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Islamic Bank Deposits during COVID-19 Pandemic: A Spatial Finance Approach

(Deposit Bank Islam semasa Pandemik COVID-19: Pendekatan Kewangan Ruangan)

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ABSTRACT

This study aims to determine factors affecting deposits in banks during COVID-19 pandemic by employing a spatial finance approach on a sample of Islamic Rural Banks in the Indonesian archipelago. The results showed that the COVID-19 pandemic, capital financing, and bank asset had a spatial influence on bank deposits. Specifically, while COVID-19 pandemic reduces bank deposits, capital financing and bank assets increase these. Using Spatial Lag Model and Local Indicator of Spatial Autocorrelation through Spatial Rate Analysis, the study further found that there is a potential spillover effect in certain provinces based on the bank deposit relationship with COVID-19, financing and bank assets. This implies that the three factors tend to spatially affect the socio-economic activities of the neighboring areas of certain provinces. This study may shed some light for the government in determining post-COVID-19 economic recovery policies using a geographical approach in providing information on financial interactions between regions.

Keyword: Spatial finance; spillover effects; COVID-19; Islamic rural bank; Indonesian archipelago; Islamic banking
JEL: C31, G21, R12

ABSTRAK

Kajian ini bertujuan untuk menentukan faktor-faktor yang mempengaruhi deposit di bank semasa pandemik COVID-19 dengan menggunakan pendekatan kewangan spatial pada sampel Bank Pembiayaan Rakyat Syariah di kepulauan Indonesia. Hasilnya menunjukkan bahawa pandemik COVID-19, pembiayaan modal, dan aset bank mempunyai pengaruh ruang terhadap deposit bank. Khususnya, sementara pandemik COVID-19 mengurangkan deposit bank, pembiayaan modal dan aset bank meningkatkan deposit bank. Dengan menggunakan Model Spatial Lag dan Penunjuk Tempatan Autokorelasi Spatial melalui Analisis Kadar Spatial, kajian itu selanjutnya mendapati bahawa terdapat kesan limpahan yang berpotensi di wilayah tertentu berdasarkan hubungan deposit bank dengan COVID-19, pembiayaan dan aset bank, masing-masing. Ini menunjukkan bahawa pandemik COVID-19, pembiayaan dan aset bank cenderung mempengaruhi aktiviti sosio-ekonomi di kawasan jiran di wilayah tertentu. Kajian ini mungkin memberi pencerahan kepada kerajaan dalam menentukan dasar pemulihan ekonomi pasca COVID-19 menggunakan pendekatan geografi dalam memberikan maklumat mengenai interaksi kewangan antara wilayah.

Kata kunci: Kewangan ruangan; kesan limpahan; COVID-19; bank pembiayaan rakyat syariah; Kepulauan Indonesia; Perbankan Islam

INTRODUCTION

The spread of the COVID-19 virus in various countries significantly disrupted supply chains, economic shocks, and consumer preferences globally. In addition, the pandemic contributed to instability in the financial sector, which had in turn adversely affected the banking industry. The global recession had threatened the liquidity levels of the financial system, thereby affecting investors' and customers' confidence (Bolton et al., 2016; Erfani & Vasigh, 2018; Y.-K. Chen et al., 2018) & Financial Stability Board, 2020). Despite the negative impacts of the virus, banks must maintain liquidity levels to mitigate risks (Diamond & Dybvig, 1983; Ennis & Keister, 2003; Mohammad et al., 2020).

According to a 2020 report by OECD (2020), the global financial industry had declined by up to 50% in the investment sector since the pandemic thus leading central banks in several countries to provide bailouts to maintain banking stability and liquidation (Baret et al., 2020). The policy however was considered unsuccessful (Barrell & Davis, 2008; Lucchetta, 2016; Moschella & Tsingou, 2013; Thakor, 2013), thus necessitating a specific approach that considers spatial aspect in responding to the spread of COVID-19 in individual regions (Boot et al., 2020; Wullweber et al., 2020), especially in large countries with numerous administrative areas.

Indonesia is an archipelago with the largest Muslim population on earth. The country has a prominent Islamic finance industry comprising 32 Islamic Banks and 163 Islamic Rural Banks (IRB), making it one of the largest Islamic finance industries globally that has good knowledge, high awareness and regulation (Mohamed

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& Ahmed, 2021). The country has potential in the Islamic banking industry in both global and domestic markets, with Asset growth of 65% over the last five years (Central Intelligence Agency, 2019; Financial Services Authority, 2020; Mohamed et al., 2020; Rizvi et al., 2020). In predominantly Muslim Indonesia, Islamic banks possess better market forces than conventional banks due to their ability to exploit the value of religiosity in customers (Aysan et al., 2018; Risfandy et al., 2019). Islamic banks is generally divided into two groups, namely large Islamic banks consisting of Islamic Commercial Banks (ICBs) and Islamic Business Units (IBUs), and small Islamic bank groups such as Islamic Rural Banks (IRBs). The ICBs and IBUs focus on the middle and upper income consumers, while IRBs focus on lower and middle income customers in the villages, remote areas, and local communities (Widarjono & Anto, 2020). Currently, ICBs and IBUs dominate the Islamic financing market. IRBs play an essential role in the economy because they provide financing for small to medium businesses including farmers and fishermen who are not normally the clienteles of the ICBs and IBUs (Wasiaturrahma et al., 2020). The focus is appropriate since most entrepreneurs in Indonesia are in the small to medium categories. In the latest 2018 report the vast majority of entrepreneurs were in these categories with 3,667,873 (99.3%) out of the total 3,694,195 entrepreneurs (Widarjono et al., 2021). The IRB had provided loans of up to 10.6 trillion rupiahs or 28.3% of the total Islamic microfinance financing to support the small and medium enterprises (Effendi et al., 2021; Financial Services Authority, 2020; Shaban et al., 2014). In addition, the growth of the Financing to Deposit Ratio (FDR) in IRB was rapid and has reached 119.72%, a significant reinforcement indeed for small and medium enterprises in Indonesia (Financial Services Authority, 2020; Muhammad et al., 2020; Priyadi et al., 2021).

IRB acts as a bank and an Islamic Microfinance Institution that aims to support the development of social and economic aspects of society to increase financial inclusion and economic resilience (Fithria et al., 2021; Irfan, 2020; Warninda, 2014). Its presence has helped the public avoid financing from loan sharks who demand exorbitant interests. Furthermore, IRB has a good track record in various regions of Indonesia due its ability to penetrate varied areas to reach small entrepreneurs (Trinugroho et al. ,2017; Priyadi et al., 2021). This financial institution has become a solution for customers unwilling to receive financing from conventional banks because of contradictions to Islamic Shariah Law (Trinugroho et al., 2018).

Since 2015, the performance of IRB in Financing, Assets, and Deposits had grown relatively stable. However, the performance of Deposits experienced a decrease in 2020 due to the emergence of the COVID-19 viral pandemic. Deposits are funds collected by banks from customers by means of savings and investments through the offer of various financial products. In addition, Deposits are also a fundamental factor for IRB because the amount collected can potentially affect the ability of banks to provide financing for other customers. With larger Deposits the ability to provide financing accordingly increases. Conversely, with smaller Deposits this ability is reduced thereby impacting revenue sharing in the IRB. The advent of COVID-19 has drastically changed the financing scenario for the IRBs. Bank's performance was severely curtailed due to imposition of lockdown polices to control peoples' movement that adversely affected the revenue of small to medium-sized businesses. The pandemic also similarly affected customer orientation in their saving through increasing consumer purchasing power towards basic needs (Baret et al., 2020; Boot et al., 2020). The risks to the performance of banks and Deposits on the IRBs can create a spatial spillover effect on other IRBs through direct relationships between neighbouring banks and among customers that share similar profile (Foglia et al., 2020). Moreover, Zhang et al. (2020) stated that the pandemic also created an unpredictable level of liquidation risk, thereby causing losses to all stakeholders within a short period. COVID-19 also triggered a decline in banks' revenue since their performance was highly dependent on macroeconomic conditions. The decline in revenues (Aldasoro et al., 2020; Shean, 2020) due to flagging performance will cause great difficulty in guaranteeing banks' liquidity level in times of economic recession (Altunbas et al., 2011; Claeys, 2020; Erfani & Vasigh, 2018). Further, Ari et al. (2020a) similarly reported that almost all banks experienced liquidity shocks following the pandemic due to the decline in the macroeconomic sector and banking performance.

Conversely however, Sutrisno et al. (2020) asserted that COVID-19 does not significantly impact liquidity on Islamic banking funds since they adhere to strict regulations (Danisman et al., 2021; Rabbani et al., 2021). In addition, technological approaches and social functions have engendered trust in customers (Abbas & Frihatni, 2020; Sudarsono et al., 2020) therefore, the liquidity of Deposits can be appropriately maintained (Haron et al., 2020). Setyowati (2019) and (Fakhrunnas & Imron, 2019)the paper analyzes 21 biggest Islamic rural bank which as a representative of 21 provinces around Indonesia during 2013-2017 which result 420 observation period. Furthermore, Return on Asset (ROA stated that macroeconomic factors do not significantly influence the growth of Deposits in ICB, IBU, and IRB because most Islamic bank customers Deposit their funds based on religious guidance (Karim et al., 2017; Mushtaq & Siddiqui, 2017; Suhartanto et al., 2018).

Banking performance is influenced by economic growth which also takes into account aspects of spatial spillovers generated in neighboring regions (Ascani

et al., 2012; Asnawi et al., 2020; Boďa & Zimkova, 2019; Mansur, 2019 & Mufraini et al., 2020). The concentration of financial activities in a given region improve its economic performance thus creating the spillover effect beneficial to surrounding regions. Conversely, areas with low financial activities are capable of adversely affecting neighboring regions due to their limitations in providing access, services, information, and infrastructure. Most of the approaches used in measuring Deposits in banks have employed global regression. This study was conducted in Indonesia, a geographically vast archipelago nation, with numerous administrative provinces. Given the geographical spread, the spatial approach is thus considered appropriate to predict the impact on financial activities due to the spread of the COVID-19 pandemic (Bognanni et al., 2020; Z. L. Chen et al., 2020; Danon et al., 2020; Eggo et al., 2011; Gatto et al., 2020; Gog et al., 2014; Guo, 2007; Ludovic et al., 2020). Studies in several countries, such as Canada, Kuwait, and the USA, have developed a spatial finance approach as an indicator in measuring the effect of geography in financial and banking performance since individual regions possess varying capabilities in receiving and responding to external and internal influences (H. Chen & Strathearn, 2020). As an archipelago nation consisting of 34 administrative provinces with 17,504 islands (Fauzan et al., 2020; Grydehøj & Hayward, 2014; Mahendradhata et al., 2017; Mufraini et al., 2020), Indonesia judiciously adopts the spatial approach to provide the most accurate information on financial interactions between regions. Such information would best assist the government in identifying and formulating the right policies for post-pandemic economic recovery for the financial sector (H. Chen & Strathearn, 2020; Patterson et al., 2020; H. Zhang, 2014).

This study aims to promote a spatial finance approach to measure variation in regional Deposits in IRBs. The instruments used comprise macroeconomic factors represented by Regional Gross Domestic Product (RGDP) and Regional Consumption, Banking Performance based on Capital Financing, Investment Financing and Bank Assets, and the impact of pandemic due to COVID-19. The spatial finance approach thus aims to determine the factors that affect Deposits regionally in the IRBs and to predict the spillover effect affecting these Deposits.

LITERATURE REVIEW

The development of the financial system is the key to improving economic growth because a good level of stability allows for an entity to make investment allocation and risk diversification in the long run (Schumpeter, 1911; Ülgen, 2015). Conversely, the level of financial stability is inseparable from economic activity in each region due to its opportunity to influence neighbouring regions with spillover effect (Carbó-Valverde & Sánchez, 2013; Fernández et al., 2013; Ijaz et al., 2020; Oyelami & Saibu, 2021; Ughetto et al., 2019; Wang, 2018; H. Zhang, 2014; Y. Zhang et al., 2008). The growth of the financial system in the last two decades has given rise to regional concentration (Agnes, 2000; Palmberg, 2011), increased transaction efficiency and financial activities to the various regions (Falzon, 2001; Kaufman, 2001). The consequent growth of regional concentration in the financial system leads to the efficiency of labour access through cost reduction in in-house training at the head office and geographical proximity to neighbours that is capable of minimizing the cost of interactions and transactions between IRB branches (Cetorelli & Gambera, 2001; Llovet Montanes & Schmukler, 2018; Popov, 2018).

Typically, the spatial finance structure is corrected and refined through the interactions between regions by social, economic and financial factors (H. Zhang, 2014). The potential spillover effect is closely related to a region's level of financial capability (F. Li & Li, 2018; Rainone, 2020). The prominent region designated as the financial center can exert either a negative or positive economic impact on its neighboring regions based on the nature of their responses (Anselin, 1995; Crocco et al., 2010; Jones, 2017; Lukongo & Rezek, 2018; Pan, 2012). The advent of the spatial finance approach has changed the measurement of potential and financial risk of each region given that regional financial instability can accrue over time into a systemic crisis (Carbó-Valverde & Sánchez, 2013; Manu et al., 2011). Spatial approaches also motivate banks to improve the quality of their services in the banking industry through mapping financial services in order to optimize the function of intermediary institutions (Ansong et al., 2015; Richards et al., 2008).

The spatial economic approach has evolved since the mid-nineteenth century. It provides the methodology to analyse interactions in economic transactions between regions based on geographical proximity (Andersson, 2005; Prykhodko, 2017). According to Fujita (2010), spatial approaches specifically encapsulate all aspects of economics through the development of geographical economics. It is essential in reducing the economic gap between regions, due mainly to incredibly imperfect competition as a result of the inability to read the region's potential in the past (Krugman, 2011). Abeyratne & Cooray (2017) stated that economic inequality in low-income regions occurs due to the lack of ability in predicting the economic spillover effect, thus rendering the role of high-income regions to be suboptimal in fostering economic improvement (Combes et al., 2005). Implementing the spatial approach has brought the banking industry into a new era by considering geography-based financial risks. Conceptually, spatial mapping can reduce the risk of banking competition

as a result of asymmetric information due to the significant physical distances between banks and customers (Agarwal & Hauswald, 2010; Ansong et al., 2015). Therefore, proximity to customers makes it easier for banks to source valid information for effective operation in mitigating financing risk (H. Chen & Strathearn, 2020; Ergungor & Moulton, 2011; Flögel, 2016; Verma, 2011). In addition, the facility associated with geographical proximity can also foster increasing customer trust, thereby indirectly improving Deposits (Benamati & Serva, 2007; Liberti & Petersen, 2019; Richards et al., 2008).

The World Bank introduced the spatial finance approach through accurate detection of geographical locations by remote sensing on Asset distribution patterns and banking financial activities capable of producing spillover effects on neighboring regions (Patterson et al., 2020). In addition, the concept of spatial finance aims to translate the phenomena of spatial distance, geography, data science and financial performance to produce comprehensive analytical results. The development of spatial finance in the banking sector is influenced by the consumption and economic growth of individual regions (Balash et al., 2020), which consequently affect the region's financing and economic performance (Abduh & Azmi Omar, 2012; Khasanah & Wicaksono, 2021). Spatial finance is a method of analysis that adopts a geospatial approach that provides information on financial activities through interactions between regions based on the combination of the Geographic Information Systems (GIS) and remote sensing (Patterson et al., 2020; H. Zhang, 2014). There is a difference between the gravity model and spatial finance, with the former oriented on the optimal distance in transactions. In contrast, spatial finance analyses spillover effects through remote sensing based on latitude and longitude. The approach aims to explore future economic potential through an accurate picture of the earth map. In addition, this approach has innovated an update in financial modelling through changing the social and cultural perceptions in individual region (Palmberg, 2012; Sellar et al., 2019). By comparison, many preliminary studies (Fakhrunnas & Imron, 2019; Muhammad et al., 2020; Priyadi et al., 2021; Wasiaturrahma et al., 2020) on the subject were basically number-oriented without involving any geographic approach in measuring the financial performance of IRBs.

METHODOLOGY

The study measured factors affecting Deposits on the IRB and mapped spatial finance potential during pandemic event. The Independent Variables consisted of COVID-19 pandemic, Regional Gross Domestic Product (RGDP), Regional Consumption, Capital Financing, Investment Financing, and Assets. While the dependent variable used was Deposit. The explanation of each variable is given in Table 1.

Cross-section data with sampling were used in this study that included all IRBs in Indonesia based on province. Data were sourced from the COVID-19 Task Force, the Financial Services Authority (OJK), and the Central Statistics Agency (BPS) in 2020. A descriptive analysis was carried out in the first phase to describe the relevant information on the sample and population (Loeb et al., 2017; Marshall & Jonker, 2010). In the second phase, Regression Diagnostics testing was conducted based on the Ordinary Least Square (OLS) approach through normality, heteroskedasticity, and multicollinearity tests to determine spatial relationships (Anselin, 2005; J. LeSage & Pace, 2009; Mostafa, 2018). According to preliminary studies, the inability of the three analyses to meet the rules of the classic assumption indicates the potential for spatial influence in the model, therefore necessitating the application of spatial analysis. The third stage was diagnostic for spatial dependence testing to determine the best spatial model between Spatial Lagrange Multiplier (SLM) with notation metrics (Anselin, 1988; Griffith, 1993; Putra et al., 2020):

$$Y = \rho \mathrm{W}\mathrm{y} + \mathrm{X}\beta + \varepsilon, \tag{1}$$

$$y = \left(I_n - pW\right)^{-1} X\beta + \left(I_n - pW\right)^{-1} \varepsilon, \tag{2}$$

$$\varepsilon \sim N\left(O_{nx1}, \sigma^2 I_n\right), \tag{3}$$

where Y is a dependent variable, n is an observational unit, W is a spatial contiguity matrix that shows the pattern of spatial units in a sample, ρ is the spatial autoregression coefficient, X is the n x k matrix of the explanatory variable, with the regression coefficient vector k x 1 associated β, and ε is vector of random error. The Spatial Error Model (SEM) can thus be written as follows (Anselin, 1988; Griffith, 1993; Putra et al., 2020):

$$Y = X\beta + u, \tag{4}$$

$$u = \lambda Wu + \varepsilon, \tag{5}$$

Where, λ is the spatial autocorrelation coefficient and u is the vector of error terms. Then, Spatial Autoregressive Moving Average (SARMA) can be presented as follows (J. P. LeSage, 1999):

$$Y = \rho \mathrm{W}\mathrm{y} + \mathrm{X}\beta + u, \tag{6}$$

$$u = \lambda Wu + \varepsilon, \tag{7}$$

$$\varepsilon \sim N\left(O, \sigma^2\right), \tag{8}$$

In addition, René (2002) and Anselin and Smirnov (1996) simultaneously confirmed spatial dependence, as in the following Figure 1.

Figure 1 shows that several points are directly connected. However, some points require intermediaries to be connected. For example, there are four paths connecting points 1 and 4: line one (1-4), line two (1-3-4), line three (1-3-2-4), and line four (1-2-4). However, the number of paths available is basically information that serves to identify the connecting points between points 1 and 4. The priority is to know the shortest path between the two points so as to understand the spatial potential and spillover effect between them. In terms of geographical territory, this can indicate a province with direct or indirect relations among its neighbors either through infrastructure, socio-culture or financial activities. In the final stage, a Local Indicator of Spatial Autocorrelation (LISA) analysis for spatial finance mapping based on Spatial Rate Analysis, helps in detecting outliers and spatial grouping rates on-site to predict the potential spillover effect on a province. This study used Eviews 10 and GeoDA 1.12 in the first and second stages.

RESULTS AND DISCUSSION

Descriptive statistics of variable cases of COVID-19, RGDP, Regional Consumption, Capital Financing,

TABLE 1. Variable description

Variable	Description	Source of Data
Independent Variables		
COVID-19	Coronavirus Disease 2019 (COVID-19) cases that occur in every province	COVID-19 Task Force
Regional Gross Domestic Product (RGDP)	Gross Domestic Product (GDP) value in each province	BPS
Regional Consumption	The value of household consumption in each province	BPS
Capital Financing	Capital Financing provided by IRB in each Province	OJK
Investment Financing	Investment Financing provided by IRB in each Province	OJK
Asset	All Assets owned by IRB in each Province	OJK
Dependent Variable		
Deposits	All Deposits in the IRB by Province	OJK

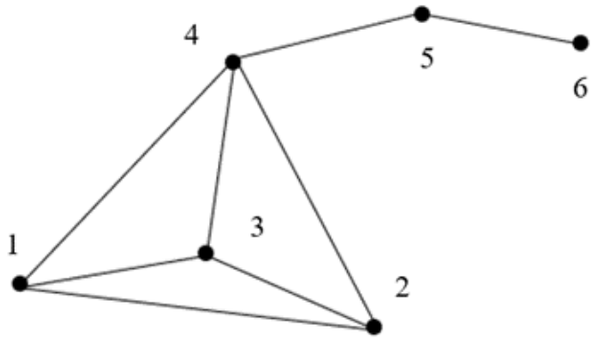

FIGURE 1. The spatial dependence concepts

TABLE 2. Descriptive statistics

Variable	N	Mean	Min	Max	Std. Dev.
COVID-19	34	11,968.97	581.00	104,847.00	19,929.89
RGDP	34	-2.60	-12.28	6.66	2.97
Regional Consumption	34	-2.13	-6.94	2.54	2.10
Capital Financing	34	141,049.90	0.00	1,228,324.00	310,649.00
Investment Financing	34	45,963.59	0.00	425,458.00	91,113.76
Asset	34	416,293.00	0.00	4,476,364.00	896,917.00
Deposits	34	272,408.00	0.00	2,850,246.00	581,873.30

Investment Financing, Asset, and Deposits based on observations in thirty-four (34) provinces are depicted in Table 2.

The results showed an average of 11,968.97 cases of COVID-19 in each province, resulting in a decrease in RGDP to -2.60% and a decrease in Regional Consumption to -2.13% (Central Bureau of Statistics, 2020). The International Monetary Fund (2020) in the Fiscal Monitor said that the spread of COVID-19 has adversely affected the global emerging markets and middle-income economies. The General Government Fiscal Balance in Indonesia decreased by -10.7%, in addition to General Government Debt that increased to 65% of GDP in 2020. The general decrease in consumption is due to strict social restrictions imposed by the government in handling COVID-19 that consequently impacts economic growth (Bekaert et al., 2020; del Rio-Chanona et al., 2020; Hassan et al., 2020). In addition, the results showed differences in the level of Financing distribution, Assets increase, and in Deposits in various provinces. Since each province has its own authority to enforce social restrictions (Sevindik et al., 2021) significant gaps develop between the maximum and average value in banking performance and Deposits in every province.

The next step is the Regression Diagnostic Test to determine the existence of apparent spatial attachment. The results are shown in Table 3.

The Regression Diagnostic Test results indicate that the OLS approach does not qualify for testing because of the non-normality of data. There is a non-normal distribution level on the normality of error test based on insignificant probability in the Jarque-Bera test, which is 0.00 or $p<0.05$ (Khatun, 2021; Stehlík et al., 2014; Thadewald & Büning, 2007). In addition, Breusch-Pagan test results showed heteroskedasticity based on insignificant probability of 0.00 or $p<0.05$ (Klein et al., 2016; Z. Li & Yao, 2019). The Variant Inflation Factor (VIF) test also showed a multicollinearity relationship between variables with a condition number value of 16.33 or VIF > 10 (Shrestha, 2020). In contrast to OLS, Anselin (2005) stated that spatial lag model (SLM) is indicated through the OLS model that does not pass regression diagnostic test because there is a spatial relationship between neighboring areas and a particular area based on weighted spatial lag and uniformity of patterns and values between regions (Anselin et al., 2006; Mostafa, 2018; Putra et al., 2020).

Diagnostic for Spatial Dependence results (Table 4) showed a significant tolerance limit of 0.05 (J. LeSage & Pace, 2009) which indicates that there is significance in the Lagrange Multiplier (Lag) test of 0.01 and robust LM (Lag) test of 0.02, while the results of Lagrange multiplier (error), Robust LM (error) and Lagrange Multiplier (SARMA) tests showed insignificant results with a value of $p>0.05$. Anselin (2005) and Moise & Kalipeni (2012) explained that if the diagnostic results for spatial dependence testing show significance in Lagrange Multiplier (lag) and Robust LM (lag) tests, then the best model used is SLM. If however the Lagrange Multiplier (error) and Robust LM (error) tests are significant, then the best model is the Spatial Error Model (SEM). Further, if the Lagrange Multiplier (SARMA) test is similarly significant, then the best model is the Spatial Autoregressive Moving Average (SARMA).

The study used the SLM test, identified as the best model (Anselin, 2005; Anselin et al., 2006; Mufraini et al., 2020), to elucidate factor of Deposits in the IRB. The SLM test results are given in Table 5. COVID-19 produced a negative and significant effect on Deposits in IRB with a coefficient value of -0.93. Similarly, the variable of Capital Financing and Assets positively and significantly affect the Deposits with coefficient values of 0.14 and 0.63 respectively. The R-squared result in the model equation shows a value of 0.99, meaning that independent variables affect dependent variables by 99%.

Small-scale industries, currently experiencing financial stress due to the rapid spread of COVID-19 (Adian et al., 2020; Gourinchas et al., 2021), are making extensive withdrawals to fund their liabilities (World Bank Group, 2020; Wullweber et al., 2020). Being priority customers, the withdrawals greatly impacted the IRBs. However, in some areas, the virus had minor effects on the performance of Capital Financing (Mansour et al., 2021; Sugiharto et al., 2021) due to the variation between regions in their economic strength and the effectiveness of the authorities in implementing social restrictions (Hill et al., 2008; Roziqin et al., 2021; Sevindik et al., 2021; Vidyattama, 2013). The resilience of Capital Financing during the pandemic was mainly attributed the IRBs' orientation to profit and loss sharing and strict supervision in the financing process (Omar, 2020; Rabbani et al., 2021). In addition, the government also carried out policy stimulus by restructuring financing below 10 billion rupiahs for small-scale industries enabling them continuous growth, crucial in maintaining the level of IRB liquidity (National Economic Stimulus as Countercyclical Policy Impact of Coronavirus Disease Spread 2019, 2020). In consequence, the Asset variables led to the influence on Deposits since the IRB fixed Assets have substantially increased during the pandemic (Financial Services Authority, 2020). Additionally, the fixed Assets provided access to savings for customers (Ahmad et al., 2011; Awan & Bukhari, 2011; Shabbir, 2019). Current IRB Assets, in the form of cash, investment, receivables, inventory, and rent similarly showed controlled performance (Financial Services Authority, 2020), which thus translate into the ability to contribute to Deposits.

LISA analysis is based on pseudo $p<0.05$ and Moran's I values. If Moran's I value is between $-1<I<1$,

-1 indicates perfect negative autocorrelation, while +1 indicates perfect positive autocorrelation (Lee & Wong, 2001; Munibah et al., 2018; Tsai, 2012). The measurement of significant levels of spatial relationship through the tolerance limit of $p<0.05$ values (Anselin, 2005) is shown in Table 6.

LISA analysis shows that COVID-19, Capital Financing and Asset separately have positive spatial autocorrelations to Deposits, through the significance of pseudo and Moran I value. This suggests that when a province is able to manage IRB funds well, it will impact its neighbors in the surrounding environment, thereby creating a spillover effect based on similar spatial patterns formed. Figure 2 shows the mapping of results of spatial rate analysis used to determine the areas capable of creating spillover effects on neighboring regions.

Spatial rate analysis results predict that several provinces have the potential to provide spillover effects on neighboring regions. Furthermore, based on spatial relations on the spread of the pandemic to Deposits, some provinces, such as South and West Sulawesi, have

TABLE 3. Regression diagnostic test

Diagnostic	Indicator	Value	Prob.	Rule of Thumbs	Note
Normality of Errors	Jarque-Bera	31.57	0.00	P > 0.05	Not Significant
Heteroskedasticity	Breusch–Pagan Test	22.52	0.00	P > 0.05	Not Significant
Multicollinearity	Varian Inflation Factor	Condition Number 16.33		VIF < 10	Not Significant

Note: *Significant at 0.05

TABLE 4. Diagnostic for spatial dependence regression modeling

Test	MI/DF	Value	Prob
Lagrange Multiplier (lag)	1	5.46	0.01*
Robust LM (lag)	1	5.27	0.02*
Lagrange Multiplier (error)	1	0.26	0.60
Robust LM (error)	1	0.07	0.78
Lagrange Multiplier (SARMA)	2	5.54	0.06

Note: *Significant at 0.05

TABLE 5. Result of Spatial Lag Model

Variable	Coefficient	Std. Error	Z-Value	Probability
Constant	1,333.53	8,341.80	0.15	0.87
COVID-19	-0.93	0.38	-2.45	0.01*
RGDP	-2,019.72	1,735.29	-1.16	0.24
Regional Consumption	49.32	2,531.15	0.01	0.98
Capital Financing	0.14	0.05	2.69	0.00*
Investment Financing	-0.45	0.25	-1.79	0.07
Asset	0.63	0.03	18.70	0.00*
R-squared	0.99			

Note: *Significant at 0.05

TABLE 6. Local indicator of spatial autocorrelation

Spatial Relations	Moran's I	Pseudo P-Value	Note
Deposits with COVID-19	0.54	0.00	Significant
Deposits with Capital Financing	0.55	0.00	Significant
Deposits with Asset	0.47	0.00	Significant

Note: *Significant at 0.05

the potential to create spillover effects with a forecasting rate of 90% - 99%. Meanwhile, spatial mapping on Capital Financing to Deposits indicates that East and South Kalimantan provinces have spillover potential ranging from 90% to 99%. In addition, 17 provinces cannot be predicted in creating spillover effects, 7 of which are West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, Bali, Bangka Belitung, and Riau Islands, which geographically do not have directly adjacent neighbors (Mufraini et al., 2020; Munibah et al., 2018; Tampah-Naah et al., 2019). Meanwhile, the other 10, namely Gorontalo, Jambi, West Kalimantan, Central Kalimantan, North Kalimantan, Papua, West Papua, Central Sulawesi, Southeast Sulawesi, and North Sulawesi, are areas that are predicted to have no potential spillover on their neighboring regions due to the existence of outliers and non-uniform grouping patterns on COVID-19, Capital Financing and Asset to Deposits. Therefore, through stimulus and local and central government policies, the province can potentially receive spillover effects from other provinces in the future.

Predictions of spillover effect on Deposits through COVID19, Capital Financing, and Asset show the same spatial distribution pattern in several provinces with the potential to affect their neighbors (F. Li & Li, 2018; Seif et al., 2017; Ying, 2003). In addition, the increase in positive cases in a province directly affects the surrounding area. It is evident that every policy adopted by a province will affect its neighbors' economic, social, cultural, and political activities (Mahyudin, 2018; Miguel & Herrero-Prieto, 2020). This should also include social restriction measures implemented by a province in dealing with the pandemic. Therefore, when the provinces of South Sulawesi and West Sulawesi are recorded as regions with COVID-19 cases, the Deposits are highest on the island of Sulawesi thus making it predictable for spillover effect on their neighbors. In addition, a similar pattern is also apparent in South Sulawesi and West Sulawesi provinces where the

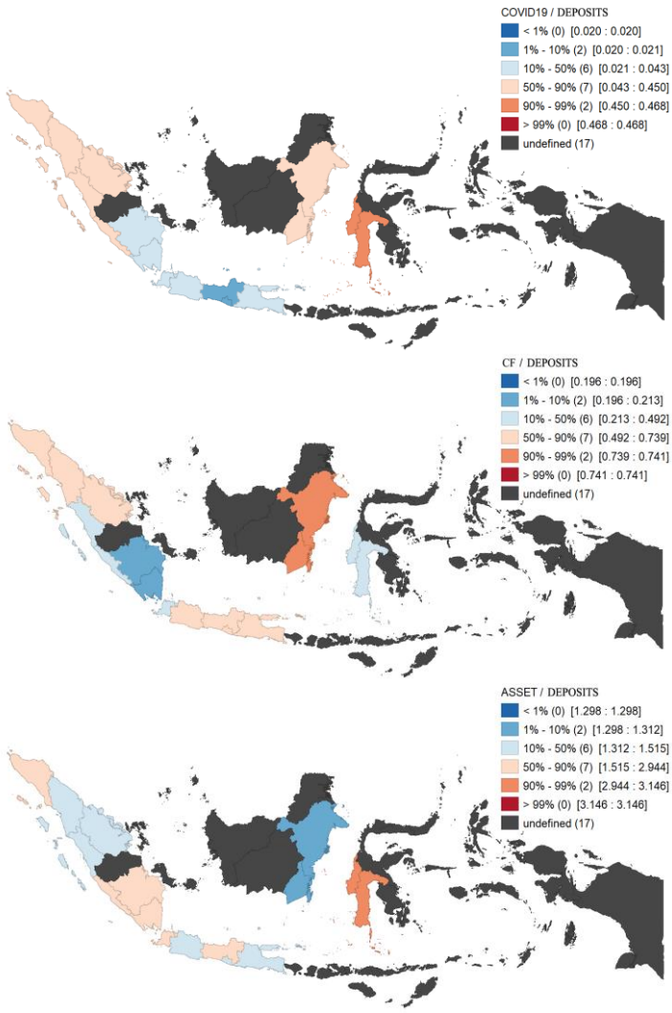

FIGURE 2. Spatial Rate Analysis Map
Source: GeoDa's data process

spillover effect show predictive results on Deposits through their Assets. Meanwhile, the predictive results of spillover effect on Deposits based on the response to Capital Financing showed great potential in the provinces of East Kalimantan and South Kalimantan. Both provinces had the most optimal financial performance with the highest asset and Deposit value on the island of Kalimantan.

CONCLUSION

In this study Deposits in IRB were measured based on the spatial finance approach using variables, such as COVID-19, RGDP, Regional Consumption, Capital Financing, Investment Financing, and Assets. The results established a spatial role in increasing Deposits through impact of COVID-19, Capital Financing and Assets. In addition, the study also predicted the potential spillover effect in the province of South Sulawesi, West Sulawesi, East Kalimantan, and South Kalimantan based on the relationship between the pandemic and variables of Deposits, Capital Financing to Deposits, and Assets through the LISA mapping on Spatial Rate Analysis. In general, spatial effects occur due to interactions between neighboring populations, thereby effecting change in individual preferences as influenced by the surrounding environment. The influence of COVID-19 on deposits triggers a decrease in liquidity levels in a particular area. This spatial effect is due to impact of policies taken by the province in dealing with the pandemic that affected social and economic activities of the surrounding region. Increased Capital Financing and bank Assets may encourage economic activities in neighboring areas. Furthermore, the ability to manage appropriate Assets could improve IRB services, thereby making it possible to maintain the level of liquidity in Deposit.

This study contributes to the extant literature on the spatial impact on economy and finance during the pandemic period, particularly in a vastly sprawling nation with numerous administrative regions, such as the extensive archipelago of Indonesia. In addition, it also adds to the literature on the role of spatial finance in measuring IRB performance for stakeholders in the banking sector. The study aims to assist the government in deciding whether the post-COVID-19 economic recovery policy should be centered in Java or alternatively in a newly created financial center outside this region as identified through the spatial financial approach. This center should have the required potential and capacity to provide spillover effect to their neighbors for a more balanced economic recovery. The study has limitation due to adopting the cross-section data analysis approach, which has led to difficulty in drawing conclusions that are time series in nature. Further research should consider adopting localized spatial measurements using factors unique to the particular area based on weighting at latitude and longitude.

Empirical evidence from the study should provide the salient recommendation to the Indonesian government in recognising the spatial measurement approach of IRB performance given the vast and numerous regions in her domain comprising 34 provinces and 17,504 islands. The government needs to create a financial center in the area capable of providing optimal spillover effect on neighboring regions to spur increased economic and financial activities and equitable distribution between them. Presently, the economic and financial recovery strategy only focuses on the island of Java without considering demographic, geographical, and potential economic aspects of other regions. These strategies are very dependent on the social and cultural interaction between these regions. This greatly imbalanced focus of development on the island of Java, without due consideration to the potential of other regions, would slowdown the process of the national economic recovery. The government also need to maintain the level of liquidity of Deposits in the IRB through the development of infrastructure, technology, and Islamic financial literacy in the various regions. Given that IRB could provide a solution in the distribution of finance for small and medium-sized entrepreneurs in remote areas, economic and financial activities can thus be increased through growth patterns from the ground up. The rationale being that with the increase in regional economy will consequently stimulate national economic growth. The spatial approach is thus essential to elucidate the potential of particular regions in providing spillover effects to their neighbors. Regions thus identified with potential may be transformed into financial centers to accelerate the process of national economic recovery.

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