

# SPATIAL FINANCE EXPLORATION ON HAJJ FUNDS SUSTAINABILITY GROWTH: EVIDENCE FROM INDONESIAN ARCHIPELAGIC

Tb. Ace Hasan Syadzily<sup>1</sup>, M. Arief Mufraini<sup>2</sup>, Ade Sofyan Mulazid<sup>3</sup>, Murodi<sup>4</sup>, Ahmad Tibrizi Soni Wicaksono<sup>5</sup>

<sup>1,2,3,4</sup>UIN Syarif Hidayatullah, Jakarta, Indonesia

Jl. Ir. H. Djuanda No. 95 Ciputat, Kota Tangerang Selatan 15412

<sup>5</sup>UIN Maulana Malik Ibrahim, Malang, Indonesia

Jl. Gajayana No. 50, Kota Malang 65144

E-mail: <sup>1</sup>acehasans.uinjkt@gmail.com, <sup>2</sup>ariefmufraini@uinjkt.ac.id, <sup>3</sup>adesofyanmulazid@uinjkt.ac.id,

<sup>4</sup>murodi@uinjkt.ac.id, <sup>5</sup>tibrizisoni@uin-malang.ac.id

**Abstract:** This research aims to adopt a spatial finance approach to hajj fund sustainability by finding the factors that influenced it during the COVID-19 pandemic. This research involved GRDP, Household Consumption, COVID-19 Cases, Islamic Banking Office Network, and Religiosity Index as exogenous variables with secondary data in 2020. This research uses Spatial Autoregressive Model analysis and Local Indicators of Spatial Autocorrelation through Spatial Rate Analysis to predict spillover effects. Research findings show that the Religiosity Index and Office Network have a spatial effect on Hajj funds. In addition, the provinces of East Java and Central Java are predicted to have a strong potential to have a spillover effect and affect the surrounding areas to increase the sustainable growth of the Hajj fund.

**Keywords:** Hajj fund; spatial finance; sustainability growth; religiosity

**Abstrak:** Penelitian ini bertujuan untuk mengadopsi pendekatan keuangan spasial terhadap keberlanjutan dana haji dengan menemukan faktor-faktor yang mempengaruhinya selama pandemi COVID-19. Penelitian ini melibatkan PDRB, Konsumsi Rumah Tangga, Kasus COVID-19, Jaringan Kantor Perbankan Syariah, dan Indeks Religiusitas sebagai variabel eksogen dengan data sekunder pada tahun 2020. Penelitian ini menggunakan analisis Spasial Autoregressive Model dan Indikator Lokal Autokorelasi Spasial melalui Analisis Spasial Rate untuk memprediksi spillover efek. Temuan penelitian menunjukkan bahwa Indeks Religiusitas dan Jaringan Kantor mempunyai pengaruh spasial terhadap dana haji. Selain itu, Provinsi Jawa Timur dan Jawa Tengah diperkirakan memiliki potensi yang kuat untuk memberikan efek limpahan dan berdampak pada wilayah sekitarnya untuk meningkatkan pertumbuhan dana haji yang berkelanjutan

**Kata kunci:** dana Haji; pembiayaan spasial; pertumbuhan keberlanjutan; religiusitas

## Introduction

COVID-19 led to the inception of a multi-sectoral crisis that affects the level of banking and financial liquidity.<sup>1</sup> The lockdown system indirectly had an impact on the decline in income and purchasing power,<sup>2</sup> with significant changes in the economic

behavior of individuals and companies.<sup>3</sup> The pandemic threatened government tax revenues throughout the country with a significant decline in productivity and economic transactions.<sup>4</sup> The

<sup>1</sup> W A Arnoud, Arnoud Boot, and Stephen Schaefer, 'The Coronavirus and Financial Stability' (Frankfurt, 2020), <http://hdl.handle.net/10419/214882>.

<sup>2</sup> Konstantinos Eleftheriou and Patroklos Patsoulis, 'COVID-19 Lockdown Intensity and Stock Market Returns: A Spatial Econometrics Approach' (Munich, 2020), <https://mpra.ub.uni-muenchen.de/100691/>; International Monetary Fund, 'Fiscal Monitor: Policies for the Recovery' (Washington, DC, 2020).

<sup>3</sup> Jean-Noel Barrot, Basile Grassi, and Julien Sauvagnat, 'Sectoral Effects of Social Distancing', *SSRN Electronic Journal*, no. March (2020), <https://doi.org/10.2139/ssrn.3569446>; R. Maria del Rio-Chanona et al., 'Supply and Demand Shocks in the COVID-19 Pandemic: An Industry and Occupation Perspective', April 14, (2020), pp. 1–38, <http://arxiv.org/abs/2004.06759>; Jeremy Phillipson et al., 'The COVID-19 Pandemic and Its Implications for Rural Economies', *Sustainability (Switzerland)*, vol. 12, no. 10 (2020), pp. 1–9, <https://doi.org/10.3390/SU12103973>.

<sup>4</sup> Sascha Kraus et al., 'The Economics of COVID-19: Initial Empirical Evidence on How Family Firms in Five European Countries Cope with the Corona Crisis', *International Journal of Entrepreneurial Behavior & Research*, vol. 26, no. 5 (23 May

global economic recession due to the pandemic impacted individual behavior with a decrease in consumer preferences.<sup>5</sup>

The global economy is likely to experience a prolonged recession with the continuation of the pandemic.<sup>6</sup> Therefore, a policy is needed to minimize the impact of COVID-19 and recover the economic sector,<sup>7</sup> through the World Economic Outlook Update, placed Asia as the region with the best economic resilience at a decline of -0.2%, which means that it has the ability to survive better than other regions.<sup>8</sup> The pandemic strongly influences economic changes by creating an unpredictable level of financial market risk in various regions.<sup>9</sup>

The emergence and massive spread of the COVID-19 pandemic increased economic weaknesses in every country.<sup>10</sup> However, as the largest Muslim

country globally, Indonesia has the opportunity to accelerate economic recovery through religious-based financial optimization.<sup>11</sup> not only because the prohibition of interest has made Islamic finance more flexible in crises,<sup>12</sup> some sources of funds of Islamic banking are based on unique motives, which is so called as hajj fund, it was a cost of pilgrimage worships (hajj) that pooled to deliver optimal services of doing worship every year. Indonesian Islamic banking strategically on their position to utilize Hajj funds that have reached 144 trillion Rupiah through allocating hajj pooled funds to their various investment sector.<sup>13</sup> Although the pandemic temporarily halted religious activities of Muslims, such as delay in their departure for the Hajj, there was still an increase in registrants to 4.99 million people after two months of the pandemic.<sup>14</sup> Almost all regions experienced a decline in financial and economic performance during the pandemic.<sup>15</sup> However, it was not followed by a decrease in people's decisions to perform pilgrimage. Economic factors do not necessarily influence the ability to perform worship, and most people are more religious during the pandemic.<sup>16</sup>

The public's enthusiasm for hajj through increasing the deposit funds of hajj candidates will be an interesting eternal source of funds in

2020), pp. 1067–92, <https://doi.org/10.1108/IJEER-04-2020-0214>; John Muellbauer, 'The Coronavirus Pandemic and U.S. Consumption', INET Oxford COVID-19 Blog, 2020; OECD, 'COVID-19 Crisis Response in ASEAN Member States', (2020).

<sup>5</sup> Mizanur Rahman, 'Money and Liquidity in Times of COVID-19 Pandemic : The Role of Bangladesh Money and Liquidity in Times of COVID-19 Pandemic : The Role of Bangladesh', no. April (2020).

<sup>6</sup> Warwick J McKibbin and Roshen Fernando, 'The Economic Effects of a Pandemic', in *Economics in the Time of COVID-19*, ed. Richard Baldwin and Beatrice Weder di Mauro (CEPR Press, 2020), pp. 45–51.

<sup>7</sup> McKibbin and Fernando; Bryan Gurhy et al., 'COVID-19 Outbreak: Capital Markets Implications and Response', COVID-19 Notes Finance Series, (2020).

<sup>8</sup> Mohd Rozaimy Bin Ridzuan et al., 'The Resilience of China-ASEAN Economic Cooperation: From the Perspective of Services Trade', *The International Journal of Humanities & Social Studies*, vol. 7, no. 3 (2019), pp. 8–11, <https://doi.org/10.24940/theijhss/2019/v7/i3/hs1903-059>; Joo-OK Lee et al., 'COVID-19 – The True Test of ASEAN Youth 's Resilience and Adaptability Impact of Social Distancing on ASEAN Youth' (Geneva, 2020); OECD, 'COVID-19 Crisis Response in ASEAN Member States'.

<sup>9</sup> Dayong Zhang, Min Hu, and Qiang Ji, 'Financial Markets under the Global Pandemic of COVID-19', *Finance Research Letters*, no. April (2020), p. 101528, <https://doi.org/10.1016/j.frl.2020.101528>.

<sup>10</sup> Riyanti Djalante et al., 'Review and Analysis of Current Responses to COVID-19 in Indonesia: Period of January to March 2020', *Progress in Disaster Science* 6 (April 2020), p. 100091, <https://doi.org/10.1016/j.pdisas.2020.100091>; Jan Maarten D E Vet et al., 'Impacts of the COVID-19 Pandemic on EU Industries', *Publication for the Committee on Industry, Research and Energy, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament*, no. March (2021), pp. 1–83, [https://cdn.g4media.ro/wp-content/uploads/2021/03/IPOL\\_STU2021662903\\_EN.pdf](https://cdn.g4media.ro/wp-content/uploads/2021/03/IPOL_STU2021662903_EN.pdf); OECD, 'The Territorial Impact of COVID-19: Managing the Crisis and Recovery across Levels of Government', *Tackling Coronavirus (COVID-19): Contributing to a Global Effort* (Paris, 2021), <https://www.oecd.org/coronavirus/>

[policy-responses/the-territorial-impact-of-covid-19-managing-the-crisis-and-recovery-across-levels-of-government-a2c6abaf/](https://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-covid-19-managing-the-crisis-and-recovery-across-levels-of-government-a2c6abaf/).

<sup>11</sup> Central Intelligence Agency, *The CIA World Factbook 2019-2020* (Skyhorse Publishing, 2019); Y Mahendradhata et al., *The Republic of Indonesia Health System Review*, ed. Krishna Hort and Walaiporn Patcharanarumol, Health sys, vol. 7 (New Delhi: Asia Pacific Observatory on Health Systems and Policies, 2017).

<sup>12</sup> Mumtaz Hussain, Asghar Shahmoradi, and Rima Turk, 'An Overview of Islamic Finance', *IMF Working Paper*, IMF Working Paper (Washington DC, 2015), <https://www.imf.org/external/pubs/ft/wp/2015/wp15120.pdf>; Nur Hidayah et al., 'The Resilience of Sharia and Conventional Banks in Indonesia during the Covid-19 Pandemic Crisis', *Al-Iqtishad: Jurnal Ilmu Ekonomi Syariah*, vol. 13, no. 2 (2021), pp. 209–28, <https://doi.org/10.15408/aiq.v13i2.23964>.

<sup>13</sup> Hajj Fund Management Agency, '2020 Annual Report', *Synergy and Adaptive Amidst the Challenges* (Jakarta, 2020), [https://bphk.go.id/cdn/uploads/2021/10/Highres-AR-BPKH\\_20Sept-Rev1.pdf](https://bphk.go.id/cdn/uploads/2021/10/Highres-AR-BPKH_20Sept-Rev1.pdf).

<sup>14</sup> Hajj Fund Management Agency.

<sup>15</sup> Anil Ari, Sophia Chen, and Lev Ratnovski, 'COVID-19 and Non-Performing Loans: Lessons from Past Crises', *SSRN Electronic Journal*, no. 71 (2020), pp. 1–7, <https://doi.org/10.2139/ssrn.3632272>.

<sup>16</sup> (Boguszewski et al., 2020; Kowalczyk et al., 2020)

affecting the liquidity level of Islamic banking. Despite the pandemics' ability to generally weaken the economy, people still deposited their funds for Hajj in Islamic banks through congregational savings.<sup>17</sup> Hajj funds have played a significant role in increasing investment in the economic growth sector.<sup>18</sup> Indonesia has the largest Hajj quota after Saudi Arabia, with a waiting period of 11-39 years.<sup>19</sup> The funds collected from prospective Indonesian Hajj managed by Islamic banking significantly influence economic growth.<sup>20</sup>

Hajj is only held once a year at the site of the holy cities of Mecca and Medina. Besides that, the Hajj also attracts about 2.5 million Muslim pilgrims from 150 countries, with foreign pilgrims reaching 75%.<sup>21</sup> Indonesia contributes up to 10% of the total hajj quota provided annually. Although Muslim citizens have the same opportunity and desire to perform the Hajj, Indonesia's limited hajj quota impacts the waiting list queue that reaches 39 years in the future. It means that when someone registered for Hajj in 2020, it is estimated that they will leave in 2059. So that the new financial phenomenon referred to as Hajj funds continue to grow non-stop and are legally managed by the

Hajj Financial Management Agency.<sup>22</sup> However, the spread of the COVID-19 pandemic has a different economic impact in each region, so the rationality of consumption in prioritizing hajj can change in the future. It has the potential to disrupt the increase in deposits of prospective pilgrims.<sup>23</sup>

Spatial finance aspects play an important role in Islamic activities in an archipelago.<sup>24</sup> The spatial finance influences prove this in Indonesia provinces, such as DKI Jakarta, Banten, Central Sulawesi, East Sulawesi, South Sulawesi, and East Java, which influences Islamic activities in its surrounding.<sup>25</sup> In addition, spatial finance influences also significantly impacted the pandemic spread around the DKI Jakarta.<sup>26</sup> As the capital city, it is the economic center with a very high level of mobility, which causes the spread to occur very quickly. Spatial dimension influences the religious level of a region formed through social behavior and religious values.<sup>27</sup> In fact, the development of religious communities provides a spillover effect on national welfare through the concept of utility sharing

<sup>17</sup> Arif Setyawan, Hendro Wibowo, and Mustafa Kamal, 'Analysis of Optimization Model of Haji Financial Investment Portfolio in BPKH RI (Haji Financial Management Agency of the Republic of Indonesia)', *Jurnal Ekonomi Dan Perbankan Syariah*, vol. 8, no. 1 (9 August 2020), pp. 5–27, <https://doi.org/10.46899/jeps.v8i1.173>; Nur Hasnida Abdul Rahman et al., 'A Conceptual Model of Depositors' Trust and Loyalty on Hajj Institution - Case of Lembaga Tabung Haji Malaysia', *International Review of Management and Marketing*, vol. 10, no. 1 (15 January 2020), pp. 99–106, <https://doi.org/10.32479/irmm.8315>.

<sup>18</sup> Habibah Yahaya et al., 'Tabung Haji Malaysia as a World Role Model of Islamic Management Institutions', *International Journal of Business and Management Invention*, vol. 5, no. 11 (2016), pp. 44–55, [www.ijbmi.org](http://www.ijbmi.org).

<sup>19</sup> Ariani Dian Pratiwi, Idqan Fahmi, and Rifki Ismal, 'Optimal Hajj Funds Management by Islamic Bank', *ETIKONOMI*, vol. 18, no. 2 (22 September 2019), pp. 303–14, <https://doi.org/10.15408/etk.v18i2.10938>.

<sup>20</sup> Singgih Muheramtohad, 'The Use of Hajj Fund For Investment Purpose : A Maqashid Sharia Approach', *Journal of Islamic Economics, Management, and Business*, vol. 1, no. 1 (2019), pp. 119–36, <https://doi.org/10.21580/jiemb.2019.1.1.3740>.

<sup>21</sup> Anas Khan et al., 'Estimating the COVID-19 Risk during the Hajj Pilgrimage', *Journal of Travel Medicine*, vol. 27, no. 8 (23 December 2020), pp. 1–3, <https://doi.org/10.1093/jtm/taaa157>; Onur Akbulut and Yakin Ekin, 'Reflections of Hajj and Umrah Pilgrimage on Religious Stores in Mugla-Turkey', *International Journal of Religious Tourism and Pilgrimage*, vol. 6, no. 3 (2018), pp. 18–29, <https://arrow.tudublin.ie/ijrtp/vol6/iss3/4>.

<sup>22</sup> Hajj Fund Management Agency, '2020 Annual Report'.

<sup>23</sup> Accenture, 'COVID-19 Will Permanently Change Consumer Behavior: Fast-Changing Consumer Behaviors Influence the Future of the CPG Industry', *Accenture*, 2020; Wesley J. Wildman et al., 'Religion and the COVID-19 Pandemic', *Religion, Brain and Behavior*, vol. 10, no. 2 (2020), pp. 115–17, <https://doi.org/10.1080/2153599X.2020.1749339>.

<sup>24</sup> Nur Asnawi, Ahmad Tibrizi Soni Wicaksono, and Nina Dwi Setyaningsih, 'Measuring the Economic Islamicity Index in the Archipelagic Indonesia: Does Spatial Role Affect It?', *Talent Development & Excellence*, vol. 12, no. 1 (2020), pp. 3464–89.

<sup>25</sup> Arief Mufraini et al., 'Islamic Bank Financing: Finding The Spatial Effect and Influencing Factors From An Archipelagic Indonesia', *International Journal of Economic Policy in Emerging Economies*, vol. 13, no. 1 (2020), p. 1, <https://doi.org/10.1504/IJEP.2020.10027820>.

<sup>26</sup> Ramadhan Tosepu et al., 'Correlation between Weather and Covid-19 Pandemic in Jakarta, Indonesia', *Science of the Total Environment* 725 (2020), <https://doi.org/10.1016/j.scitotenv.2020.138436>.

<sup>27</sup> Christine Chivallon, 'Religion as Space for the Expression of Caribbean Identity in the United Kingdom', *Environment and Planning D: Society and Space*, vol. 19, no. 4 (2001), pp. 461–83, <https://doi.org/10.1068/d2341>; Christopher D. Ives and Jeremy Kidwell, 'Religion and Social Values for Sustainability', *Sustainability Science*, vol. 14, no. 5 (2019), pp. 1355–62, <https://doi.org/10.1007/s11625-019-00657-0>; Moukhtar M. Mai and Shuhana Shamsuddin, 'Ethnic Spatial Identity in the Context of Urbanization: The Transformation of Gbagyi Compounds in North Central Nigeria', *Journal of Urbanism*, vol. 1, no. 3 (2008), pp. 265–80, <https://doi.org/10.1080/17549170802532096>; Chris Park, 'Religion and Geography', in *The Routledge Companion to the Study of Religion* (London: Routledge, 2004), pp. 439–55, [https://doi.org/10.4324/9780203412695\\_chapter\\_25](https://doi.org/10.4324/9780203412695_chapter_25).

based on helping others.<sup>28</sup> Inline, although the government did not open hajj registration during the COVID-19 pandemic,<sup>29</sup> optimizing hajj funds had distributed a benefit value of 2 trillion rupiahs through the provision of subsidies up to 50% of the travel cost for prospective pilgrims in the current year. In addition, hajj funds have transformed into one of the solutions for economic growth through the placement of funds in Islamic banking and Islamic investments of 45.33 trillion rupiah (31.28%) and 99.58 trillion rupiah (68.72%).<sup>30</sup> It shows how important the accumulation of increased hajj funds in each region is to encourage the acceleration of economic recovery after the COVID-19 pandemic.

Currently, the research of Hajj funds is only oriented toward optimizing the management of hajj funds during COVID-19. In addition, research on religious leaders' considerations about the placement of Hajj funds in the productive investment sector.<sup>31</sup> Meanwhile, there was conducted simulations through a mean-variance portfolio optimization theory approach to find the most optimal portfolio for the placement of Hajj funds.<sup>32</sup> In addition, research to consider the placement of Hajj funds in infrastructure-based Sukuk by referring to the Hajj Tube Management Institute in Malaysia.<sup>33</sup> Meanwhile, there was tested the influence of hajj funds on the Saudi stock market with the approach of Autoregressive Moving Average - Generalized Autoregressive Conditional Heteroskedasticity (ARMA-GARCH).<sup>34</sup> In addition, it also conducted Sharia hedging

simulations to mitigate exchange rate risk in Hajj funds.<sup>35</sup> However, what if there is no increase in hajj applicants during the pandemic? This research offers the most essence, namely the method of mapping the spillover effect on areas suspected of having the potential to become the center of spillover. Subsequently, the government can carry out various policies to optimize hajj fund collection from various regions and provide input to bankers by considering the aspects as an effort to respond to the potential funding source based on spatial finance approaches.

This research aims to provide an academic contribution by adopting a spatial finance approach in collecting funds based on the number of Hajj registrants during the pandemic. These are expected to validate the factors capable of influencing spatial finance Hajj funds by determining the best regression model associated with the COVID-19 economy and the religiosity level of each region in Indonesia. Moreover, it also aims to conduct mapping in predicting spatial finance potential in each province, and it is expected to provide input to policymakers by considering the aspects as an effort to respond to risks associated with the pandemic.

## Method

This research examines the spatial relationship of geography between GRDP, Household Consumption, COVID-19 Cases, Islamic banking office network, and Religiosity Index on the Pool of Hajj Registrant Funds during the pandemic. Based on the closing of hajj registration conducted by the Indonesian government in 2021.<sup>36</sup> this research uses 2020 data with saturation sampling techniques through an explanation of operational variables in

<sup>28</sup> Lasse Steiner, Lisa Leinert, and Bruno S. Frey, 'Economics, Religion and Happiness', *Zeitschrift Für Wirtschafts-Und Unternehmensethik*, vol. 11, no. 1 (2010), pp. 9–24, <https://doi.org/10.5771/1439-880X-2010-1-9>.

<sup>29</sup> Hajj Fund Management Agency, '2020 Annual Report'.

<sup>30</sup> Muheramtohad, 'The Use of Hajj Fund For Investment Purpose : A Maqashid Sharia Approach'; Hajj Fund Management Agency, '2020 Annual Report'.

<sup>31</sup> Muheramtohad, 'The Use of Hajj Fund For Investment Purpose: A Maqashid Sharia Approach'.

<sup>32</sup> Pratiwi, Fahmi, and Ismal, 'Optimal Hajj Funds Management by Islamic Bank'.

<sup>33</sup> Iffah Karimah and Shafira Iskandar, 'Optimization of Hajj Fund Development through Infrastructure-Based Sukuk', in *Advancing Rule of Law in a Global Context* (CRC Press, 2020), pp. 120–27, <https://doi.org/10.1201/9780429449031-17>.

<sup>34</sup> Shaista Wasiuzzaman, 'Seasonality in the Saudi Stock Market: The Hajj Effect', *The Quarterly Review of Economics and Finance* 67 (February 2018), pp. 273–81, <https://doi.org/10.1016/j.qref.2017.07.007>.

<sup>35</sup> Rifki Ismal and Nurul Izzati Septiana, 'Islamic Hedging for Pilgrimage Funds: Case of Indonesia', *Qualitative Research in Financial Markets*, vol. 11, no. 3 (5 August 2019), pp. 328–41, <https://doi.org/10.1108/QRFM-11-2017-0101>.

<sup>36</sup> Maharani Alifah Dhiya Rahmadhanitya and Sidik Jatmika, 'The Impact of Covid-19 on Indonesian Muslim Pilgrimage', *Millah*, vol. 21, no. 1 (2021), pp. 1–22, <https://doi.org/10.20885/millah.vol21.iss1.art1>; the Minister of Religious Affairs, 'Decree of the Minister of Religious Affairs of the Republic of Indonesia Number 660 of 2021 Concerning the Cancellation of the Departure of Hajj in 1442 H/2021 M' (Jakarta: the Ministry of Religion Affairs of the Republic of Indonesia, 2021), <https://cdn.kemenag.go.id/storage/archives/1622708987.pdf>.

Table 1. The Lagrange Multiplier analysis was used to forecast the spatial finance factors, while the Local Indicator of Spatial Autocorrelation (LISA) analysis was based on Spatial Rate-Smoothed through Queen Contiguity weighting to detect spatial finance risk between regions.

Table 1. Operational Variable

Variable	Description	Source of Data
<b>Exogenous Variables</b>		
Household Consumption	The value of Household Consumption in each province	BPS
COVID-19	Coronavirus Disease 2019 (COVID-19) cases in each Province	COVID-19 Task Force
Religiosity Index	The value of Religiosity Index in each Province	Ministry of Religious Affairs
Office Network	Islamic Bank Office Network in each Province	OJK
GRDP	Gross Regional Domestic Product (GRDP) in each Province	BPS
<b>Endogenous Variable</b>		
Hajj Funds	Hajj Funds in each Province	BPKH

Note: the Statistics Indonesia (BPS), the Financial Services Authority (OJK), the Hajj fund management agency (BPKH)

The descriptive analysis process was carried out at the initial stage, followed by the use of the classical assumption testing to determine the existence of a spatial relationship based on normality, multicollinearity, heteroscedasticity, and spatial autocorrelation tests.<sup>37</sup> Each data in the Ordinary Least Square (OLS) equation is expected to meet the assumption testing criteria needed to determine the validation process on the regression results. According to<sup>38</sup> and<sup>39</sup> the classical assumption test rules in the regression diagnostic indicate a spatial relationship in the equations used in this research. The next stage is the spatial diagnostic test which aims to determine

<sup>37</sup> James LeSage and R. Kelley Pace, 'Introduction to Spatial Econometrics', in *Introduction to Spatial Econometrics*, ed. N. Balakrishnan and William R. Schucany (Boca Raton: CRC Press, 2009), pp. 1–321.

<sup>38</sup> Anselin (2005)

<sup>39</sup> Mann et al. (2015)

the best model and alternative most significant form of the Spatial Autoregressive Model (SAR) or Spatial Error Model (SEM).<sup>40</sup> The next step is to verify the model by comparing the best based on Spatial Diagnostic with the OLS model. In the final stage, the Local Indicator of Spatial Autocorrelation (LISA) analysis approach is used to forecast the outlier value in the spatial distribution in a certain region. This process is carried out by testing the Spatial Rate-Smoothed sensitivity, which is used to estimate the potential for certain spatial units with the information obtained from others through the Statistic Bayesian approach.<sup>41</sup>

## Result and Discussions

Data were descriptively obtained from 34 provinces based on the Household Consumption, COVID-19 cases, Index Religiosity, Islamic Bank office network, and GRDP variables.

Table 2. Regression Diagnostic

Diagnostic	Indicator	Value	Prob.
Normality of Errors	Jarque-Bera	42.3003	0.00000
Heteroskedasticity	Breusch-Pagan Test	39.3727	0.00097
	Koenker-Bassett	11.5029	0.04227
Spatial autocorrelation	Moran's I	2.5852	0.00973
Spatial Diagnostic	Lagrange Multiplier Lag	6.7392	0.00943
Multicollinearity	VIF	Condition Number	
		60.914078	

Source: GeoDa Data Processed

The results of the regression diagnostic test using the OLS approach show that the normality of errors through jarque-bera test has a probability value of 0.00000 or  $p < 0.05$ . This means that the data in the equation is not normally distributed<sup>42</sup>. Furthermore, the heteroskedasticity test results based on the breusch-pagan and koenker-Bassett

<sup>40</sup> Anselin, 'Exploring Spatial Data with GeoDa : A Workbook'.

<sup>41</sup> (Anselin et al., 1995; 2004)

<sup>42</sup> Damodar N. Gujarati and Dawn C. Porter, *Basic Econometrics*, Fifth (New York: McGraw-Hill/Irwin, 2009).

test show probability values of 0.00097 and 0.04227 or  $p < 0.05$ , which means that there are symptoms of heteroscedasticity in the equation.<sup>43</sup> The Moran's I value test results show a significance value of 0.00973, which means that the equation used in the research model leads to a spatial autocorrelation.<sup>44</sup> Meanwhile, the spatial diagnostic results show a significant level of 0.00943 on the Lagrange Multiplier, which means that the Spatial Autoregressive Model is the best.<sup>45</sup> There is a multicollinearity relationship between variables in the VIF model used at a value of 60.914078 or  $VIF > 10$ .<sup>46</sup> In contrast to OLS, a SAR indicates that the equation that does not meet the assumption test is due to the spatial lag of the average in a region to the surrounding.<sup>47</sup> Therefore, it is necessary to spatially test the two models to verify the best regression, as follows:

Table 3. Comparison of OLS and SAR

Variable	OLS			SAR		
	Coef.	Std. Error	Prob.	Coef.	Std. Error	Prob.
Constant	-8934.46	4821.98	0.07447	-8071.68	3760.54	0.03184
Household Consumption	50.8699	114.866	0.66127	57.2473	89.4929	0.52238
COVID-19	-0.00873	0.01482	0.56039	-0.01231	0.01160	0.28885
Religiosity Index	119.67	64.0178	0.07207	107.13	49.9327	0.03191*
Office Network	21.3732	4.76788	0.00011*	17.3097	3.88076	0.00001*

<sup>43</sup> Zhaoyuan Li and Jianfeng Yao, 'Testing for Heteroscedasticity in High-Dimensional Regressions', *Econometrics and Statistics*, vol. 9 (January 2019), pp. 122–39, <https://doi.org/10.1016/j.ecosta.2018.01.001>.

<sup>44</sup> Mann et al., 'Spatial and Temporal Trends in Information Technology Outsourcing'; Anselin, 'Local Indicators of Spatial Association - LISA'.

<sup>45</sup> Mufraeni et al., 'Islamic Bank Financing: Finding The Spatial Effect and Influencing Factors From An Archipelagic Indonesia'; Luc Anselin, Ibnu Syabri, and Youngihn Kho, 'GeoDa: An Introduction to Spatial Data Analysis', *Geographical Analysis*, vol. 38, no. 1 (January 2006), pp. 5–22, <https://doi.org/10.1111/j.0016-7363.2005.00671.x>; Anselin, 'Exploring Spatial Data with GeoDa : A Workbook'.

<sup>46</sup> Jong Hae Kim, 'Multicollinearity and Misleading Statistical Results', *Korean Journal of Anesthesiology*, vol. 72, no. 6 (1 December 2019), pp. 558–69, <https://doi.org/10.4097/kja.19087>.

<sup>47</sup> Mohamed M. Mostafa, 'A Spatial Econometric Analysis of Residential Land Prices in Kuwait', *Regional Studies, Regional Science*, vol. 5, no. 1 (1 January 2018), pp. 290–311, <https://doi.org/10.1080/21681376.2018.1518154>.

Variable	OLS			SAR		
	Coef.	Std. Error	Prob.	Coef.	Std. Error	Prob.
GRDP	7.57486	81.735	0.92682	18.2658	63.8645	0.77487
Akaike info criterion		590.555			584.379	
Schwarz criterion		599.713			595.063	
R-squared		0.608978			0.711834	

Note: \*Significant at 0.05  
Source: GeoDa Data Processed

In Table 3, the OLS results show that the Office Networks with a probability level of 0.00011 is the only variable that affects Hajj funds. Meanwhile, 2 variables have a significant influence in SAR, the Religiosity Index and Office Networks through probability levels of 0.03191 and 0.0000. Furthermore, the comparison of linear regression models between OLS and SAR is determined using the Akaike Info Criterion (AIC), Schwarz Criterion (SC), and R-Squared. It is assumed that the best is the model with the smallest AIC & SC and the highest R-Squared.<sup>48</sup> The comparison estimation results show that SAR is the best approach model through the lowest AIC & SC values of 584,379 and 595,063 with the highest R-Squared value of 0.711834. This means that the SAR has the ability to explain Hajj funds better than the OLS using the spatial approach.

Based on the testing results through the SAR Model, household expenditures do not significantly impact peoples' decisions to perform the Hajj. This means that any amount of expenditure spent on household consumption costs has no effect on each individual's ability to make the initial deposit payment because worship is not a consumptive activity rather it is an act to fulfill spiritual needs related to the faith.<sup>49</sup> Moreover, the equation

<sup>48</sup> Syarifah Diana Permai, Ronald Jauri, and Andry Chowanda, 'Spatial Autoregressive (SAR) Model for Average Expenditure of Papua Province', *Procedia Computer Science*, vol. 157 (2019), pp. 537–42, <https://doi.org/10.1016/j.procs.2019.09.011>.

<sup>49</sup> Sami M. Abbasi, Kenneth W. Hollman, and Joe H. Murrey, 'Islamic Economics: Foundations and Practices', *International Journal of Social Economics*, vol. 16, no. 5 (May 1989), pp. 5–17, <https://doi.org/10.1108/03068298910367215>; PrakashB Behere et al., 'Religion and Mental Health', *Indian Journal of Psychiatry*, vol. 55, no. 6 (2013), pp. 187, <https://doi.org/10.4103/0019-5545.105526>; Rena Latifa, Komaruddin Hidayat, and Akhmad Sodik, 'Commentary on Place Spirituality', *Archive*

results also show that the pandemic has no significant effect on people's decision to register, instead, it has made most people more obedient in carrying out religious orders.<sup>50</sup>

The number of hajj funds increased after a moratorium that delayed hajj departures after the spread of the pandemic. Therefore, its utilization is a stimulus for economic growth in the pandemic.<sup>51</sup> This research showed insignificant influence between the GRDP of a province on the increase in the Hajj Fund. Hajj is an activity that does not depend on the economic factors of a region because they are not responsible for peoples' inability to perform worship.<sup>52</sup> Hajj is anything carried out by people that involves faith, with the ability to increase economic growth.<sup>53</sup> This research geospatially shows that the SAR model equation, which increases the initial deposit funds for Hajj, is very dependent and influenced by the Religiosity Index level and the distribution of the Islamic bank office network in each province. This is because the level of faith tends to determine people's behavior preferences in allocating their funds.<sup>54</sup> Meanwhile,

an increase in the Islamic bank distribution plays a significant role in raising the ease of access to make deposit payment transactions.<sup>55</sup> This means that the easier it is for people to gain access to banks, the greater the potential for increasing the funds received. Therefore, this tends to positively affect Indonesia's economic growth as a whole by The Hajj Fund Management Agency, to ensure it is carried out optimally through the placement of funds in various sharia investment instruments.

The Spatial Rate-Smoothed analysis in picture 1 shows a potential spatial finance influence on the increase in Hajj Funds in each region based on the distribution of Islamic bank office networks. This means that the increase in funds in a province has the ability to provide a tailing effect on its surrounding through the number of Islamic bank offices. Therefore, Islamic banks are oriented towards increasing the number of offices, which means that indirectly the people are given the convenience of accessing services in various remote regions and facilitating the paying process of the initial deposit.

Based on the spatial finance influence mapping of Hajj funds through an office network, the 3 provinces that have a potential of 1% - 10% in providing spatial finance influence are West Kalimantan, Aceh, and North Sumatra. Meanwhile, the 11 provinces that have a spatial finance potential of 10% - 50% are Gorontalo, Riau, DKI Jakarta, Riau

for the *Psychology of Religion*, vol. 41, no. 1 (16 March 2019), vol. 38–42, <https://doi.org/10.1177/0084672418825314>.

<sup>50</sup> Kowalczyk et al., 'Religion and Faith Perception in a Pandemic of COVID-19'; Boguszewski et al., 'The COVID-19 Pandemic's Impact on Religiosity in Poland'; Wildman et al., 'Religion and the COVID-19 Pandemic'; Mohammad Ali Fardin, 'COVID-19 Epidemic and Spirituality: A Review of the Benefits of Religion in Times of Crisis', *Jundishapur Journal of Chronic Disease Care*, vol. 9, no. 2 (26 May 2020), pp. 26–29, <https://doi.org/10.5812/jjcdc.104260>.

<sup>51</sup> Ismal and Septiana, 'Islamic Hedging for Pilgrimage Funds: Case of Indonesia'.

<sup>52</sup> Timothy Tyler Brown, 'Rational Praying: The Economics of Prayer', *The Journal of Socio-Economics*, vol. 38, no. 1 (January 2009), pp. 37–44, <https://doi.org/10.1016/j.socsec.2008.07.006>; B.J. Klerk, 'Worship, Prayers and Poverty', *The Ecumenical Review*, vol. 57, no. 3 (July 2005), pp. 342–57, <https://doi.org/10.1111/j.1758-6623.2005.tb00555.x>; Martin Lindhardt, 'More Than Just Money: The Faith Gospel and Occult Economies in Contemporary Tanzania', *Nova Religio*, vol. 13, no. 1 (1 August 2009), pp. 41–67, <https://doi.org/10.1525/nr.2009.13.1.41>.

<sup>53</sup> Unbreen Qayyum, Sohail Anjum, and Samina Sabir, 'Religion and Economic Development: New Insights', *Empirica*, vol. 47, no. 4 (7 November 2020), pp. 793–834, <https://doi.org/10.1007/s10663-019-09456-3>; Abula Abdul Hameed Bokhari, 'The Economics of Religious Tourism (Hajj and Umrah) in Saudi Arabia', in *Global Perspectives on Religious Tourism and Pilgrimage* (IGI Global, 2018), pp. 159–84, <https://doi.org/10.4018/978-1-5225-2796-1.ch010>; Yahaya et al., 'Tabung Haji Malaysia as a World Role Model of Islamic Management Institutions'.

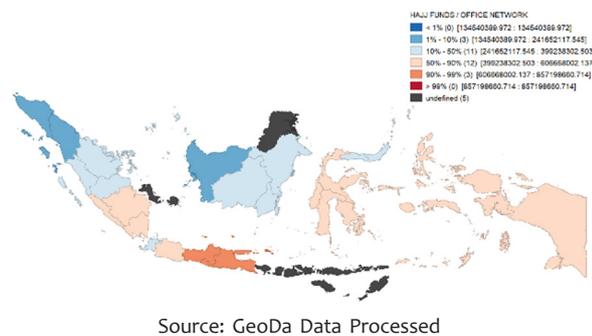
<sup>54</sup> Daniel J. Benjamin, James J Choi, and Geoffrey Fisher,

'Religious Identity and Economic Behavior', *Review of Economics and Statistics*, vol. 98, no. 4 (October 2016), pp. 617–37, [https://doi.org/10.1162/REST\\_a\\_00586](https://doi.org/10.1162/REST_a_00586); Robert H. Nelson, 'Why Economic Progress Depends on Economic Religion', *SSRN Electronic Journal*, (2017), pp. 1–12, <https://doi.org/10.2139/ssrn.2993525>; Faheem Bukhari et al., 'Motives and Role of Religiosity towards Consumer Purchase Behavior in Western Imported Food Products', *Sustainability*, vol. 12, no. 1 (2 January 2020), p. 356, <https://doi.org/10.3390/su12010356>; Ridhi Agarwala, Prashant Mishra, and Ramendra Singh, 'Religiosity and Consumer Behavior: A Summarizing Review', *Journal of Management, Spirituality & Religion*, vol. 16, no. 1 (1 January 2018), pp. 32–54, <https://doi.org/10.1080/14766086.2018.1495098>.

<sup>55</sup> Ian Walsh et al., 'Building a High-Powered Branch Network in Retail Banking', *The Boston Consulting Group*, 2010; Niels Peter Mols, Per Nikolaj D. Bukh, and Jørn Flohr Nielsen, 'Distribution Channel Strategies in Danish Retail Banking', *International Journal of Retail & Distribution Management*, vol. 27, no. 1 (February 1999), pp. 37–47, <https://doi.org/10.1108/09590559910252694>; Miklós Pakurár et al., 'The Service Quality Dimensions That Affect Customer Satisfaction in the Jordanian Banking Sector', *Sustainability*, vol. 11, no. 4 (20 February 2019), p. 1113, <https://doi.org/10.3390/su11041113>.

Island, Jambi, Banten, South Kalimantan, North Sulawesi, Central Kalimantan, West Sumatra, and East Kalimantan. Furthermore, 12 provinces that have a potential of 50% - 90%, are South Sulawesi, South Sumatra, Bengkulu, Lampung, West Sulawesi, North Maluku, West Papua, West Java, Southeast Sulawesi, Papua, Maluku, and Central Sulawesi. Moreover, 3 provinces that have a potential for spatial effects of 90% - 99% are East Java, Central Java, and Yogyakarta. However, 5 provinces were unidentified namely the Bangka Belitung, West Nusa Tenggara, East Nusa Tenggara, Bali, and North Kalimantan. This is because these regions do not have direct borders and Islamic bank offices, thereby eliminating the potential for spatial finance influence.

Figure 1. Forecasting The Spatial Influence on Hajj Funds Over Office Network

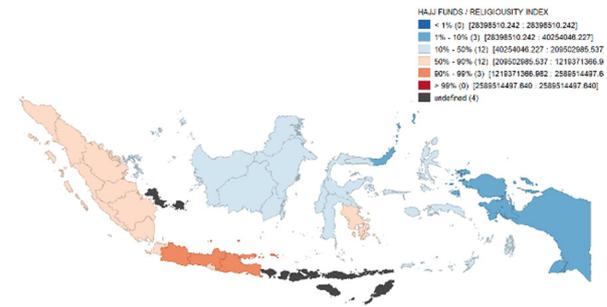


Source: GeoDa Data Processed

LISA analysis through Spatial Rate-Smoothed showed that there are 3 provinces with a 90% - 99% potential in providing a spatial influence on the increase in Hajj Funds through the distribution of Islamic bank office networks, namely East Java, Central Java, and Yogyakarta. This is because East and Central Java are the first and second-largest provinces with Hajj registrant funds in Indonesia with a value of 2,05 and 1,53 Trillion Rupiahs, respectively. Meanwhile, Yogyakarta is on the fifteenth-place value at 144.3 billion Rupiah. Moreover, based on the distribution of the Islamic bank office network, East Java, Central Java, and Yogyakarta respectively occupy the third (255 offices), fifth (193 offices), and thirteenth (61 offices) nationally. The location of these 3 provinces has provided the potential for spatial impacts. In this case, Yogyakarta is directly adjacent to Central Java, which has the potential to receive spatial influences, while Central and East Java tend

to influence each other spatially to increase Hajj funds through a network of Islamic banks.

Figure 2. Forecasting The Spatial Influence on Hajj Funds Over Religiosity Index



Source: GeoDa Data Processed

The analysis in picture 2 shows a potential spatial finance influence on increasing Hajj Funds through the level of religiosity. This means that increase in Hajj registrants in a province during the pandemic is also determined by the condition of religious observance in a region, which tends to have a spatial effect. Adjacent geographical locations indirectly affect the demographic conditions of the surrounding people by adopting cultural values and social behavior.<sup>56</sup> Based on the mapping through the Religiosity Index, only 3 provinces had a potential of 1% - 10% in influencing the surrounding, namely North Sulawesi, West Papua, and Papua. Moreover, 12 provinces had the potential to provide a spatial effect of 10% - 50%, namely Gorontalo, Riau Island, South Sulawesi, West Kalimantan, South Kalimantan, North Kalimantan, West Sulawesi, North Maluku, Central Kalimantan, East Kalimantan, Maluku, and Central Sulawesi. Furthermore, 12 provinces had a potential of 50% - 90%, namely Riau DKI Jakarta, South Sumatra, Aceh, Bengkulu, Lampung, North Sumatra, Jambi, Banten, Yogyakarta, Southeast Sulawesi, and West Sumatra. Then, 3 provinces had the potential for 90% - 99% spatial effects,

<sup>56</sup> Rod Gerber and Michael Williams, eds., *Geography, Culture and Education*, vol. 71, The GeoJournal Library (Dordrecht: Springer Netherlands, 2002), <https://doi.org/10.1007/978-94-017-1679-6>; Johannes Glückler and Patrick Doreian, 'Editorial: Social Network Analysis and Economic Geography—Positional, Evolutionary and Multi-Level Approaches', *Journal Of Economic Geography*, vol. 16, no. 6 (2016), pp. 1123–34, <https://doi.org/10.1093/jeg/lbw041>; Gundhild Setten and Katrina Myrvang Brown, 'Social and Cultural Geography: Moral Landscapes', in *International Encyclopedia of Human Geography*, vol. 36 (Elsevier Ltd, 2009), pp. 191–95.

namely East Java, Central Java, and West Java. Meanwhile, 4 provinces were unidentified, namely Bangka Belitung, West Nusa Tenggara, East Nusa Tenggara, and Bali, because they do not have neighboring regions, therefore, the spatial effects were not found.

The Spatial Rate-Smoothed analysis indicates that the provinces of East, Central, and West Java have a potential spatial effect of 90% - 99% capable of increasing Hajj Funds through the level of religiosity of the surrounding people. Based on the amount of Hajj funds, these 3 provinces have the largest fund, namely East, Central, and West Java, in the first, second, and third positions with funds of 2.05, 1.53, and 1.42 trillion Rupiah throughout 2020. Furthermore, based on the level of Religiosity Index, the provinces of Central, East, and West Java are ranked thirteenth (74.6), seventeenth (73.7), and thirty-two (68.5). The mapping results show they are geographically close to each other and neighbors. Therefore, there is a very large potential for spatial effects. East Java, as the region with the largest Hajj registrant funds, has a tailing effect on Central Java and West Java through the process of acculturation of culture and religious observance in each province. Therefore, a positive spatial effect of East Java indirectly has an impact on the neighboring region of Central Java.

## Conclusion

Conclusions should answer the objectives of research. Tells how your work advances the field from the present state of knowledge. Without clear Conclusions, reviewers and readers will find it difficult to judge the work, and whether or not it merits publication in the journal. Do not repeat the Abstract, or just list experimental results. Provide a clear scientific justification for your work, and indicate possible applications and extensions. You should also suggest future experiments and/or point out those that are underway.

The regression diagnostics test shows the role of spatial finance in the equation model through the Moran's I test results. Meanwhile, the verification results indicated that the SAR has a better ability than the OLS in explaining the Hajj funds sustainability growth in each province by considering spatial finance aspects and through

the comparison model. The results also showed that the macroeconomic variables proxied through Household Consumption and GRDP, while the spread of COVID-19 cases variable has no significant role in the Hajj funds sustainability growth. Based on the spatial finance aspect, the Hajj funds is directly influenced by the Religiosity Index and the Islamic bank office networks in all provinces. It is because peoples' level of faith indirectly affected their decision in allocating income. Meanwhile, the distribution of Islamic banks plays a fundamental role in increasing the convenience of making transactions for paying the initial deposit of Hajj funds in each region, therefore, these two variables have significant influence.

The results of spatial finance mapping indicate its potential in the Hajj funds sustainability growth through the distribution of Islamic banks, and the religiosity level in each province shows that 3 provinces have the potential of 90% - 99% in giving spatial influence to the surrounding, namely East Java, Central Java, and Yogyakarta. Meanwhile, based on the religiosity level, East Java, Central Java, and West Java have the potential for spatial effects of 90% - 99% in influencing the surrounding regions. This research indirectly shows that East Java and Central Java have strong potential as regions capable of influencing the surroundings to increase the Hajj funds sustainability growth through both variables. In addition, optimizing the collection of Hajj funds is not only the task of the Hajj Fund Management Agency but also Islamic banks. It is because Hajj funds have the potential to become an eternal source for Islamic banks to improve intermediary performance, so Islamic banks need to increase the number of office networks in each region to make it easier for prospective pilgrims to register.

The implication of this research provides input to the government and bankers in increasing the Hajj funds by considering spatial finance aspects that occur between provinces. Therefore, based on a spatial finance approach through the distribution of Islamic banks, the religiosity level can optimize the potential possessed by East Java and Central Java as Hajj Funds Center to influence other regions. Furthermore, the government can maximize areas with a 50% - 90% potential spatial

finance influence to encourage more areas that can provide spillover effects to neighbouring regions. It can increase the growth of hajj fund sustainability. It is important because Indonesia is a country consisting of 34 provinces with 17,504 islands. Then, the Hajj funds sustainability growth will impact social implications by increasing economic growth through the placement of Hajj funds in various investment sectors. The limitation of this research is the availability of data that only exists in 2020. In addition, the research only involved macroeconomics, COVID-19 cases, and religiosity values as variables. Further research is expected to involve more variables with a long time susceptible so that the analysis results on the hajj fund sustainability growth are more comprehensive.

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