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Forecasting of Agricultural Loan in Bangladesh

Md. Mosfiqur Rahman, Masuma Parvin and Sayedul Anam
Department of Mathematics, General Educational Development, Daffodil International University, Dhaka, Bangladesh

Key words: Time series, ARIMA, ACF, PACF, ADF, stationary, autoregressive, moving average

Corresponding Author:
Md. Mosfiqur Rahman
Department of Mathematics, General Educational Development, Daffodil International University, Dhaka, Bangladesh

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Abstract: The agriculture sector is important to meet up the challenges of twentieth century in Bangladesh. It has huge contribution to our life. This sector secures the food security, export earnings and poverty reduction (Agricultural and MSME finance' 2017, BB). In this paper, we forecast the agricultural loan disbursement, overdue and recovery in Bangladesh. Morln eover, we have discussed the flaw of loan disbursement, recovery and overdue and that of the way out.

INTRODUCTION

Farming is the development of land and breeding of animals and plants to give nourishment, fiber, therapeutic plants and different items to support and improve life. Horticulture was the key advancement in the ascent of inactive human progress whereby cultivating of trained species made nourishment surpluses that empowered individuals to live in urban communities. The investigation of farming is known as agricultural science. The historical backdrop of horticulture goes back a large number of years; people gathered wild grains no <105,000 years prior and started to plant them around 11,500 years back before they become domesticated. Pigs, sheep and steers were domesticated <10,000 years back. Crops begin from no <11 locales of the world. Modern horticulture dependent on vast scale monoculture has in the previous century come to rule agrarian yield, however, around 2 billion people worldwide still rely upon subsistence agriculture (Wikipedia).

Current agronomy, plant breeding and agrochemicals, for example, pesticides and composts and innovative advancements have pointedly expanded yields from development and yet have caused boundless biological and ecological harm. Specific breeding and modern practices in animal husbandry have correspondingly expanded the yield of meat, yet have raised worries about animal welfare and environmental harm through contribution to a dangerous atmospheric deviation, consumption of aquifers, deforestation, anti-microbial opposition and development hormones in modernly delivered meat. Hereditarily altered animals are broadly utilized, despite the fact that they are restricted in a few nations (Wikipedia).

The major horticultural items can be extensively assembled into sustenance's; strands, energizes and crude materials. Classes of nourishments in incorporate oats (grains), vegetables, natural products, oils, meat, drain, growths and eggs. About <33% of the world's laborers are utilized in agribusiness, second only to the service sector in spite of the fact that the quantity of horticultural workers in developed nations has diminished altogether in the course of recent hundreds of years (Wikipedia).

Bangladesh is a country freed in 1971 and after that developing gradually based on agriculture mostly. It has great impact on economy. Majority percent people depend on agriculture directly or indirectly in Bangladesh. The most significant part of gross domestic income comes from the agriculture sector. Currently the contributing rate of agriculture sector to GDP is 14.8% and almost 47% of labor force employment depending on this sector (Agricultural and MSME finance'2017, BB). Moreover, this sector provides raw material for micro, medium and small industries (Agricultural and MSME finance'2017, BB).

So, agriculture sector plays a vital role for the development to it's inter connected sector with the remaining part of the economy. Recently the advancement of technology that is introduced to agriculture contributed to its revolutionary production in agriculture sector. But in Bangladesh farmers are not capable to occupy with the advanced technology without the financial support from government as well as private sector. If they are facilitated with the enough financial support it will be easier to uphold the growth of agricultural product in our economy.

As the sector is key fact to achieve the target of self sufficiency in food production, Bangladesh government has prioritized the agriculture sector. In line with the Bangladesh government, different Banks and private sectors are making their proactive policy and support to boost up agricultural production. Banks are formulating agricultural loan policy and program accordingly. Maximum percent of agricultural loan is the small scale based loans in Bangladesh for the poor entrepreneurs. This type loan allows them to access into lending institution to borrow fund and start their own business in a small scale.

Literature review: The existing procedure in financial institution is procrastinating for the disbursement of loan in Bangladesh. A farmer need to go through a long term process to avail the loan disbursement opportunity in a bank. Long term process in disbursement is a bar to secure agricultural loan. Sarker[1] did a research work where he mentioned that the main impediment in securing loan disbursement is from institutional source recorded by 90% farmers. On the other hand bankers are interested to disburse loan to urban areas rather than in rural areas. The ratio of loan-deposit in urban areas is near about 85% that is 20% more than in rural areas. There is a shortage of banking operation in rural areas. The banking operation has not spread out adequately in rural areas. As a result the disbursement of agriculture loan from different banks is not quite enough for the farmers, especially for medium and large farmers. The argument is accepted by farmers stated a survey (Farmer's credit survey, Sarker[1]). Moreover trivial cooperation has identified as another problems in getting bank loan.

Banking loan rules is one of others obstacle for small and marginal farmers for getting loan. Loan rule are designed very complicatedly that is not apprehended by most of the farmers. A survey conducted by Sarker[1] showed that 79.2% very small farmer in which 82.9% identifies the loan rules are difficult to avail the loan from bank and 78% of all farmers think same. Alam categorized four types of non-interested cost of bank loan such as (a) application fees, stamp and documents required in support of loan (b) form filling and writing (c) cost of traveling for loan negotiation (d) cost of entertaining people who assisted in loan negotiation.

To overcome the problems banks should be cooperative and participation among different banks should be ensured. The payment procedure of interest and principal should be readjusted. To increase the recovery rate of loan and to minimize the overdue rate of loan strict supervision is needed very badly from the lender side. Monitoring system must be expanded. Recently Bangladesh bank has inspired all scheduled banks to gather information of farmers from the Department of Agricultural extension to classify the original farmers[2]. The selection process for distributing loan as well as recovering loan is full of biasness. The responsible personnel in bank gives special priority to their relatives, friends and those maintain good relation with bank employees in selecting the borrowers[3]. Strict monitoring and supervision is therefore needed by central bank to reduce the tendency of mismanagement in disbursing loan and recovery system. If it is monitored in a proper way overdue of loan will be reduced automatically. Although, disbursing rate of loan is increased yearly in amount but it is not enough for increasing demand. After disbursement time loan recovery must be proportional to disbursement to avoid the increasing rate of overdue loan.

MATERIALS AND METHODS

Time series analysis: ARIMA Model is used to carry out forecasting. The time series model used in this study are briefly portrayed. A critical parametric group of stationary time series is the Autoregressive Moving Average (ARMA) process and it assumes a key job in the modeling of time series data. At the point when a time series isn't stationary, more often than not differencing tasks are connected at the suitable lag with the end goal to accomplish stationary. The mean is normally subtracted and an ARMA Model is fit to the data set. A stationary zero mean ARMA (p, q) model is defined as[4] a sequence of random variables $\{X_t\}$ which satisfy, $X_t - \phi_1 X_{t-1} -, ..., \phi_p X_{t-p} = Z_t + \theta_1 Z_{t-1} +, ..., +\theta_q Z_{t-q}$ for every t and where $\{Z_t\}$ is a sequence of uncorrelated random variables with zero mean and constant variance σ^2. A process is said to be an ARMA process with mean μ if $\{X_t-\mu\}$ is an ARMA (p, q) process. A process is called an ARMA (p, d, q) process if d is a nonnegative integer such that $(1-B)^d X_t$ is an ARMA (p, q) process and where B is the usual backward shift operator $E(\xi_t/\xi_u, u \triangleleft t) = 0, t \in z$.

This model selection also includes the Akaike Information Criterion (AIC), Corrected Akaike Information Criterion (AICC) and Bayesian Information Criterion (BIC). The AIC statistic is defined as AIC = -2 In L+2(p+q+1) where L is the Gaussian Likelihood for an ARMA (p, q) process. On the other hand, the AICC statistic is defined as:

$$AICC = -2 \ln L + \frac{2(p+q+1)n}{n-p-q-2}$$

Since, the AICC criterion has a more extreme penalty than the AIC statistics; it would counteract fitting very large models. The Bayes Information Criterion (BIC) is given by BIC= -2 (Log likelihood) +p log (n). In general, BIC penalizes models with more parameters more strongly than AIC.

RESULTS AND DISCUSSION

The data that are used in this research is collected from the‘ Bangladesh Bank’ (https://www.bb.org.bd/pub/pubpublictn.php. In this study, we want to forecast agricultural loan disbursement, recovery and overdue. The yearly data of agricultural loan are given in data Table 1.

Forecasting Agricultural loan: The Agricultural loan disbursement for time series analysis our prerequisite is data is to be stationary. The above graph (Fig. 1) shows that the data is not stationary. The data are therefore, differenced once at lag1 and the plot is shown in Fig. 2.

Lag1: This study has tested ADF and found 8.061262 which is >3.646342 at 0.01 critical levels, i.e., expectedly the study reject the null hypothesis. The graph and the table showed in Fig. 2 and Table 2. Finally, it is established that data set is stationary in lag1. Hence, the fitted ARIMA (2, 1, 0) model and the forecasting graph (Fig. 4) can be stated as follows:

$$y_t = 0.546990 - 1.678808\mu_t + 0.678809\mu_{t-1}$$

The overdue loan: For time series analysis our prerequisite is data is to be stationary. The above graph (Fig. 5) shows that the data is not stationary. The data are therefore, differenced once at lag1 and the plot is shown in Fig. 6.

Table 1: Yearly agricultural loan data (N [N], ‘billion BDT’)

Years	Disbursement	Recovery	Overdue
2017	209.990	188.410	67.08
2016	176.460	170.560	56.78
2015	159.780	154.070	67.29
2014	160.370	170.460	76.12
2013	146.670	143.620	52.09
2012	131.320	123.590	60.52
2011	121.840	121.480	60.97
2010	111.170	101.120	64.04
2009	92.840	83.770	60.80
2008	75.348	53.840	59.43
2007	52.920	46.760	66.35
2006	57.890	41.240	65.99
2005	49.560	31.711	57.81
2004	40.480	31.350	62.64
2003	32.780	35.160	65.26
2002	29.550	32.590	67.54
2001	30.190	28.770	67.95
2000	28.510	29.960	64.58
1999	30.060	19.160	53.99
1998	16.430	16.990	54.89
1997	15.170	15.940	53.12
1996	14.180	12.730	49.20
1995	14.900	11.240	44.90
1994	11.000	9.790	42.03
1993	8.420	8.690	38.54
1992	7.940	6.620	35.72
1991	5.950	6.250	39.33
1990	6.860	7.010	32.84
1989	88.070	5.780	23.55
1988	6.560	5.950	19.32
1987	6.670	11.070	15.75
1986	6.310	6.070	17.78
1985	11.530	5.840	11.58
1984	10.050	5.170	7.55
1983	6.780	3.420	4.56

Table 2: Hypothesis disbursement

Variables	t-statistic	Prob.*
Augmented Dickey-fuller test statistic	0.442545	0.9819
Test values: 1% level	-3.639407	
5% level	-2.951125	
10% level	-2.514300	

Mackinnon one-sided p-values; Null hypothesis: disbursement has a unit root Exogenous: constant; Lag length: 0 (Automatic. Based o SIC, max lag = 8)

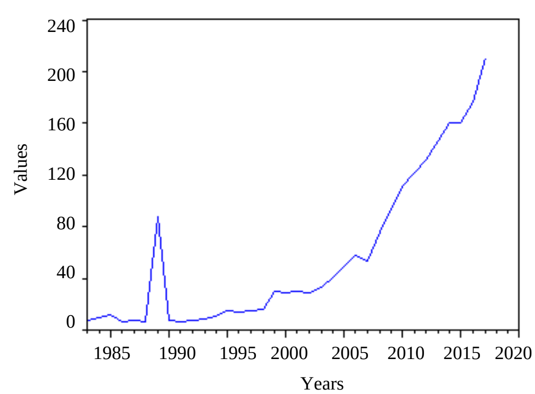

Fig. 1: Time graph of loan disbursement

Table 3: Lag1 table of loan disbursement data

Variables	t-statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.061262	0.0000
Test critical values:1% level	-3.646342	
5% level	-2.954021	
10% level	-2.615817	

*Mackinnon one-sided p-values; Null Hypothesis: DISBURSEMENT1 has a unit root Exogenous: Constant Lag Length: 0 (Automatic-based on SIC, maxlag = 8)

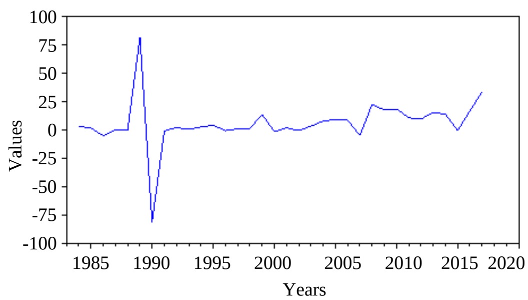

Fig. 2: Lag1 of loan disbursement

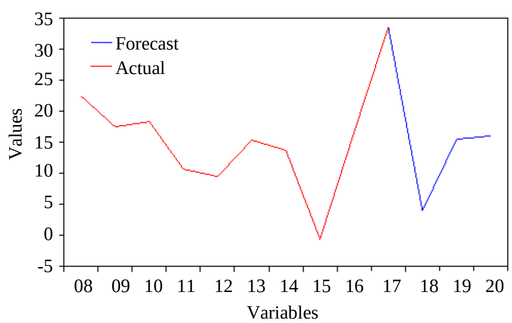

Fig. 3: Forecasted graph of loan disbursement

Lag1: This study has tested ADF and found 6.165677 which is >3.653730 at 0.01 critical levels, i.e., expectedly the study reject the null hypothesis. The graph and the Table 3 showed in Fig. 6 and Table 4 and 5. Finally, it is established that data set is stationary in lag1. Hence, the fitted ARIMA (3, 1, 0) model and the forecasting graph (Fig. 7) can be stated as follows:

$$y_t = 1.775601\text{-}0.460199\mu_t\text{-}0.181263\mu_{t\text{-}1}0.976614\mu_{t\text{-}2}$$

The loan recovery: For time series analysis our prerequisite is data is to be stationary. The above graph (Fig. 8) shows that the data is not stationary. The data are therefore, differenced once at lag1 and the plot is shown in Fig. 9.

Lag1: For time series analysis our prerequisite is data is to be stationary (Table 6-8). The above graph (Fig. 9) shows that the data is not stationary. The data are, therefore, differenced once at lag2 and the plot is shown in Fig. 10.

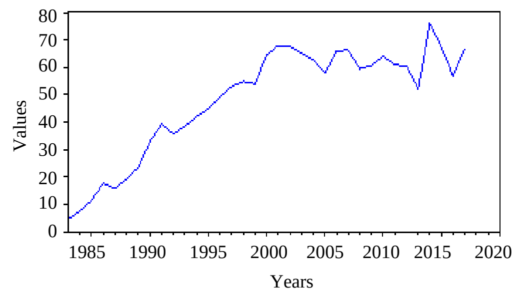

Fig. 4: Time graph of overdue loan

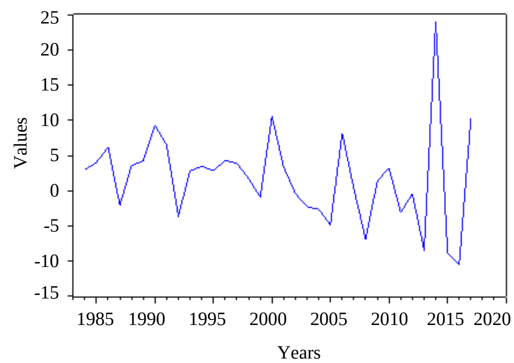

Fig. 5: Lag1 of overdue laon; Overdue1

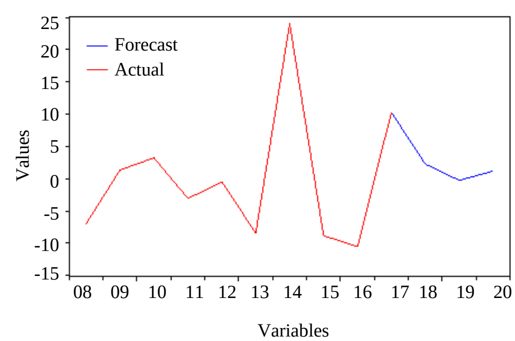

Fig. 6: Forecasted graph of overdue loan

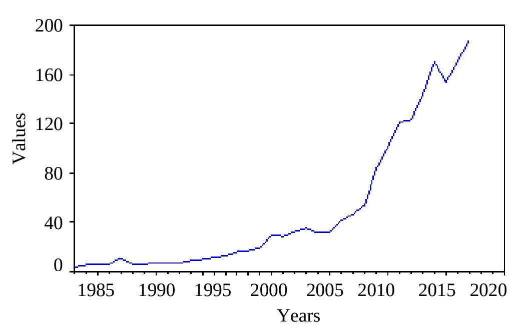

Fig. 7: Time graph of loan recovery

Table 4: Correlogram table for ACF and PC

Autocorrelation	Partial correlation	AC	PAC	Q-stat	Prob.
		1 -0.361	-0.361	4.8277	0.028
		2 0.018	-0.129	4.8403	0.089
		3 0.027	-0.014	4.8696	0.182
		4 0.083	-0.107	5.1506	0.272
		5 0.048	0.145	5.2463	0.387
		6 0.067	0.176	5.4426	0.488
		7 0.023	0.139	5.4661	0.603
		8 0.027	0.093	5.4995	0.703
		9 - 0.030	-0.020	5.5425	0.785
		10 0.067	-0.000	5.7691	0.834
		11 -0.007	-0.038	5.7716	0.888
		12 0.011	-0.045	5.7783	0.927
		13 -0.029	-0.800	5.8268	0.952
		14 -0.032	-0.118	5.8909	0.969
		15 -0.023	-0.124	5.9259	0.981
		16 -0.020	-0.115	5.9529	0.989

Date 10/02/18 Time: 23:40 Sample: 1983 2020; include observation: 36

Table 5: Coefficient covariance computed using outer product of gradients

Variables	Coefficient	SE	t-statistic	Prob.
C	0.546990	0.229916	2.379084	0.0242
MA(1)	-1.678808	87.60015	-0.019164	0.9848
MA(2)	0.678809	64.47233	0.010529	0.9917
SIGMASQ	299.366300	14659.67	0.020421	0.9838

Automatic ARIMA Forecasting; Selected dependent variable: D(DISBURSEMENT1); Date: 10/03/18; Time: 21:54; Sample: 1983 2020; Included observations: 33; Forecast length: 0; Number of estimated ARMA Models: 25; Number of non-converged estimations: 0; Selected ARMA Model: (0, 2)(0, 0); AIC value: 7.79177862209; Dependent Variable: D(DISBURSEMENT1); Method: ARMA Maximum Likelihood (BFGS); Date: 10/03/18; Time: 21:54; Sample: 1985 2017; Included observations: 33; Convergence achieved after 43 iterations

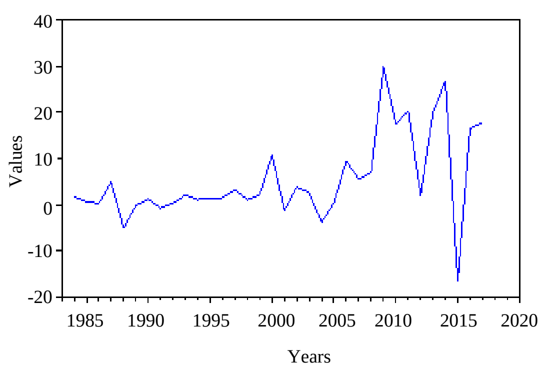

Fig. 8: Lag1 graph of loan recovery

Lag2: This study has tested ADF and found 7.163520 which is >3.689194 at 0.01 critical levels, i.e., expectedly the study reject the null hypothesis. The graph and the table showed in Fig 10 and Table 9. Finally, it is established that data set is stationary in lag2. Hence, the fitted ARIMA (4, 2, 0) model and the forecasting graph (Fig. 11) can be stated as follows:

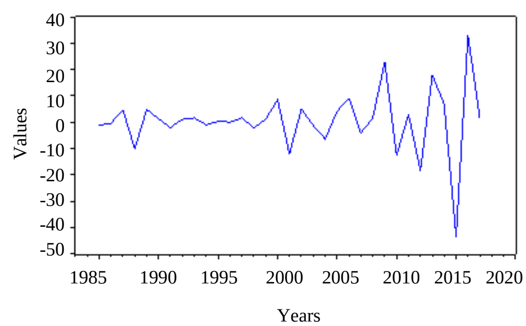

Fig. 9: Lag2 graph of loan recovery

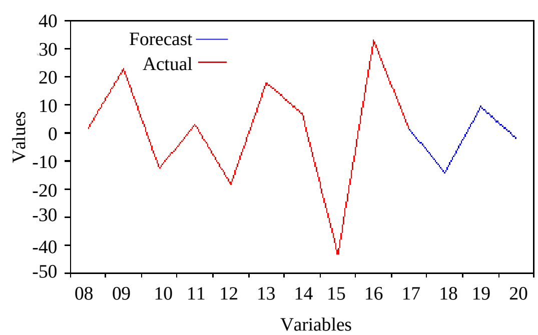

Fig. 10: Forecasted graph of loan recovery; Actual and forecast

$$y_t = 0.410885 - 0.990055\,\mu_t + 1.72E\text{-}07\,\mu_{t-1} + 0.9000521\,\mu_{t-2} - 0.999996\,\mu_{t-3}$$

Finally, the fitted ARIMA (2, 1, 0) for the loan disbursement calculated the forecasted loan disbursement that is gradually increasing in amount but the fitted ARIMA (4, 2, 0) for loan recovery forecasting the declining rate of loan recovery to the disbursement that leads the fitted ARIMA (3, 1, 0) for overdue rate calculating the forecasted value of overdue rate is scattered (Table 10-17).

Table 6: Regression co-efficient

Models	LogL	AIC*	BIC	HQ
(0, 2) (0, 0)	-144.043794	7.791779	7.964156	7.853109
(0, 3) (0, 0)	-144.035322	7.843964	8.059436	7.920628
(1, 2) (0, 0)	-144.035914	7.843995	8.059467	7.920659
(2, 1) (0, 0)	-144.809993	7.884736	8.100208	7.961400
(1, 1) (0, 0)	-146.006630	7.895086	8.067463	7.956416
(2, 2) (0, 0)	-144.026224	7.896117	8.154683	7.988113
(0, 4) (0, 0)	-144.027802	7.896200	8.154766	7.988196
(1, 3) (0, 0)	-144.032862	7.896466	8.155032	7.988462
(3, 1) (0, 0)	-144.177136	7.904060	8.162626	7.996056
(3, 2) (0, 0)	-144.018158	7.948324	8.249985	8.055653
(2, 3) (0, 0)	-144.034751	7.949197	8.250858	8.056526
(4, 1) (0, 0)	-144.051090	7.950057	8.251718	8.057386
(4, 2) (0, 0)	-143.891004	7.994263	8.339018	8.116925
(3, 3) (0, 0)	-144.014076	8.000741	6.345496	8.123402
(0, 1) (0, 0)	-149.218911	8.011522	8.140805	8.057520
(4, 3) (0, 0)	-144.015185	8.053431	8.441280	8.191425
(4, 4) (0, 0)	-143.587776	8.083567	8.514511	8.236894
(4, 0) (0, 0)	-147.799696	8.094721	8.353287	8.186717
(3, 0) (0, 0)	-149.663080	8.140162	8.355634	8.216825
(2, 0) (0, 0)	-152.421990	8.232736	8.405114	8.294067
(1, 0) (0, 0)	-156.227186	8.380378	8.509661	8.426376
(0, 0) (0, 0)	-164.763848	8.777045	8.863233	8.807710
(1, 4) (0, 0)	-164.856897	9.045100	9.346760	9.152428
(2, 4) (0, 0)	-164.844606	9.097085	9.441839	9.219746
(3, 4) (0, 0)	-164.846813	9.149832	9.537682	9.287826

Model selection criteria table; Dependent variable: D (Disbursement 1); Data: 10/03/18 Time: 21: 54; Sample 1983 2020; Included observations: 33

Table 7: Parameters

Variables	t-statistic	Prob.*
Augmented Dickey-Fuller statistic	-2.886277	0.0581
Test ontical values: 1% level	-3.653730	
5% level	-2.957110	
10% level	-2.617434	

*MacKinnon one-sided p-values; null hypothesis: Overdue has a unit root; Exogenous: constant Lag Length: 2 (Automatic. Based on SIC. Maxiag = 8)

Table 8: Lag1 table of overdue data

Variables	t-statistic	Prob.*
Augemented Dickey-Fuller test statistic	6.165677	0.000
Test critical values: 1% level	3.653730	
5% level	2.957110	
10% level	2.67434	

Mackinnon (one sided p-values) null hypothesis: Overdue 1 has a unit root; Exogenous: constant: Lag length : 1 (Automatic-based on SIC, maxlag = 8)

Table 9: Correlogram table for ACF and PC

Autocorrelation	Partial correlation	AC	PAC	q-stat	Prob.
		1 -0.263	0.263	2.5636	0.109
		2 -0.252	-0.344	4.9832	0.083
		3 0.192	0.015	6.4363	0.092
		4 0.073	0.071	6.6531	0.155
		5 0.106	0.270	7.1267	0.211
		6 -0.072	0.105	7.3555	0.289
		7 0.015	0.108	7.3651	0.392
		8 0.139	0.127	8.2746	0.407
		9 -0.129	-0.092	9.0923	0.429
		10 0.010	-0.075	9.0975	0.523
		11 0.063	-0.086	9.3073	0.594
		12 -0.017	-0.051	9.3242	0.675
		13 -0.054	-0.097	9.4933	0.735
		14 0.063	0.069	9.7331	0.781
		15 -0.150	-0.179	11.1850	0.739
		16 -0.010	-0.102	11.1910	0.798

Date: 10/03/18 Time: 22: 39; Sample: 1983 2020; Included observation: 34

Table 10: Product of gradients

Variables	Coefficient	SE	t-statistic	Prob.
C	0.546990	0.229916	2.379084	0.0242
MA(1)	-1.678808	87.60015	-0.019164	0.9848
MA(2)	0.678809	64.47233	0.010529	0.9917
SIGMASQ	299.366300	14659.67	0.020421	0.9838

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Table 11: Regression co-efficient

Models	LogL	AIC*	BIC	HQ
(0, 3) (0, 0)	-107.325868	6.418621	6.640814	6.495322
(2, 0) (0, 0)	-108.427847	6.424448	6.602202	4.485809
(0, 1) (0, 0)	-109.672661	6.438438	6.571753	6.484458
(1, 3) (0, 0)	-106.947618	6.454150	6.720781	6.546191
(0, 4) (0, 0)	-106.991094	6.456834	6.723265	6.548675
(3, 0) (0, 0)	-108. 420954	6.481197	6.703390	6.557898
(2, 1) (0, 0)	-108.423981	6.481370	6.703563	6.558071
(2, 2) (0, 0)	-107.474401	6.484251	6.750883	6.576293
(1, 0) (0, 0)	-110.559445	6.489111	6.622427	6.535132
(0, 2) (0, 0)	-109.597470	6.491284	6.669038	6.552645
(1, 1) (0, 0)	-109.653823	6.494504	6.672258	6.555865
(3, 1) (0, 0)	-107.696738	6.496956	6.763688	6.588997
(3, 2) (0, 0)	-106.747992	6.499885	6.810955	6.607266
(1, 4) (0, 0)	-106.772514	6.501286	6.812356	6.608668
(0, 0) (0, 0)	-111.808816	6.503361	6.592238	6.534041
(2, 3) (0, 0)	-106.866290	6.506588	6.817658	6.613969
(4, 0) (0, 0)	-108.023852	6.515649	6.782280	6.607690
(1, 2) (0, 0)	-109.065179	8.518010	6.740203	6.594711
(4, 1) (0, 0)	-107.124418	6.521395	6.832465	6.628776
(3, 4) (0, 0)	-105.721248	6.555500	6.955447	6.693561
(4, 2) (0, 0)	-106.730246	6.556014	6.911522	6.678735
(3, 3) (0, 0)	-106.731968	6.556112	6.911621	6.678834
(2, 4) (0, 0)	-106.771668	6.558381	6.913889	6.681102
(4, 3) (0, 0)	-106.588014	6.605029	7.004976	6.743091
(4, 4) (0, 0)	-105.680095	6.610291	7.054676	6.763693

Model selection criteria table; Dependent variable: overdue 1; Date 10/03/18; Time: 22:43; Sample: 1983 2017; Included observation: 34

Table 12: Hypothesis recovery

Variables	t-statistic	Prob.*
Augemented Dickey-Fuller test statistic	3.151694	1.000
Tset critical values: 1% level	-3.711457	
5% level	-2.981038	
10% level	-2.529906	

*Mackinnon one-sided p-values; Null hypothesis: recovery has a unit root; Exgenous: constant; Lag length: 8 (Automatic-based on SIC, maxiag = 8)

Table 13: Lag1 table of loan recovery

Variables	t-statistic	Prob.*
Augemented Dickey-Fuller	-1.450644	0.5447
test statistic 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

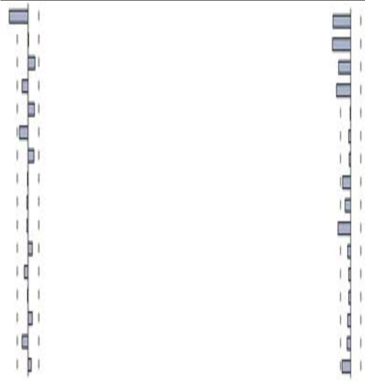
*Mackinnon one-sided p-values

Table 14: Lag2 table of loan recovery

Variables	t-statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.163520	0.0000
Test critical values: 1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

*Mackinnon one-sided p-values; null Hypothesis: D(RECOVERY2) has a unit root; Exogenous: Constant; Lag Length: 3 (Automatic-based on SIC, maxlag = 8)

Table 15: Correlogram table for ACF and PC



Autocorrelation	Partial correlation	AC	PAC	q-stat	Prob*.
		1-0.634	-0.634	14.105	0.000
		2 0.018	-0.642	14.116	0.001
		3 0.235	-0.438	16.187	0.001
		4-0.197	-0.150	17.700	0.001
		5 0.215	-0.018	19.567	0.002
		6-0.286	-0.075	22.979	0.001
		7 0.194	-0.056	24.618	0.001
		8-0.020	-0.293	24.637	0.002
		9-0.036	-0.202	24.698	0.003
		10-0.040	-0.457	24.776	0.006
		11 0.133	-0.108	25.690	0.007
		12-0.119	-0.068	26.463	0.009
		13-0.009	-0.079	26.468	0.015
		14 0.150	-0.144	27.833	0.015
		15-0.189	-0.117	30.112	0.012
		16 0.105	-0.298	30.856	0.014

Table 16: Automatic ARIMA forecasting

Models	LogL	AIC*	BIC	HQ
(0, 4) (0, 0)	-109.466476	6.599227	6.865858	6.691268
(1, 4) (0, 0)	-109.431207	6.653212	6.964281	6.760593
(2, 4) (0, 0)	-109.395721	6.708327	7.063835	6.831048
(3, 4) (0, 0)	-109.395703	6.765469	7.166415	6.903530
(4, 4) (0, 0)	-109.369187	6.821096	7.266482	6.974498
(4, 3) (0, 0)	-111.041799	6.859531	7.266482	6.974498
(2, 3) (0, 0)	-113.327944	6.875883	7.186952	6.983564
(3, 3) (0, 0)	-112.405763	6.880329	7.235837	7.003051
(4, 2) (0, 0)	-112.475388	6.884308	7.239185	7.007029
(2, 2) (0, 0)	-114.500041	6.885717	7.152348	6.977758
(3, 2) (0, 0)	-113.739504	6.899400	7.210470	7.006781
(0, 1) (0, 0)	-117.923824	6.909933	7.043248	6.955953
(4, 1) (0, 0)	-114.140221	6.922298	7.233368	7.029680
(1, 2) (0, 0)	-116.150865	6.922907	7.145099	6.999607
(1, 3) (0, 0)	-115.223300	6.927046	7.193677	7.019087
(2, 0) (0, 0)	-117.228006	6.927315	7.106069	6.988675
(0, 2) (0, 0)	-117.228006	6.927315	7.135508	7.019114
(1, 1) (0, 0)	-117.778835	6.958791	7.136545	7.020151
(2, 1) (0, 0)	-117.133348	6.979048	7.201241	7.055749
(3, 0) (0, 0)	-117.138665	6.979352	7.201545	7.056053
(4, 0) (0, 0)	-117.084432	7.033396	7.300027	7.125437
(3, 1) (0, 0)	-117.132356	7.036135	7.302766	7.128176
(0, 3) (0, 0)	-119.383690	7.107639	7.329832	7.184340
(1, 0) (0, 0)	-124.486628	7.284887	7.418203	7.330908
(0, 0) (0, 0)	-129.368412	7.606766	7.695643	7.537447

Model selection criteria table dependent variable: recovery 2 Date: 10/03/16 Time: 23:47 Sample: 1983 2017 Included observations: 33

Table 17: Regression co-efficient

Variables	Coefficient	SE	t-Statistic	Prob.
C	0.410885	0.200009	2.0543390	0.0497
MA(1)	-0.990055	2791.294	-0.000355	0.9997
MA(2)	1.72E-07	4915.463	3.50E-110	1.0000
MA(3)	0.990052	4609.508	0.0002150	0.9998
MA(4)	-0.999996	7472.441	-0.000134	0.9999
SIGMASQ	33.201900	10573.65	0.0031400	0.9975

Dependent variable: recovery 2; Method: ARMA maximum Likelihood (BFGS); Date: 10/03/18 Time: 23:47; Sample: 1985 2017 Included observations: 33; Failure to improve objective (non-zero gradients) after 76 iterations; Coefficient covariance computed using outer product of gradients

CONCLUSION

Exploring the current scenario of agricultural loan in Bangladesh is the main purpose of this study and to identify the liable reason for the growth of agricultural loan in Bangladesh mathematically. Analyzing the data above it is obvious that there are no harmony among loan disbursement, recovery and overdue. Huge difference is observed in between loan disbursement and recovery. Data simulation showing the loan disbursement gradually increasing but at the same time recovery of loan is gradually decreasing. To achieve great success in this sector it is mandatory to keep balance among these factors disbursement, recovery and overdue loan.

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