

Risk-Taking Comparison of Islamic and Conventional Banks During COVID-19 Pandemic: Indonesian Case Study

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Abstract - Indonesia adopts a dual banking system that is Islamic and Conventional which operate sides-by-side. There are 96 Conventional and 14 Islamic banks in Indonesia. During a pandemic, both banks use their strategies to maintain their performance. During Global Financial Crisis (GFC), conventional banks' risk-taking was less inclined when they were faced with lower funding liquidity risk while Islamic Banks tend to be more careful in taking more risk. However, it is unknown what impact will it have on banks in Indonesia during the COVID-19 pandemic. Using Islamic and Conventional banks data in Indonesia, this research analyzed using panel data regression finds that the presence of COVID-19 pandemic affects conventional and Islamic banks' risk-taking behavior, and both banks' risk-taking behavior was found to be different. It is also found that banks' size has a positive correlation with banks' risk-taking.

Keywords – Bank risk-taking, Conventional banks, COVID-19 pandemic, Islamic banks

I. INTRODUCTION

Indonesia adopt a dual banking system that is Islamic and Conventional banking systems which run simultaneously. Even if Islamic banking is intended for Muslims in a Muslim country, this concept of banking (Islamic banking) has been broadly expanded all over the world, after the financial crisis [7]. Meaning that the adaptation of the Islamic banking system regardless of their beliefs.

Compare to Conventional banking, Islamic banking's nature, structure, and product are completely different. In Islamic banking it isn't allowed in a transaction that involved interest (riba), meanwhile, Conventional banks acquired interest as their revenue, uncertainty (gharar), and speculations (qimar). Islamic banks face a dissimilar liquidity risk different to conventional banks, Islamic banks also received deposits and need to pay profit but due to the limitation of investment venues, it is found harder to pay the profit for Islamic banks thus increases their liquidity risk. There are recent studies that record that Islamic banks be more stable mainly during the financial crisis but in fact, some of them were close due to liquidity shortage [7].

At the end of 2019, the world is shocked by the spread of COVID-19's first case in Wuhan (China) and rapidly contagious all around the world. The virus reached Indonesia in early 2020 and rapidly spread until the government enacts a lockdown policy and safety protocols.

During this time, many businesses are also doing various strategies to survive, for example, restructuration, lay-offs, or even modify their business model. This makes an increase in unemployment and changes many people's activities including workers and households which are one the economic factors, this also causing a decrease in their income and influence their spending habit which also affects the bank primary function as a financial intermediary [10].

Islamic and Conventional bank have their way to cope and survive in this situation. Both banks use their strategies to maintain their performance during the pandemic. Though Indonesia implements both of these systems (dual-banking system), one of the banking systems may affect more than the other one because of their differences in terms of rules and principles. Nevertheless, both the banking system contributes to the country's economic performance.

The spread of COVID-19 from Wuhan (China) affects Indonesia's economic condition. The lockdown policy by the government prohibits people from outdoor activities and makes many firms disturbed since they lost their customers. This situation affects banking activities including the two-banking system in Indonesia; Islamic and Conventional.

Bank as one of the important aspects in the gear of the economic system must maintain its performance to make the economic activities still run during a pandemic. The performance and situation of each bank not only affect it internally but also affect the way it serves customers. Moreover, with the change in household supply, demand, and cash flow during a pandemic, the ability of banks to make their service accessible and usable is important though they might be also affected by this situation. As from the previous research in 2020 [11], a bank with a lower funding liquidity risk tends to take more risk, increased the banks' insolvency risk. The study also found that Islamic banks are to be more careful in terms of risk-taking and confirms the difference in risk attitudes between the two banking systems.

The previous research in 2020 examines banks in 18 different countries over the 2004-2016 period and showed that during Global Financial Crisis, the bank that has a lower funding liquidity risk were more prone to risk-taking [11]. However, it is unknown what impact it will have on banks in Indonesia during the COVID-19 pandemic, whether it is going to be positively or negatively affected and also each bank's (Islamic and Conventional) behavior towards it. This research will find out which banking

system in Indonesia takes more risk during the recession caused COVID-19 Pandemic. Whereas, banks still needed to maintain their performance during this time as a contribution to the economics' gear. This may affect the way each bank strategy and consideration in facing future uncertainty and customer preferences is choosing a banking system in Indonesia.

II. METHODOLOGY

In this research, researchers use quantitative secondary data of Islamic banks' and Conventional banks' financial statements with a time range from 2010-2020 which is sourced from Orbis BankFocus and respective banks' official websites. To test our hypothesis, this research has objectives to find out the what is the impact of COVID-19 pandemic on Conventional and Islamic banks' risk-taking behavior by estimating the following regression model:

$$BRT_{it} = f(\text{COVID-19 Pandemic}_{it}, \text{Credit Risk}_{it}, \text{Funding Risk}_{it}, \text{Bank Controls}_{it}) \quad (1)$$

The function derived according to previous research [13] and [11] where *BRT* show the measurement of banks' risk-taking. *COVID-19* is a dummy variable that equals 1 if it's in the case of the COVID-19 period (2020) and 0 otherwise, bank control is specific variable data of a bank *i* at period *t*.

A. Dependent Variable: Bank Risk-Taking

The dependent variable (banks' risk-taking) is measured by a z-score in this study. The z-score formula is the return on assets added by the capital-to-total-asset ratio (equity per total assets), divided by the standard deviation of the return on assets (ROA), and written as:

$$z\text{-score}_{it} = \frac{ROA + \left(\frac{\text{Equity}}{\text{Assets}}\right)}{\sigma ROA} \quad (2)$$

Z-score is defined as the number of standard deviations below the mean at which bank profits must fall to consume the banks' equity, and it is negatively correlated with risk-taking at bank *i* at period *t*. The z-score is the most often used risk indicator for banks. Not only z-score but non-performing loan to total loan ratio (NPL) is also used to measure bank risk-taking [11]. For Islamic banks, the term NPL is usually known as non-performing financing (NPF), without changing its meaning, in this study the term NPL (gross) will be used for both banks. Following previous research by [1] that measures risk with loan loss reserves. In this study, loan loss reserves to total asset ratio will also be used as the dependent variable.

B. Independent Variable

Following [7] [11], to measure funding liquidity risk as independent variables, researchers use total deposits to total asset ratio. The bank that has more deposits will be having lower *run* risk which makes greater risk will be taken by the managers due to the less probability that these banks are facing a crisis of funding in the near term [8]. Deposits guard banks from run risk, therefore, banks that have a greater deposit will have a lower funding liquidity risk gives bank management enough incentive to take more risks because they are protected from the risk's downside. Thus, higher deposits resulted in a greater risk-taking that showed by a lower z-score [11].

C. Control Variables

Following previous research by [11], in this study control for the bank-specific variables for bank *i* in the period *t*. Specifically, control for the bank liquidity risk with the bank funding gap ratio, which is estimated using the difference between loans and deposits is divided by the total assets to (*lr*), then the bank size, as the natural logarithm of total assets (*size*), bank's managerial efficiency, calculated by a cost-to-income ratio (*cir*); expansion strategy of the bank as the total assets annual growth (*assetg*). The researcher also introduces a dummy variable (*covid*) that will equal 1 if it is on the COVID-19 pandemic period and 0 otherwise.

TABLE I
OPERATIONAL VARIABLES

No	Variables	Description	Label
Dependent			
1	Bank risk-taking	z-score	zscore
		NPL (gross)	npl
		Loan loss reserves to gross loans ratio	llr
Independent: Variable of Interest			
1	COVID-19 Pandemic	Dummy = 1 if it's during the COVID-19 period and 0 otherwise	covid
2	Funding Liquidity Risk	Deposits to total asset ratio	flr
Independent: Control Variables			
1	Liquidity risk	Bank funding gap = (Loans-deposits)/Total assets)	lr
2	Bank size	Ln (total assets)	size
3	Efficiency	Cost-to-income ratio	cir
4	Asset growth	Annual growth to total assets	assetg

D. Hypothesis Development

The COVID-19 Pandemic and Banks' Risk-Taking

The previous studies show that during the global financial crisis (GFC), less risk-taking is showed by when there is a decrease in funding liquidity and empirically, as

a result of the rise in deposits, banks with greater deposit levels take more risk than banks with lower deposit levels [8]. The first and second hypothesis is developed to find out whether it is applied to the COVID-19 pandemic or not as follows:

H1: During the COVID-19 Pandemic, banks were less inclined to risk-taking when they were faced with lower funding liquidity.

H2: There's a change in risk-taking behavior in both Islamic and Conventional banks before and during the COVID-19 pandemic.

According to previous research [11], large banks involved in higher risk-taking when faced with lower funding liquidity and also stated that bank size has an important determinant of banks' risk-taking and large banks take less risk than small banks. This background leads to the third hypothesis:

H3: Bank size is negatively correlated with the risk-taking behavior of Islamic and Conventional banks

Islamic and Conventional Banks

Based on previous research in 2019, it was discovered that Islamic banks had a lower liquidity risk in general, resulting in greater stability. This situation might increase bank stability, but it will encourage bank management to take greater risks to maximize profits, which will negate the benefits and increase bank instability. This study also found that Islamic banks outperformed conventional banks in terms of credit and liquidity risk, whereas conventional banks are more stable. After the Global Financial Crisis, a negative correlation was found between credit risk and liquidity risk, as well as a negative correlation between liquidity risk and bank stability for Islamic banking, while a positive relationship was found between liquidity risk and bank stability in conventional banks for the same period. [7]. Another research in 2019 showed that in comparison to conventional banks, Islamic banks create more liquidity per unit of assets on the asset side of the balance sheet and less liquidity off the balance sheet [1].

Previous research in 2020 records that the credit growth of conventional banks will be harmed by increased economic uncertainty, but the credit growth of Islamic banks will be unaffected. The study also found that countries with specific deposit insurance protection for Islamic banks, smaller foreign presence, and countries with a larger deposit share and assets in Islamic banks are less influenced by economic uncertainty. In conclusion, this research suggests that Islamic banks could play a role in economic stabilization since it is less affected by uncertainty [2]. The discussion showed a different relationship and behavior of each banking system, further, it leads to the fourth hypothesis to find out whether there is a difference between both banks' risk-taking behavior during the COVID-19 pandemic as follow:

H4: The risk-taking of Islamic and Conventional banks are different during the COVID-19 pandemic.

III. RESULTS

TABLE reports the summary of dependent and independent on this observation. This data obtains from 11 Islamic and 95 Conventional banks for the years 2010 to 2020 in Indonesia. It contains 769 observations for the dependent variable z-score with a mean of 2.288 and a standard deviation of 1.822. Z-score is negatively correlated with bank risk-taking means a lower z-score will result in a higher bank engages in taking more risk. The loan loss reserves to total asset ratio, labeled by llr have a mean and standard deviation of 1.22 and 0.7857 respectively. While the non-performing loan which was labeled by NPL showed a mean of 2.820 and a standard deviation of 1.512. Higher NPL may indicate higher risk lending that leads to bank failure since it showed the ineffectiveness of the banks in receiving their loans. Z-score, loan loss reserves to total asset ratio, and NPL are the variables to measure bank risk-taking. The deposit to total assets ratio which is to represents funding liquidity risk (flr), has a mean of 77.317 and a standard deviation of 8.075, showed that some banks have a large number of deposits as a source of their assets.

For the bank funding gap as a measurement for liquidity risk, that is labeled by lr, showed a mean of -0.138, indicates that on average banks' loan are lower than banks' deposit. The cost-to-income ratio (cir), as to measure banks' efficiency have a mean of 63.236 and a standard deviation of 14.643, the lower the ratio the more profitable the banks would be. For asset growth, labeled by assetg, have a mean of 12.381 and a standard deviation of 10.009, although the mean is 12.381 some banks can grow more than that while there are still also banks that have negative growth.

TABLE is the detailed summary statistics for both Islamic and conventional banks. The result showed that Islamic banks have a lower z-score compared to conventional banks, lower bank funding gap, higher NPL, and less efficient with more asset growth on average. Compared to before the COVID-19 pandemic, both banks showed an increase in z-score, lower NPL, higher loan loss reserves to total asset ratio which indicates that banks are aware of future risk by setting a higher reserve to face loss risk. Both banks also showed lower deposit to total asset ratio and asset growth.

(Continued)

TABLE II
SUMMARY STATISTICS

Var	Obs	Mean	Std. Dev.	Min	Max
covid	783	0.0957854	0.2944849	0	1
zscore	769	2.288326	1.822725	0.012172 1	4.769148
llr	750	1.228149	0.78575	0.214505	2.3673
npl	527	2.621613	1.522866	0.55	4.81
flr	770	77.31709	8.075081	59.68749	85.10845
lr	770	-0.1382386	0.0766858	-0.269961 9	-0.044565 1
size	777	13.94	1.031768	12.29541	15.29731
cir	761	63.23679	14.64327	40.63	82.66
assetg	682	12.38136	10.00901	-2.4	25.91

TABLE III
SUMMARY STATISTICS BY DUMMY VARIABLES

Var	Before COVID-19				
	Conventional Banks				
	Obs	Mean	Std. Dev.	Min	Max
zscore	610	2.346443	1.833929	0.012172	4.769148
llr	609	1.083157	0.710374	0.214505	2.367285
npl	422	2.675545	1.472926	0.71	4.96
flr	608	76.91027	7.947097	59.68749	85.10845
lr	608	-0.13243	0.075604	-0.26996	-0.04456
size	610	13.91839	1.039769	12.29541	15.29731
cir	610	61.22613	14.2698	40.63	82.66
assetg	535	12.52079	9.930601	-2.4	25.91
Variable	Islamic Banks				
zscore	94	1.860852	1.778447	0.012172	4.769148
llr	69	1.33917	0.862988	0.214505	2.367285
npl	49	3.999388	1.511282	0.71	4.96
flr	94	81.32702	6.674272	59.68749	85.10845
lr	94	-0.15789	0.07145	-0.26996	-0.04456
size	94	13.65165	1.051805	12.29541	15.29731
cir	94	75.81691	13.56136	50.7	91.13
assetg	83	16.36277	10.46358	-1.47	29.78
During COVID-19					
Conventional Banks					
zscore	56	2.4130	1.7105	0.01217	4.769148
llr	63	2.3454	0.1269	1.47868	2.367285
npl	48	2.8204	1.3977	0.71	4.96

flr	59	75.093	9.4013	59.68749	85.10845
lr	59	-0.158	0.0834	-0.26996	-0.04456
size	64	14.512	0.6741	13.2983	15.29731
cir	49	71.404	13.665	40.63	82.66
assetg	55	6.6309	9.2460	-2.4	25.91
Islamic Banks					
zscore	9	2.0380	1.8561	0.059354	4.769148
llr	9	2.3672	0	2.367285	2.367285
npl	8	3.2337	1.2067	1.69	4.96
flr	9	77.498	8.9084	59.68749	85.10845
lr	9	-0.191	0.0914	-0.26996	-0.04456
size	9	14.345	0.8373	13.35327	15.29731
cir	8	53.68	14.388	40.63	82.66
assetg	9	11.244	9.5696	-0.11	25.91

Our objective is to find out the impact of the COVID-19 pandemic on both banks' risk-taking, hence, we use panel data to estimates our model. Based on the previous test, Fixed Effect Model is the most appropriate to estimate all models except model 9 that will use Random Effect Model. The regression is defined into three models for each dependent variable; overall banks, conventional banks, and Islamic banks, and labeled by numbers 1 to 9 respectively. Model 1, 2, 4-6, 8 uses Fixed Effect Model with clustered standard error to overcome both autocorrelation and heteroscedasticity, model 3 and 7 uses Fixed Effect Model with AR(1) regression to overcome autocorrelation, model 9 uses Random Effect Model with AR(1) regression to overcome autocorrelation. The result can be seen in TABLE
(continued)

TABLE IV
 PANEL DATA RESULT

Overall Banks			
	zscore	llr	NPL
covid	Not Significant	+	-
flr	Not Significant	-	-
lr	+	Not Significant	Not Significant
size	-	+	Not Significant
cir	-	+	Not Significant
assetg	+	-	Not Significant
_cons	+	-	Not Significant
Obs	673	486	393
Prob	0	0	0
R ²	0.1995	0.4128	0.3253
Conventional Banks			
	zscore	llr	NPL
covid	+	+	-
flr	Not Significant	Not Significant	-
lr	+	Not Significant	Not Significant
size	-	Not Significant	Not Significant
cir	-	Not Significant	Not Significant
assetg	+	-	Not Significant
_cons	+	Not Significant	Not Significant
Obs	582	435	435
Prob	0	0	0
R ²	0.2149	0.4139	0.2739
Islamic Banks			
	zscore	llr	NPL
covid	-	-	-
flr	Not Significant	-	+
lr	Not Significant	+	Not Significant
size	Not Significant	-	Not Significant
cir	-	-	+
assetg	+	Not Significant	Not Significant

_cons	+	+	Not Significant
Obs	62	73	51
Prob	0.0033	0.0001	0
R ²	0.3408	0.6225	0.3182

As shown in TABLE **Error! Reference source not found.**, significant variables that affect overall banks' z-score are liquidity risk and asset growth that is positively correlated, banks' size, and cost to income ratio that is negatively correlated. For liquidity risk, as measured by the differences between loan and deposit per total assets, meaning that the higher the deposit, leads to lower liquidity risk and the lower the bank engages in taking more risk, same goes for asset growth where banks take less risk as their asset increases. It is also shown that the covid dummy variable has no significant coefficient to overall banks, but the result is different where the regression of each bank is taking into account. Covid dummy variable shows a negatively significant coefficient with NPL which is consistent in all models and positively significant to llr.

Cost to income ratio (cir) has a negative and significant correlation with z-score, meaning that the lower their cir, the more profitable they are, the high the z-score, and they are engages in taking less risk same goes for banks size that is significantly correlated with z-score and loan loss reserves to total asset ratio (llr) but found has a negative coefficient with z-score and positive coefficient with llr, meaning that the big the size of the bank (measured by the natural logarithm of total asset) the higher the reserves they keep and the higher the risk they took. On the other hand, funding liquidity risk has a negative and significant correlation to loan loss reserves to the total asset ratio.

Both bank size (size) and costs to income ratio (cir) have a positive correlation with loan loss reserves to total asset ratio (llr). This finding indicates that the larger the size of the banks, which is measured by Ln total asset, the higher the reserves they keep. While deposit to total asset ratio (flr) has no significant and negative relation with z-score, not only to z-score, it has no significance and negative correlation to non-performing loan (NPL) and negatively significant with llr. This result showed that no obvious relationship between deposit to total asset ratio and bank risk-taking is found in this study. Bank funding gap (lr) and asset growth (assetg) have a positive and significant correlation to z-score, while bank funding gap (lr) found to insignificant with loan loss reserves to total asset ratio and asset growth (assetg) also has a significant relationship with loan loss reserves to total asset ratio with a negative relationship. This indicates banks that have more growth will have higher z-score and lower loan loss reserves to total asset ratio.

As mentioned before, covid has no significant correlation for overall banks but found to be positive and significant at 10% level with z-score, the positive and

significant correlation at 1% level with llr, and negative and significant correlation at 1% for conventional banks, meaning that the presence of covid will resulted to increase in z-score and lower risk are taken for conventional banks, leads to higher reserves, and a decrease in conventional banks' NPL or the presence of covid affect conventional banks risk-taking behavior. This finding also supports the hypothesis of there is a change in risk-taking for conventional banks before and during the COVID-19 pandemic and the change is that conventional banks take less risk on average. Cost to income ratio was found to be negative and significantly correlated with z-score and but not significant to llr, meaning that the more profitable the conventional banks, the higher the z-score would be and the lower they are in taking a risk.

Liquidity risk, banks' size, the cost to income ratio, and asset growth have a significant correlation to z-score with a positive coefficient for liquidity and asset growth and the negative coefficient for banks' size and cost to income ratio. On the contrary, liquidity risk and asset growth have no significant coefficients with llr. Meaning that the higher liquidity risk and asset growth, the higher conventional banks' z-score and the lower the risk it took, while the bigger the banks and the lower their deposit to total asset ratio (the more profitable they are), the lower the z-score and the higher the risk it took. Higher liquidity risk meaning that lower deposits as it is measured by differences between loan and deposit per total asset, lower deposit (higher liquidity risk) will result in higher z-score and less risk-taking for conventional banks these findings are not aligned with previous research (Smaoui et al., 2020) that stated large banks are found to take less risk, while banks with more deposits are found to take more risk. The funding liquidity risk, as measured by the deposit-to-total-asset ratio, has a positive but not statistically significant relationship with the z-score. Also, a negative coefficient to llr and NPL but only significant to NPL. It shows that there is no significant impact of deposit to total assets ratio for conventional banks' z-score and llr that contra with previous research that indicates banks when dealing with a smaller funding liquidity risk, take smaller risks. (Smaoui et al., 2020).

Other than the covid dummy variable, the other variable that has a negative and significant correlation with conventional banks' NPL is funding liquidity risk. This finding reveals that when there is an increase in conventional banks' funding liquidity risk will lead to a decrease in conventional banks' NPL.

For Islamic banking, covid dummy variables are found to be negative and significantly correlated across all dependent variables meaning that the presence of COVID-19 pandemic will affect Islamic banks' z-score, loan loss reserves to total asset ratio, and NPL. Meaning that the presence of covid will result in a lower z-score (higher risk-taking), lower llr, and lower NPL. Islamic banks keep lower loan loss reserves since the function of loan loss

reserves are preventing future loss risk of the debtor's inability to pay its debt, which means that Islamic banks do not act to add a higher amount of reserves during the COVID-19 pandemic.

The other variables that have a significant coefficient with Islamic banks' z-score are cost to income ratio with negative correlation and asset growth with positive correlation. The results showed that the lower Islamic banks' cost to income ratio, the more profitable they are, the higher their z-score and the less risk they took and when Islamic banks' asset growth is increasing, it will also increase the banks' z-score which means the lower risk Islamic banks are taking. Cost to income ratio has also a negative and significant coefficient with Islamic banks' loan loss reserves to total asset ratio, it means that the lower the cir, the more profitable the banks are, the higher loan loss reserves to total asset ratio since the Islamic banks have more resources to set a higher reserve as a way to overcome the future risk of debtors payment inability during COVID-19 pandemic. Funding liquidity risk (flr) was found to have a negative and significant coefficient with llr showed that an increase in flr will increase llr.

Cost to income ratio also has a significant coefficient with NPL and was found to be positive. This finding means that the higher the Islamic banks' cir, the less profitable it be, the higher the NPL would be. Since the presence of COVID-19 is negatively correlated, it showed that during a pandemic, Islamic banks NPL are decreased as well as Islamic banks' cir. Other than the cost to income ratio, asset growth showed a negative and not significant coefficient to NPL meaning a decrease in Islamic banks' asset growth have no obvious impact on Islamic banks' non-performing loan.

Although liquidity risk, bank's size, the cost to income ratio, and asset growth are found to be significant with z-score on overall banks model, it showed that there is no obvious correlation between liquidity risk and banks' size to Islamic banks' z-score, as goes for asset growth to Islamic banks' loan loss reserves to total asset ratio and liquidity risk, banks' size, and asset growth to Islamic banks' NPL.

IV. DISCUSSION

In this study, several regression models have been done. To find the impact of the COVID-19 pandemic on both banks' performances, covid dummy variables are used. The result shows that on aggregate COVID-19 does not have a significant correlation with banks risk-taking that is measured by z-score but if detailed on each banks performances, it has a significant effect on conventional banks' risk-taking, that the presence of COVID-19 pandemic, will make conventional banks' z-score and llr higher, meaning that conventional banks take less risk and set a higher amount of reserves, also found to be significant and negative to its NPL showed that during COVID-19

pandemic, there is a decrease in non-performing loan. While for Islamic banks, it showed that the COVID-19 pandemic is also negative and significantly affected the banks z-score, loan loss reserves to total asset ratio, and non-performing loan (NPL). It showed that during the COVID-19 pandemic, Islamic banks tend to take a higher risk that is aligned with previous research by [4], set lower loan loss reserves, and happen to be a decrease on their non-performing loan (NPL). These findings are not aligned with previous research that found during GFC, as their funding liquidity risk decreased banks tend to take less risk [8] knowing that there is no significant correlation between z-score and funding liquidity risk although it is known that conventional banks take less risk.

Funding liquidity risks are also found to be negative and significant with loan loss reserves ratio across all models and Overall, Conventional, Islamic bank's non-performing loans. It is proven that the COVID-19 pandemic has made banks' risk-taking are changing but the fact that it doesn't make banks take less risk when their lower funding liquidity risk makes it not align with the previous study [11] that stated otherwise, therefore, the first hypothesis is not accepted.

For overall banks covid dummy variable found to be significant to llr and NPL, but if get detailed found to be significant to all conventional banks' and Islamic bank risk-taking dependent variable. This result showed that the presence of the COVID-19 pandemic affected banks llr and NPL generally but affected all risk-taking measurements for conventional and Islamic banks. COVID-19 pandemic put us in an uncertain condition, lockdown and social distancing policy affect customer behavior, decrease in income, and affect their spending habit, banks as a financial intermediary must be affected by this condition, therefore, they need to do an adjustment regards their risk-taking to survive in an uncertainty condition. These findings align with a previous study that said financial crisis or economic uncertainty significantly affected banks' risk-taking behavior [2] [8] [11] although there is a mixed relationship between each dependent and independent variable, therefore, supported by these findings, the second hypothesis is accepted that during the COVID-19 pandemic, there is a change in banks' risk-taking behavior.

Banks' size variables that are estimated by natural logarithm of total asset, found to have a significant coefficient with z-score and llr for overall banks regression that is consistent with conventional banks z-score but found not to be significant to Islamic z-score and non-performing loan. For overall and conventional banks regression, the relationship is mixed which are negative to z-score meaning that the bigger the bank, the lower the z-score and the higher the bank engages in a higher risk-taking showed that there is a positive correlation between banks' size and banks' risk-taking, this result is found to be not aligned with the previous study [11] that stated banks' size is negatively correlated with banks' risk-taking or the

bigger the bank the lower risk they took as size prevent banks to take more risk [8] and banks' size has a positive correlation with loan loss reserves to total asset ratio meaning that the higher the size of the bank, the higher reserves the bank would set to overcome future loss risk since they have more resources that make them more confident and secure in taking more risk compared to smaller banks, supported by the theory as stated on [11]. According to this finding, the third hypothesis is not accepted.

As mentioned before, the COVID-19 pandemic affects each banks' risk-taking, while the presence of COVID-19 positively correlated with conventional banks' z-score and llr, meaning that during COVID-19 conventional banks take less risk and keep a higher reserve, and negative to NPL. While for Islamic banks, the COVID-19 pandemic is negative and significantly affected banks' z-score, llr, and NPL meaning that it takes more risk, keeps lower loan loss reserves and there's a decrease in NPL. Align with this result, the fourth hypothesis is accepted that implied the differences of risk-taking between conventional and Islamic banks, it is also aligned with previous research [2]. In this study, the differences are when COVID-19 affects conventional banks to a higher z-score, less risk-taking, higher loan loss reserves to total asset ratio, decrease in NPL while it affects Islamic banks to take more risk, lower loan loss reserves to total asset ratio, and decrease in NPL. The result showed that Islamic banks tend to be riskier in this study since they needed to comply with sharia law that limits some instruments due to uncertainty prohibition and Islamic banks can't diversify to some extent as conventional banks did. For example, on conventional banks the fund could be allocated to any investment when Islamic banks only on investment that categorized as halal or comply sharia guidance, supported by the fact that one of the halal industry, halal tourism, for example, faced a slowdown during COVID-19 pandemic [9] also a profit-sharing mechanism that relies on the profit rather than conventional banks who use fixed interest rates so it can be predicted.

The result shows that banks with higher growth, the more efficient they are will have a higher z-score, and banks that are more profitable, measured by the lower cost to income ratio will have a higher z-score and the lower the risk they took for overall banks that is consistent with each banking system risk-taking behavior. Although NPL been used to estimate bank risk-taking in previous studies [5] [6] [11], covid dummy variables are found to be consistent in all models that have a significant correlation with NPL, while only asset growth as the independent variable that has a significant correlation for NPL in all models plus cir variable for Islamic banks panel data model. NPL might not be the best to reflect the real condition of a banks' risk-taking same goes for llr compared to z-score knowing that NPL is related to government regulation that keeps being on a certain range as an act of regulation compliance while

llr are formulated based on the assets which potentially to have risk. Since NPL shows a realization of the asset risk and llr shows a strategy that management takes to overcome risk. Supported by previous research [3] that stated loan loss reserves ratio (which measures loan quality) and as an anticipation of high non-performing revenue, measure only partially loan portfolio knowing the variations between banks may occurs due to the different banking policies regarding non-performing loans, reserves, and write-offs.

V. CONCLUSION

In this study, risk-taking Islamic and conventional banks during the COVID-19 pandemic are identified using 11 Islamic and 95 Conventional banks for the years 2010 to 2020 that contain 769 observations. First, several panel data tests are conducted to determine which models are the most suitable to estimate the model. The regression model is separated into overall banks, conventional banks, and Islamic banks with a covid dummy variable to identify the effect of the COVID-19 pandemic on bank risk-taking.

The study found out that in general, the COVID-19 pandemic only significantly affected banks' loan loss reserves to total asset ratio and non-performing loans. But if get detailed on each banking system, the COVID-19 pandemic affects each dependent variable (z-score, loan loss reserves to total asset ratio, and non-performing loan), or could be said that the presence of COVID-19 pandemic affects conventional and Islamic banks risk-taking behavior.

Although there is a change during the COVID-19 pandemic, the risk-taking behavior of conventional and Islamic banks found to be different. Where the presence of COVID-19 pandemic has a significant and positive impact on conventional banks z-score, loan loss reserves to total asset ratio and negative significant impact on non-performing loan, meaning conventional banks take less risk, set higher loan loss reserves, and found to have a decreased on its non-performing loan. While for Islamic banks, the presence of COVID-19 pandemic has a negative and significant impact on all the dependent variables (z-score, loan loss reserves to total asset ratio, and non-performing loan) meaning Islamic banks take more risk, keep lower loan loss reserves ratio, and found to have a decreased on NPL. Islamic banks were found to be most affected by the COVID-19 pandemic due to the fact it has a higher absolute coefficient and takes more risk as measured by z-score.

Banks' size is also to have a negative and significant impact on banks' z-score that is consistent on all models, meaning that the higher the size of the banks (measured by natural logarithm of total asset), the lower the z-score it would be, and banks' are engaged in taking more risk. So, their correlation between banks' size and risk-taking is found to be positive. While banks' size is also found to be significant with loan loss reserves to total asset ratio with mixed relationship across all models.

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