

2.2 Peer-to-peer lending

P2P lending distributes loans to individuals or business units without involving banks as intermediaries between parties with excess capital and parties needing capital (Tang, 2019).

P2P is a breakthrough in lending because borrowers and lenders are brought together directly through an online platform, without bank intermediaries, to initiate money loans to individuals and businesses (Yeo and Jun, 2020). Malaga *et al*. (2018) explained that P2P lending is a crowdfunding-based loan that can quickly overcome customers' short-term funding shortages without bank assistance. Some groups consider P2P lending to have greater social responsibility and value than conventional banking (Naysary and Daud, 2021).

In Vietnam, P2P lending has received increasing attention over the past few years, not only because of its disruptive nature of almost all major banking functions but also because of its rapid growth and expansion of services (Uyen and Ha, 2017). In China, P2P lending platforms are preferred by most small and medium enterprises (SMEs) and individual consumers who do not have a credit history (Suryono *et al*., 2019). In the USA, accounting standards have changed, indicating that P2P lending has become a substitute for bank loans in some markets and primarily serves SMEs and individuals who are overlooked by banks (Jagtiani and John, 1956). This platform is more flexible because it allows lenders to choose borrowers and provides borrowers with alternatives to choose loan terms according to their needs. These platforms often provide business risk ratings derived from algorithms to screen borrowers using big data (Vives, 2019).

P2P lending presents new challenges to financial intermediation theory by eliminating the role of banks as traditional intermediaries (Tang, 2019; Yeo and Jun, 2020; Naysary and Daud, 2021). P2P lending as fintech can change the way financial intermediation is carried out by shifting some of the traditional functions of banks to technology platforms (Vives, 2019). This will affect LDR and ROA in Indonesian conventional banks. LDR is a ratio that measures the amount of credit given compared to the amount of public funds and capital used (Kasmir, 2008). Meanwhile, bank ROA, as an indicator of profitability, focuses on the company's ability to obtain earnings in company operations (DeAngelo *et al*., 2006; Benvenuto *et al*., 2021; Hidayati and Yuvia, 2015). Banks must adapt by providing more flexible and innovative services to maintain relevance in the modern financial system.

2.3 Hypothesis development

Numerous recent studies look into the connection between fintech, bank profitability, liquidity and credit risk. According to Lv *et al*. (2022), banks' profitability and fintech development were positively correlated. Fintech's effects on bank profitability took the form of a "U," with early phases having an adverse effect on operations and lowering profitability, followed by a progressive increase in benefits in middle and later phases, which resulted in higher profitability. However, financial technology innovation decreased banks' overall profitability and asset quality, as demonstrated by Zhao *et al*. (2022). Although to a lesser extent for policy banks and state-owned commercial banks, this result enhanced banks' capital adequacy and managerial efficiency and it was particularly noticeable for major state-owned commercial banks.

Empirical research also shows that fintech has the ability to provide competitive advantages, notwithstanding the threats it poses to the established financial sector. Ozili (2018) discovered that the majority of investors made additional deposits to other banks in a matter of minutes, which prompted them to improve the quality of their services. Working with fintech companies can provide banks a competitive edge. According to Juengerkes (2016), these kinds of partnerships can increase consumer trust and provide beneficial outcomes, which can be used as a tactic to counter disruptive innovation. Although the traditional banking sector has been upended by fintech's rise, empirical research indicates that it can also generate chances for competitive advantage through cooperation and synergistic effects. As a result, fintech serves traditional banks more as a supplement than a replacement (Yudaruddin *et al*., 2024).

According to the most recent research by Yudaruddin *et al*. (2024), the degree of fintech development determines how liquidity affects credit risk. Additionally, the results imply that the kind of the bank and the state of the economy influence how fintech affects credit risk.

These findings have important policy ramifications, particularly for managing the risks connected to fintech development and for creating an inclusive financial framework in the digital era. Through careful fintech integration in accordance with Indonesia's changing regulatory frameworks, such as FSA and Bank of Indonesia recommendations, credit risk and bank profitability can be balanced in order to promote inclusive innovation and the resilience of the financial system. Using technological partnerships and adjusting to FSA's digital banking laws to maintain bank profitability in the face of growing digital competition. FSA and Bank of Indonesia are working together to promote appropriate fintech integration within the financial ecosystem in order to safeguard consumers and maintain market stability.

Well-functioning commercial banks increase economic growth (Barth *et al*., 2004). The financial sector is developing by providing funds for development investment and mitigating financial problems such as inflation and non-performing loans (NPL) financial deficits (Gabriel *et al*., 2019). Through various policies and regulations, formal financial institutions such as central banks encourage commercial banks and other financial institutions to increase financial inclusion by offering services that suit individual needs and business regulations (Shihadeh *et al*., 2018). Previous research explains that liquidity has a negative effect on bank performance. For example, banks with lower liquidity (larger loan-to-deposit ratio) show higher profits, considering that banks allocate credit effectively. On the other hand, the profile of loans in bank portfolios is an important issue for the banking sector (Hada *et al*., 2020). Higher credit risk (NPL) reduces bank profitability by increasing credit loss reserves. The credit profile in a bank portfolio is crucial for banks (Ozili, 2020; Hada *et al*., 2020). Therefore, the following hypothesis is made:

H1a. Liquidity has a negative effect on the profitability of conventional banks in Indonesia.

H1b. Credit risk has a negative effect on the profitability of conventional banks in Indonesia.

Credit risk is when the borrower cannot return the money borrowed within the time specified as agreed (Greuning and Bratanovic, 2003). Banks that grow rapidly are more exposed to increased credit risk during the financial crisis (Cucinelli, 2016). Greater credit allocation by conventional banks will likely increase NPL (Ozili and Adamu, 2021; Tölö and Virén, 2021), thereby increasing credit risk (Dao *et al*., 2020). Many NPL (increased credit risk) will result in lower profits. As a result, banks have to implement strict regulations and spend large resources to manage them (Aiyar *et al*., 2015). The negative effect of liquidity on bank profitability can be weakened when credit risk increases due to several reasons such as interest margin adjustment, risk management improvement, portfolio efficiency and operational efficiency. Normally, banks charge higher interest rates on loans to compensate for the higher cost of funding related to liquidity increase, thus increasing the possibility of credit risk (Hakimi *et al*., 2011; Flamini *et al*., 2009). Prudential risk management might reduce the negative impact of low liquidity on profitability in the case of increased credit risk since banks will be more careful in allocating credit (Hada *et al*., 2020; Cucinelli, 2016). Therefore, the following hypothesis is made:

H2. As a moderating variable, credit risk weakens liquidity's effect on banks profitability.

The P2P lending model is considered simple, fast and cheap, but bank loans have many advantages, including a more stable source of funds, large loan funds and other banking services (Welltrado, 2018). P2P lending provides cash loans to individuals or business units without involving banks as intermediaries between parties with excess funds and parties needing additional funds (Tang, 2019). These loans are based on crowdfunding that quickly addresses short-term funding shortfalls without involving banks (Malaga *et al*., 2018). P2P lending shows greater social responsibility and value than conventional banks (Naysary and Daud, 2021). The 2008 crisis has allowed new lenders (individuals and small businesses that

do not have traditional sources of capital) to turn to P2P lending (Arslanian and Fischer, 2019). The increasing popularity of P2P lending due to this distrust directly impacts the decline in bank profitability. Customers who switch to P2P lending reduce the bank's customer base, decreasing income from loan interest and other services. In addition, banks must also compete with more competitive interest rates from P2P platforms, which further tightens profit margins (Malaga *et al*., 2018; Tang, 2019). Therefore, the hypothesis is as follows:

H3. P2P lending has a negative effect on banks' profitability.

High-risk fintech loans replace bank loans, while low-risk loans can facilitate credit expansion (Vives, 2019; Wolfe and Yoo, 2017). P2P lending is a platform that targets high-risk loans beyond traditional bank loans (Roure *et al*., 2018). P2P lending is predicted to influence conventional bank lending activities regarding the influence of liquidity on profitability. Regardless of whether P2P lending platforms and banks are complements or substitutes, tightening bank lending criteria is driving an increase in the volume of P2P lending loans (Tang, 2019). The shrinking size of bank loans can potentially reduce bank profitability (Yurttadur *et al*., 2019). By implementing strict risk management practices, P2P lending in the loan services industry will cause Indonesian conventional banks to obtain lower credit risks. The loan burden experienced by customers increases when customers have loans from banks and P2P lending. Therefore, the hypothesis is as follows:

H4a. P2P lending, as a moderating variable, weakens the impact of liquidity on the profitability of conventional banks in Indonesia.

H4b. P2P lending as a moderating variable weakens the impact of credit risk on the profitability of Indonesian conventional banks.

3. Research methods

Our population is 46 Indonesian conventional banks listed on the Indonesian Stock Exchange (IDX). We exclude Islamic banks since Islamic banks operate under a different scheme from conventional and P2P lending, known as non-interest-based lending, in order to comply with Islamic Sharia. The sample is selected with the following criteria: (1) the firm belongs to the bank subsector; (2) the firm was not delisted during the observation period; (3) the firm did not engage in acquisition or merger activities; (4) the firm is not a Sharia bank; and (5) the firm had complete data in 2010–2020. The sampling criteria yield 22 sample banks.

This research uses ROA to measure bank profitability since ROA describes the bank's financial condition in a certain period, including aspects of collecting and distributing funds. LDR is the measure of liquidity and it represents a ratio that shows the bank's ability to channel third-party funds. Meanwhile, NPL is a credit risk measure arising from a customer's failure to fulfill their obligations. Table 1 below presents the research variables, proxies of the research variables and their formulations (Hariadi, 2016; Stephani *et al*., 2017; Winarso *et al*., 2020).

Table 1 summarizes all variables that were used for the current study. We processed the data with Stata ver. 14. The following steps run the test of the estimation models. First, the partial test (*t*-test) examined the partial impact of the independent variables on the dependent variable. Second, the moderated regression analysis (MRA) analyzed whether the moderating variable strengthens or weakens the impact of the independent variables on the dependent variable. Third, the dynamic panel data model was estimated using the system generalized method of moments (SYS-GMM). Arellano and Bond (1991) proposed that the lagged levels of the regressors (explanatory variables) are used as instruments. The GMM dynamic panels estimator using moment conditions.

The following are the empirical models for our research using a dependent variable model through the system SYS-GMM:

Table 1. Variable measurement

Variable	Proxy	Scale
Dependent Variable	ROA = $\frac{\text{Net Income}}{\text{Total Asset}}$	Ratio
Profitability		
Independent Variable	LDR = $\frac{\text{Credits Allocated}}{\text{Total Funds Received}}$ x 100%	Ratio
Liquidity		Ratio
Credit Risk	NPL = $\frac{\text{Total NPL}}{\text{Total Credit}}$ x 100%	Ratio
Moderating Variable	Year dummy	Nominal
P2P Lending	1 = After P2P Lending	
	0 = Before P2P Lending	
Control Variable	SIZE = Ln (Total Assets)	Ratio
SIZE	Net Interest Margin	Ratio
NIM	Annual inflation rate	Ratio
INF	Annual GDP growth rate	Ratio
GDP		
Dummy Variable	0 = before P2P lending	Nominal
P2P Lending	1 = after P2P lending	

Source(s): Authors' own work

$$ROA_{i,t} = \beta_0 + \gamma_1 ROA_{i,t-1} + \gamma_2 ROA_{i,t-2} + \beta_1 LDR_{i,t} + \beta_2 NPL_{i,t} + \beta_3 Size_{i,t} + \beta_4 NIM_{i,t} + \beta_5 Inf_{i,t} + \beta_6 GDP_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ROA_{i,t} = \beta_0 + \gamma_1 ROA_{i,t-1} + \gamma_2 ROA_{i,t-2} + \beta_1 LDR_{i,t} + \beta_2 (LDRxNPL)_{i,t} + \beta_3 NPL_{i,t} + \beta_4 Size_{i,t} + \beta_5 NIM_{i,t} + \beta_6 Inf_{i,t} + \beta_7 GDP_{i,t} + \beta_8 P2P_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \beta_0 + \gamma_1 ROA_{i,t-1} + \gamma_2 ROA_{i,t-2} + \beta_1 LDR_{i,t} + \beta_2 (LDR \text{ x } P2P)_{i,t} + \beta_3 NPL_{i,t} + \beta_4 Size_{i,t} + \beta_5 NIM_{i,t} + \beta_6 Inf_{i,t} + \beta_7 GDP_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$ROA_{i,t} = \beta_0 + \gamma_1 ROA_{i,t-1} + \gamma_2 ROA_{i,t-2} + \beta_1 NPL_{i,t} + \beta_2 (NPL \text{ x } P2P)_{i,t} + \beta_3 LDR_{i,t} + \beta_4 Size_{i,t} + \beta_5 NIM_{i,t} + \beta_6 Inf_{i,t} + \beta_7 GDP_{i,t} + \varepsilon_{i,t} \quad (4)$$

This study uses SIZE, NIM, INF and GDP as the control variables and P2P lending as a dummy variable. SIZE indicates banks' total wealth through their total assets. Net interest margin (NIM) measures the difference between banks' interest income and interest expense paid to their depositors. We also include INF and GDP as macroeconomic control variables. $ROA_{i,t}$ refers to the profitability in bank i at time t, $\gamma_1 ROA_{i,t-1}$ is profitability with a period of lag 1 for bank i at time t, $\gamma_2 ROA_{it-2}$ is profitability with a period of lag 2 for bank i at time t and $\varepsilon_{i,t}$ shows the residual regression error for bank i at time t.

Arellano and Bond (1991) proposed that the lagged levels of the regressors (explanatory variables) are used as instruments. The GMM dynamic panel estimator uses the following moment conditions. Based on the GMM procedure, the moment conditions are used to generate consistent and efficient parameter estimates. The consistency of the GMM estimator depends on the specification/diagnostic test. The Arellano–Bond test (AB test) is used for residual serial correlation. Based on the theory, the null hypothesis of the absence of first-order serial correlation (AR1) should be rejected. The absence of second-order serial correlation (AR2) should not be rejected. For a small selection of instruments, the Sarga–Hansen test may

not be able to identify validity violations if we have instruments but still have a tiny sample size. Thus, an alternate method for specification/diagnostic testing could be the Arellano–Bond test (AB test) for residual serial correlation (Law, 2018).

4. Results and discussions

4.1 Descriptive statistics

Our empirical analysis consists of descriptive statistics, panel stationarity tests, and hypothesis testing using SYS-GMM. Table 2 below displays the descriptive statistics of our research variables.

Table 2 suggests that our bank-year observations have a mean ROA of 1. 824 with a standard deviation 1.647. The conventional banks' NPL has a mean value of 2.730 and a standard deviation 1.897. The average mean of NPL is below the regulatory threshold of 5% gross NPL which indicate that on average conventional banks in observations comply to the regulatory indicator of banks' financial health. logSIZE's mean (standard deviation) value is 11.283 (1.668). Further, NIM's mean (standard deviation) value is 5.653% (2.150%). For the macroeconomic control variables, INF's mean (standard deviation) value is 4.457% (2.191%). The lowest (highest) INF is 1.68% (8.38%) in 2020 (2013). Further, GDP's mean (standard deviation) value is 0.047 (0.022%). The lowest (highest) GDP value was −0.021% (0.062%) in 2020 (2010).

4.2 Panel stationary

Panel unit root tests are more powerful than standard time-series unit root tests because the variation across countries adds a lot of information to the variation across time, potentially producing more accurate parameter estimates. This is because the power of unit root tests is dependent on the total variation in the data used. Unlike individual time series unit root tests with non-standard limiting distributions, panel unit root tests have the advantage of having a standard normal asymptotic distribution. The characteristics of panel-based unit root tests have previously been investigated, assuming the data is identically distributed across individual fields (Levin *et al*., 2002). Table 3 highlights the panel stationary tests.

Table 3 presents the stationarity test results, including the level [I(0)]. Almost all variables in level-order are stationary with adjusted t* value ranging from −2.91699 until −11.5122 (p-value <1%). Our findings indicated that panels are stationary.

4.3 Model measurement

Our findings are organized according to the dynamic panel data equation to test each of the four hypotheses. The results can be seen in Table 4.

Table 4 highlights that liquidity does not significantly affect banks' profitability (coefficient = −0.0075407 and p-value of 0.478 > z). Meanwhile, credit risk significantly and negatively affects banks' profitability (coefficient = −0.549 and p-value of 0.000 < z).

Table 2. Descriptive statistics of the research variables

Variable	Obs.	Mean	Std. dev.	Min	Max
ROA	220	1.824	1.647	−11.150	5.150
LDR	220	83.898	14.924	39.330	163.000
NPL	220	2.730	1.897	0.000	15.820
SIZE	220	11.283	1.668	7.359	14.292
NIM	220	5.653	2.150	−0.470	14.100
INF	220	4.457	2.191	1.680	8.380
GDP	220	0.047	0.022	−0.021	−0.062

Source(s): Authors' own work

Table 3. Panel stationary tests

Variable	Adjusted t	*p*-value	Conclusion
LDR	−2.9872	0.0014***	Panel is stationary
NPL	−11.5122	0.0000***	Panel is stationary
SIZE	−5.2171	0.0000***	Panel is stationary
NIM	−2.9169	0.0018***	Panel is stationary
INF	−3.8063	0.0001***	Panel is stationary
GDP	−3.8658	0.0001***	Panel is stationary

Note(s): *** indicate significance at 1% level
Source(s): Authors' own work

Table 4. System GMM results for the first equation

Dependent variable: ROA Variables/statistics	Coef.	z	p>|z|
L1.ROA	0.2341993	2.97	0.003***
L2.ROA	−0.1567179	−3.88	0.000***
LDR	−0.0075407	−0.71	0.478
NPL	−0.747937	−8.94	0.000***
SIZE	0.3596238	2.58	0.010***
NIM	0.2012846	1.90	0.058*
INF	−0.0744718	−1.85	0.064*
GDP	6.56531	1.87	0.061*
AB test AR(1)	−2.2796 (0.0226)**		
AB test AR(2)	0.27466 (0.7836)		

Note(s): *, **, *** indicate significance at 10%, 5% and 1% levels
Source(s): Authors' own work

Thus, hypothesis 1a is rejected, while hypothesis 1b is supported. As for control variables, bank size significantly affects banks' profitability. Larger banks tend to experience a higher profit. Other control variables do not significantly affect banks' profitability for $\alpha = 1\%$ but are significant for lower α (10%). Moreover, System GMM Results for the second equation can be shown in Table 5.

Table 5 indicates that the interaction between credit risk and liquidity (LDRNPL) has no significant effect on banks' profitability. There is insufficient evidence to support the hypothesis that higher credit allocations (low liquidity) will increase banks' profit when the credit risk is lower. Inflation is the only control variable that has a 1% level of significance. A lower bank's profitability occurs when there is a rise in inflation. Moreover, the SYS-GMM coefficient shows that P2P lending does not affect banks' profitability. Thus, hypotheses 2 and 3 are not supported. Further, System GMM Results for the third equation can be presented in Table 6.

Further, Table 6 indicates that P2P lending does not moderate liquidity's effect on Indonesian banks' performance, suggesting that hypothesis 4a is not supported. Inflation is the only control variable negatively significant at 1%, affecting a bank's profitability. System GMM Results for the fourth equation can be shown in Table 7.

Table 7 suggests that the coefficient regression of credit risk is −0.5691317. Further, P2P lending weakens the effect of credit risk on Indonesian banks' performance (−0.1736365), implying that hypothesis 4b is supported. This is in line with the statement of Roure *et al.* (2018), which states that the emergence of P2P lending may cause the banking sector to shrink

Table 5. System GMM results for the second equation

Dependent variable: ROA Variables/statistics	Coef.	z	p>|z|
L1.ROA	0.2041542	2.39	0.017**
L2.ROA	−0.1704811	−3.89	0.000***
LDR	0.0070449	0.44	0.657
LDR*x*NPL	−0.0026701	−1.37	0.169
NPL	−0.5054965	−2.91	0.004***
SIZE	0.4757452	2.28	0.022**
NIM	0.2489193	2.23	0.026**
INF	−0.1286867	−3.46	0.001***
GDP	5.187515	1.37	0.170
P2P	−0.4440396	−1.19	0.232
AB test AR(1)	−2.2398 (0.0251)**		
AB test AR(2)	0.54343 (0.5868)		

Note(s): *, **, *** indicate significance at 10%, 5% and 1% levels
Source(s): Authors' own work

Table 6. System GMM results for the third equation

Dependent variable: ROA Variables/statistics	Coef.	z	p>|z|
L1.ROA	0.2033695	2.47	0.013**
L2.ROA	−0.1696829	−3.93	0.000***
LDR	0.002067	0.19	0.848
LDR*x*P2P	−0.0060937	−1.48	0.140
NPL	−0.7281615	−8.07	0.000***
SIZE	0.4913217	2.51	0.012**
NIM	0.2351229	2.17	0.030**
INF	−0.1453763	−3.93	0.000***
GDP	6.473455	1.83	0.068*
AB test AR(1)	−2.2252 (0.0261)**		
AB test AR(2)	0.54631 (0.5849)		

Note(s): *, **, *** indicate significance at 10%, 5% and 1% levels
Source(s): Authors' own work

and become less risky and perhaps more profitable in terms of risk-adjusted returns on assets. The welfare implications of this contraction due to a shift in credit supply from banks to non-bank lenders may produce welfare effects through its impact on the operations of these borrowers. This effect is relatively small, but whether it will occur on a broader scale in credit markets is a promising topic for future research. The findings may indicate that individuals use P2P lending as a substitute to look for sources of financing other than banks. Thus, credit distribution carried out by banks shows different conditions when referring to liquidity and credit risk.

The parameter consistency analysis comes next as a specification test. The Arellano–Bond (AB) test was used to carry it out (Baltagi *et al*., 2009). AR(1) shows a *p*-value of 0.0226 < 0.05 for the first equation. The AR(2) highlights the *p*-value 0.7836 > 0.05. For the second equation, AR(1) presents the *p*-value 0.0251 < 0.05). The AR(2) reveals the *p*-value 0.5868 > 0.05. AR (1) indicates the *p*-value 0.0261 < 0.05 for the third equation. The AR(2) describes the *p*-value

Table 7. System GMM results for the fourth equation

Variables/statistics	Coef.	z	P>|z|
L1.ROA	0.2172146	2.76	0.006***
L2.ROA	−0.1615667	−4.02	0.000***
NPL	−0.5691317	−4.03	0.000***
NPL*x*P2P	−0.1736365	−2.21	0.027**
LDR	−0.0050382	−0.47	0.639
SIZE	0.427858	2.83	0.005**
NIM	0.2172958	2.00	0.046**
INF	−0.1165449	−3.50	0.000***
GDP	6.477461	1.83	0.068*
AB test AR(1)	−2.3196 (0.0204)**		
AB test AR(2)	0.3895 (0.6969)		

Note(s): *, **, *** indicate significance at 10%, 5% and 1% levels

Source(s): Authors' own work

0.5849 > 0.05. AR(1) denotes the *p*-value 0.0204 < 0.05 for the fourth equation. The AR(2) exhibits the *p*-value 0.6969 > 0.05. These are correct and follow GMM theory (Law, 2018).

In addition, robustness testing is carried out to determine the ability of an analysis technique to maintain initial analysis. For example, Robust Least Squares (RLS) and Two-Stage Least Square (2-SLS) that presented in Table 8.

As estimated in the baseline specification, the findings correspond closely to the actual outcomes. This research concluded that the results are robust to using robust least squares and two-stage least square. Along with the consistency between system GMM, robust least squares and two-stage least square, the results indicated that the heterogeneity and endogeneity issues in the data do not appear. This methodological robustness enhances the findings' reliability and strengthens the conclusion's validity.

4.4 Discussions

Before the inclusion of P2P lending in the first equation, our findings show that while credit risk affects banks' profitability (hypothesis 1b accepted), there is no support for the impact of liquidity on banks' profitability (hypothesis 1a rejected). Higher credit risk reduces banks' profitability, implying an increase in banks' loan loss provisions. Banks ought to absorb losses due to borrowers' default by providing sufficient loan loss provisions, which will decrease banks' profit. Moreover, excessive loan defaults may deteriorate banks' capital and health (Berger and De Young, 1997). The increase associated costs related to management of troubled loans may also reduce banks' profitability. By having prudential credit risk management banks may reduce the severity of credit risk impact by conducting rigorous loan assessment, diversification of risk by constructing bank loans portfolio and proper loan quality monitoring. Reducing concentration risk by adhering to legal lending limit regulation by Indonesian FSA may lessen the severity of credit risk impact on banks' profitability. In addition, implementing various type of diversification such as geographic diversification, sectoral diversification and other type of diversification may reduce the severity of bank credit risk thus limiting the impact of credit risk on banks' profitability.

After including P2P lending in the second equation, neither hypothesis 3 nor hypothesis 4a is supported. Our findings are consistent with prior studies (Do *et al*., 2020; Ozili, 2020; Ozili and Adamu, 2021). Credit cannot be disrupted in the banking industry if banks are selective in disbursing credit, mainly when banks focus much on NPL (Siek and Sutanto, 2019). In addition, according to Yeo and Jun (2020), P2P lending might reduce banks' exposure to risky loans and interim liquidity needs, which tend to be better served by P2P lending platforms. Banks earn income from various source such as traditional lending, investment banking,

Table 8. Robust least squares (RLS) and two-stage least square results (2SLS)

Variables	Model 1 RLS Coef.	Prob.	2-SLS Coef.	Prob.
LDR	−0.012035	0.0006***	−0.010904	0.1312
NPL	−0.249773	0.0000***	−0.625074	0.0000***
SIZE	0.347248	0.0000***	0.319652	0.0000***
NIM	0.243561	0.0000***	0.177198	0.0027***
INF	0.018857	0.4598	0.076859	0.4852
GDP	10.12210	0.0001***	−12.53767	0.4379

Variables	Model 2 RLS Coef.	Prob.	2-SLS Coef.	Prob.
LDR	−0.002581	0.5750	−0.009186	0.1027
LDR*x*NPL	−0.003804	0.0052***	0.000803	0.6257
NPL	0.073809	0.5570	−0.551307	0.0001***
SIZE	0.361807	0.0000***	0.276601	0.0000***
NIM	0.226275	0.0000***	0.210183	0.0000***
INF	−0.037378	0.2968	−0.080281	0.0699*
GDP	10.01886	0.0001***	5.180859	0.1181
P2P	−0.366633	0.0173**	−0.500467	0.0174**

Variables	Model 3 RLS Coef.	Prob.	2-SLS Coef.	Prob.
LDR	−0.007541	0.0745*	−0.010629	0.0782*
LDR*x*P2P	−0.004321	0.0223**	−0.003038	0.2918
NPL	−0.239863	0.0000***	−0.564759	0.0000**
SIZE	0.356978	0.0000***	0.276331	0.0000***
NIM	0.234996	0.0000***	0.119006	0.0089**
INF	−0.040785	0.2698	−0.170529	0.0036***
GDP	9.624930	0.0005***	28.96994	0.0009***

Variables	Model 4 RLS Coef.	Prob.	2-SLS Coef.	Prob.
NPL	−0.140588	0.0020***	−0.252604	0.0000***
NPL*x*P2P	−0.142269	0.0009***	−0.295139	0.0000***
LDR	−0.011898	0.0004***	−0.008677	0.0332**
SIZE	0.351292	0.0000***	0.261323	0.0000***
NIM	0.240373	0.0000***	0.201576	0.0000***
INF	−0.033580	0.2760	−0.108459	0.0030***
GDP	9.140110	0.0005***	3.854933	0.2170

Note(s): *, **, *** indicate significance at 10%, 5% and 1% levels

Source(s): Authors' own work

wealth management and other fee-based income services. By having various sources of income banks are less reliant on income from lending. Although P2P may take some of banks' market share but there is a possibility of banks expand their business to other areas such as

digital banking, fee-based services and bundling bank and insurance products through bancassurance model. The findings may indicate that instead of substituting banks' role, P2P lending plays a complementary role in Indonesian financial system. We leave this as a subject of further research.

Our findings show no support for hypothesis 4a. P2P lending does not moderate liquidity's effect on Indonesian banks' performance. The findings indicate that the competition from P2P lending platforms does not pressure banks to reduce liquidity. This might relate to the fact that P2P lending mainly focuses on unbankable segments (different clientele), causing lax control of lending mechanisms and higher default rates that negatively affect P2P lending firms' performance (Zohar, 2015). Aside of different target market as possible reason for inexistence of liquidity effect on banks profitability, banks diversified business model and economics of scale positioned banks in a better situation in terms of liquidity. This contradicts the findings of Phan *et al*. (2020), which show that fintech has a negative and significant impact on banks' performances in Indonesia. This study shows that despite P2P lending, there is no evidence that banks might experience low liquidity (high LDR), which affects their profitability. Banks seem not to utilize their entire funds to provide loans to the public. Hence, they do not lead to tight liquidity for higher expected profits despite lower public funds (Wolfe and Yoo, 2017).

In contrast, there is support for hypothesis 4b. P2P lending moderates the effect of credit risk on Indonesian bank performance. Banks are able to reduce the negative impact of credit risk on profits by shifting high-risk borrowers to P2P platforms, so that banks only have low-risk customers. In addition, banks can direct loans to customers with better borrower behavior by implementing better credit assessment methods. This will have an impact on the process of determining better loan interest rates. The presence of P2P lending encourages banks to focus on their core lending strengths on less risky but more profitable customer segments by leveraging economies of scale and better loan evaluation and monitoring capabilities supported by technology.

These findings indicate that P2P lending drives Indonesian conventional banks to accrue lower credit risk by implementing stringent risk management practices. The negative effect of P2P lending on the impact of credit risk on banks' profitability might be attributable to the similarity of the products offered between this platform and banks. P2P lending may reduce the banking industry's market share (Suryono *et al*., 2021; Jiang *et al*., 2021; Tang, 2019; Vives, 2019; Wolfe and Yoo, 2017). Banks may lower their credit risk through a more prudent risk management practice to preserve their market share, specifically in lending decisions. According to Utami *et al*. (2021), communication between businesses and customers is crucial for businesses to align their priorities with customer needs and increase the uptake of fintech.

5. Conclusions

This study investigates the effects of liquidity and credit risk on banks' profitability before and after P2P lending. The results demonstrate that credit risk negatively affects bank profitability before including P2P lending. In addition, P2P lending negatively weakens the relationship between credit risk and banks' profitability. P2P lending drives Indonesian conventional banks to accrue lower credit risk by implementing stringent risk management practices. This study supports the intermediation theory, suggesting that banks and fintech providers can enhance their efficiency in serving customers by channeling funds more effectively, each focusing on their respective market segments and that Indonesian banks should effectively implement prudential risk management to preserve their performance, especially in response to advances in financial technology. Practicing sound risk management might reduce banks' liquidity and credit risk when competing with P2P lending providers. Moreover, the collaboration between banks and P2P lending providers is expected to accelerate the financial inclusion of unbanked society with prudential management. From a regulatory standpoint, a stronger collaboration between the Indonesian Central Bank and the FSA is crucial to setting a level playing field for players in the Indonesian financial system. In addition, the collaboration between the

regulators of the Indonesian financial system will increase customer protection and financial literacy.

Regarding practical or research implications, this research provides a solid foundation for ensuring healthy competition between banks and fintech is regulatory cooperation and robust risk management. To create a level playing field between banks and P2P lending provider, FSA may introduce reporting obligations for P2P lenders regarding loan default rates, capital adequacy (if applicable) and concentration risks. In addition, regulations to reduce information asymmetry and improve risk pricing may also be issued to encourage data portability and interoperability which allows banks and P2P platforms to share credit histories responsibly. In the era of technology advancement, it is also possible for regulators to encourage banks to leverage artificial intelligence and big data to streamline credit scoring and automate underwriting. Finally, regulator may also issue regulations that monitor interconnectedness between P2P platforms and banks, especially where banks are funding or collaborating with P2P firms.

This study is subject to a caveat. In our analysis, we cannot obtain detailed secondary data on P2P lending in the form of Rupiah (IDR). Thus, our analysis is conducted using a nominal scale of measurement in the form of a dummy variable to determine the effect of P2P lending. We leave it to future studies to investigate this issue, provided there is access to the higher-order measurement scale for P2P lending data.

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Further reading

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