RISK-TAKING COMPARISON OF ISLAMIC AND CONVENTIONAL BANKS DURING COVID-19 PANDEMIC: INDONESIAN CASE STUDY

Oktofa Yudha Sudrajad
Rafif Adit Saksono
Kurnia Fajar Afgani
Desy Kharohmayani

Oktofa Yudha Sudrajad, *Institut Teknologi Bandung, Bandung, Indonesia*
Email: oktofa@sbm-itb.ac.id

Rafif Adit Saksono, *Institut Teknologi Bandung, Bandung, Indonesia*

Kurnia Fajar Afgani, *Institut Teknologi Bandung, Bandung, Indonesia*

Desy Kharohmayani, *Institut Teknologi Bandung, Bandung, Indonesia*

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

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. 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.[1]

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[2].

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[2], 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 [3]. 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.

Literature Review

Indonesia implements the dual-banking system, where both Islamic and Conventional banks run simultaneously as follows:

Conventional Banks

A commercial bank (or conventional term will be used on this study), or also called the bank, are one of a kind of financial institutions that provide several services such as gather, give, and offer deposits, loan, and basic investment products. For sure, banks need to take risks in giving loans and credit cards to their customers because it is an economic driver[4].[5] There are three major profits for conventional banks: business assets, business liabilities, and business as an intermediary. For their business asset, conventional banks only deal with high-value customers including big or medium-sized corporations with good solvability. While conventional banks' business liabilities, the deposit is a basic thing for its activities such as loan, investment, and others[6]. Conventional banks are debt-based, and they permit transfer or risk when the lender needs to pay interest independently from their investment, and banks transfer this risk using securitization. When the lender is under pressure due to economic conditions, they tend not to pay the interest and pay its debt, that is why banks prefer not to give new loans[7].

Islamic Banks

When conventional banks generate their income from interest, on the other hand, Islamic banks obey sharia guidance of equity, participation, and ownership as in Islamic law and guide. Correspondingly, Islamic banks prohibit riba (riba generally defined interest or excess interest), gharar (risk or uncertainty, that generally define as speculations), and financing on prohibited industries on Sharia (for example drugs, alcohol, and pork)[8]. This prohibition is following Islamic provisions and law. Indonesia implementing a dual-banking system where Islamic banks are projected to grow simultaneously with conventional banks to drive economic growth and financial inclusion. This is because Islamic banks generally target Muslims that refuse to use conventional financing due to religious faith[9], Even if Islamic banking 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 [10] followed by another study that stated that after the global financial crisis, Islamic banks appears as a viable alternative to conventional. Those research frequently stated the increase of customer's awareness towards Islamic banks products in the latest financial crisis which triggers the customer to have an alternative as a factor the rising trend of Islamic [11] but the customer of Islamic banks are neither limited to Muslims nor Islamic-beliefs. Islamic banks have a function that is similar to conventional banks even the origin and structure are dissimilar. While conventional banks are debt-based, and they are possible to permit the transfer of risk when the borrower needs to pay the interest independently from their investment return and the banks transfer this risk using securitization while Islamic banks offer intermediary based on asset and risk-sharing when they prohibit using derivatives and asset that is toxics[7, 12].

The other difference between Islamic and conventional banks is that first, it is based on profit and loss sharing, at least from their liability side of the balance sheet. Islamic banks control their financing activities in several ways. Overall, it can be categorized into two: profit-loss sharing that consist of mudharabah (profit-sharing), musyarakah (partnership) or non-profit-loss sharing (non-equity contracts); murabahah (cost-plus financing), ijarah (leasing), diminishing musyarakah (gradual ownership on a partnership), qard (benevolent loan) and other contracts [9]

Although being sharia-compliant in its operation, Islamic banks cannotbe said as immune to all the risk that conventional banks have. Among all risks, liquidity and credit risk are the most important aspect to face in the banking sector. Banks usually face risk on their asset side of the balance sheet, while liquidity risk appears on the liability side. If a bank already finances the too much-troubled project, it is harder for the bank to fulfill the depositor's demand. Borrowers' failure is positively correlated with liquidity risk. Other than that, when the economic situation is worsening, a bank

could face a "bank run" on its deposit that will decrease its asset value finance by the banks. Because of that reason, a higher credit risk leads to a higher liquidity risk .

Differences between Conventional and Sharia banks could also be expressed in the following table as cited from [13]

Table 1

Conventional and Sharia Banks Differences

Conventional Bank	Sharia Bank
Deposit/Liabilities	
All types of deposits based on a loan are accepted: term deposit, savings, and current account.	Deposit products are based on: 1. Qard: banks bear the risk of the fund and the client receives no additional benefits solely from this product 2. Mudarabah: clients' funds are invested in various places and the profit is split between the banks and the client based on the agreed-upon profit-sharing ratio.
Lending/Financing	
Based on loan agreement in which the bank and the client have the roles and borrower, respectively	Offer financing/leasing services to their clients to meet their business needs, based on the following contracts, which vary depending on the client's needs: 1. Characteristic of financing transactions: The risk of the bank is taken by the Islamic bank 2. Revenue derived from sales or leasing agreements 3. Split profit and losses, as appropriate 4. There will be no consequences (charges) 5. The fund will only be used in Sharia-compliant ways by the bank
Trade Finance	
The notion of services, guarantees, and lending is used to trade finance-related operations.	Islamic banks provide trade finance under the concepts of services, guarantee, and financing, with the following conditions: The following are the characteristics of Islamic banks' transactions: 1. Earning based on commissions under Sharia law 2. Earning from payment and document processing services 3. Revenue from asset sales or leases 4. Split profit and losses, as appropriate 5. There will be no consequences (charge) 6. The fund will only be used in Sharia-compliant ways by the bank

Risk management implementations vary in sophistication among banks. Bank competition and sector concentration in the loan market are the two key factors of risk management tool options in the theoretical model. Risk-sharing has become more accessible as a result of financial innovation. Financial regulations require banks to maintain a certain level of risk management.

Above the basic level, banks can choose whether or not to collect additional credit risk information and whether or not to share credit risk. The factors that influence these decisions are mostly unknown. Banks can diversify their holdings by transferring risk. Banks can often diversify and fine-tune their portfolios by employing

both risk management instruments (advanced risk management). When there is a lot of competition, credit risk transfer is more desired, and lesser sector concentration is more desirable. When there are a lot of rivalries and a lot of sector concentration, using both risk management instruments, advanced risk management, is a good idea[14]. Credit risk in Islamic banks can take many various forms, depending on the financing type used, such as Selem or exemption agreement. It happens when payment is made to another party without obtaining their assets or cash. Furthermore, financing models such as Murabaha, in which assets are given without receiving payment, are viewed as a payment risk or a potential loss situation.

In terms of risk exposure and risk management, there are some variations between Islamic banking institutions and traditional financial organizations. Risk management in Islamic banking has been the subject of numerous academic studies around the world. The high level of non-performing loans in banks negatively correlated with bank profitability and is the primary cause of financial crises. Bank-specific or macroeconomic variables are commonly considered for negative effects on non-performing loans. According to the literature review, explanatory variables use bank-specific or macroeconomic variables of the studies as the primary determinants of credit risk. Both types of variables have been utilized in several research[15].

Bank risk-taking could be discussed from two sides, as follow:
Funding Liquidity Risk

According to [16] the ability to settle debts quickly is what funding liquidity refers to. As a result, if a bank is unable to meet its obligations on time, it is considered illiquid. Funding liquidity is also known as the possibility of the bank being unable to fulfill commitments instantly over a particular period. In contrast to other academic and practitioner definitions, their definitions include some crucial features such as solvency, funding liquidity is a point at a time and a binary idea in which a bank can either fulfill obligations or not. In contrast, depending on the underlying financing position of the bank, funding liquidity risk might take on an endless number of values.

The study further clarifies the distinctions between funding liquidity and funding liquidity risk. Funding liquidity is defined as the ability to fulfill obligations quickly. Banks are illiquid, and if they are unable to fulfill their obligations, they are in default. The research, on the other hand, defines funding liquidity risk as to the likelihood that a bank would be unable to fulfill obligations promptly during a specified period. In a nutshell, funding liquidity is a binary term that considers whether or not a bank can meet its obligations. On the other hand, because it is linked to the distribution of future outcomes, funding liquidity risk can take on an unlimited many value. This divergence also implies a different time horizon. Funding liquidity is discussed at a certain point in time, whereas funding liquidity risk is always quantified over a specific time horizon. It's also motivated by the potential that the bank won't be able to settle debts promptly over a given time frame. Based on another research on 2020[2], the relationship and impact of the Global Financial Crisis (GFC) on bank risk-taking, as measured by deposits to total asset assets, was investigated using financing liquidity risk.

Credit Risk

The inability or unwillingness of a client or counterparty to fulfil commitments associated with lending, trading, hedging, settlement, and other financial activities is known as credit risk or default risk. Transaction risk, also known as default risk, and portfolio risk are two types of risk. Intrinsic and concentration risks are two types of portfolio risk. External and internal variables influence a bank's portfolio credit risk. The state of the economy, large changes in commodity or equity prices, foreign

exchange and interest rates, trade restrictions, economic sanctions, and so on are examples of external influences. Internal issues include insufficient loan policies/administration, the lack of prudential credit concentration limitations, and ill-defined lending limits for Loan Officers/Credit Committees, among others. Credit risk is one of the most significant concerns because it is linked to every active trace. Banks often implemented a risk management approach that incorporates risk management principles such as risk identification, monitoring, and measurement. Credit risk is the danger of losing money if a company fails to meet its contractual obligations and so causes the creditors to lose money. These responsibilities arise from a variety of activities, including lending, trading, and investing, as well as payment and settlement of securities trading on its account and foreign account[13].

Credit risk is at the heart of individual banks' risk exposure, and through contagion, it's also at the heart of financial stability. It's crucial to understand how competition in the loan and deposit markets influences the risks banks incur when making lending choices[17]. Based on the previous research in 2020, there is some debate over the risk of bank credit. First, some experts think that the macroeconomic climate has a considerable impact on bank risk. Second, several articles look at how market variables affect bank credit risk. Finally, some academics look into how bank characteristics affect bank credit risk. Finally, existing research focuses mostly on the factors that influence bank credit risks, such as the macroeconomic environment, market characteristics, and bank characteristics[18].

Banking credit risk management is a dependable and adaptable method of calculating and monitoring regulatory credit risk in a bank's portfolio. It is simply described as the risk of a bank borrower or counterparty failing to meet its commitments according to agreed-upon terms. The goal of objective risk management is to increase the bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable limits. Credit risk, which is inherent in the entire portfolio, including the risk in individual credits or transactions, needed to be controlled by banks. Banks had to analyze the relationship between credit risk and other risks as well. Effective credit risk management is a vital component of a comprehensive risk management strategy and critical to any banking organization's long-term performance[13].

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. 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 [2] 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[14]. 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[8].

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[7]. 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.

Methods

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:

$$BRT_{it} = f(COVID\text{-}19\ Pandemic_{it},\ Credit\ Risk_{it},\ Funding\ Risk_{it},\ Bank\ Controls_{it}) \qquad (Eq.1)$$

The function derived according to previous research [19] and [2] 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*.

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:

$$z\text{-}score_{it}\text{:}\ \frac{ROA+(\frac{Equity}{Assets})}{\sigma ROA} \qquad (Eq.\ 2)$$

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[2]. 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 [8] 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.

Independent Variable

Following[2], 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. 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 [2]

Control Variables

Following previous research by[2], 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   *Table2*

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

Result and Discussion
nks that have negative growth.

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 3

Summary Statistics

Var	Obs	Mean	Std. Dev.	Min	Max
covid	783	0.0957854	0.2944849	0	1
zscore	769	2.288326	1.822725	0.0121721	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	-0.2699619	-0.0445651
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

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..

Table 4

Panel Data Result

Overall Banks				Conventional Banks				Islamic Banks			
	zscore	llr	NPL		zscore	llr	NPL		zscore	llr	NPL
covid	NS	+	-	covid	+	+	-	covid	-	-	-
flr	NS	-	-	flr	NS	NS	-	flr	NS	-	+
lr	+	NS	NS	lr	+	NS	NS	lr	NS	+	NS
size	-	+	NS	size	-	NS	NS	size	NS	-	NS
cir	-	+	NS	cir	-	NS	NS	cir	-	-	+
assetg	+	-	NS	assetg	+	-	NS	assetg	+	NS	NS
_cons	+	-	NS	_cons	+	NS	NS	_cons	+	+	NS
Obs	673	486	393	Obs	582	435	435	Obs	62	73	51
Prob	0	0	0	Prob	0	0	0	Prob	0.0033	0.0001	0
R^2	0.1995	0.4128	0.3253	R^2	0.2149	0.4139	0.2739	R^2	0.3408	0.6225	0.3182

NS = Not Significant

As shown in

, 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 [2]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[2].

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.

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.

References

1. Soldatos, G.T., *In/Stability under Ideal Income Tax and Ideal Consumption Tax.* Cuadernos de Economía, 2021. **44**(125): p. 29-37.DOI: https://doi.org/10.32826/cude.v44i124.115.
2. Smaoui, H., et al., *Funding liquidity risk and banks' risk-taking: Evidence from Islamic and conventional banks.* Pacific-Basin Finance Journal, 2020. **64**: p. 101436.
3. Talha, M., et al., *Impact of Oil Prices, Energy Consumption and Economic Growth on the Inflation Rate in Malaysia.* Cuadernos de Economía, 2021. **44**(124): p. 26-32.
4. Moradi, S. and F.M. Rafiei, *A dynamic credit risk assessment model with data mining techniques: evidence from Iranian banks.* Financial Innovation, 2019. **5**(1): p. 1-27.
5. Tomé, J.P.M., *La acumulación de capital en la periferia. Una propuesta analítica desde la economia política.* Cuadernos de Economía, 2020. **43**(122): p. 119-130.
6. Dong, J., et al., *Impact of internet finance on the performance of commercial banks in China.* International Review of Financial Analysis, 2020. **72**: p. 101579.
7. Bilgin, M.H., et al., *Bank credit in uncertain times: Islamic vs. conventional banks.* Finance Research Letters, 2021. **39**: p. 101563.
8. Boubakri, N., et al., *The stock liquidity of banks: A comparison between Islamic and conventional banks in emerging economies.* Emerging Markets Review, 2019. **39**: p. 210-224.
9. Meslier, C., T. Risfandy, and A. Tarazi, *Islamic banks' equity financing, Shariah supervisory board, and banking environments.* Pacific-Basin Finance Journal, 2020. **62**: p. 101354.
10. Valencia, G.A.D., *Forms of informal financing of informal traders in Colombia Cases: Cúcuta, Ibagué and Villavicencio.* Cuadernos de Economía, 2020. **43**(123): p. 259-274.
11. Aysan, A.F., et al., *Religiosity versus rationality: Depositor behavior in Islamic and conventional banks.* Journal of Comparative Economics, 2018. **46**(1): p. 1-19.
12. Vergara, R.M.A., *Methodological approach to the quantitative evaluation of the carrying capacity of urban land: Bogotá (Colombia 2015).* Cuadernos de Economía, 2020. **43**(123): p. 291-304.
13. Spuchľáková, E., K. Valašková, and P. Adamko, *The credit risk and its measurement, hedging and monitoring.* Procedia Economics and finance, 2015. **24**: p. 675-681.
14. Bulbula, D., H. Hakenes, and C. Lambert, *What Influences Banks' Choice of Credit Risk Management Practices.* Theory and Evidence. **40**: p. 1-14.
15. İncekara, A. and H. Çetinkaya, *Credit risk management: A panel data analysis on the Islamic banks in Turkey.* Procedia Computer Science, 2019. **158**: p. 947-954.
16. Drehmann, M. and K. Nikolaou, *Funding liquidity risk: definition and measurement.* Journal of Banking & Finance, 2013. **37**(7): p. 2173-2182.
17. Martín-Oliver, A., S. Ruano, and V. Salas-Fumás, *How does bank competition affect credit risk? Evidence from loan-level data.* Economics Letters, 2020. **196**: p. 109524.
18. Cheng, M. and Y. Qu, *Does bank FinTech reduce credit risk? Evidence from China.* Pacific-Basin Finance Journal, 2020. **63**: p. 101398.
19. Sudrajad, O.Y. and G. Hübner, *Empirical evidence on bank market power, business models, stability and performance in the emerging economies.* Eurasian Business Review, 2019. **9**(2): p. 213-245.