The Impact of COVID-19 on Credit Risk: An Assessment in Malaysian Banking System

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Abstract
The unprecedented COVID-19 pandemic around the world is one of the shocking events in this decade. It has affected the financial institution in particular and banking institutions worldwide. Policymakers are getting worried due to the continuous increases in credit risk, and the situation is expected to worsen in the era of COVID-19 pandemic. The COVID-19 pandemic is said to be no difference with financial crisis. It affects the banking system and the commercial banks throughout the world has suffered a steady increase in the credit risk. Therefore, this paper tries to assess the the impact of COVID-19 on credit risk in Malaysian banking system. Two models were developed to test for the impact of COVID-19 pandemic. Model 1 was developed to present COVID-19 pandemic as the sole impact on the credit risk while Model 2 included the interaction between the economic performance and COVID-19. Johansen cointegration method was utilized in this study. The quarterly data spanning from 2013 to 2020 were tested. Finding revealed that COVID-19 pandemic influence the credit risk in the long run equilibrium through the interaction of economic performance. This implies that the failure of payback the loans during the COVID-19 pandemic together with the lower economic performance may constrain the bank's ability to lend to other borrower thus causes the to experience the rising outstanding loans and create problems in banking the system. This can harm the entire banking institution and the economic conditions as a whole.
Keywords: COVID-19, Credit Risk, Household Debt, Banking System, Non Performing Loan

Introduction
The COVID-19 pandemic has led to an unprecedented global contraction in economic activity, with Malaysia is no exception. The pandemic has caused chaos across the global economic and financial sphere, as it emerges as the biggest test for financial systems since the 2008–09 global financial crisis (GFC) (Barua & Barua, 2021). The Asian Development Bank predicts that the global economic cost of the pandemic is likely to be between $5.8 and $8.8 trillion (about 6.4–9.7% of world GDP) (Park et al., 2020). Some researchers (Ari et al., 2020; Kasinger et al., 2021) are comparing between the decline in economic activity during the financial crisis and said it has no difference with the crisis during COVID-19 pandemic. In 2008 economic and financial crisis, the rise of credit risks reduced bank lending, increased financial instability and

slowed the global economic growth. The financial crisis has impacted the financial institution in particular banking institutions worldwide. In fact, a wide array of impacts to the operating and financial performance of the banks has occurred globally (Smolo & Mirakhor, 2010; Kassim & Majid, 2010). Credit risk will arise when the financial crisis occurs and exacerbates the economic conditions (Ahmad et al., 2019). The Asian financial crisis 1997-1998 for example has led to the failure of banking sector which drawn attention to the economists. During this time the shortcomings and the risks of baking system were exposed.

The COVID-19 pandemic is expected to be more persistent and can leads to a deeper and prolonged recession. This will lead to a significant decline in economic activity across the countries. The disruption in the economy come together with renewed disruptions in financial markets and currency depreciation. The non-financial corporate performance also could deteriorate further, and banks could face a substantial increase in credit risk and their profitability and capital adequacy would come under renewed pressure (IMF, 2020). Statistically, in Malaysia the COVID-19 is expected to result in an increase in impaired loans (non–performing loans). The credit growth forecast for the banking system is from 1%-3% in 2020 (BNM, 2021). It is expected NPLs to reach 1.7%-1.8% of outstanding loans in 2021. While based on Bank Negara's simulation, 60% of the defaults would occur in 2021, making up 71% of new impaired debt. Sixty-six per cent of borrowers who default would be those earning less than RM3,000 per month, but in value terms, 52% of impaired debt would stem from borrowers earning RM5,000 to RM10,000 a month.

The potential of a vicious circle of low asset quality, low bank profitability, pressure on capital levels and constrained lending, with negative effects on growth can worsen the initial NPL problem, thus pointing to the macroeconomic and financial stability significance of NPLs (OECD, 2021). In Malaysia, household loan impairments are expected to double by end 2021 (The Malaysian Reserve, 2020). According to the central bank, 63% of defaults are expected to arise from firms in the services sector, while 33% of defaults are from large corporates and listed firms with weak financials. The lockdown order by Malaysian government has forced employees to work from home and businesses to close. This lockdown order inevitably reduces the income of Malaysian. Furthermore, the physical distancing and travel restrictions have resulted in a sharp decline in revenue for many businesses. It is highly affected tourism industry, restaurants and hotels. As a consequence, there is a growing risk of default, as businesses may not be able to pay their rents or mortgage loans.

Persisting uncertainty surrounding the severity of the crisis and prospects for an economic recovery raise questions on the potential consequences for the banking sector (OECD, 2021). The emerging of accumulated higher bank risk has caused concerned. The problem will weaken the ability of banking system to supply more credits and this will continue to unsupport economic recovery. For the developing nation such as Malaysia, the challenges will go to the authorities in managing the bank risk in during the pandemic crisis. The failure of credit risk management will lead banks to face many serious problems as the lending is one of the major businesses in banking system (OECD, 2021). Along with the weak Malaysian economic conditions, the concrete solution by the authorities is needed to be done. In light on these dynamics, the objective of the paper is to the the impact of COVID-19 on credit risk in Malaysian banking system.

The remaining of the paper is organized as follows. Section 2 discusses the overview. The credit risk conditions in Malaysia will be highlighted in section 3. Section 4 discusses the literature review. Lastly, section 5 offer conclusions

Literature Review

Credit risk is one of the crucial issues in the banking industry, as it measures banks' ability to acquire financing and to handle potential losses arising from financing activities (Wiseman & Catanach, 1997). The failure to manage credit caused the collapse of big institutions such as Lehman Brothers, has led to a great financial crisis of 2008 (Friedland, 2009). Therefore, management of credit risk is primarily required to achieve healthy banking performance.

Generally, credit risk arises when the borrowers of the bank unable to fulfill their contractual obligation. In a simple word, this is the the failure of debtor to fulfill its obligations will affect the bank performanceIt is banks' obligation to scrutinize the loans granted in order to ensure the borrowers will fulfill to the agreed agreements. Okenyuri (2013) defines that the loan that cannot be paid will be known as nonperforming loan and it is a vital credit risk in the banking system. While, Duffie and Singleton (2003) report that credit risk is one of the most frequent risks for banks. It is generally accepted that this risk is the most important and widespread risk for banks.

Hue (2015) clarifies that most of the banks only focus on achieving their target rather than evaluate their customer's quality before granting the loans. It is due to poor management and inability of bank manages their loans properly. This situation will lead higher unproductive debts in the banking system and expose to the high probability of default. As a major consequence, the credit risk harms the entire banking institution particularly on bank's profitability and efficiency.

Nervertheless, there is still lack of study on the impact COVID-19 on credit risk. Most of the studies concentrated on the conceptual impact as there is limited data to for empirical research. Some studies highlighted there is no difference between earlier financial crisis and the COVID-19 pandemic (Ari et al., 2020; Kasinger et al., 2021). The impact is said to be similar towards economic activity particularly in banking system. Kasinger et al (2021) for example provides an empirical assessment of potential scenarios and draws lessons from previous crises for effective bank risk treatment. The paper highlights the importance of early and realistic assessment of loan losses to avoid adverse incentives for banks. Real sector disruptions hit the banking sector indirectly, notably by weakening or damaging firms' business models, and by reducing household wealth. Both effects will ultimately weaken a bank's loan book. As a result, a disproportionate share of the loan book will become non-performing, lowering the bank's economic capital. The current pandemic is no exception to this regime. While, Ari et al (2020) compared the 2008 crisis, it is found that some factors during Covid-19 pandemic some factors are conducive to influence bank risk. During government debt is substantially higher, banks are less profitable, and corporate balance sheets are often weak. It is stated that high credit risk as measured by NPL levels are a common feature of banking crises, and are often studied around such events. Laeven and Valencia (2013) shows data report is at peak NPL levels during crises. During crises, NPLs typically follow an inverse U-shaped pattern. NPLs start at modest levels, rise rapidly around the start of the crisis, and peak some years afterwards, before stabilising and declining. Looking at all crises it is found that that NPL levels peak at about 20% of total loans on average, but the variance is large: in developing countries in particular, NPLs can exceed 50% of total loans. Only less than a fifth of banking crises avoid high NPL levels.

The impact of COVID-19 on the increase in bad credits at conventional commercial banks in Indonesia had been investigated by (Hardiyanti and Aziz, 2021). Using a simple regression analysis to determine the influence of COVID-19 on non-performing loans, the finding shows that COVID-19 has a significant effect on non-performing loans. It is also found that COVID-19 variable can be used as an external indicator of the increase in non-performing loans for commercial banks in Indonesia.

Barua and Barua (2020) study possible impacts of the pandemic on the Bangladesh's banking sector. The study highlighted the COVID-19 pandemic is damaging economies across the world, including financial markets and institutions in all possible dimensions. The pandemic generates multifaceted crises particularly in banking system. It can be seen through the increase in bank risk. This situation is likely to be worse in developing economies with poor financial market architecture. Using a state-designed stress testing model, the paper estimates the impacts of the COVID-19 pandemic on three particular dimensions—firm value, capital adequacy, and interest income, under different NPL shock scenarios. Findings suggest that all banks are likely to see a fall in risk-weighted asset values, capital adequacy ratios, and interest income at the individual bank and sectoral levels. However, estimates show that larger banks are relatively more vulnerable. The decline in all three dimensions will increase disproportionately if NPL shocks become larger. Findings further show that a 10% NPL shock could force capital adequacy of all banks to go below the minimum BASELIII requirement, while a shock of 13% or more could turn it to zero or negative at the sectoral level.

According to Wahyudi and Arbay (2021), the Covid-19 pandemic has been detrimental to the economic aspect. This pandemic made it difficult for many debtors to fulfil their credit obligations that led the government to issue a countercyclical policy to provide a stimulus to the national economy. The study used descriptive qualitative with a literature approach of credit risk management in banks. It is found that the existence of this regulation can maintain the stability of banking performance by keeping the Non-Performing Loan (NPL) number below 5% and providing a reference for banks in risk management with a model that is relevant to economic conditions during the COVID-19 pandemic.

Methodology
This study tries to divert from previous studies by examining the long equilibrium for two models. Model 1 included the macroeconomic factors together with COVID-19 occurance. Model 2 shows the combination of macroeconomic factors and the interaction between COVID-19 occurance and the economic performance in Malaysia. This is to examine whether the COVID-19 occurance solely impact the changes in credit risk or the COVID-19 through economic performance can significantly impact the credit risk. Both models are shown as below;

$$CR = \alpha - \beta_1 MS + \beta_2 IR + \beta_3 UR - \beta_4 EP + \beta_5 COV + \varepsilon \qquad \text{(Model 1)}$$

$$CR = \alpha - \beta_1 MS + \beta_2 IR + \beta_3 UR - \beta_4 EP*COV + \varepsilon \qquad \text{(Model 2)}$$

Based on the models, CR represents the credit risk which is taken from the total amount of non performing loans in Malaysia's banking system. MS indicates the money suppy, IR represents the interest rates, UR shows the unemployment rate, EP indicates economic performance which is been measured by Industrial Production Index. For modelling

framework, COV indicates the COVID-19 which represents by the the dummy variable. While, the COV*EP represents the interaction between the occurance of COVID-19 and Economic performance. The dummy variable COV indicates the period of COVID-19. In its original form, it is set 1 COVID-19 occurred. Otherwise it is set 0, yielding a sequence isolated 1s, surrounded by 0s. Lastly, α and β indicate the constant and coefficient. ε shows the error term. The expected coefficients are MS< 0, INT > 0, UR < 0, IPI < 0, COV > 0 and COV*EP > 0

This study applies the cointegration method it is therefore important to confirm stationary or non-stationary properties of variables chosen. The test for the presence of the unit root test is necessary. The ADF unit root test is based on the null hypothesis H_0: each variable chosen is not I(0). If the calculated ADF statistics is less than the critical value the null hypothesis is rejected, otherwise accepted.

The ADF unit root test can be performed by estimating the regression;

$Yt = ρyt-1 + α1Δyt1 + ... + αρ-1 Δyt-ρ+1 + εt$

Cointegration analysis will be used by taking the Johansen cointegration test. This aims aims explicitly to deal with the relationship between non-stationary time series and spurious result can be avoided. The cointegration test will be based on two tests; trace test statistics and the maximum eigenvalue test statistics. In order to check for the long run equilibrium exists between the variables to achieve the objective, Johansen cointegration test (Johansen, 1988 and Johansen and Juselius, 1990) is used.

This study has benefitted from monthly data set of eight years covering from 2013 to 2020. The observation is adequate for the method chosen. Sample is restricted to this time span in order to get uniformness of the data set and considering the availability of the data. Data is obtained from Bank Negara Malaysia monthly statistical bulletin.

Finding and Discussion
In order to avoid the spurious problem which usually happen in the OLS method, the Augmented Dickey-Fuller (ADF) test is conducted in order to check whether the series of the data is stationary or non-stationary. Table 1 provides the summary of stationary test. Using 1% significance level, all variables fail to reject the null hypothesis of non-stationary at the level form. Conversely, all variables are stationary at their first difference form, since the null hypothesis of non-stationary can be rejected. All variables are I(1) or integrated of order 1. The dummy variable Covid 19 is not included in the Stationary Test as it was argued in Glynn and Perera (2007) that dummy variable is an exception in this test.

Table 1
Stationary Test

Variable	Level I(0)	First differences I(1)	ADF Value
CR	1.171	7.783	3.501***

MS	1.425	9.452	3.501***
IR	0.634	3.843	3.502***
UR	0.746	9.693	3.501***
IPI	3.488	11.139	3.502***

All the variables in Table 1 are significant at 1 % significance level. The result shows that all the variables are non-stationary in level, but are stationary after first differencing. Since the result from ADF confirmed a series at first differences stationarity, the test of unit root strongly suggest that all variables are integrated of order one or I (1) by adjusting the maximum lag to 11. Since all the variables are in the same order of integration then it will continue to apply the technique of co-integration.

Once the order of integration is established for each variable, the evaluation of the cointegration test for the data series is continued. This cointegration test is used to determine whether a linear combination of the series has a long run equilibrium.

Result from the Johansen cointegration test is demonstrated in Table 2. From the analysis of the maximum eigenvalue, the model shows the presence of one cointegrating equation since these statistics exceed their critical value at the 5% significance level. There is a cointegrating relationship between independent variable, therefore the null hypothesis of no cointegration can be rejected.

Table 2
Johansen Cointegation Test Result
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistics	0.05 Critical Value
None *	0.5336	125.9338	95.7536
At most 1	0.2053	55.0062	69.8189
At most 2	0.1690	33.6312	47.8561
At most 3	0.1171	16.4106	29.7971
At most 4	0.0506	4.8309	15.4947
At most 5	0.00002	0.0021	3.8414

Unrestricted Cointegration Rank Test (maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max eigen Statistic	0.05 Critical Value
None *	0.5336	70.9276	40.0775
At most 1	0.2053	21.3751	33.8768
At most 2	0.1690	17.2205	27.5843
At most 3	0.1171	11.5798	21.1316
At most 4	0.0506	4.8287	14.2646
At most 5	0.00002	0.0021	3.8414

Based on the Johansen co-integration test, the trace test (125.9338) are higher than the critical value (95.7536) whereas the max-eigen value (70.9276) is also higher than the critical value (40.0775). Since the trace test and max-eigen is higher than critical value it shows there

is a long run equilibrium. The test suggests that null hypothesis is rejected at the 5% significance level, which means there is at least one co-integration equation.

The existence of cointegration implies variables are cointegrated and there is a meaningful long run relationship. Testing with provision of four lags, the model exhibits no serial correlation and no normality problem. Thus, the study has proceeded to the next step to find out the magnitude of the long run relationship. Estimated long run equilibrium model is as follows;

Table 3
Results of long run equilibrium

Variable	MODEL 1		MODEL 2	
	Coefficient	t statistics	Coefficient	t statistics
MS	0.0008	0.3077	-0.003472	0.5148
IR	7478.306	3.1421***	-508.6097	0.0943
UR	-2637.807	0.7882	9668.642	1.9504*
EP	-2939.143	8.5910***		
COV	885.5825	0.1448		
COV*EP			6337.885	6.0570***

Notes: *** 1% level of significance

Based on Table 3, in MS is not found to be statistically significant in either Model 1 or Model 2. While interest rate in Model 1 shows a positive magnitude and highly significant and 0.01 significance level. It depicts that a high interest rate will lead to higher credit risk as borrowers cannot afford to pay back the loan when the interest rate is high. For the unemployment rate (UR), only Model 1 indicates an expected magnitude with a significant impact at 10% level of significance. While in Model 2 magnitude of negative relationship is found which is not compatible with the theory. This finding however can be rejected as the UR does not statistically significant with stock price. As expected the economic performance (EP) show a higly significant influence on the increasing of credit risk. The magnitude is negative showing that the higher economic performance will lead to lower credit risk vice versa.

The major highlight in this study is COVID-19 pandemic (COV). When COV is tested solely based on the dummy (Model 1) of the occurance of pandemic, it is revealed that there is no significant influence on the credit risk. Nonetheless when tested using the interaction between COVID-19 and economic performance (COV*EP) it is found that the interaction shows a highly significant influence on credit risk. This interaction is significant at less than 1% alpha in the long run equilibrium. The positive magnitude also indicates to the higher COVID-19 will interact through the economic performance and led to higher cases of credit risk. The asymmetric effect of economic performance is captured by significant coefficient for the interaction term. Finding reveals that credit risk will react to the COVID-19 through the economic performance. This study is in parallel with Barua and Barua (2020) and Wahyudi and Arbay (2021) who conceptualy study the impact of COVID-19 on the credit risk. Empirically, this study supported the finding by Hardiyanti and Aziz (2021) who uses a simple regression to study the impact on COVID-19. Nonetheless, this study reveals the direct impact rather than the interaction of variable. In the case of Malaysia, the direct impact did not emerge as it is too short period to observe the COVID-19 pandemic. However, the impact of COVID-19 is only realized when the interaction is used. The increase in COVID-19 pandemic

lead through the weak economy create the increasing loss of the Malaysian income. As a consequence, there is a growing credit risk, as personal or businesses may not be able to pay their rents or mortgage loans.

Conclusions

With the emergence of the COVID-19, there are many claims that bank risks appear to escalate in Malaysia. Therefore, this study tries to assess the relationship between COVID-19 pandemic and credit risk in Malaysia. Based on the literature review discussed an increasing amount of credit risk will increase when the COVID-19 occured. It is found that COVID-19 in Malaysia solely cannot influence the credit risk. Nonethelss, the interaction between the COVID-19 and credit risk there is highly significant influence in the increasing of credit risk. The consequences of the increase in credit risk lead to the loss of the bank. Failure of paying back the loans on time may constraint the bank's ability to lend to other borrower thus cause the banks fail to achieve their objective and lead banks to experience the rising outstanding loans thus affect the cash flow problem in banking system. The increase credit risk during the COVID-19 together with the down of the economic performance can harm the entire banking institution and the economic conditions as a whole.

The significant increase in credit risks across the countries was a serious test of people, systems, and procedures. There are a lot of factors may also play a role, however this paper offers a case study of credit risk of commercial banks in Malaysia during the COVID-19 pandemic. This paper suggests that government need to take measures to combat the economic consequences of the pandemic and eventually affect the credit risk. The finding of the study also has contributed to the awareness for the commercial banks. Malaysian commercial banks need to prepare for higher losses in the future by making provisions. It is possible that the crisis' maximum impact on commercial banks in Malaysia is still not felt. Therefore, banks need to monitor carefully recognize payment problems of their customers. The slow action, recognition and handling of high numbers of credit risk problems loans in commercial banks will hinder the economic recovery as whole.

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