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SPATIO-TEMPORAL ANALYSIS OF RUPIAH LOANS PROVIDED BY COMMERCIAL BANKS AND RURAL BANKS

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Abstract. *According to SEKI data in 2020, DKI Jakarta is the province that has the highest average monthly value of rupiah loans provided by commercial banks and rural banks. Many factors can affect the size of the value. The amount of rupiah loans provided by commercial banks and rural banks in the previous months can affect the current value. The geographical conditions of an area can have an impact on the surrounding area. Likewise, the number of rupiah loans in DKI Jakarta Province is suspected of having mutual influence with surrounding provinces. The provinces that are directly adjacent to DKI Jakarta are Banten Province and West Java Province. The purpose of this study is to conduct spatio-temporal analysis of the amount of loans provided by commercial banks and rural banks. The data used is the monthly amount of rupiah loans provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces in a time period between January 2012 to July 2021. The GSTAR method has been used to analyze the spatio-temporal relationship. The GSTAR model formed is GSTAR(3,6,12) with differencing order of 1. Based on the model formed, it was concluded that the amount of loans provided by commercial banks and rural banks in the three provinces is related to each other spatially and temporally. The RMSE value for each of the models formed is 1.871 for Banten Province, 13.701 for DKI Jakarta, and 2.919 for West Java Province.*

Keywords: *loans, spatial, temporal, GSTAR.*

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1. INTRODUCTION

One of the constituent sectors of Indonesia's Economic and Financial Statistics (SEKI) is the monetary sector. The monetary sector is a policy made by the central bank to influence the macro situation implemented through the money market. The monetary sector has an important role in maintaining financial system stability. Financial system stability is a situation that explains the possibility of the national financial system working effectively and efficiently and being able to survive from internal and external vulnerabilities. Financial system stability aims to keep a country's economic growth and stability. According to Novella & Syofyan [1], the monetary sector has an influence to the stability of the financial system in Indonesia.

The stability of a country's financial system must be maintained and regulated as well as possible. The impact of instability and inefficiency of the financial system is that it will hamper the growth of the country's economy [2]. If this is allowed to continue, then the relevant country will experience a crisis. It costs a lot to save the country out of the crisis. Another impact is the loss of public trust in the financial system. It is not easy to restore trust and convince the public if the implemented financial system has failed. It takes quite a long time and a difficult strategy to initiate.

The constituents of the monetary sector are divided into three constituents, money and banks, business activities of non-bank financial institutions, as well as money and capital markets [3]. The government has a very important role in policy-making to regulate the three constituents of the monetary sector. One of the government's considerations for making this policy is based on the available data. Policies can be made based on the condition of data from one region to another or based on the data series formed.

One of the important components of the monetary sector constituents in money and banks is the position of rupiah loans provided by commercial banks and rural banks. The definition of a loan according to the Banking Law is the provision of money from the bank to the borrower based on the approval of the loan agreement. The borrower is obliged to pay off the loan and interest payments according to the agreed time. Loans are used by borrowers for business capital or other purposes. The size of the loan depends on the use of the money. If the borrower needs large funds, the loan funds needed will be greater.

The function of lending is to increase the usefulness of money [4]. If the idle money is not used, the benefits will be reduced. If the idle money is lent to the party in need, it will add value to the money. Furthermore, the function of lending is to increase the circulation and traffic of money. Lending has an impact on the progress of a region. The progress of the region can affect other regions, resulting in mutually beneficial economic activity. The existence of economic activity will increase the circulation of money in the region.

According to SEKI data in 2020, DKI Jakarta is the province that has the highest average monthly value of rupiah loans provided by commercial banks and rural banks. In monthly data, rupiah loans in DKI Jakarta Province have relatively increased and fluctuated every month. Many factors can affect the size of the value. The amount of rupiah loans provided by commercial banks and rural banks in the previous months can affect the current value. The geographical conditions of an area can have an impact on the surrounding area. Likewise, the number of rupiah loans in DKI Jakarta Province is suspected of having mutual influence with surrounding provinces. The provinces that are directly adjacent to DKI Jakarta are Banten Province and West Java Province.

One of the efforts to maintain financial system stability in DKI Jakarta is by managing rupiah loan positions provided by commercial banks and rural banks. It is necessary to analyze how much influence the previous period's rupiah loans had on the current period and how much influence from the surrounding provinces. In addition, it is necessary to analyze how much the impact of rupiah loan of DKI Jakarta to Banten Province and West Java Province.

Generalized Space Time Autoregressive (GSTAR) is one of the models that can capture time series and spatial phenomena. In general, the time series model only pays attention to previous events or factors that affect them. Along with the development of time series models, currently time series models can also involve spatial factors. GSTAR can be used to analyze the spatial and temporal of an event. The advantage of the GSTAR model [5] is that it can explain how much the influence of the previous events, the surrounding area, and the previous events on the surrounding area. There are several studies that use GSTAR model as a tool to answer problems. One example of research using GSTAR model is the research of Mario, et al. [6]. In their research, they analyzed inflation in various regions in Java. The model they obtained can explain the time series and spatial relationships of inflation in those regions.

Based on the background, the purpose of this study is to analyze the spatio-temporal of rupiah loans provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces. To achieve the purpose of this study, the GSTAR model was used. It is hoped that the GSTAR model can explain the relationship monthly rupiah loans provided by commercial banks and rural banks among DKI Jakarta, West Java, and Banten Provinces.

2. RESEARCH METHODS

2.1 Data Sources

The data used in this study is secondary data obtained from the website of Bank Indonesia (www.bi.go.id). The data is the monthly amount of rupiah loans provided by commercial banks and rural banks in the provinces of DKI Jakarta, West Java, and Banten. The period used in this study is starting from January 2012 to July 2021.

2.2 Research Variables

The variable used in the study is the number of rupiah loans provided by commercial banks and rural banks. The followings are the definitions of the research variables used:

a. The amount of rupiah loans provided by commercial banks and rural banks in Banten Province: is the amount of loans provided by commercial banks and rural banks for the Banten Province area. In this study, the variable was denoted by $Y_{1,t}$.
b. The amount of rupiah loans provided by commercial banks and rural banks in DKI Jakarta Province: is the amount of loans provided by commercial banks and rural banks for the DKI Jakarta Province area. In this study, the variable was denoted by $Y_{2,t}$.
c. The amount of rupiah loans provided by commercial banks and rural banks in West Java Province: is the amount of loans provided by commercial banks and rural banks for the West Java Province. In this study, the variable was denoted by $Y_{3,t}$.
d. Spatial weight of the amount of rupiah loans provided by commercial banks and rural banks in Banten Province. In this study, the variable was denoted by $U_{1,t}$. The value of $U_{1,t}$ is obtained by $0{,}5*(Y_{2,t}+Y_{3,t})$.
e. Spatial weight of the amount of rupiah loans provided by commercial banks and rural banks in DKI Jakarta Province. In this study, the variable was denoted by $U_{2,t}$. The value of $U_{2,t}$ is obtained by $0{,}5*(Y_{1,t}+Y_{3,t})$.
f. Spatial weight of the amount of rupiah loans provided by commercial banks and rural banks in West Java Province. In this study, the variable was denoted by $U_{3,t}$. The value of $U_{3,t}$ is obtained by $0{,}5*(Y_{1,t}+Y_{2,t})$.

2.3 Research Analysis Steps

a. Describing data of the number of rupiah loans provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces. The analytical tools used are time series plots [7] and descriptive statistics [8].
b. Conducting a correlation test of the number of rupiah loans provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces. This research uses pearson correlation [9].
c. Stasionarity test in variance and mean of rupiah loan amounts provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces. The Box-Cox test is used to test stationarity in variance [10] and the Dicky-Fuller test used to test stationarity in mean [11].
d. Conducting GSTAR modeling for the amount of rupiah loans provided by commercial banks and rural banks in DKI Jakarta, West Java, and Banten Provinces. According to Anselin [12], the amount of the interrelationship of regions is influenced by the weight of the region. In this study, the weight of Rook Cointiguity is used [13]. The amount of the weight value can be seen in the research variables of the spatial weight section. In general, the GSTAR model can be written as follows [14]:

$$Y(t)=\sum_{s=1}^{p}\left[\mathbf{\Phi}_{s0}+\sum_{k=1}^{\lambda_S}\mathbf{\Phi}_{sk}\mathbf{W}^{(k)}\right]Y(t-s)+\mathbf{e}(t), \tag{1}$$

with

$\mathbf{\Phi}_{s0}$ $= \text{diag}(\varphi_{s0}^{1},...,\varphi_{s0}^{N})$ is the coefficient matrix for temporal parameter

$\mathbf{\Phi}_{sk}$ $= \text{diag}(\varphi_{sk}^{1},...,\varphi_{sk}^{N})$ is the coefficient matrix for spatial parameter

$\mathbf{W}^{(k)}$ = weight matrix

$\mathbf{e}(t)$ = error component.

If three different locations are used, then equation (1) can be written as follows:

$$\begin{bmatrix} Y_1(t) \\ Y_2(t) \\ Y_3(t) \end{bmatrix} = \begin{bmatrix} \varphi_{10} & 0 & 0 \\ 0 & \varphi_{20} & 0 \\ 0 & 0 & \varphi_{30} \end{bmatrix} \begin{bmatrix} Y_1(t-1) \\ Y_2(t-1) \\ Y_3(t-1) \end{bmatrix} + \begin{bmatrix} \varphi_{11} & 0 & 0 \\ 0 & \varphi_{21} & 0 \\ 0 & 0 & \varphi_{31} \end{bmatrix} \begin{bmatrix} 0 & w_{12} & w_{13} \\ w_{21} & 0 & w_{23} \\ w_{31} & w_{32} & 0 \end{bmatrix} \begin{bmatrix} Y_1(t-1) \\ Y_2(t-1) \\ Y_3(t-1) \end{bmatrix} + \begin{bmatrix} e_1(t) \\ e_2(t) \\ e_3(t) \end{bmatrix}. \quad (2)$$

The followings are GSTAR modelling steps:

i. GSTAR model indication using Matrix of Partial Autocorrelation Function (MPACF) [15].
ii. Parameter estimation.
iii. Checking the error assumptions that must fulfill the white noise condition and have a normal multivariate distribution.
iv. Calculate *Root Mean Square Error* (RMSE) value [16].

e. Interpreting the formed model.

3. RESULTS AND DISCUSSION

3.1 Characteristics of the Amount of Rupiah Loans Provided by Commercial Banks and Rural Banks

Every month the amount of loans provided by commercial banks and rural banks changes. As can be seen in Figure 4.1, the patterns formed by the three-time series tend to increase. Based on the amount of loans, DKI Jakarta is the province with the highest value compared to the other two provinces. The second province that has a high amount of loan value is West Java Province and followed by Banten Province on the third position.

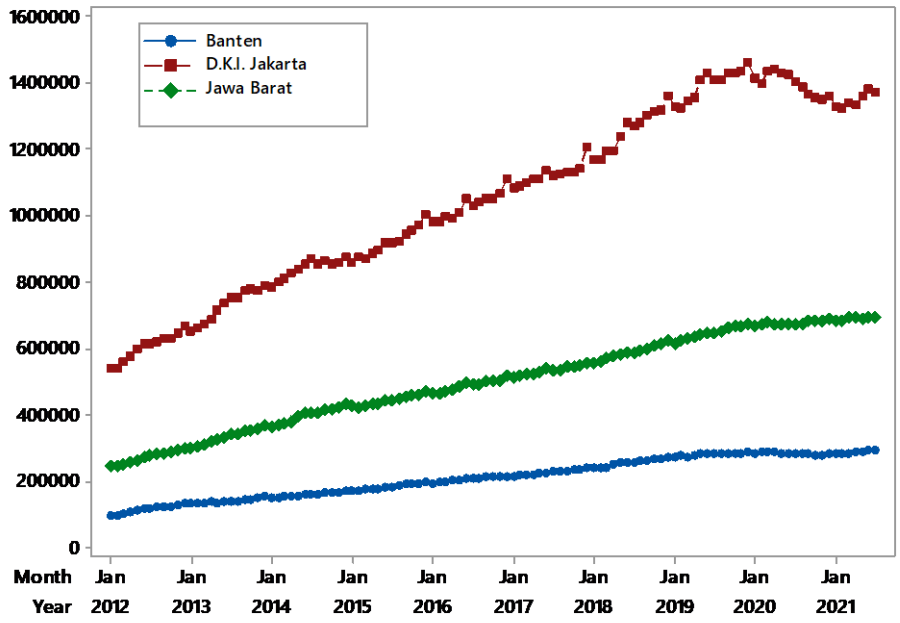

Figure 1. Time Series Plot of the Amount of Rupiah Loans Provided by Commercial Banks and Rural Banks (In Billions)

Based on statistics, the amount of DKI Jakarta loans for the period January 2012 to July 2021 has an average of around Rp1.051,821,000,000,000.-. The average loan of DKI Jakarta Province is far above West

Java Province and Banten Province, which is around Rp. 498,520,000,000,000.- and around Rp. 209,862,000,000,000.-.

Table 1. Descriptive Statistics on the Number of Rupiah Loans Provided by Commercial Banks and Rural Banks (In Billions)

Province	Mean	Standard Deviation	Minimum	Maximum
Banten	209,862	60,024	96,202	294,265
DKI Jakarta	1,051,821	275,742	537,790	1,462,679
West Java	498,520	137,100	244,996	693,082

In Table 1, it can be seen that the standard deviation of loans from the three provinces is quite high, which shows that each month the amount of loans varies in nominal. The highest and lowest nominal values of each province's loan amount can be seen in Table 1. The lowest value of DKI Jakarta Province, West Java Province, and Banten Province occur in January 2012. Meanwhile, the maximum value of DKI Jakarta Province is in December 2019 and for other provinces, it is in July 2021.

3.2 Correlation Test

Table 2 shows the results of the correlation test of the number of rupiah loans provided by commercial banks and rural banks for the monthly period in DKI Jakarta, West Java, and Banten Provinces.

Table 2. Correlation of The Amount of Rupiah Loans Provided by Commercial Banks and Rural Banks

Correlation	Correlation Coefficient	*P*-Value
DKI Jakarta vs Banten Province	0.996	0.000
DKI Jakarta vs West Java Province	0.992	0.000
West Java Province vs Banten Province	0.995	0.000

Based on Table 2, it can be seen that the three provinces have a very strong correlation. The value of the three provinces has a score above 0.9 and a p-value of 0.05. These values show that the three provinces have a positive relationship which means that if the number of loans of one province increases, it will be followed by an increase in the other province.

3.3 Data Stationarity Test

3.3.1 Data Stationarity Test in Variance

Table 3 is the result of the stationarity test in variance. Based on Table 3, it can be seen that not all observational data are stationary in variance.

Table 3. Data Stationaryity Test in Variance

Variable	Rounded Value	Transformation
DKI Jakarta	0.500	$\sqrt{X}$
West Java Province	1	Not necessary
Banten Province	1	Not necessary

There is one data that has not been stationary in the variance, which is the amount of DKI Jakarta Province loans. To fulfill the stationary conditions in the variance, the loan amount of DKI Jakarta must be transformed using the square root transformation. Meanwhile, the loan data of West Java Province and Banten Province have fulfilled stationary conditions in variance.

3.3.2 Data Stationaryity Test in Mean

Dicky Fuller Test results showed that the data had not met stationary conditions in mean. Therefore, differencing with the order of 1 is carried out. After differencing, the result is obtained that the data already meets the condition of the stationarity in mean. The results of the Dicky Fuller Test of data that have passed differencing can be seen in Table 4. In Table 4, it is obtained that the values of Prob < Rho and Prob < Tau are less than 0.05, which means that the differenced data with the order of 1 is already stationary in mean.

Table 4. Data Stationaryity Test in Mean

Variable	Type	Rho	Prob<Rho	Tau	Prob<Tau
Banten Province	Zero Mean	-31.870	0.000	-3.880	0.000
	Single Mean	-89.571	0.001	-6.520	0.000
	Trend	-104.360	0.000	-6.910	0.000
DKI Jakarta	Zero Mean	-89.074	0.000	-6.680	0.000
	Single Mean	-151.479	0.000	-8.600	0.000
	Trend	-185.629	0.000	-9.460	0.000
West Java Province	Zero Mean	-37.412	0.000	-4.300	0.000
	Single Mean	-160.019	0.000	-8.790	0.000
	Trend	-194.216	0.000	-9.720	0.000

3.4 GSTAR Modelling

3.4.1 Data Stationaryity Test in Variance

To determine the shape of the GSTAR model from the data, an MPACF is used. The following is the MPACF matrix of the number of monthly rupiah loans provided by commercial banks and rural banks in the provinces of DKI Jakarta, West Java, and Banten.

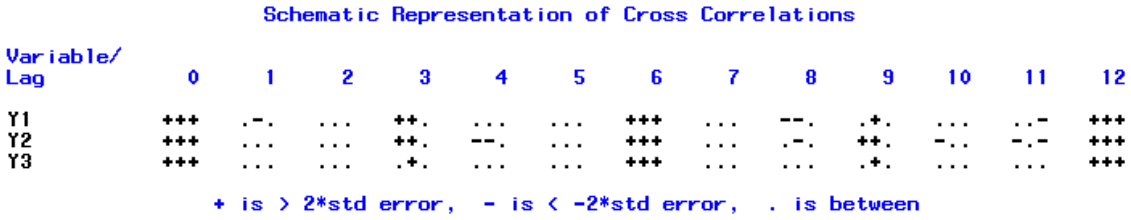

Figure 2. MPACF

Based on Figure 2, it is found that there is minus (-) and positive (+) signs dominating in lag 3, 6, 9, and 12. The minus (-) and positive (+) signs are the indication of the GSTAR model order. Based on the MPACF, the model is GSTAR (3,6,9,12).

3.4.2 GSTAR Parameter Estimation

Based on the results of the model indication using MPACF, it shows that the GSTAR model formed is GSTAR (3,6,9,12). The followings are the estimation results from the GSTAR model based on research data.

Table 5. Parameter Estimation Results

Variable	DF	Estimate	Error	t Value	Pr > |t|
$Y_{1,t-3}$	1	0.224	0.085	2.640	0.010
$Y_{1,t-6}$	1	0.184	0.091	2.020	0.046
$U_{1,t-12}$	1	0.183	0.098	1.870	0.065
$Y_{1,t-12}$	1	0.225	0.101	2.230	0.028
$U_{2,t-6}$	1	0.001	0.001	3.600	0.001
$Y_{2,t-12}$	1	0.516	0.516	6.280	0.000
$U_{3,t-3}$	1	0.725	0.267	2.710	0.008
$Y_{3,t-6}$	1	0.217	0.082	2.660	0.009
$Y_{3,t-12}$	1	0.584	0.077	7.600	0.000

Based on Table 5, the results of parameter estimation with a *t*-test for each variable and significant lag with alpha levels of 0.05 and 0.10 were obtained. Variables or lags that are not significant are excluded from the model. The loan amount of Banten Province is influenced by the loan amount of the previous months. Viewed from a spatial perspective, the amount of loans in Banten Province is influenced by the loan amount of DKI Jakarta and West Java Provinces. The loan amount of DKI Jakarta is influenced by the loan amount of the previous months and in terms of spatial terms, the amount of DKI Jakarta loans is influenced by the loan amount of West Java and Banten Provinces. The loan amount of West Java Province is influenced by the loan amount of the previous months. Viewed from a spatial perspective, the amount of loans in West Java Province is influenced by the loan amount of Banten and DKI Jakarta Provinces.

3.4.3 GSTAR Model Assumption Checking

In general, there are two assumptions that must be fulfilled in time series modeling. The assumptions are that the residual must be normally distributed and have a white noise condition. For the GSTAR model, the assumptions that must be fulfilled are that the residual must be normally multivariate distributed and have a white noise condition.

To test the normal multivariate residual, the Shapiro-Wilk test is used. The Shapiro-Wilk test results gave a value of 0.989 and a *p*-value of 0.727. From the results of these outputs, it can be concluded that the residual has met the assumption of normal multivariate distribution because the *p*-value is greater than 0.05.

For the white noise test, the minimum information criteria of ar lag and MA of the model residual data are used. If the minimum information criteria values are located in AR(0) and MA(0), then it can be concluded that the residual has met the white noise condition. The minimum information criteria of the formed model are presented in Table 6.

Table 6 Minimum Information Criteria

Lag	MA(0)	MA(1)	MA(2)	MA(3)	MA(4)	MA(5)
AR(0)	34.345	34.537	34.397	34.481	34.602	34.688
AR(1)	34.388	34.580	34.467	34.618	34.776	34.882
AR(2)	34.375	34.582	34.583	34.773	34.884	34.951
AR(3)	34.510	34.711	34.790	34.996	35.132	35.152
AR(4)	34.545	34.746	34.885	35.109	35.369	35.435
AR(5)	34.680	34.835	34.965	35.226	35.481	35.611

Based on Table 6, it is obtained that the smallest criterion value is 34.345 and is located in AR(0) and MA(0). Therefore, it can be concluded that the redisul has met the white noise condition.

3.4.4 RMSE of GSTAR Model

Root Mean Square Error (RMSE) shows an indication of the model's goodness in predicting. To find out the goodness of the model, the in-sample RMSE value is used.

Table 7. In-sample RMSE of GSTAR Model

Model	In-sample RMSE		
	Banten Province	DKI Jakarta	West Java Province
GSTAR(3,6,9,12)	1.871	13.701	2.919

It can be seen that the largest in-sample RMSE value is DKI Jakarta due to the number of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta Province is higher than in other provinces.

3.4.5 GSTAR(3,6,9,12) Interpretation

Based on the results of the analysis, the GSTAR model (3,6,9,12) was obtained which already met the required assumptions. The GSTAR model formed can be explained into models for each province.

a. Model of the amount of monthly rupiah loans provided by commercial banks and rural banks in Banten Province:

$$Y_{1,t}(1-B) = \left(0{,}224Y_{1,t-3} + 0{,}184Y_{1,t-6} + 0{,}225Y_{1,t-12} + 0{,}183 * 0{,}5U_{1,t-12}\right)(1-B) + e_t$$

$$Y_{1,t} = Y_{1,t-1} + 0{,}224Y_{1,t-3} + 0{,}184Y_{1,t-6} + 0{,}225Y_{1,t-12} + 0{,}183 * 0{,}5U_{1,t-12} - 0{,}224Y_{1,t-4} - 0{,}184Y_{1,t-7} - 0{,}225Y_{1,t-13} + 0{,}183 * 0{,}5U_{1,t-13} + e_t$$

Based on the model of monthly amount of rupiah loans provided by commercial banks and rural banks in Banten Province, it can be explained that the current loan amount is influenced by the loan amount of 1, 3, 4, 6, 7, 12, and 13 months earlier. In addition, the current amount of loans is influenced by the loan amounts of DKI Jakarta Province and West Java Province 12 and 13 months earlier.

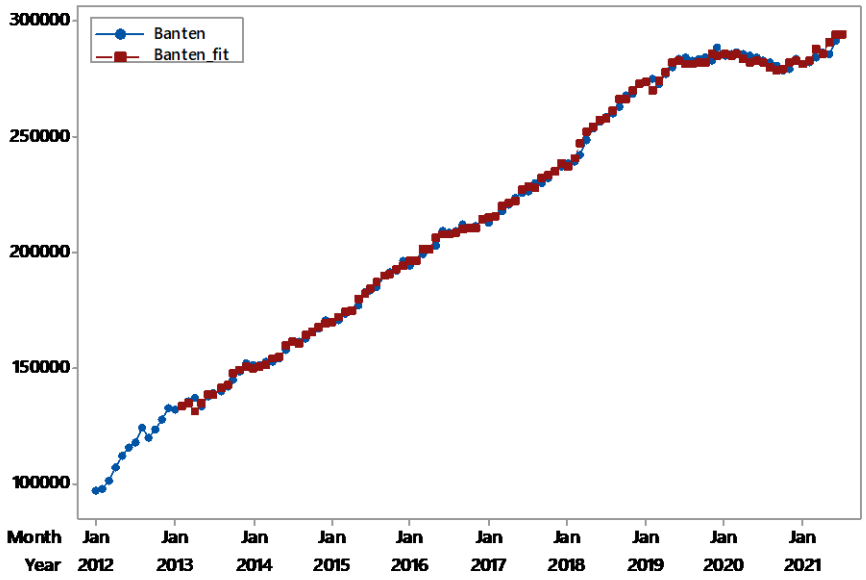

Figure 3. Time Series Plot of the Amount of Monthly Rupiah Loans Provided by Commercial Banks and Rural Banks in Banten Province vs Fit (In Billions)

In Figure 3, it can be seen that the fit value follows the pattern of the number of monthly rupiah loans provided by commercial banks and rural banks in Banten Province.

b. Model of the amount of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta:

$$Y_{2,t}^{*}(1-B) = (0{,}516Y_{2,t-12}^{*} + 0{,}001 * 0{,}5U_{2,t-6})(1-B) + e_t$$

$$Y_{2,t}^{*} = Y_{2,t-1}^{*} + 0{,}516Y_{2,t-12}^{*} + 0{,}001 * 0{,}5U_{2,t-6} - 0{,}516Y_{2,t-13}^{*} - 0{,}001 * 0{,}5U_{2,t-7} + e_t$$

with $Y_{2,t}^{*} = \sqrt{Y_{2,t}}$.

Based on model of the number of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta Province, it can be explained that the current amount of loans is influenced by the amount of loan 12 and 13 months earlier. In addition, the current amount of loans is influenced by the loan amounts of Banten Province and West Java Province 6 and 7 months earlier.

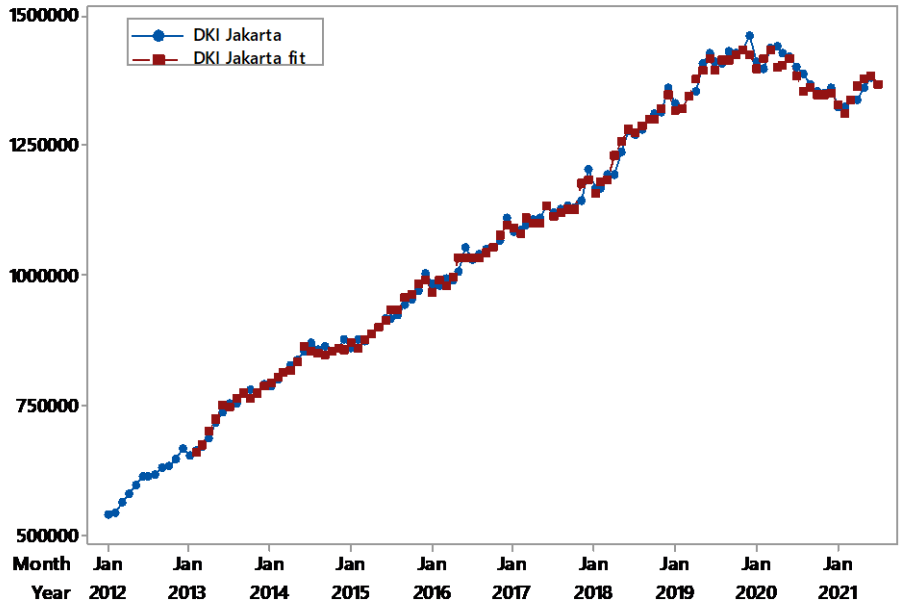

Figure 4. Time Series Plot of the Amount of Monthly Rupiah Loans Provided by Commercial Banks and Rural Banks in DKI Jakarta vs Fit (In Billions)

Shown in Figure 4, the fit value follows the pattern of the number of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta Province.

c. Model of the amount of monthly rupiah loans provided by commercial banks and rural banks in West Java Province:

$$Y_{3,t}(1-B) = (0{,}217Y_{3,t-6} + 0{,}584Y_{3,t-12} + 0{,}725 * 0{,}5U_{3,t-3})(1-B) + e_t$$

$$Y_{3,t} = Y_{3,t-1} + 0{,}217Y_{3,t-6} + 0{,}584Y_{3,t-12} + 0{,}725 * 0{,}5U_{3,t-3} - 0{,}217Y_{3,t-7} - 0{,}584Y_{3,t-13} - 0{,}725 * 0{,}5U_{3,t-4} + e_t$$

Based on the monthly rupiah loan amount model provided by commercial banks and rural banks in West Java Province, it can be explained that the current loan amount is influenced by the loan amount 6, 7, 12, and 13 months earlier. In addition, the current loan amount is influenced by the loan amount of Banten and DKI Jakarta Provinces 3 and 4 months earlier.

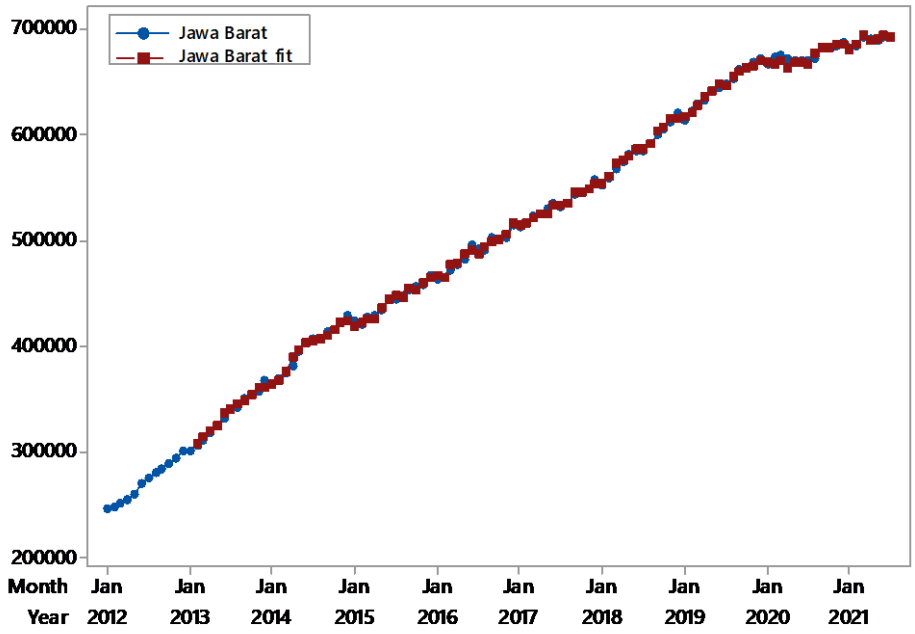

Figure 5. Time Series Plot of the Amount of Monthly Rupiah Loans Provided by Commercial Banks and Rural Banks in West Java Province vs Fit (In Billions)

Shown in Figure 5, the fit value follows the pattern of the number of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta.

4. CONCLUSIONS

The number of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta is the highest in value compared to Banten Province and West Java Province. The time series pattern formed from the three provinces tends to increase every month.

The GSTAR model formed is GSTAR(3,6,12) with differencing order of 1. Based on the model, its spacial and temporal relationship can be explained. The number of monthly rupiah loans provided by commercial banks and rural banks in Banten Province can be explained that the current amount of loans is influenced by the loan amount 1, 3, 4, 6, 7, 12, and 13 months earlier. In addition, the current amount of loans is influenced by the loan amounts of DKI Jakarta and West Java Province 12 and 13 months earlier. The amount of monthly rupiah loans provided by commercial banks and rural banks in DKI Jakarta can be explained that the current loan amount is influenced by the loan amount 12 and 13 months earlier. In addition, the current amount of loans is influenced by the loan amounts of Banten Province and West Java Province 6 and 7 months earlier. The number of monthly rupiah loans provided by commercial banks and rural banks in West Java Province can be explained that the current loan amount is influenced by the loan amount 6, 7, 12,

and 13 months earlier. In addition, the current amount of loans is influenced by the loan amounts of Banten Province and DKI Jakarta Province 3 and 4 months earlier.

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