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DARI SINI PENCERAHAN BERSEMI

Forecasting Analysis of Agen Jatim Branch Tuban Performance

Oleh:

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Progam Studi Magister Manajemen

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Introduction

TUBAN REGENCY

Tuban regency is one of regency in East Java province which is located on the north coast of Java Island.

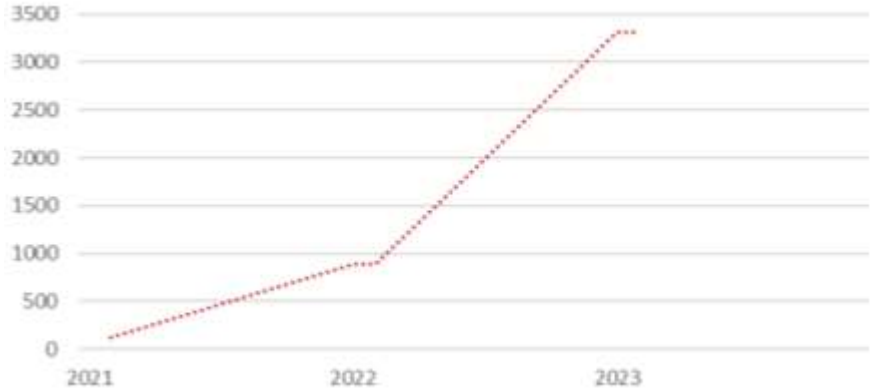
Area	: 1,904.70 km2	Vilages	: 328
Coastline	: ±65 km	Sub-district	: 20
Population	: ±1 million people		

The majority of the residents make their living as farmers because of the diversity of natural resources, as well as the diverse topography and soil structure. Tuban regency has a lot of economic potential from a variety of sources, including agriculture, fisheries, plantations, tourism, trade, animal husbandry, mining, forestry and extraction of other natural resources.

Introduction

Bank Jatim is one of the Regional Bank in Indonesia which was founded on 17 August 1961 and has its head office in Surabaya, East Java as a Regional Development Bank

Agen Jatim is the business potential for the communities because they can be opened by individuals, employees and legal entities. Agen Jatim very flexible, there are no sanctions given to Agent if they do not meet the predetermined transaction targets. There is a distribution of fees given to Agen Jatim, where the fees obtained will not be deducted from tax, so it is very profitable for business people who open Agen Jatim. Customers who transfers between Bank Jatim accounts at Agen Jatim free on administration fees. The facilities obtained include being able to make transfers, open accounts, cash deposits, PLN payments, purchase tokens, cash withdrawals, purchase credit, BPJS payments, PBB payments, PKB tax payments, and credit applications. Based on this, the number of Agen Jatim in Tuban regency continues to increase year to year.

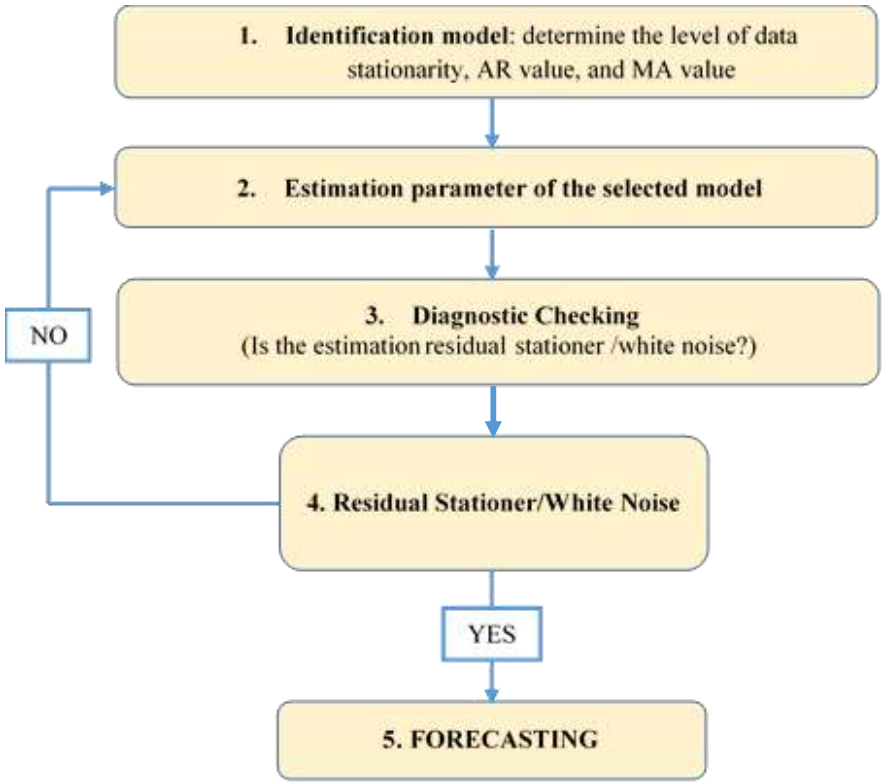


Problem Formulation

- What are the results of forecasting the Number of Agents, Amount of Saving, and NoA (Number of Amount) of Tuban Branch East Java Agents in January 2024?
- What is the best ARIMA model to predict the Number of Agents, Amount of Saving, and NoA (Number of Amount) for East Java Tuban Branch Agents in January 2024
- How does the Number of Agent, Amount of Saving, and NoA affect Agen Jatim branch Tuban?

Method

Research using ARIMA (Autoregressive Integrated Moving Average) method



Result and Discussion

a. Number of Agen Jatim

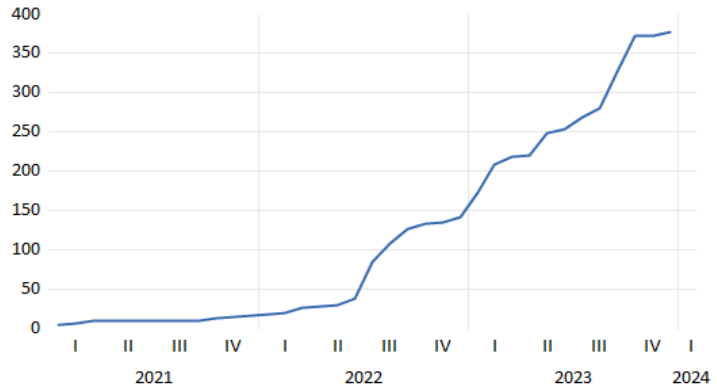


Figure 5. Plot Data Graph for Number of Agen Jatim branch Tuban

The graph shows that the data is not stationary, because the movement inconsistent increase, so it must do the differencing data to determine “d” value using the Augmented Dickey-Fuller (ADF) test on the Unit Root Test

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.520580	1.0000
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

(a)

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.639483	0.0100
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

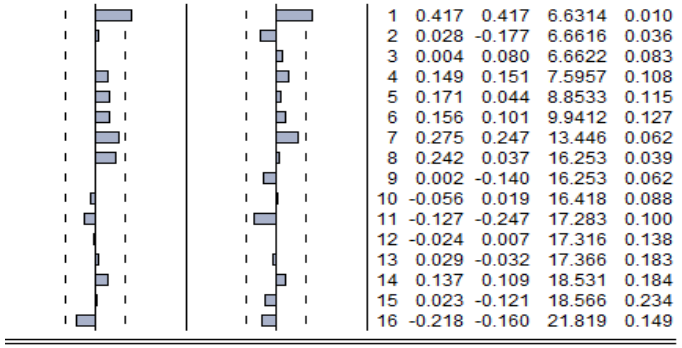
(b)

Table 1. (a) Unit root test on Level (b) Unit root test on 1st Difference

Table 1(a) the value is 1.00 > 0.05 so the data can be said to be non-stationary at the level.
Table 1(b) is stationary data at the 1st difference because the value is 0.01 < 0.05
So the value of order d = 1.
The next step, is do the correlogram test to determine ARIMA model (p, d, q).

Result and Discussion

Date: 05/11/24 Time: 21:06
Sample (adjusted): 2021M02 2023M12
Included observations: 35 after adjustments



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.417	0.417	6.6314	0.010
		2	0.028	-0.177	6.6616	0.036
		3	0.004	0.080	6.6622	0.083
		4	0.149	0.151	7.5957	0.108
		5	0.171	0.044	8.8533	0.115
		6	0.156	0.101	9.9412	0.127
		7	0.275	0.247	13.446	0.062
		8	0.242	0.037	16.253	0.039
		9	0.002	-0.140	16.253	0.062
		10	-0.056	0.019	16.418	0.088
		11	-0.127	-0.247	17.283	0.100
		12	-0.024	0.007	17.316	0.138
		13	0.029	-0.032	17.366	0.183
		14	0.137	0.109	18.531	0.184
		15	0.023	-0.121	18.566	0.234
		16	-0.218	-0.160	21.819	0.149

Table 2. Correlogram on 1st difference

The Autocorrelation (ACF) and Partial Autocorrelation (PACF) decrease from the first lag

So the possibilities:

1. p = 1 ; q = 0
2. p = 0 ; q = 1.

The ARIMA (p,d,q) models:

- ARIMA (1,1,0) or AR(1)
- ARIMA (0,1,1) or MA(1).

Then AR(1) and MA(1) test using the estimation equation

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/11/24 Time: 21:09
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 9 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.33359	7.651146	1.350594	0.1863
AR(1)	0.413114	0.192300	2.148283	0.0394
SIGMASQ	167.6633	58.14437	2.883569	0.0070

R-squared	0.177219	Mean dependent var	10.62857
Adjusted R-squared	0.125795	S.D. dependent var	14.48343
S.E. of regression	13.54185	Akaike info criterion	8.136610
Sum squared resid	5868.215	Schwarz criterion	8.269926
Log likelihood	-139.3907	Hannan-Quinn criter.	8.182630
F-statistic	3.446243	Durbin-Watson stat	1.831617
Prob(F-statistic)	0.044111		

Inverted AR Roots	.41

(a)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/11/24 Time: 21:12
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 12 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.56697	5.262782	2.007868	0.0532
MA(1)	0.450150	0.163287	2.756799	0.0096
SIGMASQ	163.6350	51.40728	3.183110	0.0032

R-squared	0.196987	Mean dependent var	10.62857
Adjusted R-squared	0.146799	S.D. dependent var	14.48343
S.E. of regression	13.37818	Akaike info criterion	8.113414
Sum squared resid	5727.226	Schwarz criterion	8.246730
Log likelihood	-138.9847	Hannan-Quinn criter.	8.159435
F-statistic	3.924957	Durbin-Watson stat	1.894032
Prob(F-statistic)	0.029892		

Inverted MA Roots	-.45

(b)

Table 3. (a) Estimate equation AR(1) ; (b) Estimate equation MA(1)

Adjusted R-squared	AR(1) < MA(1),
Sum squared resid	AR(1) > MA(1),
Akaike info criterion	AR(1) > MA(1),
Schwarz criterion	AR(1) > MA(1).

So it can be concluded that MA(1) is better than AR(1)

Result and Discussion

Date: 05/11/24 Time: 21:13
Sample (adjusted): 2021M02 2023M12
Q-statistic probabilities adjusted for 1 ARMA term

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.046	0.046	0.0789	
		2	0.029	0.027	0.1127	0.737
		3	-0.055	-0.058	0.2365	0.888
		4	0.143	0.148	1.0916	0.779
		5	0.102	0.093	1.5375	0.820
		6	0.056	0.037	1.6799	0.891
		7	0.178	0.194	3.1520	0.790
		8	0.223	0.215	5.5370	0.595
		9	-0.098	-0.148	6.0141	0.646
		10	0.038	0.047	6.0871	0.731
		11	-0.162	-0.210	7.5102	0.677
		12	0.056	-0.069	7.6859	0.741
		13	-0.045	-0.075	7.8069	0.800
		14	0.143	0.095	9.0651	0.768
		15	0.037	0.007	9.1520	0.821
		16	-0.182	-0.180	11.421	0.722

Table 4. Correlogram Q-statistic MA(1) or ARIMA (0,1,1) model

The results of the Q statistical correlogram on the ARIMA (0,1,1) model shows that the average probability value is greater than 0.05 so the ARIMA (0,1,1) model can do the forecasting.

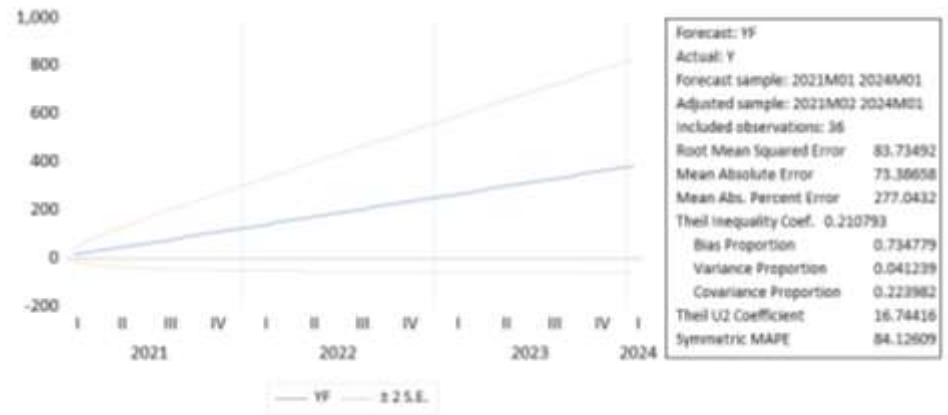


Figure 6. Forecating Result Number of Agen Jatim branch Tuban period Januari 2024

The Agen Jatim branch Tuban forecasting graph shows an increase in January 2024 with 385.41 agents.

The increasing number of Agen Jatim, the more people will know about Bank Jatim and make transactions using Bank Jatim and this can be made easier by the presence of Agen Jatim. If the number of Agen Jatim branch Tuban continues to increase every month, many Tuban people will make transactions using Bank Jatim, this will make Bank Jatim as a transactional bank in Tuban Regency.

Result and Discussion

b. Amount of Saving

Figure 7. Plot Data Graph Amount of Saving Agen Jatim branch Tuban

The graph amount of saving Agen Jatim branch Tuban shows that amount of saving Agen Jatim unstable, up and down inconsistently, so the data is non-stationary data, so it must do the stationary test using the Augmented Dickey-Fuller (ADF) test on the unit root test.

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.755163	0.3953
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

(a)

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.562443	0.01114
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

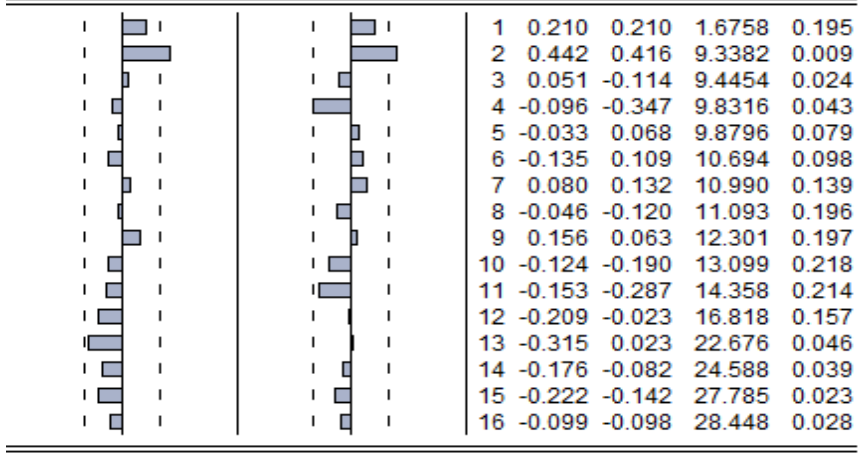
(b)

Table 5. (a) Unit root test on Level (b) Unit root test on 1st Difference

The data was stationary at the 1st difference because the value was 0.01 < 0.05, so the value of order d = 1 was obtained.
After obtaining the stationary data, the correlogram was checked by paying attention to the ACF and PACF values for determine the ARIMA model (p,d,q)

Result and Discussion

Date: 05/22/24 Time: 16:37
Sample (adjusted): 2021M02 2023M12
Included observations: 35 after adjustments



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.210	0.210	1.6758	0.195
		2	0.442	0.416	9.3382	0.009
		3	0.051	-0.114	9.4454	0.024
		4	-0.096	-0.347	9.8316	0.043
		5	-0.033	0.068	9.8796	0.079
		6	-0.135	0.109	10.694	0.098
		7	0.080	0.132	10.990	0.139
		8	-0.046	-0.120	11.093	0.196
		9	0.156	0.063	12.301	0.197
		10	-0.124	-0.190	13.099	0.218
		11	-0.153	-0.287	14.358	0.214
		12	-0.209	-0.023	16.818	0.157
		13	-0.315	0.023	22.676	0.046
		14	-0.176	-0.082	24.588	0.039
		15	-0.222	-0.142	27.785	0.023
		16	-0.099	-0.098	28.448	0.028

Table 6. Correlogram on 1st difference

The Autocorrelation (ACF) and Partial Autocorrelation (PACF) plots have decreased compared to the second row

The possibilities:

1. p = 1 ; q = 2
2. p = 2 ; q = 1
3. p = 0 ; q = 1
4. p = 0 ; q = 2

The ARIMA (p,d,q) models:

- ARIMA (1,1,2)
- ARIMA (2,1,1)
- ARIMA (2,1,2)
- ARIMA (1,1,1)
- ARIMA (0,1,1)
- ARIMA (0,1,2)
- ARIMA (1,1,0)
- ARIMA (2,1,0)

Result and Discussion

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:39
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 33 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1865699.	2435211.	0.766135	0.4494
AR(1)	0.175123	0.140135	1.249680	0.2208
MA(2)	0.734449	0.186375	3.940716	0.0004
SIGMASQ	3.88E+13	1.01E+13	3.850277	0.0006

R-squared	0.422976	Mean dependent var	2364520.
Adjusted R-squared	0.367135	S.D. dependent var	8323937.
S.E. of regression	6621925.	Akaike info criterion	34.40334
Sum squared resid	1.36E+15	Schwarz criterion	34.58110
Log likelihood	-598.0585	Hannan-Quinn criter.	34.46470
F-statistic	7.574650	Durbin-Watson stat	2.026119
Prob(F-statistic)	0.000612		

(a)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:40
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 13 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1397667.	3761340.	0.371587	0.7127
AR(2)	0.519833	0.177621	2.926638	0.0064
MA(1)	0.131899	0.147301	0.895434	0.3775
SIGMASQ	4.93E+13	1.11E+13	4.443017	0.0001

R-squared	0.266840	Mean dependent var	2364520.
Adjusted R-squared	0.195889	S.D. dependent var	8323937.
S.E. of regression	7464258.	Akaike info criterion	34.61434
Sum squared resid	1.73E+15	Schwarz criterion	34.79210
Log likelihood	-601.7510	Hannan-Quinn criter.	34.67570
F-statistic	3.760915	Durbin-Watson stat	1.922311
Prob(F-statistic)	0.020614		

(b)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:40
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 13 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1397667.	3761340.	0.371587	0.7127
AR(2)	0.519833	0.177621	2.926638	0.0064
MA(1)	0.131899	0.147301	0.895434	0.3775
SIGMASQ	4.93E+13	1.11E+13	4.443017	0.0001

R-squared	0.266840	Mean dependent var	2364520.
Adjusted R-squared	0.195889	S.D. dependent var	8323937.
S.E. of regression	7464258.	Akaike info criterion	34.61434
Sum squared resid	1.73E+15	Schwarz criterion	34.79210
Log likelihood	-601.7510	Hannan-Quinn criter.	34.67570
F-statistic	3.760915	Durbin-Watson stat	1.922311
Prob(F-statistic)	0.020614		

(c)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:46
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 45 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1810357.	4263316.	0.424636	0.6740
AR(1)	0.721272	0.324968	2.219516	0.0339
MA(1)	-0.467331	0.413975	-1.128889	0.2676
SIGMASQ	5.99E+13	9.91E+12	6.040538	0.0000

R-squared	0.110338	Mean dependent var	2364520.
Adjusted R-squared	0.024242	S.D. dependent var	8323937.
S.E. of regression	8222425.	Akaike info criterion	34.79437
Sum squared resid	2.10E+15	Schwarz criterion	34.97213
Log likelihood	-604.9015	Hannan-Quinn criter.	34.85573
F-statistic	1.281565	Durbin-Watson stat	2.268287
Prob(F-statistic)	0.297981		

(d)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:48
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2335087.	1784915.	1.308234	0.2001
MA(1)	0.113471	0.133171	0.852074	0.4005
SIGMASQ	6.57E+13	1.19E+13	5.529354	0.0000

R-squared	0.024144	Mean dependent var	2364520.
Adjusted R-squared	-0.036847	S.D. dependent var	8323937.
S.E. of regression	8475905.	Akaike info criterion	34.82554
Sum squared resid	2.30E+15	Schwarz criterion	34.95886
Log likelihood	-606.4469	Hannan-Quinn criter.	34.87156
F-statistic	0.395864	Durbin-Watson stat	1.869603
Prob(F-statistic)	0.676349		

(e)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:49
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 33 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1909701.	1924771.	0.992171	0.3286
MA(2)	0.745607	0.167821	4.442863	0.0001
SIGMASQ	4.01E+13	9.43E+12	4.255529	0.0002

R-squared	0.403745	Mean dependent var	2364520.
Adjusted R-squared	0.366479	S.D. dependent var	8323937.
S.E. of regression	6625359.	Akaike info criterion	34.37891
Sum squared resid	1.40E+15	Schwarz criterion	34.51223
Log likelihood	-598.6309	Hannan-Quinn criter.	34.42493
F-statistic	10.83414	Durbin-Watson stat	1.622609
Prob(F-statistic)	0.000255		

(f)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:50
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 23 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2276735.	2118689.	1.074596	0.2906
AR(1)	0.212194	0.133377	1.590933	0.1215
SIGMASQ	6.42E+13	1.12E+13	5.740985	0.0000

R-squared	0.045796	Mean dependent var	2364520.
Adjusted R-squared	-0.013842	S.D. dependent var	8323937.
S.E. of regression	8381350.	Akaike info criterion	34.80405
Sum squared resid	2.25E+15	Schwarz criterion	34.93736
Log likelihood	-606.0709	Hannan-Quinn criter.	34.85007
F-statistic	0.767894	Durbin-Watson stat	2.159694
Prob(F-statistic)	0.472349		

(g)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/22/24 Time: 19:53
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1421181.	3347571.	0.424541	0.6740
AR(2)	0.524651	0.171981	3.050630	0.0046
SIGMASQ	5.06E+13	1.06E+13	4.765218	0.0000

R-squared	0.248538	Mean dependent var	2364520.
Adjusted R-squared	0.201571	S.D. dependent var	8323937.
S.E. of regression	7437841.	Akaike info criterion	34.58227
Sum squared resid	1.77E+15	Schwarz criterion	34.71559
Log likelihood	-602.1898	Hannan-Quinn criter.	34.62829
F-statistic	5.291815	Durbin-Watson stat	1.591447
Prob(F-statistic)	0.010340		

(h)

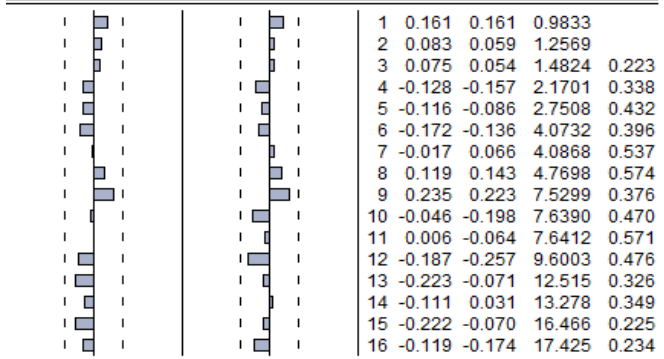
Table 7. Estimate equation

(a) Estimate equation ARIMA (1,1,2) ; (b) Estimate equation ARIMA (2,1,1) ; (c) Estimate equation ARIMA (2,1,2) ; (d) Estimate equation ARIMA (1,1,1) ; (e) Estimate equation ARIMA (0,1,1) ; (f) Estimate equation ARIMA (0,1,2) ; (g) Estimate equation ARIMA (1,1,0) ; (h) Estimate equation ARIMA (2,1,0)

Result and Discussion

ARIMA (2,1,2) model is better than all of model because the value of adjusted R-squared value is larger ; sum squared resid is smaller; akaike info criterion is smaller; and schwarz criterion is smaller
Then continue to check the Q-statistic correlogram

Date: 05/22/24 Time: 20:02
Sample (adjusted): 2021M02 2023M12
Q-statistic probabilities adjusted for 2 ARMA terms



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.161	0.161	0.9833	
		2	0.083	0.059	1.2569	
		3	0.075	0.054	1.4824	0.223
		4	-0.128	-0.157	2.1701	0.338
		5	-0.116	-0.086	2.7508	0.432
		6	-0.172	-0.136	4.0732	0.396
		7	-0.017	0.066	4.0868	0.537
		8	0.119	0.143	4.7698	0.574
		9	0.235	0.223	7.5299	0.376
		10	-0.046	-0.198	7.6390	0.470
		11	0.006	-0.064	7.6412	0.571
		12	-0.187	-0.257	9.6003	0.476
		13	-0.223	-0.071	12.515	0.326
		14	-0.111	0.031	13.278	0.349
		15	-0.222	-0.070	16.466	0.225
		16	-0.119	-0.174	17.425	0.234

Table 8. Correlogram Q-statistic ARIMA (2,1,2)

The results of the Q statistical correlogram on the ARIMA (2,1,2) shows that the average probability value is greater than 0.05 so the ARIMA (2,1,2) can do the forecasting.

Result and Discussion

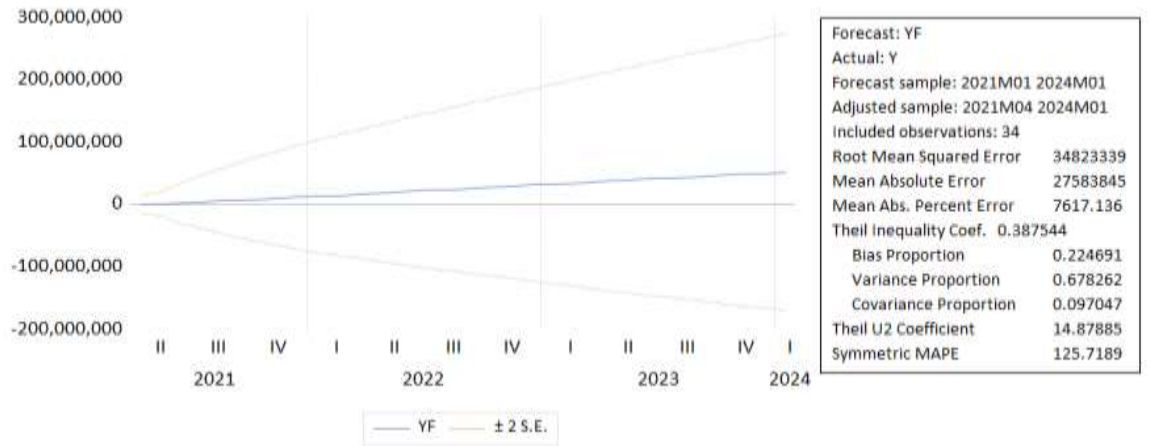


Figure 9. Forecasting Result the Amount of Saving Agen Jatim branch Tuban January 2024

The results forecasting the amount of saving Agen Jatim branch Tuban is increase on January 2024, totally Rp. 52,464,254.00

If the amount of saving Agen Jatim branch Tuban continues to increase every month, this indicates that many Tuban people do transactions using Bank Jatim. This must be maintained by Bank Jatim by providing the best service to customers who make transactions using the branchless banking and accepting criticism and suggestions from customers so that it can become better. The increase in the amount of saving Agen Jatim branch Tuban indicates that Bank Jatim has become a transactional bank in Tuban Regency and chooses to save money in Bank Jatim accounts.

Result and Discussion

c. NoA (Number of Amount)

Figure 9. Plot Data Graph of NoA Agen Jatim branch Tuban

Figure 9 shows that the graph of NoA Agen Jatim branch Tuban is increase but not consistently, so the differencing test is carried out to make data becomes stationary.

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.032697	0.9488
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

(a)

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.059533	0.0394
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

(b)

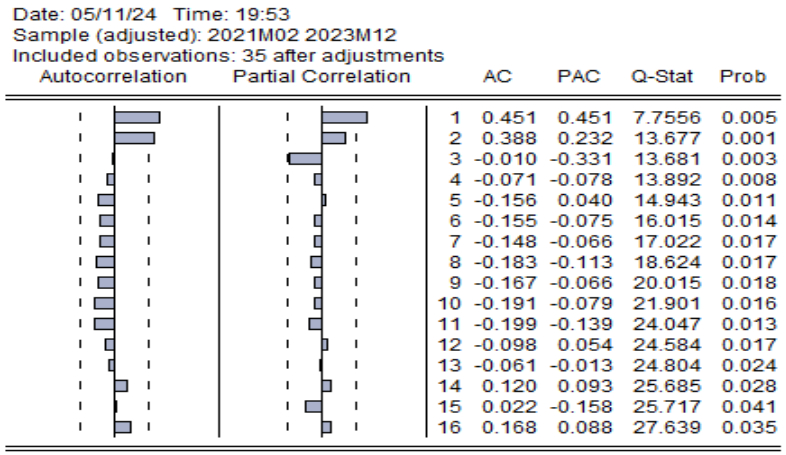
Table 9. (a) Unit root test on Level (b) Unit root test on 1st Difference

Table 9(a) shows that the probability of the unit root test at the level is 0.09 > 0.05 so this data non-stationary at the level
Table 9(b), the data is stationary at the 1st difference because the value is 0.03 < 0.05, so we get a value of order d = 1

Next, determine the ARIMA model (p, d, q) using the correlogram test

Result and Discussion

Date: 05/11/24 Time: 19:53
Sample (adjusted): 2021M02 2023M12
Included observations: 35 after adjustments



	AC	PAC	Q-Stat	Prob
1	0.451	0.451	7.7556	0.005
2	0.388	0.232	13.677	0.001
3	-0.010	-0.331	13.681	0.003
4	-0.071	-0.078	13.892	0.008
5	-0.156	0.040	14.943	0.011
6	-0.155	-0.075	16.015	0.014
7	-0.148	-0.066	17.022	0.017
8	-0.183	-0.113	18.624	0.017
9	-0.167	-0.066	20.015	0.018
10	-0.191	-0.079	21.901	0.016
11	-0.199	-0.139	24.047	0.013
12	-0.098	0.054	24.584	0.017
13	-0.061	-0.013	24.804	0.024
14	0.120	0.093	25.685	0.028
15	0.022	-0.158	25.717	0.041
16	0.168	0.088	27.639	0.035

Table 10. Correlogram on 1st difference

The ACF and PACF plots have decreased compared to the first row

The possibilities:

1. p = 1 ; q = 0
2. p = 0 ; q = 1.

The ARIMA (p,d,q) models:

- ARIMA (1,1,0) or AR(1)
- ARIMA (0,1,1) or MA(1).

Then AR(1) and MA(1) test using the estimation equation

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/11/24 Time: 19:56
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 6 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	52.88232	66.43575	0.795992	0.4319
AR(1)	0.486920	0.199916	2.435620	0.0206
SIGMASQ	9381.888	2258.865	4.153364	0.0002

R-squared	0.226604	Mean dependent var	48.97143
Adjusted R-squared	0.178267	S.D. dependent var	111.7477
S.E. of regression	101.2988	Akaike info criterion	12.16357
Sum squared resid	328366.1	Schwarz criterion	12.29689
Log likelihood	-209.8625	Hannan-Quinn criter.	12.20959
F-statistic	4.687981	Durbin-Watson stat	2.013087
Prob(F-statistic)	0.016384		

Inverted AR Roots	.49

(a)

Dependent Variable: D(Y)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 05/11/24 Time: 20:00
Sample: 2021M02 2023M12
Included observations: 35
Convergence achieved after 11 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	50.57022	50.73668	0.996719	0.3264
MA(1)	0.297405	0.131024	2.269850	0.0301
SIGMASQ	10499.94	3021.396	3.475195	0.0015

R-squared	0.134437	Mean dependent var	48.97143
Adjusted R-squared	0.080340	S.D. dependent var	111.7477
S.E. of regression	107.1649	Akaike info criterion	12.27108
Sum squared resid	367497.9	Schwarz criterion	12.40439
Log likelihood	-211.7438	Hannan-Quinn criter.	12.31710
F-statistic	2.485088	Durbin-Watson stat	1.587263
Prob(F-statistic)	0.099260		

Inverted MA Roots	-.30

(b)

Table 11. (a) Estimate equation AR(1) ; (b) Estimate equation MA(1)

Adjusted R-squared	AR(1) > MA(1)
Sum squared resid	AR(1) < MA(1)
Akaike info criterion	AR(1) < MA(1)
Schwarz criterion	AR (1) < MA(1)

So it can be concluded that AR(1) is better than MA(1)

Result and Discussion

Date: 05/11/24 Time: 19:58
Sample (adjusted): 2021M02 2023M12
Q-statistic probabilities adjusted for 1 ARMA term

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.085	-0.085	0.2754	
		2	0.309	0.303	4.0109	0.045
		3	-0.169	-0.139	5.1670	0.076
		4	-0.016	-0.138	5.1775	0.159
		5	-0.116	-0.032	5.7553	0.218
		6	-0.066	-0.055	5.9496	0.311
		7	-0.032	-0.016	5.9967	0.424
		8	-0.103	-0.104	6.5028	0.482
		9	-0.046	-0.084	6.6064	0.580
		10	-0.079	-0.050	6.9272	0.645
		11	-0.147	-0.187	8.0940	0.620
		12	-0.004	-0.031	8.0949	0.705
		13	-0.123	-0.095	8.9840	0.704
		14	0.167	0.091	10.703	0.636
		15	-0.135	-0.141	11.879	0.616
		16	0.334	0.202	19.471	0.193

Table 12. Correlogram Q-statistic AR(1) or ARIMA (1,1,0) Model

The probability value is greater than 0.05 so that the NoA of Agen Jatim branch Tuban can be forecasted to see the predicted NoA in January 2024.

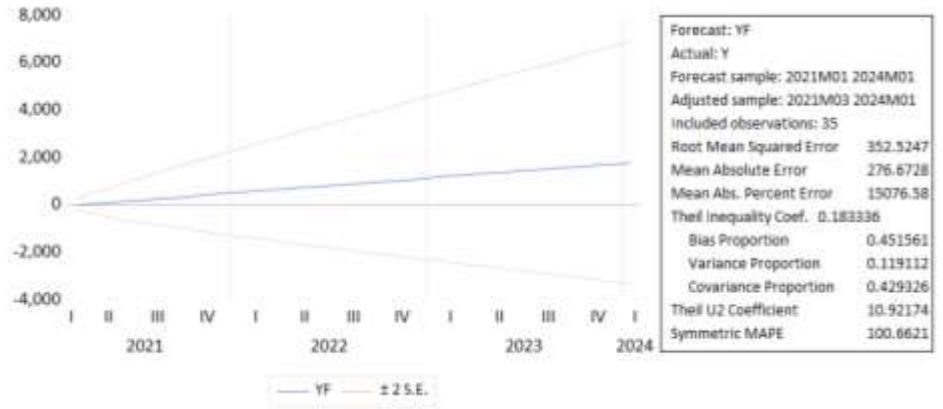


Figure 10. Forecasting NoA of Agen Jatim branch Tuban Period January 2024

Forecasting of NoA (Number of Amount) Agen Jatim branch Tuban will be increase in January 2024, totally 1801.69

If the NoA of Agen Jatim branch Tuban continues to increase every month, this indicates that many Tuban people are making transactions with branchless banking. This must be maintained by Bank Jatim by providing the best service for customers who make transactions using the branchless banking and accepting criticism and suggestions from customers so that it can be better.

Conclusion

Based on the research and testing data results of the number of agents, amount of saving, and NoA of Agen Jatim branch Tuban shows that the best forecasting model for the number of agent is ARIMA (0,1,1) model, the best forecasting model for the amount of saving is ARIMA (2,1,2) model, and the best forecasting model for NoA is ARIMA (1,1,0) model. The number of agents, amount of saving, and NoA of Agen Jatim branch Tuban in January 2024 will increase, so the role of Agen Jatim branch Tuban is very important and has received a positive response from the Tuban people in terms of transactions using branchless banking. With the existence of the Agen Jatim, many people will get information about branchless banking, so they can make transactions using Bank Jatim. This means that more Agen Jatim there, more Tuban people will make transactions using the branchless banking. This research can be useful for Bank Jatim, with this research Bank Jatim can find out if Agen Jatim can make amount of saving and number of amount (NoA) increase.

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