

# **A Study on the Effect of the Pradhan Mantri Fasal Bima Yojana Scheme in Karnataka**

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## **Abstract**

Crop insurance is one of the utmost significant tools which can be used in agriculture to protect farmers against loss. PMFBYS plays a major for the betterment of agriculture by providing financial assistance to farmers, stabilizing the income of the farmers, encouraging farmers to adopt innovative and modern agricultural practices, etc. The present study focuses on to Analyse the inter-relationship between the factors affecting the PMFBY scheme with respect to time. The study considers five variables claim amount, farmer's share premium, number of insured, sum insured and area insured ha. From 2016 to 2022 for six years of PMFBYS started till now in Karnataka. The study is carried out on Descriptive statistics, VAR (Vector Auto Regression) Estimation, Least square with the dependent variable for each five variable with individual formulas, Roots of Characteristics Polynomial, VAR Granger Causality/Block Exogeneity wald Tests, VAR Residual Normality Tests, VAR Residual Serial Correlation LM Tests. In this, regard the model satisfies the stability condition and helps for further study on PMFBYS.

## **Keywords**

PMFBYS, Area Insured, Farmers, Share premium, Agriculture

## **1. Introduction**

Agricultural Sector includes extra hazard factors and suspicions when it tries to compare with other major industrial and service sectors. Karnataka state is one of the large producers of food crops in India(H.V, 2015). Nearly they produce five-point zero two percent food grains total in Karnataka. At the time of the increasing effect of climate change all over through frequent scarcity, unbalanced rainfalls, increase in global temperature, drought (R. K. Ghosh et al., 2021), etc. To overcome such problems and to save farmers from loss, crop insurance takes a major role. Agriculture insurance company of India limited", in various states of India with different schemes, some of the insurances are implemented by the government such as Pradhan Mantri Fasal Bima Yojana Scheme(Jain et al., 2020). The newly introduced scheme PMFBY affords extensive insurance protection against failure of the crops and assists in soothing the income of the insured farmers(Singh & Kumar Singh, 2019).

The primary objective of crop insurance is to, protect farmers from financial loss and act as a guiding tool in risk management(S. Ghosh, 2019). In crop insurance, food crops can be considered as a major tool for other crop insurance. Food crops are paddy, green gram, wheat, maize, rice, millets and pulses etc.

The farmers will be deciding the type of crop insurance they need and the capacity to pay premium. Farmer who is willing to apply for loan for them Pradhan Mantri Fasal Bima Yojana Scheme is compulsory and the scheme is elective for non-loanee farmers(H.V, 2015). For food crop insurance, Pradhan Mantri Fasal Bima Yojana Scheme is contributing more benefits and facilities with different premium rates. PMFBYS is applicable for both rabi and kharif season as well (Paulraj & Easwaran, 2020). The premium for PMFBYS is less compared to other schemes and it also reduces the (Rajbee 2022) burden of the farmers who receipts loan and safeguard them against intemperate weather(Paulraj & Easwaran, 2020). The PMFBYS was implemented to remove the numerous

strategic and implementation problems. It is also creating confidence among the farmers to accept new advanced technology in crop production, alleviating the income of the farmers due to their constant farming and will withstand the credit flow among the farming community

### **1.Objectives**

- 1.1. To study the factors affecting Pradhan Mantri Fasal Bhima Yojana Scheme (PMFBYS) in Karnataka
- 1.2. To establish the interrelationship between the factors affecting the PMFBYS with respect to time
- 1.3. To develop and validate a model to measure the impact of PMFBYS in Karnataka

### **2. Literature Review**

The study focuses on the agenda of RI (responsible innovation) allows an accountable authority and also understands the main participants like stakeholders of governance in arranging UAVs in crop insurance claims in India. The study states that UAVs take a major for the betterment of farmers and the government to identify crop damage, and even take further steps in claim settlement. The author concludes they need to be balanced participation among performers and investors of UAV governance that need to be considered other government bodies, research administrations, insurance agencies, local supervision, and farmers to encourage responsible governance (Rajbee 2022). The study focuses on the risk supervision possibilities included in reducing income losses. The author states that, the two different ways to reach farmers like formal and informal ways to connect the risk management options for farmers. The study carried four different variables to measure the farmer's commercial crop insurance, regional rural banks, mixed farming, and money from informal credits like friends, family. The author concludes, there should be active involvement for the betterment of farmers from both insurance and commercial acclaim marketplace (Sirohi 2022). The focus of the study specifies the CIBI usefulness and the claim is deficient in various weather assistance farmers in these countries. The study categorized different variables result indicates that there are drought, cold, flood heat, humidity, others were found as the main criteria for the betterment of IBI in different countries like Germany, the United States of America and Kenya, etc. The author concludes that many countries consuming high climate and food uncertainty risks founded happening some climates and food security, that gages that lack agricultural climate IBI research that can support farmers in these countries. (Adeyuyi 2022) The study focuses on the historical data to find the effect of the yield index with index-based insurance. The study is based on secondary data. The study also made to analyse the effect of different insurance schemes on climatic change. The source of data was collected with the help of AIC, magazines, newspapers, and articles. The study used different statistical tools and formulas to find the effect of indemnity levels. The author concludes that there is less focus on index-based insurance for developing countries, so the government should take initiative to complete the task (Kolli N Roa, 2022). The study was carried to investigate how the soil organic protects united states maize. The author states that after comparing different countries it's understood that there is a positive impact on yield from soil organic. The study also reveals that, if there is a one percent increase in soil organic then there will be zero point eight three to zero point zero four Mg. The study also states that with good yield the cost of crop insurance will be reduced. The author concludes that, a similar benefit to experiment worldwide for the betterment of crops and farmers and to reduce crop insurance expenses. (Daniel A Kane. Mark A Bradford 2021). The study was conducted, to understand new estimations of agriculturalists' (WTP) willingness-to-pay for insurance in the framework of a extensive sponsored programme in India. The study focuses on There are numerous potential substitutions that insurance providers could consider like timely pay and coverage period. The authors conclude that, premium rate is generally higher than the farmers are paying and also insurance coverage in India is low (Ranjan Kumar Ghosh 2021). The study focuses on The Demand for Crop Insurance in Developing Countries. The results suggest that, other things equal, farmers would generally be interested in purchasing crop insurance similar to the products being offered under PMFBY, and furthermore, at premium rates higher than they are currently being asked to pay. The author concludes that, governments use to smooth farm incomes such as quotas, minimum price support systems, input subsidies, and low interest crop loans (Kumar 2020). The study's goal was to look into current policy involvements in agriculture insurance in India. The government of India is coming up with more changes like insurance coverage, opportunities in helping farmers, and exposure. But farmers are still giving their negative feedback by word of mouth. The author concludes that there is a misappropriate way of dealing with farmers' premiums, one of the important draws in agricultural insurance policy (Agarwal 2020).

### **3. Methods**

The study was conducted based on secondary data. The sources of data have been collected with the help of the Commissionerate of Agriculture, Agriculture Insurance Company, and Directorate of Economic Statistics. A few Articles are also considered as source for the study. This study is a time series data from 2016 to 2022. The actual effect of PMFBYS was considered.

This study is based on quantitative data. For the study, five different variables were used are claim amount, farmer's share premium, number of insured, sum insured and area insured. Each variable is considered for its effect on dependent and independent variables. The study is done based on the E-Views software to find out the results like Descriptive statistics, Lag criteria test, Roots tests, VAR (Vector Auto Regression) Estimation, Least square with the dependent variable for each of the five variables with individual formulas, VAR Granger Causality/Block Exogeneity wald Tests, VAR Residual Normality Tests, VAR Residual Serial Correlation LM Tests, VAR Residual Normality Tests.

#### **4. Data Collection**

The first step was to identify the research problem. The next step was to review the literature. More than thirty literatures were collected for the purpose of review, and based on these, the research gap was identified, then aims and objectives were developed. The study aims mainly to establish the interrelationship between the factors affecting the PMFBYS with respect to time. Further study was carried out to develop and validate a model to measure the impact of PMFBYS in Karnataka. The data is collected from the Commissionerate of Agriculture and the Directorates of Economics Statistics. The study period is 6 years from 2016 to 2021. Various software, such as E-VIEWS and SPSS, are used for organising and running various regressions.

#### **5. Results and Discussion**

The study as used five variables such as No of Insured, Area in Hectare, Sum Insured, Farmers Share Premium and Claim Amount. This is a time series model from 2016 to 2021. The descriptive statics representing the half yearly data and its effect are shown in Table 1.

Table 1. Descriptive Statistics of the variable

	<b>NO of Insured</b>	<b>Area In (Ha.)</b>	<b>Sum Insured (Rs.)</b>	<b>Farmers Share Premium (Rs.)</b>	<b>Claim Amount (Rs.)</b>
<b>Mean</b>	1899.31818	1424.02615	56043386.4	1917863.64	3380181.8
<b>Standard Error</b>	1006.78086	645.760428	29241104.6	1291824.12	1825669.3
<b>Median</b>	87.5	67.2247438	1893000	36500	52500
<b>Mode</b>	5	5	5000	5000	4000
<b>Standard Deviation</b>	6678.2287	4283.49009	193963545	8568991.8	12110120
<b>Sample Variance</b>	44598738.5	18348287.4	3.76219164	7.3427613	1.4671475
<b>Kurtosis</b>	32.5774003	20.3735724	23.3504831	38.5937038	17.071358
<b>Skewness</b>	5.49375884	4.36791829	4.7460377	6.09996227	4.1792104
<b>Range</b>	42213	24094.5149	1115449000	55773000	60214000
<b>Minimum</b>	1	0.4047	39000	1000	1250
<b>Maximum</b>	42214	24094.9196	1115488000	55774000	60214000
<b>Sum</b>	83570	62657.1507	2465909000	84386000	148728000
<b>Count</b>	44	44	44	44	44

During the study it was found that Area Insured of Hectare has increased maximum of 62657.1507 and minimum of 0.4047 and with a mean of 1424. It was also observed that No of insured has reached maximum of 24094 and minimum of 1. The study also observed that claim amount has increased maximum of 60214000 and minimum of 1250.

#### **5.2 VAR Lag order selection Criteria**

The lag order selection criteria helps to choose the lag length for the study. The number of lags is typically small, 1 or 2 lags in order not to lose a degree of freedom. For quarterly data, 1 to 8 lags are appropriate and for monthly data, 6, 12, or 24 lags can be used.

Table 2. VAR Lag order selection Criteria

VAR Lag Order Selection Criteria  
Endogenous variables: AR\_IN\_HA\_\_CL\_AMT\_RS\_\_FSP\_RS\_\_NO\_OF\_IN...  
Exogenous variables: C  
Date: 07/05/22 Time: 14:57  
Sample: 1 44  
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2731.799	NA	1.85e+53	136.8399	137.0511	136.9163
1	-2664.589	114.2572	2.26e+52	134.7294	135.9961	135.1874
2	-2627.325	54.03224	1.30e+52	134.1163	136.4385	134.9559
3	-2569.092	69.88015*	2.91e+51*	132.4546*	135.8323*	133.6759*
4	-2550.429	17.72941	5.65e+51	132.7715	137.2048	134.3744

\* indicates lag order selected by the criterion  
LR: sequential modified LR test statistic (each test at 5% level)  
FPE: Final prediction error  
AIC: Akaike information criterion  
SC: Schwarz information criterion  
HQ: Hannan-Quinn information criterion

Here, the study is considered half- yearly time series data. The study carried 1 to 4 Lag selection criteria. the result indicates that the optimal lag is that which has the minimum value as reported by each of the criteria. That is, FPE, AIC, SC, and HQ all indicate lag 3 for the study.

### 5.3 Unit Root Test

The time series data was tested to find that values to be stationary to run Auto-regression models.

Table 3. Unit Root Test on Claim Amount

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-6.626983</b>	<b>0.0000</b>
Test critical values: 1% level	-3.592462	
5% level	-2.931404	
10% level	-2.603944	

To assume that time series data be stationary to run Auto-regression model at levels. Hence, Stationary test for different data series were conducted through ADF Test. The results of ADF shown in the above Table 3 indicates that statistic value for claim amount is -6.626983 and the associated p-value is 0.0000 for all the variables. Test critical values at 1, 5 and 10% levels are shown in the table. It was found that, the t-statistics is less than the critical value and the variable does not have unit root and is desirable at level.

Table 4. Unit Root Test on FSP

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-6.624132</b>	<b>0.0000</b>
Test critical values: 1% level	-3.592462	
5% level	-2.931404	
10% level	-2.603944	

To assume that time series data be stationary to run Auto-regression model at levels. Hence, Stationary test for different data series were conducted through ADF Test. The results of ADF shown in the above Table 4 indicates that statistic value for claim amount is -6.624132 and the associated p-value is 0.0000 for all the variables. Test critical values at 1, 5 and 10% levels are shown in the table 5. It was found that, the t-statistics is less than the critical value and the variable does not have unit root and is desirable at level.

Table 5. Unit Root Test on No of Insured

Null Hypothesis: NO OF IN has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-5.485546</b>	<b>0.0000</b>
Test critical values: 1% level	-3.592462	
5% level	-2.931404	
10% level	-2.603944	

To assume that time series data be stationary to run Auto-regression model at levels. Hence, Stationary test for different data series were conducted through ADF Test. The results of ADF shown in the above table indicates that statistic value for claim amount is -5.485546 and the associated p-value is 0.0000 for all the variables. Test critical values at 1, 5 and 10% levels are shown in the table 6. It was found that, the t-statistics is less than the critical value and the variable does not have unit root and is desirable at level.

Table 6. Unit Root Test on Sum Insured

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-6.408981</b>	<b>0.0000</b>
Test critical values: 1% level	-3.592462	
5% level	-2.931404	
10% level	-2.603944	

To assume that time series data be stationary to run Auto-regression model at levels. Hence, Stationary test for different data series were conducted through ADF Test. The results of ADF shown in the above table indicates that statistic value for claim amount is -6.408981 and the associated p-value is 0.0000 for all the variables. Test critical values at 1, 5 and 10% levels are shown in the table 7. It was found that, the t-statistics is less than the critical value and the variable does not have unit root and is desirable at level.

Table 7. Unit Root Test on Area Insured

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

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-5.627582</b>	<b>0.0000</b>
Test critical values: 1% level	-3.592462	
5% level	-2.931404	
10% level	-2.603944	

To assume that time series data be stationary to run Auto-regression model at levels. Hence, Stationary test for different data series were conducted through ADF Test. The results of ADF shown in the above table indicates that statistic value for claim amount is -5.627582 and the associated p-value is 0.0000 for all the variables. Test critical values at 1, 5 and 10% levels are shown in the table 8. It was found that, the t-statistics is less than the critical value and the variable does not have unit root and is desirable at level.

### 5.4 Vector Autoregression Estimation

VAE is broadly used in time series research to scrutinise the dynamic associations that exist among variables that interrelate with one another.

Table 8. Vector Autoregression Estimates

Variables	AR IN HA	CL AMT	FSP RS	NO OF IN	SUM IN
<b>R-Squared</b>	0.960514	0.764581	0.903457	0.841234	0.920584

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The above result indicates that vector autoregression estimates five variables Sum insured, Claim amount, Area insured hectare, Farmer’s share premium and Number of insured. A high R-Squared between 75% and 100% indicates that the performance of the variables moves comparatively in line with the table 9. The study reveals that the R-Squared value for the area insured hectare is 0.960541, indicating good performance; the second variable reveals that the R-Square value for the claim amount is 0.764581, indicating average performance; the third variable reveals that the R-Square value for FSP is 0.903457, indicating good performance; and the fourth variable reveals that the R-Square value for the number of insured is 0.841234, indicating poor performance

## 5.5 Least Squares

### 5.5.1 Least Square of Area Insured

The least square regression estimation with the variables viz, Area Insured Hectare, Claim amount, Farmers share premium, Number of insured and Sum insured are shown in Eq.1.least square equation:

$$AR\_IN\_HA\_ = C(1)*AR\_IN\_HA\_(-1) + C(2)*AR\_IN\_HA\_(-2) + C(3)*AR\_IN\_HA\_(-3) + C(4)*CL\_AMT\_RS\_(-1) + C(5)*CL\_AMT\_RS\_(-2) + C(6)*CL\_AMT\_RS\_(-3) + C(7)*FSP\_RS\_(-1) + C(8)*FSP\_RS\_(-2) + C(9)*FSP\_RS\_(-3) + C(10)*NO\_OF\_IN(-1) + C(11)*NO\_OF\_IN(-2) + C(12)*NO\_OF\_IN(-3) + C(13)*SUM\_IN\_RS\_(-1) + C(14)*SUM\_IN\_RS\_(-2) + C(15)*SUM\_IN\_RS\_(-3) + C(16)$$

Table 9. Least Square of Area Insured

Variable	R-Squared	Prob(F-Statistics)
Area Insured Hectare	0.996544	0.000012

The above results are of least square equation estimation with the variable Area insured ha by the farmer’s share premium, claim amount, sum insured and number of farmers. Here, the indicated R-squared with the higher value of 0.996544 indicates that the performance is good and the value of Prob (F- statistic) is near zero (0.000012), which implies that the regression is accepted.

### 5.5.2 Least Square of Claim Amount

The least square regression estimation with the variables viz, Area Insured Hectare, Claim amount, Farmers share premium, Number of insured and Sum insured are shown in Eq.2. least square equation:

$$CL\_AMT\_RS\_ = C(17)*AR\_IN\_HA\_(-1) + C(18)*AR\_IN\_HA\_(-2) + C(19)*AR\_IN\_HA\_(-3) + C(20)*CL\_AMT\_RS\_(-1) + C(21)*CL\_AMT\_RS\_(-2) + C(22)*CL\_AMT\_RS\_(-3) + C(23)*FSP\_RS\_(-1) + C(24)*FSP\_RS\_(-2) + C(25)*FSP\_RS\_(-3) + C(26)*NO\_OF\_IN(-1) + C(27)*NO\_OF\_IN(-2) + C(28)*NO\_OF\_IN(-3) + C(29)*SUM\_IN\_RS\_(-1) + C(30)*SUM\_IN\_RS\_(-2) + C(31)*SUM\_IN\_RS\_(-3) + C(32)$$

Table 10. Least Square of Claim Amount

Variable	R-Squared	Prob(F-Statistics)
Claim Amount	0.790552	0.000245

The above results are of least square equation estimation with the dependent variable Claim amount by the farmer’s share premium, area insured ha, sum insured, and the number of farmers (Table 10). the indicated R-squared with the more value of 0.790552 indicates that the performance is average but still accepted because the actual performance of R-squared will be accepted above 75% and the value of Prob (F- statistic) is above zero (0.000245), which implies that the regression is Accepted.

### 5.5.3 Least Square of Farmers Share Premium

The least square regression estimation with the variables viz, Area Insured Hectare, Claim amount, Farmers share premium, Number of insured and Sum insured are shown in Eq.3. least square equation:

$$FSP\_RS\_ = C(33)*AR\_IN\_HA\_(-1) + C(34)*AR\_IN\_HA\_(-2) + C(35)*AR\_IN\_HA\_(-3) + C(36)*CL\_AMT\_RS\_(-1) + C(37)*CL\_AMT\_RS\_(-2) + C(38)*CL\_AMT\_RS\_(-3) + C(39)*FSP\_RS\_(-1) + C(40)*FSP\_RS\_(-2) + C(41)*FSP\_RS\_(-3) + C(42)*NO\_OF\_IN(-1) + C(43)*NO\_OF\_IN(-2) + C(44)*NO\_OF\_IN(-3) + C(45)*SUM\_IN\_RS\_(-1) + C(46)*SUM\_IN\_RS\_(-2) + C(47)*SUM\_IN\_RS\_(-3) + C(48)$$

Table 11. Least Square of Farmers Share Premium

Variable	R-Squared	Prob(F-Statistics)
Farmers Share Premium	0.903457	0.000000

The above results (Table 11) are of least square equation estimation with the dependent variable Farmer's share premium by the area insured ha, claim amount, sum insured and number of farmers. Here, the indicated R-squared with the higher value of 0.903457 indicates that the performance is good and the value of Prob (F- statistic) is near zero (0.0000), which implies that the regression is accepted.

#### 5.5.4 Least Square of No of Insured

The least square regression estimation with the variables viz, Area Insured Hectare, Claim amount, Farmers share premium, Number of insured and Sum insured are shown in Eq.4. least square equation:

$$\text{NO\_OF\_IN} = C(49)*\text{AR\_IN\_HA\_}(-1) + C(50)*\text{AR\_IN\_HA\_}(-2) + C(51)*\text{AR\_IN\_HA\_}(-3) + C(52)*\text{CL\_AMT\_RS\_}(-1) + C(53)*\text{CL\_AMT\_RS\_}(-2) + C(54)*\text{CL\_AMT\_RS\_}(-3) + C(55)*\text{FSP\_RS\_}(-1) + C(56)*\text{FSP\_RS\_}(-2) + C(57)*\text{FSP\_RS\_}(-3) + C(58)*\text{NO\_OF\_IN}(-1) + C(59)*\text{NO\_OF\_IN}(-2) + C(60)*\text{NO\_OF\_IN}(-3) + C(61)*\text{SUM\_IN\_RS\_}(-1) + C(62)*\text{SUM\_IN\_RS\_}(-2) + C(63)*\text{SUM\_IN\_RS\_}(-3) + C(64)$$

Table 12. Least Square of No of Insured

Variable	R-Squared	Prob(F-Statistics)
No of Insured	0.974564	0.000045

The above results (Table 12) are of least square equation estimation with the dependent variable No of insured by the area insured ha, claim amount, sum insured and farmer's share premium. Here, the indicated R-squared with the higher value of 0.974564 indicates that the performance is good and the value of Prob (F- statistic) is near zero (0.000045), which implies that the regression is accepted.

#### 5.5.5 Least Square of Sum Insured

The least square regression estimation with the variables viz, Area Insured Hectare, Claim amount, Farmers share premium, Number of insured and Sum insured are shown in Eq.5. least square equation:

Table 13. Least Square of Sum Insured

Variable	R-Squared	Prob(F-Statistics)
Sum Insured	0.904512	0.000003

$$\text{SUM\_IN\_RS\_} = C(65)*\text{AR\_IN\_HA\_}(-1) + C(66)*\text{AR\_IN\_HA\_}(-2) + C(67)*\text{AR\_IN\_HA\_}(-3) + C(68)*\text{CL\_AMT\_RS\_}(-1) + C(69)*\text{CL\_AMT\_RS\_}(-2) + C(70)*\text{CL\_AMT\_RS\_}(-3) + C(71)*\text{FSP\_RS\_}(-1) + C(72)*\text{FSP\_RS\_}(-2) + C(73)*\text{FSP\_RS\_}(-3) + C(74)*\text{NO\_OF\_IN}(-1) + C(75)*\text{NO\_OF\_IN}(-2) + C(76)*\text{NO\_OF\_IN}(-3) + C(77)*\text{SUM\_IN\_RS\_}(-1) + C(78)*\text{SUM\_IN\_RS\_}(-2) + C(79)*\text{SUM\_IN\_RS\_}(-3) + C(80)$$

The above results (Table 13) are of least square equation estimation with the dependent variable sum insured by the area insured ha, claim amount, the sum number of insured and, farmer's share premium. Here, the indicated R-squared with the higher value of 0.904512 indicates that the performance is good and the value of Prob (F- statistic) is near zero (0.00003), which implies that the regression is accepted.

### 5.6 Roots of Characteristics Polynomial

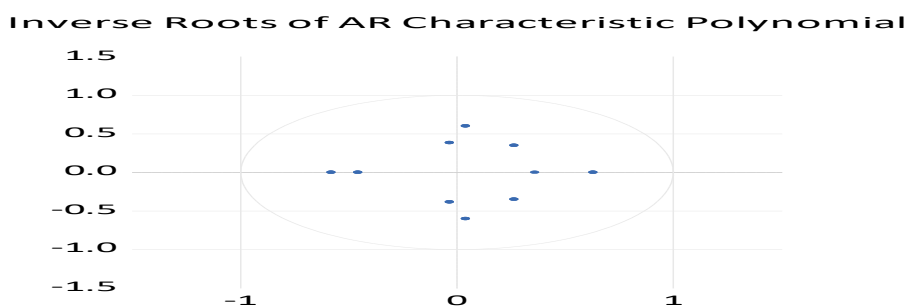


Figure 1. Inverse root

The Above AR roots characteristics polynomial table and graphs represent, that all the roots have a modulus less than one and we can observe in the graph that no roots lie outside the unit circle (Figure 1). Thus, we can conclude that the VAR model satisfies the stability condition.

### 5.7 VAR Granger Causality/Block Exogeneity wald Tests

Granger causality is a way of investigating the causality in a time series between two variables. The Granger Causality test is a technique for seeking the direction of causality between dependent variables and independent variables (Table 14). The method is a probabilistic account of causality; employs empirical data sets to find correlation patterns

Table 14. VAR Granger Causality Tests

Dependent variable: AR IN HA			
Excluded	Chi-sq	df	Prob.
CL AMT RS	16.99788	3	0.0007
FSP Rs	16.33926	3	0.0010
NO OF IN	35.08996	3	0.0000
SUM IN RS	5.404026	3	0.1445
<b>All</b>	<b>54.30662</b>	<b>12</b>	<b>0.0000</b>
Dependent variable: CL AMT RS			
Excluded	Chi-sq	df	Prob.
AR IN HA	0.082117	3	0.0024
FSP Rs	0.167245	3	0.9827
NO OF IN	0.63743	3	0.0079
SUM IN RS	0.121191	3	0.9892
<b>All</b>	<b>18.97271</b>	<b>12</b>	<b>0.0045</b>
Dependent variable: FSP Rs			
Excluded	Chi-sq	df	Prob.
AR IN HA	0.521044	3	0.0012
CL AMT RS	4.306467	3	0.0011
NO OF IN	9.583174	3	0.0001
SUM IN RS	43.03049	3	0.0000
<b>All</b>	<b>233.2794</b>	<b>12</b>	<b>0.0000</b>
Dependent variable: NO OF IN			
Excluded	Chi-sq	df	Prob.
AR IN HA	2.085019	3	0.0022
CL AMT RS	21.97358	3	0.0001
FSP Rs	8.597483	3	0.0005
SUM IN RS	4.748631	3	0.1912
<b>All</b>	<b>49.31843</b>	<b>12</b>	<b>0.0000</b>
Dependent variable: SUM IN RS			
Excluded	Chi-sq	df	Prob.
AR IN HA	1.1686	3	0.0017
CL AMT RS	11.96838	3	0.0075
FSP Rs	76.44032	3	0.0000
NO OF IN	25.38521	3	0.0000
<b>All</b>	<b>123.4151</b>	<b>12</b>	<b>0.0000</b>



- 5.7.1 Here, from the first variable, the Area insured ha with the explanatory variables claim amount, FSP, number of insured, and Sum insured indicates that the probability of 0.0007, 0.0000, 0.0000 and 0.0000 is the overall prob value of 0.0000. The probability value is less than the significance level, i.e., 0.05. Which helps to predict casual relations among variables
- 5.7.2 For the second variable, the Claim amount with the explanatory variables Area insured ha, FSP, Number of Insured and sum insured, the result indicates that the probability of 0.0024, 0.0027, 0.0079, 0.9892 and overall prob value is 0.0045. The probability value is less than the significance level, i.e., 0.05. Which helps to predict casual relation among variables.
- 5.7.3 For the Third variable, the FSP with the explanatory variables Area insured ha, claim amount, number of insured and sum insured, the result indicates that the probability of 0.0012, 0.0011, 0.0000 and overall prob value is 0.0000. The probability value is less than significance level, i.e., 0.05. which helps to predict casual relation among variables
- 5.7.4 For the Fourth variable, the number of insured with the explanatory variables Area insured ha, claim amount, FSP, and sum insured the result indicates that probability of 0.0022, 0.0001, 0.1912 and overall prob value is 0.0000. The probability value less than significance level, i.e., 0.05. which helps to predict casual relation among variables.
- 5.7.5 For the fifth variable sum insured, with the explanatory variables Area insured ha, claim amount, FSP, and sum insured, the result indicates that the probability of 0.0017, 0.0075, 0.000, 0.0000 and 0.0000 is the probability value less than the significance level of 0.05. Which helps to predict casual relations among variables. Therefore, from all the above results indicate that all the variables hold good for the study (Table 15).

## 5.8 VAR Residual Serial Correlation LM Tests:

5.9

Table 15. VAR Residual Serial Correlation LM Tests

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	10.49970	25	0.9951	0.380202	(25, 60.9)	0.9953
2	9.482810	25	0.9978	0.340923	(25, 60.9)	0.9979
3	69.37466	25	0.9784	3.913961	(25, 60.9)	0.4584
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	10.49970	25	0.9951	0.380202	(25, 60.9)	0.9953
2	22.46039	50	0.9997	0.359752	(50, 53.5)	0.9998
3	85.65084	75	0.1880	1.068673	(75, 33.0)	0.4270

### 5.8.1 The following are the assumption of the test.

- Null: There is no serial correlation in the residual
- Alternative: There is serial correlation

Based on the two tests in the table above: LRE and Rao F. The top line of the table indicates that the null hypothesis is that there is no serial correlation. To reject this null hypothesis with 95% confidence, we need p-values less than or equal to 0.05 in the "Prob." columns; both tests produce p-values greater than that. As a result, neither test can rule out the possibility of no serial correlation nor we accept null hypothesis. In other words, from lag 1 to 3, there is no evidence of serial correlation.

## 5.9 Normality Test:

In statistics, normality tests are used to determine whether a data set is well-modelled by a normal distribution and to calculate how likely it is to be normally distributed for a random variable that underlies the data set.

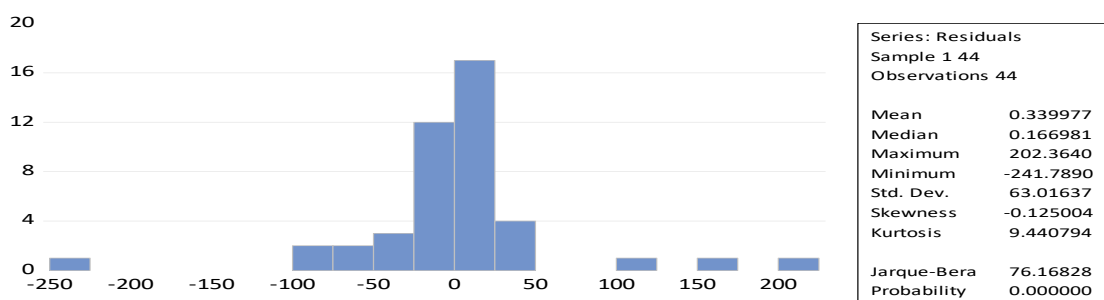


Figure 2. Normality test on profitability as dependent variable

From Figure 2, the probability value is 0.000, which means it is less than the significance level i.e., 0.05, so we reject the null hypothesis. The null hypothesis states that residuals are normally distributed, and it is accepted for the best fit model.

## 6. Conclusion:

The Government created several crop insurances programs to safeguard all farmers' hard work and efforts around the country. So that farmers may quickly obtain the claim amount and have their losses covered. Crop insurance schemes were created to help farmers reduce their losses. It offers financial assistance and encouragement to crop loss farmers, the loss caused by natural disasters, pests, and diseases. The PMFBY scheme plays a major role in agriculture and benefits farmers. This study carries the initial step in identifying a different variable and correlating the effect of the PMFBY scheme in Karnataka. The study also involved a Unite root test, criteria order selection has base test for the analysis. Once after this analysing VAR estimation with the help of each individual variable has been considered with the formula to find the least square. The least-squares method is a statistical procedure to find the best fit for a set of data points by minimising the sum of the offsets or residuals of points from the plotted curve. Least squares regression is used to predict the behaviour of dependent variables. This was considered for each variable to know the probability and the fit. The second test was done on the root of polynomial characteristics. To find its stabilising condition. The third variable, the VAR Granger Casualty, was considered to know all the five variables, which help us predict the dependent variable. VAR Residual Serial Correlation LM Tests help to know, as a result, neither test can rule out the possibility of no serial correlation. In other words, from lag 1 to 3, there is no evidence of serial correlation. Thus, it can be concluded that the VAR model satisfies the stability condition. Therefore, all the variable's holds good for the study.

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