Bank Risk-Taking and Market Discipline During the COVID-19 Pandemic

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Abstract

This study examines the impact of the COVID-19 pandemic and bank risk-taking behavior on depositor market discipline and interbank deposits in Indonesia. Using purposive sampling, the study analyzed 35 banks listed on the Indonesia Stock Exchange from 2013 to 2022 based on quarterly data. After removing outliers, 1,400 observations were analyzed using static panel data and ordinary least squares regression. The results provide evidence of market discipline in Indonesian banks, reflected in the significant effect of deposit costs on bank liquidity risk, which strengthened during the COVID-19 pandemic. In contrast, interbank discipline declined. Market discipline among foreign banks disappeared during the pandemic, while it strengthened among domestic banks. Before COVID-19, foreign banks were more aggressive in lending; however, during the crisis, they had lower credit risk and higher profitability than domestic banks, indicating greater efficiency. These findings provide valuable insights for regulators and central banks in developing banking and capital market policies that address liquidity, solvency, profitability, and management risks.

Keywords: bank risk-taking behavior; COVID-19 pandemic; depositor market discipline and interbank deposits; domestic banks; foreign banks

I. INTRODUCTION

As a global pandemic, the Coronavirus disease (COVID-19) has wreaked havoc on the economic and financial markets [Goodell & Goutte, 2021]. They emphasized that the COVID-19 epidemic caused extraordinary worldwide economic devastation in most countries, including Indonesia. [Shehzad et al., 2020] provide evidence that COVID-19 was the primary cause of the global financial crisis. They found that COVID-19 had a greater influence than the Global Financial Crisis (GFC) on variations in US, German, and Italian stock markets. However, the Great Financial Crisis had a more significant impact on the financial volatility of the Nikkei 225 and SSEC indices than COVID-19. The Indonesian Stock Exchange (IDX) reacted strongly, as evidenced by the Composite Stock Price Index (IHSG) falling sharply on March 24, 2020, to 3,937.63, a reduction of around 32.42% [Bursa Efek Indonesia, 2020]. To address the 2019 COVID pandemic, the Indonesian government adopted a Large-Scale Social Restrictions (PSBB) policy on March 31, 2020,

equivalent to a lockdown. Lockdown regulations drove enterprises and consumers into a solvency and liquidity crisis [Bartik et al., 2020].

The Basel Committee on Banking Supervision [Basel, 2010] implemented banking reforms in response to the 1997-1998 crisis (Basel II) and the 2008-2009 global financial crisis (Basel III). Each has a unique background, namely the changes that occurred in the banking industry and financial markets, including the financial crisis that occurred in Southeast Asia and South Asia in 1997-1998, which was caused by a lack of capital adequacy, wide variations in RWA between banks, very high leverage, and liquidity. During the 2008-2009 financial crisis, there was a crunch. As a result, banks must be able to assess the impact of COVID-19 on their intermediation responsibility, which includes allocating credit to ensure economic growth, minimizing credit risk, and maintaining capital adequacy and liquidity. The COVID-19 situation has highlighted concerns about whether the market is effectively disciplining banks' risky behavior, given that banks must continue to support the actual economy, which can reduce their capital positions and financial health. This is because banks help to maintain credit flows in the face of government-mandated initiatives.

Basel II focuses on bank risk-taking and punishing bank conduct. Pillar 3 (market discipline) of the Basel II Capital Accord requires banks to be transparent and offer information that allows market participants to assess the banks' health and stability. The rationale for market discipline is that banks known or considered healthy are more likely to be favored by investors, creditors, and depositors than banks that are known or considered fragile [Tarbert, 2000]. If a bank's risk level is excessively high, market participants may withdraw existing investments or refuse to invest in them [Park, 1995]. Godspower-Akpomiemie & Ojah [2021] state that the finest market discipline in emerging countries comes from external stakeholders and the banking industry itself.

This study investigates the efficiency of depositor market discipline and interbank discipline by identifying elements that can strengthen and improve their reliability before and throughout the COVID-19 period. Depositors account for the majority of bank deposits [Keeley, 1990], whereas lending banks are risk-averse because interbank deposits are not guaranteed [Nier & Baumann, 2006]. Aside from that, we believe bank ownership can impact market discipline. We anticipate that market discipline will be more prevalent among foreign banks than domestic banks. This is because international banks are regulated by domestic and host country regulators, and they have better governance, which allows market discipline to function more effectively than domestic banks [Hadad et al., 2011].

II. METHOD

A. Data

The research requires quarterly financial reports to gather CAMEL component data. The Financial Services Authority (https://www.ojk.go.id), Bank Indonesia (https://www.bi.go.id/id/default.aspx), and the Indonesian Stock Exchange (http://www.bei.co.id) websites were used to obtain research data. Observations were made on banks that went public on

the Indonesia Stock Exchange between Q1 2013 and Q4 2022, separated into the normal and COVID-19 periods. Extreme data were excluded from the sample, yielding a total of 35 listed banks and 1400 observations per bank-quarter. We separated the sample into two time periods: the pre-COVID-19 period (Q1/2013-Q4/2019) and the COVID-19 period (Q1/2020-Q4/2022). In addition, we extract shareholding data to identify majority shareholders to account for foreign-controlled institutions.

B. Operationalization of Research Variables

In the empirical model, the author will examine the role of bank risk characteristics in explaining market behavior to discipline banks. In this study, the dependent variable is the response of depositors, who are the bank's largest fund owners, and the interbank response, which is an appropriate measure of market discipline in developing countries [Godspower-Akpomiemie & Ojah, 2021], while the independent variable is a risk variable that reflects the bank's risk-taking behavior. Depositor reactions are represented by changes in the total value of savings (Dit - Dit-1)/Dit, while interest expenses are normalized by total deposits (interest expense/total deposits). Furthermore, interbank interactions are measured as the money lent split by loans [Godspower-Akpomiemie & Ojah, 2020; Martinez Peria & Schmukler, 2001]. Meanwhile, the financial ratios used in the CAMEL grading system serve as proxies for bank risk-taking.

This study will also utilize control variables, commonly used in research on this topic, to adjust for other variables that potentially alter the association between bank risk-taking behavior and market discipline. The bank control elements employed include managing bank size using the natural log of total assets, or LnTA. This control variable has also been utilized by [Hadad et al., 2011, Martinez Peria & Schmukler; 2001; Cubilas et al., 2012; Distinguin et al., 2012]. GDP growth ([Hadad et al., 2011; Martinez Peria & Schmukler; 2001; Cubilas et al., 2012; Distinguin et al., 2012] and inflation (Hadad et al., 2011; Martinez Peria & Schmukler; 2001] are used to assess economic factors. Table 1 defines each research variable.

Table 1 Variable Descriptions

Variable Name	Description
GDeposit	Deposit growth represents changes in bank deposits over a quarterly period.
CostDep	The implicit interest rate is calculated by dividing total interest expenses by total deposits.
IntBR	The interbank ratio is the amount of money lent to other banks divided by the amount borrowed from other banks. If it is more than 1.0, it indicates that the bank is a provider of funds rather than a borrower in the market, making it more liquid.
EQTA	The ratio of equity to total assets.
LLPTA	The ratio of loan-loss provision to total assets is a proxy for credit risk.
NETA	The ratio of non-interest expense to total assets is used as a proxy for management performance.
ROA	Return on Assets is defined as the ratio of earnings before interest and taxes to average total assets.

CTA	Cash and cash equivalents to total assets are a proxy for liquidity risk.
LATA	The ratio of liquid assets to total assets is a proxy for liquidity risk.
SIZE	The natural logarithm of total assets
GDP	Rate of growth in real GDP
INFL	Inflation is the quarterly inflation rate

C. Regression Models

Banks always publish firm information with a delay, resulting in market data that is outdated (lag). Depositors and other players will react based on the information provided. We employ multivariate regression to fulfill our study goals by examining the presence of market discipline. This is characterized by the importance of the market reaction to bank risk-taking behaviour. We propose three models to investigate market discipline: deposits, interest rates, and interbank deposits. We use the following equation to quantify the responsiveness of deposits to bank risk-taking:

$$GDeposit_{it} = \beta_0 + \beta_1 CAMEL_{it-1} + \gamma_i\, BankControl_{it-1} + \delta_i MacroControl_{it-1} + \varepsilon_{it} \quad \text{.....(1)}$$

The following equation can be used to examine depositors disciplining bank risk-taking by demanding higher interest rates:

$$CostDep_{it} = \beta_0 + \beta_1 CAMEL_{it-1} + \gamma_i\, BankControl_{it-1} + \delta_i MacroControl_{it-1} + \varepsilon_{it} \quad \text{..... (2)}$$

To examine interbank deposits discipline bank risk-taking, the following equation is used:

$$IntBR_{it} = \beta_0 + \beta_1 CAMEL_{it-1} + \gamma_i\, BankControl_{it-1} + \delta_i MacroControl_{it-1} + \varepsilon_{it} \quad \text{..... (3)}$$

Where:

$GDeposit_{it}$, $CostDep_{it}$, $IntBR_{it}$ is the variable market discipline carried out by depositors and owners of interbank deposits at bank i and time t.

$CAMEL_{it-1}$ is the bank risk variable represented by capital, asset quality, management, earnings, and liquidity at the bank i and time lag t-1.

$BankControl_{it-1}$ is a bank control variable at bank i and time t-1. This variable is proxied by log normal total assets.

$MacroControl_{it-1}$ is economic control at bank i and time t-1 as measured by GDP growth and inflation.

III. RESULTS AND DISCUSSIONS

A. Results

1. Descriptive Analysis

Table 2 shows a descriptive analysis of market discipline characteristics and bank risk-taking before and during COVID-19 for all banks and subsamples of foreign and domestic ownership. We

check for outliers and verify that variable standard deviations are within the minimum and maximum ranges to prevent bias in regression results.

The market discipline variables deposit growth (GDeposit), cost of deposits (CostDep), and interbank deposits (IntBR) have a mean of -0.0088, 0.0476, and 0.8827, respectively, while during the crisis they were 0.0159, 0.0327, and 0.8966. Meanwhile, the bank risk variables before the COVID-19 period were EQTA (0.1770), LLPTA (0.0119), NETA (0.0303), ROA (0.0123), CTA (0.0111), and LATA (0.2925), while during the COVID-19 period, each type of risk was consecutive. -continuously has a mean of (0.2117); (0.0222); (0.0286); (0.0046); (0.0074); and (0.3444). Overall, what is interesting is that savings growth increased by around 81%. The contribution to the increase in domestic savings was 136%, but there was a decline in growth in foreign savings of 13%. Credit risk (LLPTA) during the crisis increased to about double compared to before the crisis, while profitability (ROA) decreased two and a half times. It seems that the credit risk contribution of foreign banks (0.0171) is about twice as high as the credit risk of domestic banks (0.0092) or plays a role of around 65%. On the other hand, during the crisis, the credit risk of domestic banks increased by more than two times or to 0.0204 and the increase was greater than the increase in risk of foreign banks which was only around one and a half times or to 0.0257. The decline in ROA for foreign banks was 49.56%, which was lower than domestic banks' 68.50%. This indicates that foreign banks had higher credit risk before the crisis period but during the crisis, they were able to manage their credit policies optimally, which was shown to have lower risk so that their profitability was better, in other words, foreign banks were more efficient. The other risks are relatively the same.

Table 2 Descriptive Analysis for Pre-COVID-19 and COVID-19 Periods

	Pre-COVID-19 (period Q1/2013 - Q4/2019)					COVID-19 (Period Q1/2020 - Q4/2022)				
	Mean	Maximum	Minimum	Std. Dev.	Obs	Mean	Maximum	Minimum	Std. Dev.	Obs
All Banks:										
	DEPENDENT VARIABLES					DEPENDENT VARIABLES				
GDeposit	-0.0088	0.9360	-14.1028	0.6764	980	0.0159	0.6911	-1.9370	0.1616	420
CostDep	0.0476	0.9594	0.0016	0.0548	980	0.0327	0.6495	0.0001	0.0385	420
IntBR	0.8827	13.6928	-5.6271	2.7022	980	0.8966	12.2368	-4.3311	2.6678	420
	INDEPENDENT VARIABLES					INDEPENDENT VARIABLES				
EQTA	0.1770	0.8904	0.0404	0.1147	980	0.2117	0.8809	0.0317	0.1395	420
LLPTA	0.0119	0.1510	0.0001	0.0123	980	0.0222	0.1143	0.0002	0.0183	420
NETA	0.0303	0.6999	0.0010	0.0325	980	0.0286	0.2543	0.0001	0.0289	420
ROA	0.0123	0.4000	-0.1352	0.0220	980	0.0046	0.0529	-0.1589	0.0271	420
CTA	0.0111	0.0403	0.0007	0.0065	980	0.0074	0.0291	0.0001	0.0048	420
LATA	0.2925	0.7369	0.0036	0.0950	980	0.3444	0.8190	0.0881	0.1399	420
	CONTROL VARIABLES					CONTROL VARIABLES				
SIZE	16.5029	20.5905	0.0156	1.9065	980	17.1400	20.9540	13.7346	1.5419	420
GDP	0.0509	0.0557	0.0466	0.0023	980	0.0412	0.1173	-0.0419	0.0435	420
INFLATION	0.0476	0.0860	0.0262	0.0183	980	0.0260	0.0555	0.0143	0.0141	420
Domestic Banks:										
	DEPENDENT VARIABLES					DEPENDENT VARIABLES				
GDeposit	-0.0252	0.9360	-14.1028	0.8311	644	0.0195	0.6911	-1.9370	0.1764	276
DepCost	0.0514	0.9594	0.0021	0.0651	644	0.0318	0.1091	0.0001	0.0215	276
INTBR	0.8911	11.6892	-5.6271	2.4464	644	1.2232	12.2368	-4.3311	3.0734	276
	INDEPENDENT VARIABLES					INDEPENDENT VARIABLES				
EQTA	0.1680	0.5223	0.0682	0.0760	644	0.2170	0.8809	0.0317	0.1614	276

LLPTA	0.0092	0.0575	0.0001	0.0077	644	0.0204	0.1143	0.0002	0.0203	276
NETA	0.0270	0.3365	0.0017	0.0226	644	0.0261	0.2543	0.0001	0.0253	276
ROA	0.0127	0.1279	-0.0747	0.0154	644	0.0040	0.0529	-0.1589	0.0306	276
CTA	0.0111	0.0403	0.0007	0.0069	644	0.0073	0.0291	0.0001	0.0051	276
LATA	0.3023	0.7369	0.0527	0.0983	644	0.3607	0.8190	0.0881	0.1528	276
		CONTROL VARIABLES					CONTROL VARIABLES			
SIZE	16.1014	20.5905	0.0156	1.8276	644	16.8233	20.9540	13.7346	1.4691	276
GDP	0.0509	0.0557	0.0466	0.0023	644	0.0412	0.1173	-0.0419	0.0435	276
INFLATION	0.0476	0.0860	0.0262	0.0183	644	0.0260	0.0555	0.0143	0.0141	276
Foreign Banks:										
		DEPENDENT VARIABLES					DEPENDENT VARIABLES			
GDeposit	0.0225	0.4957	-0.3481	0.0988	336	0.0090	0.3319	-0.6506	0.1290	144
CostDep	0.0403	0.2647	0.0016	0.0236	336	0.0344	0.6495	0.0045	0.0588	144
IntBR	0.8666	13.6928	-4.5781	3.1387	336	0.2706	4.0614	-2.3202	1.4450	144
		INDEPENDENT VARIABLES					INDEPENDENT VARIABLES			
EQTA	0.1942	0.8904	0.0404	0.1640	336	0.2016	0.5135	0.0798	0.0822	144
LLPTA	0.0171	0.1510	0.0005	0.0169	336	0.0257	0.0542	0.0062	0.0131	144
NETA	0.0366	0.6999	0.0010	0.0453	336	0.0333	0.2327	0.0046	0.0344	144
ROA	0.0115	0.4000	-0.1352	0.0309	336	0.0058	0.0349	-0.0850	0.0189	144
CTA	0.0110	0.0338	0.0011	0.0056	336	0.0075	0.0209	0.0005	0.0041	144
LATA	0.2738	0.6874	0.0036	0.0855	336	0.3130	0.5884	0.1285	0.1047	144
		CONTROL VARIABLES					CONTROL VARIABLES			
SIZE	17.2724	19.4146	11.9813	1.8187	336	17.7469	19.5432	14.9528	1.5003	144
GDP	0.0509	0.0557	0.0466	0.0023	336	0.0412	0.1173	-0.0419	0.0436	144
INFLATIOAN	0.0476	0.0860	0.0262	0.0183	336	0.0260	0.0555	0.0143	0.0142	144

This table summarizes the research variables for all banks, including domestic and foreign banks. This analysis includes quarterly observations of banks that went public on the Indonesia Stock Exchange between 2013 and 2022. The dependent variables are GDeposit (growth in depositor savings), CostDep (comparison of

total interest expenses to total deposits), and IntBR. The independent variables are EQTA (equity to total assets); LLPTA (ratio of loan loss reserves to total assets), which is a proxy for credit risk; NETA (ratio of non-interest expenditure to total assets), ROA (return on assets), CTA (The Cash and cash equivalents to total assets), LATA (ratio of liquid assets to total assets), which are proxies for liquidity risk. Control variable SIZE (Natural log of total assets); general macroeconomic conditions include GDP growth as the GDP growth rate and INFL as the inflation rate.

2. Correlation Analysis

The Pearson correlation coefficient for all banks that went public on the Indonesia Stock Exchange throughout the research period is shown in Table 3. This table's rows and columns demonstrate the connection between the dependent variables GDeposit, CostDep, and IntBR, which are proxy variables for market discipline, and each independent variable of bank risk behavior represented by CAMEL. We discovered that for all banks, all independent factors of CAMEL bank risk behavior were not significantly connected with the GDeposit variable, implying that depositor discipline does not exist. However, the depositor discipline variable utilizing GDeposit is still relevant since it will be investigated further to distinguish between market discipline in international and domestic banks. Meanwhile, the ROA and CTA variables have a significant negative correlation with bank deposit costs (CostDep). Meanwhile, interbank savings (IntBR) have a significant positive correlation with capital risk (EQTA), earnings (ROA), and liquid assets (LATA) but have a significant negative correlation with CTA. Overall, these results show the existence of market discipline in Indonesian banking.

The correlation between SIZE and CostDep is negative and significant in the expected direction but not strong. The control variable GDP also significantly correlates with CostDep but not with the inflation variable (INFL). Almost all independent variables are significantly correlated with interbank savings.

Almost all correlations between independent variables are statistically significantly correlated with weak or even very weak correlation values. Thus, it can be ascertained that multicollinearity is not a serious problem.

Table 3 Pearson Correlations

	GDeposit	CostDep	IntBR	EQTA	LLPTA	NETA	ROA	CTA	LATA	SIZE	GDP	INFL
GDeposit	1											
CostDep	-0.729***	1										
IntBR	0.080**	-0.101***	1									
EQTA	-0.007	-0.033	0.536***	1								
LLPTA	0.044	-0.049	-0.016	-0.022	1							
NETA	0.026	-0.027	0.024	0.118***	0.329***	1						
ROA	0.004	-0.076**	0.162***	0.128***	-0.317***	-0.264***	1					
CTA	0.020	-0.116***	-0.073**	-0.046	-0.015	0.134***	0.104***	1				
LATA	-0.035	-0.007	0.203***	0.277***	-0.075**	0.014	-0.028	0.021	1			
SIZE	0.038	-0.140***	-0.150***	-0.443***	0.229***	-0.079**	0.158***	0.149***	-0.148***	1		
GDP	0.039	-0.062*	-0.056*	-0.002	-0.042	0.051	0.150***	0.007	0.038	-0.077**	1	
INFL	-0.011	0.050	-0.057*	-0.105***	-0.223***	-0.029	0.116***	0.123***	0.029	-0.115***	0.143***	1

Notes: This table presents the correlation between research variables. Quarterly observations of banks listed on the Indonesia Stock Exchange during the 2013–2022. The dependent variables are GDeposit (growth in depositors' savings), CostDep (comparison of total interest expenses to total deposits), and IntBR (comparison of deposits at other banks to deposits at other banks). The independent variables include EQTA (equity to total assets); LLPTA (ratio of loan loss reserves to total assets), which is a proxy for credit risk; NETA (ratio of non-interest expenditure to total assets), ROA (return on assets), CTA (The Cash and cash equivalents to total assets), LATA (ratio of liquid assets to total assets), which are proxies for liquidity risk. Control variable SIZE (Natural log of total assets); general macroeconomic conditions include GDP growth as the GDP growth rate and INFL as the inflation rate. Statistical significance is shown by the superscript asterisks ***, **, and * at < 1%, < 5%, and < 10% levels, respectively.

B. Discussions

1. Market Discipline Periode Pre-COVID-19

Table 4 displays the regression findings for all institutions, including domestic and foreign banks, before COVID-19. We begin by examining whether market discipline existed in Indonesian banks during the study period. The model results for all banks before COVID-19 show that, in Indonesia, depositors use deposit interest charges (CostDep) to discipline bank risk-taking and interbank discipline.

There is no substantial CAMEL component in Gdeposit savings, but the cash-to-assets (CTA) coefficient is negative and large for CostDep. Increasing the cash-to-asset ratio or bank liquidity has a negative correlation with deposit fees, implying that deposit costs are falling in Indonesian banks. Before the crisis, depositors at Indonesian banks appeared to respond to the banks' increased risk-taking (i.e., lower liquidity-to-asset ratios) by raising deposit rates. This conclusion demonstrates market discipline; depositors will punish banks with low asset liquidity by increasing deposit fees (as in Hadad et al. (2011), Martinez Peria & Schmukler (2001); Cubilas et al. (2018)).

Before the crisis, interbank discipline (IntBR) was discovered utilizing capital (EQTA), profitability (ROA), and liquidity (LATA), all with strong positive coefficients. Improving the equity-to-asset ratio or lowering bank capital risk has a favorable relationship with increased interbank deposits in Indonesia. Interbank depositors appear to limit their deposits in response to banks' increased solvency risk (lower equity-to-asset ratio). The ROA coefficient is notably positive, indicating that when bank profitability rises, depositors are less likely to withdraw or shift their money to other banks; hence, banks punish lower-profit banks by diverting their deposits. The CTA liquidity component's coefficient is notably negative but not consistent when other current assets are included (LATA). The liquidity coefficient shifts to a substantial positive value, indicating that increasing the ratio of liquid assets to total assets, or the more liquid the bank, is positively associated with the number of deposits, implying that deposits are increasing in the banking industry. Indonesia. This suggests that interbank deposits are disciplined, which supports Distinguin et al. (2012). A higher proportion of interbank deposits indicates that the bank is assuming less risk and is less likely to default.

Tabel 4 Pre-COVID-19 (3/2013 – 12/2019)

	All Banks			Domestic Bank			Foreign Bank		
	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)
Independent Variables:									
EQTA	0.1513	-0.0341	12.7295***	0.0537	0.0063	9.0529***	-0.1286	-0.0366**	13.5184***
	(0.6297)	(0.2039)	(0.0000)	(0.9349)	(0.9032)	(0.0000)	(0.1696)	(0.0104)	(0.0000)
LLPTA	1.7940	0.0137	2.7369	8.1371	-0.1943	6.5423	0.0447	0.0781	23.5970***
	(0.4338)	(0.9397)	(0.6951)	(0.1480)	(0.6488)	(0.6128)	(0.9139)	(0.3928)	(0.0042)
NETA	0.1845	-0.0437	0.2196	1.0349	-0.1583	-1.7583	-0.1613	0.0182	-2.9353
	(0.8041)	(0.4453)	(0.9294)	(0.5111)	(0.1776)	(0.6071)	(0.2197)	(0.5490)	(0.2695)
ROA	-0.3823	0.0150	12.4825***	-2.4501	0.0707	4.7908	0.2159	-0.0152	0.2388
	(0.7539)	(0.8747)	(0.0015)	(0.4098)	(0.7548)	(0.4909)	(0.2913)	(0.7440)	(0.9535)
CTA	1.3817	-0.7368*	-31.3087***	2.4990	-0.8319	-1.5148	-1.6119	-0.1129	42.3736
	(0.7620)	(0.0540)	(0.0070)	(0.7074)	(0.1141)	(0.9313)	(0.3421)	(0.6811)	(0.1251)
LATA	-0.4127	0.0013	2.1036***	-0.3476	0.0122	4.2885***	-0.5036***	-0.0323	-1.4952
	(0.1895)	(0.9601)	(0.0085)	(0.4589)	(0.7408)	(0.0005)	(0.0000)	(0.1282)	(0.4441)
Control Variables:									
SIZE	0.0063	-0.0026	0.1270***	0.0120	-0.0031	0.0681	-0.0577***	-0.0022*	-0.0994
	(0.7566)	(0.1532)	(0.0082)	(0.7008)	(0.2104)	(0.4363)	(0.0038)	(0.0970)	(0.5442)
GDP	13.2674	-1.7916**	-78.8749**	20.9165	-2.5892**	-100.6581***	-3.5774	-0.4814	5.3138
	(0.1599)	(0.0135)	(0.0143)	(0.1468)	(0.0160)	(0.0013)	(0.1343)	(0.3702)	(0.9090)
INFL	-0.1495	0.1589	2.6349	0.1070	0.2180	-14.7360***	0.2146	0.0181	28.4752***
	(0.9066)	(0.1087)	(0.5317)	(0.9578)	(0.1493)	(0.0010)	(0.5439)	(0.8067)	(0.0000)
Constant	-0.7244	0.1884***	-0.0354	-1.2919	0.2325***	2.7509	1.3750***	0.1169***	-2.0246
	(0.2529)	(0.0003)	(0.9853)	(0.1790)	(0.0016)	(0.2388)	(0.0013)	(0.0032)	(0.6318)
R-squared	0.0053	0.0169	0.3157	0.0130	0.0250	0.1446	0.2002	0.0552	0.3440
No. of Obs.	980	980	980	644	644	644	336	336	336

Notes: This table presents the panel data regression results for Model 1, Model 2, and Model 3 for all banks, domestic banks, and foreign banks. The numbers in the table show the coefficients and standard deviations (in brackets). The estimate uses quarterly observations of banks that went public on the Indonesia Stock Exchange

during the 2013–2022 period. The related variables are GDeposit (growth of depositors' savings), CostDep (comparison of total interest expenses to total deposits), and IntBR (comparison of deposits at other banks to deposits at other banks). Bank risk variables include EQTA (equity to total assets), LLPTA (ratio of loan loss reserves to total assets), which is a proxy for credit risk; NETA (ratio of non-interest expenses to total assets), ROA (return on assets), CTA (Cash and cash equivalents to total assets), LATA (ratio of liquid assets to total assets), which are proxies for liquidity risk. Control variable SIZE (Log of total natural assets); general macroeconomic conditions include: GDP growth as the GDP growth rate; INFL as the inflation rate. Statistical significance is shown by the superscript asterisks ***, **, and * at < 1%, < 5%, and < 10% levels, respectively.

We also briefly analyze the extent to which the split of local and international banks can yield additional information. We find that there is no significant CAMEL component for domestic bank depositors. However, foreign banks have substantial negative coefficients of liquidity (LATA) and capital (EQTA) with deposit growth (GDeposit) and cost of deposits (CostDep). Thus, domestic depositors do not constrain bank risk-taking, whereas overseas depositors do. Domestic interbank deposits have high capital-to-assets (EQTA) and liquidity-to-total assets (LATA) ratios, while international banks have significantly positive EQTA and asset quality or credit risk (LLPTA) coefficients. We observe that market discipline towards foreign banks is tighter than for domestic banks, as evidenced by depositor discipline by withdrawing deposits and increasing fees, as well as a discipline by interbank deposits, which is due to foreign banks' higher risk preference [Distinguin et al. (2012); Mian (2006)]. As a result, it is possible to conclude that international bank discipline is more dominant than domestic. These data back up Hadad et al. (2011) claim that market discipline is more significant in international banks than in domestic banks, particularly in terms of capital risk (solvency).

Overall, bank size correlates positively with interbank deposits. This favorable effect is consistent with larger banks having more investment possibilities or competing more aggressively than smaller banks. These findings are consistent with the lower risk expected of large banks, resulting in a lower probability of default, for example, due to better asset portfolio diversification or anticipated regulatory protection in the event of a too-big-to-fail scenario. Depositors and partner banks, in particular, do not respond to the growth of domestic banks, as evidenced by the lack of a significant link, although foreign bank depositors do, with both GDeposit and CostDep showing a negative and substantial association. The GDP control variable is highly negative with CostDep and IntBR for both overall and local banks, whereas foreign banks show no response. This demonstrates that there was an inverse link between deposit interest rates and GDP before COVID-19 (which supports Hadad et al. (2011) . Interestingly, overall bank inflation (INFL) is strongly negatively related to interbank deposits at domestic banks and significantly positive at foreign banks. This implies that greater inflation leads domestic interbank deposits to fall while foreign interbank deposits rise.

2. Market Discipline Periode COVID-19

Table 5 shows the findings from the study on the impact of bank risk-taking on deposit market discipline, deposit costs, and interbank deposits during the COVID-19 period. Overall, bank discipline estimates reveal that depositors continue to be undisciplined when withdrawing deposits. While the CTA liquidity coefficient remains statistically significantly negative, the LATA coefficient becomes significantly negative, indicating that when bank liquidity is low, depositors are punished with higher deposit interest rates (CostDep), resulting in increased depositor discipline during the COVID-19 period. This study supports Berger, & Turk-Ariss, (2014) conclusion that depositors maintain or enhance their discipline as a result of increasing awareness of the possibility of bank failure. Interbank deposit discipline during the COVID-19 period, on the other hand, discovered less significant risk variables, namely two variables: solvency (EQTA) and management (NETA), whereas profitability ratios (ROA) and liquidity (CTA and LATA) were not significant. This finding

is consistent with the findings of Distinguin et al. (2012), who discovered that interbank discipline reduces risk-taking in banks in liquidated countries but has little effect on their bankruptcy risk. This implies that market discipline weakened throughout the crisis (Hadad et al (2011); Cubilas et al. (2018); Berger & Turk-Ariss (2014).

According to the bank's overall statistics, depositor market discipline increased over the COVID-19 period, whereas interbank deposit discipline decreased. Researchers will investigate further by separating the foreign and domestic ownership that constitutes it. According to the Foreign Bank column, during COVID-19, depositors and interbanks did not restrict foreign bank risk-taking, as none of the CAMEL component risk variables were significant. Before COVID-19, liquidity risk (LATA), capital risk (EQTA), and credit risk (LLPTA) were used as disciplinary measures; however, during the crisis period, depositor and interbank discipline was completely lost, resulting in a weakening of discipline toward foreign banks. In contrast, in domestic banks before the crisis, market discipline was only carried out by interbank deposits. During the crisis, interbank deposit discipline continued, and depositors even increased bank risk discipline, as shown by the risk variables EQTA, NETA, CTA, and LATA having a significant negative effect on CostDep, implying that there was an increase in discipline carried out by depositors and interbank deposits by penalizing bank risk-taking by increasing cost of deposits. This demonstrates that domestic banks are more exposed to solvency risk, management risk, and liquidity risk than international banks, supporting Vazquez & Federico (2015) findings. According to Hadad et al. (2011), Dinger (2009), and Freixas & Holthausen (2005), foreign banks are viewed as low risk because they can diversify sources of liquidity, and the presence of foreign banks in developing countries reduces liquidity risk. Foreign-owned banks are also more efficient and profitable than domestic-owned banks (Laidroo (2015); Havrylchyk & Jurzyk (2011); Bonin et al. (2005)).

Table 5 COVID-19 Period (Q1/2020 – Q4/2022)

	All Banks			Domestic			Foreign		
	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)	Model 1 (GDeposit)	Model 2 (CostDep)	Model 3 (IntBR)
Independent Variables:									
EQTA	0.0653	-0.0292	11.5957***	0.0902	-0.0295**	13.1816***	-0.1930	-0.0100	2.8230
	(0.3563)	(0.1596)	(0.0000)	(0.2813)	(0.0144)	(0.0000)	(0.3367)	(0.9117)	(0.2109)
LLPTA	-0.3164	-0.0326	-5.5004	-0.2768	0.0070	-4.8566	0.2603	-0.3188	17.7357
	(0.5186)	(0.8041)	(0.4049)	(0.6448)	(0.9260)	(0.5564)	(0.8031)	(0.4965)	(0.1366)
NETA	-0.1287	-0.0869	10.0693***	-0.2599	-0.1517***	15.4297***	0.0962	0.0469	3.7252
	(0.6922)	(0.2954)	(0.0086)	(0.6165)	(0.0076)	(0.0064)	(0.7978)	(0.7809)	(0.3441)
ROA	-0.0798	-0.0756	4.8484	-0.1911	-0.0656	6.8203	0.5638	-0.1278	-1.8285
	(0.8232)	(0.4165)	(0.2739)	(0.6762)	(0.2244)	(0.2328)	(0.4216)	(0.6844)	(0.7978)
CTA	1.2791	-0.9495*	-43.8458	0.1064	-1.1631***	-29.6152	4.0652	2.0179	-20.9052
	(0.4976)	(0.0625)	(0.1106)	(0.9641)	(0.0001)	(0.4012)	(0.2732)	(0.2257)	(0.6832)
LATA	-0.0377	-0.0361**	1.0442	-0.0237	-0.0236**	0.9243	-0.1086	-0.0416	1.2834
	(0.5540)	(0.0327)	(0.2144)	(0.7611)	(0.0140)	(0.3764)	(0.4382)	(0.5079)	(0.3756)
Control Variables:									
SIZE	0.0054	-0.0047**	0.3815**	0.0066	-0.0035**	0.5237**	-0.0050	-0.0122**	-0.0397
	(0.4387)	(0.0265)	(0.0226)	(0.4919)	(0.0205)	(0.0319)	(0.6978)	(0.0362)	(0.8898)
GDP	0.4509**	-0.0753*	-0.4723	0.5312**	-0.0894***	0.0339	0.3511	-0.0471	-0.7650
	(0.0185)	(0.0925)	(0.8025)	(0.0402)	(0.0012)	(0.9899)	(0.1976)	(0.6996)	(0.7049)
INFL	-1.6818***	-0.1761	6.5083	-2.3781***	-0.0797	14.3598*	-0.2699	-0.3464	-0.6383
	(0.0033)	(0.1852)	(0.2471)	(0.0024)	(0.3302)	(0.0759)	(0.7376)	(0.3388)	(0.9185)
Constant	-0.0513	0.1501***	-8.4718***	-1.2919	0.1240***	-11.2708***	0.1200	0.2696**	-0.3623
	(-0.6817)	(0.0001)	(0.0044)	(0.1790)	(0.0000)	(0.0080)	(0.6113)	(0.0119)	(0.9431)
R-squared	0.047653	0.0571	0.2448	0.0671	0.1714	0.3014	0.0656	0.0966	0.0880
No. of Obs.	420	420	420	276	276	276	144	144	144

Notes: This table shows the panel data regression results for Model 1, Model 2, and Model 3 for all banks, domestic banks, and foreign banks. The numbers in the table show the coefficients and standard deviations (in brackets). The estimate uses quarterly observations of banks that went public on the Indonesia Stock Exchange between 2013–2022 period. The related variables are GDeposit (growth of depositors' savings), CostDep (comparison of total interest expenses to total deposits), and IntBR

(comparison of deposits at other banks to deposits at other banks). Bank risk variables include EQTA (equity to total assets); LLPTA (ratio of loan loss reserves to total assets), which is a proxy for credit risk; NETA (ratio of non-interest expenses to total assets), ROA (return on assets), CTA (Cash and cash equivalents to total assets), LATA (ratio of liquid assets to total assets), which are proxies for liquidity risk. Control variable SIZE (Log of total natural assets); general macroeconomic conditions include GDP growth as the GDP growth rate; INFL as the inflation rate. Statistical significance is shown by the superscript asterisks ***, **, and * at < 1%, < 5%, and < 10% levels, respectively.

Overall, over the COVID-19 period, the favorable link between bank size and IntBR interbank deposits persisted, whereas the relationship with CostDep deteriorated dramatically. In particular, the response of depositors and partner banks to the size of local banks changes significantly, as does the interaction between international bank depositors to only CostDep. The GDP control variable is now solely reacted to by depositors, not interbank, for all banks and domestic banks, while foreign banks remain unaffected. Surprisingly, inflation is only addressed by all banks, with a contribution from domestic banks.

We examine the economic implications of the changes in market discipline that occurred. We find an average deposit cost of 4.76% in the pre-crisis period, and the CTA cash coefficient of 0.7368 is strongly negative, implying that a 1% decline in cash availability will result in a 73.68% to 8.27% increase in deposit costs. Costs climbed by almost 21% over COVID-19, bringing deposit costs to 9.28%. A 1% decline in liquid asset liquidity, as measured by the significant negative LATA coefficient, will result in a 3.61% increase saving costs. Meanwhile, boosting capital by 1% increases Indonesia's predicted level of deposits for interbanks by approximately 12.73%, whereas deposits declined by 1% during COVID-19.

IV. CONCLUSION

We discovered empirical data that supported the existence of market discipline in Indonesian banking, showing that interbank deposit withdrawals and higher deposit fees were caused by poor capital risk (solvency risk) and low liquidity risk, respectively. Prior to the crisis, foreign banks were more vulnerable to liquidity, credit, and solvency risks than domestic banks. While local banks maintained and even enhanced their level of market discipline prior to the COVID-19 pandemic, foreign banks' sensitivity decreased. Through shifts in market participants' sensitivity to bank risk, gold functioned as an external factor that changed the efficacy of market discipline, both as a hedge before to COVID-19 and as a safe haven during that time. These results have policy ramifications for banking supervision and regulation in both regular and emergency situations.

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