THINK INDIA (Quarterly Journal)

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

Forecasting Export of Cashew Kernel from India using ARIMA Model

K.Santhi, Research Scholar, Bharathiyar University, Coimbatore. Assistant Professor, SRMIHM, SRM Institute of Science and Technology, Kattnkulathur,Kancheepuram, Tamilnadu, India,veersanthi@gmail.com.

Dr. K.Maran Research Supervisor, Bharathiyar University, Coimbatore. Prof. and Director, Sri Sairam Institute of Management Studies, Sri Sairam Engineering College, Chennai, Tamilnadu, India.

Abstract

Commercial cultivation of cashew nut begins in the early 1960s in India. Over the years, cashew became a crop with high economic value and attained the status of an export-oriented commodity, earning considerable foreign exchange for the country. This research is to forecast the export of cashew kernel form India using time series ARIMA model via eviews 10. ARIMA forecasting model is used in various fields like predicting the price of shares, production of agriculture products, sales, GDP, etc. This paper covers time series analysis, unit root analysis using augmented dickey fuller test, autocorrelation function, partial auto correlation function, akaike information criterion, bayesian information criterion, adjusted R^2 , and Q- statistics. Using ARIMA Model it is forecasted that export of cashew kernel from India will be Rs.6298.51 (Cr) in 2021. The results are numerically and graphically presented.

Key Words - ARIMA, Cashew Kernel, Export, Forecasting, Residual Analysis, Time Series.

I.INTRODUCTION

Agriculture plays an important role in the global economy, especially the Indian economy. In India, 27-30% of the GDP is contributed by the agriculture sector. Nearly 70% of the India population lives in the rural area and agriculture including natural resources help to generate 90% of their income. Cashew industry generates employment for 1.5 million people. Cashew plant introduced to Goa by Portuguese which is native of Brazil. First

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

cashew plant used to stop soil erosion. In 1920 only cashew kernel commercialised. Demand for cashew increased by 7% in the global market in which in recent yearly Vietnam is leading followed by India which was leader earlier.

In the world, India is one of the leading producer, processor, and exporter of a cashew kernel and cashew nut shell liquid. Coastal states like Odisha, Maharashtra, Andhra Pradesh, Tamilnadu, Goa, Karnataka , Kerala are primary producers and exporters of cashew kernel and liquids. In India, roughly 0.97 million hectares are under cashew plantation with the productivity of 770 kg per hectare.

The major markets for Indian cashew kernel were the USA, UAE, Japan, Netherland, France and the UK. India also earns reasonable foreign income by exporting cashew nut shell liquid to various countries especially Korea Rep, USA and Japan. During 2016-17 the major market zone for Indian Cashew kernel was West Asia (40%), America (23%), Europe(22%) and Southeast and Far East Asia (14%).

II. REVIEW OF LITERATURE

Ansari H I and Ahmed S M (2001) used ARIMA model for trend series analysis of prices and industrialized countries export prices. The results of the estimated ARIMA equations implied that the information on the current period's tea price was sufficient to forecast the next period and the industrialized countries export prices can be forecasted from information in the prices of the previous two periods. They came to the conclusion stating from the fitted ARIMA model that autoregressive procedure generates both prices and there was no influence of external factors.

G.Peter Zhang (2003) according to him Autoregressive integrated moving averages is one of the most popular model used in time series for forecasting for the last three decades. Artificial neural networks also widely used for forecasting. ARIMA models and ANNs are frequently compared with mixed conclusions in terms of dominance in forecasting performance.

Prapanna Mondal et al (2014) forecasted the stock price of six different companies selected from six sectors. The companies selected from the National Stock Exchange (NSE). Autoregressive Integrated Moving Average (ARIMA) model was used to forecast

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

the stock price. ARIMA model was chosen because of its simplicity and widely accepted model. ARIMA models referred to as Box-Jenkins model as it was first popularised by Box and Jenkins. ARIMA model is widely used for analytical and forecasting models. It is mainly utilised for forecasting or predicting stock price, electricity price, and many Industries. Akaike Information Criteria (AIC) has been used to select the best ARIMA model.

Marilena Aura Din (2015) suggested that ARIMA is the most powerful approach to forecasting as compare to other models like moving average, exponential smoothing, Markov chain, regression. Moving average might result in large errors. Exponential smoothing forecast one point at a time. His empirical study revealed that ARIMA is the best model to forecast future values for the next eight years

III.RESEARCH METHODOLOY

The analytical research design employed to forecast the export of cashew kernel using time series data from 1997 to 2018 using the ARIMA model with the help of eview 10 software. Data collected from the directorate general of commercial intelligence and statistics. In ARIMA models various criteria were followed like the stationarity of the data, autocorrelation function and partial correlation function, unit root test using augmented dickey fuller test, ARIMA models identification and selection, Akaike information criterion, adjusted R^2 bayesian or Schwarz information criterion, Q- statistics.

IV DATA ANALYSIS , INTERPRETATION AND FINDINGS

Table 1 Export of Cashew Kernel (Cr)

Year	Value Rs.(Cr)	Year	Value Rs.(Cr)
1997	1383.49	2008	2288.9
1998	1476.79	2009	2988.4
1999	2386.86	2010	2905.82
2000	1978.87	2011	2819.39
2001	1801.02	2012	4383.82
2002	1888.94	2013	4046.23
2003	1933.02	2014	5058.73

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

2004	1804.43	2015	5432.85
2005	2709.24	2016	4952.12
2006	2514.86	2017	5168.78
2007	2455.15	2018	5870.97

Source: CEPCI, Kollam

The above table shows the details of export of cashew kernel from India form 1997 to 2018. The export value of cashew kernel is increasing in trend. Export of cashew kernel slow down during 2001, 2002 but recovered after that. From then there is study growth in export of cashew kernel. Export value increased four times from 1997 to 2018. In the year 1997, the value of cashew kernel export was Rs.1383.49 cr which increased up to Rs.5870.97 Cr.

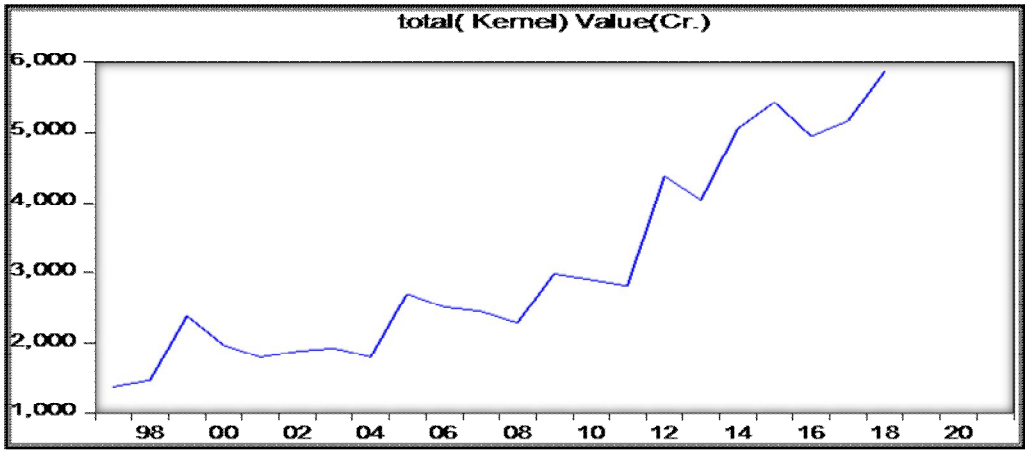
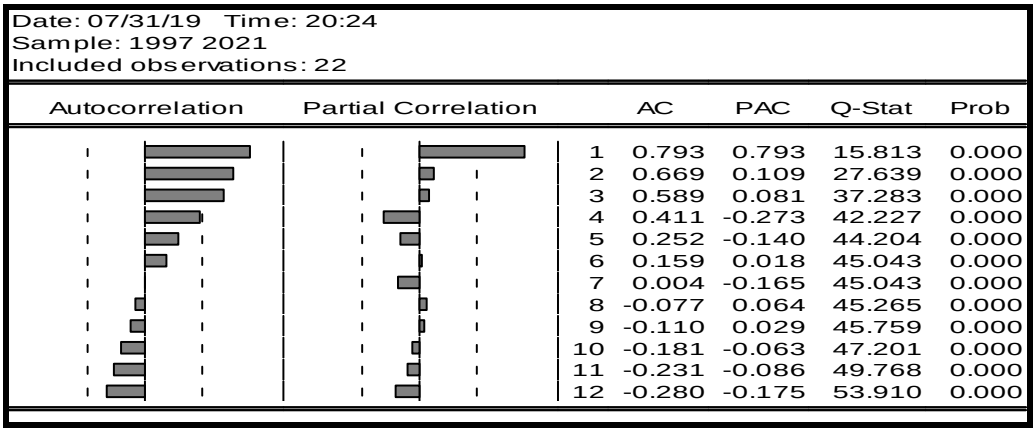


Figure 1 Export of Cashew Kernel (Rs.Cr.)

To forecast the available time-series data should be stationary. The above figure 1 shows there is no stationarity in the data.

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019



	AC	PAC	Q-Stat	Prob
1	0.793	0.793	15.813	0.000
2	0.669	0.109	27.639	0.000
3	0.589	0.081	37.283	0.000
4	0.411	-0.273	42.227	0.000
5	0.252	-0.140	44.204	0.000
6	0.159	0.018	45.043	0.000
7	0.004	-0.165	45.043	0.000
8	-0.077	0.064	45.265	0.000
9	-0.110	0.029	45.759	0.000
10	-0.181	-0.063	47.201	0.000
11	-0.231	-0.086	49.768	0.000
12	-0.280	-0.175	53.910	0.000

Figure 2 Correlogram

From the above correlogram, we can analyse that there is no similar correlogram pattern between auto correlation function and partial correlation function. There are significant spikes through the first lag in autocorrelation and exponential decay pattern in the partial correlation function.

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

Table 2 Augmented Dickey fuller test

Null Hypothesis: D(KERNEL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.280195	0.0001
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(KERNEL,2)
Method: Least Squares
Date: 07/31/19 Time: 20:24
Sample (adjusted): 1999 2018
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(KERNEL(-1))	-1.393469	0.221883	-6.280195	0.0000
C	294.1788	126.0743	2.333376	0.0314

R-squared	0.686634	Mean dependent var	30.44450
Adjusted R-squared	0.669225	S.D. dependent var	924.3533
S.E. of regression	531.6238	Akaike info criterion	15.48439
Sum squared resid	5087229.	Schwarz criterion	15.58396
Log likelihood	-152.8439	Hannan-Quinn criter.	15.50383
F-statistic	39.44084	Durbin-Watson stat	2.026836
Prob(F-statistic)	0.000006		

From the Augmented Dickey-Fuller test statistic t = -6.280195 (p= 0.0001) which is less than 0.05 and therefore the null hypothesis is rejected. So, the data has a unit root and become stationary. Higher R- square and adjusted R^2 is better in successfully predicting the model means close to 1.

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

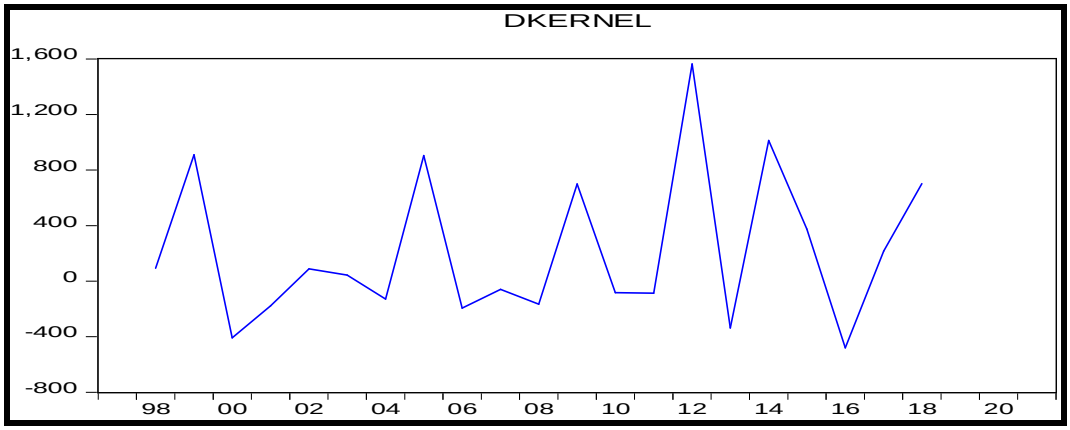


Figure 3 Stationary at First Level Difference

At the first level difference, the time series data are stationary now. For forecasting one of the important criteria is stationarity of the data.

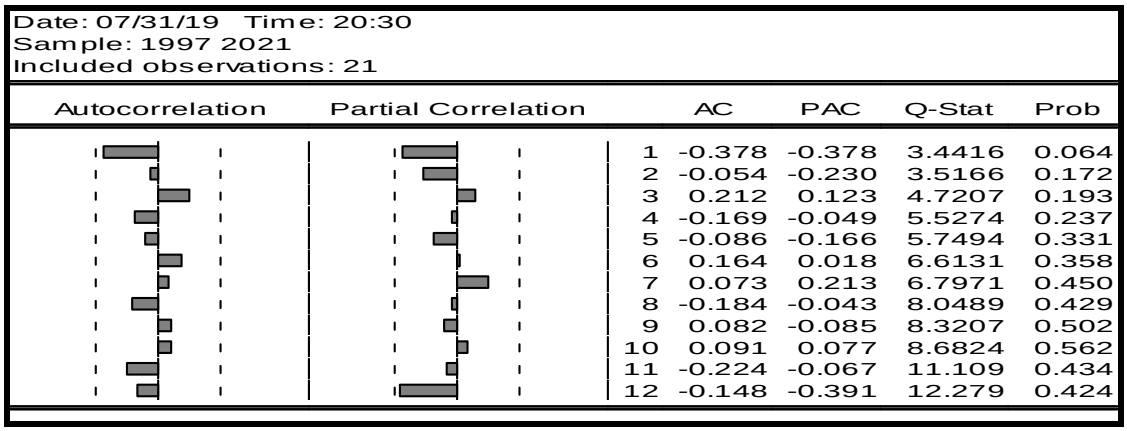


Figure 4 Correlogram at First Level Difference

Correlogram at first level difference is used to analyse various ARIMA models and to select the best ARIMA model.

Table 3 ARIMA Models

Models	AIC	Adjusted R^2	SIC
(1,1,1)	15.59357	0.033502	15.79252
(1,1,3)	15.59035	0.037479	15.78931
(1,1,5)	15.60312	0.028990	15.80208
(3,1,1)	15.55538	0.074239	15.75434
(3,1,3)	15.70745	-.076494	15..90640

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

(3,1,5)	15.72077	-.097379	15.91972
(5,1,1)	15.58016	0.050849	15.77912
(5,1,3)	15.72865	-.106957	15.92761
(5,1,5)	15.78131	-.023949	15.93053

The ARIMA model which has the lowest Akaike info criterion and lowest Schwarz criterion are selected. It is also considered which model has the highest adjusted R^2 value. ARIMA (3,1,1) is considered as the perfect model for forecasting the export of cashew kernel from India. The model returned the smallest Akaike info criterion of 15.55538 and smallest Schwarz criterion of 15.75434. the value of adjusted R^2 is highest 0.074239.

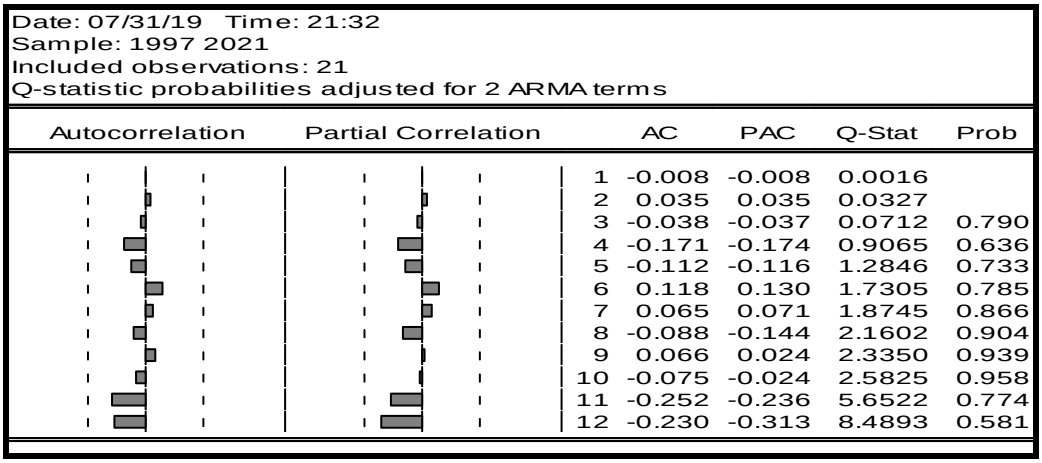


Figure 5 Goodness of Fit -Correlogram of Residuals

Figure 5 explains the residual of the series. There are no significant spikes of ACFs and PACFs, no other significant patterns left in the time series. There is no white noise

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

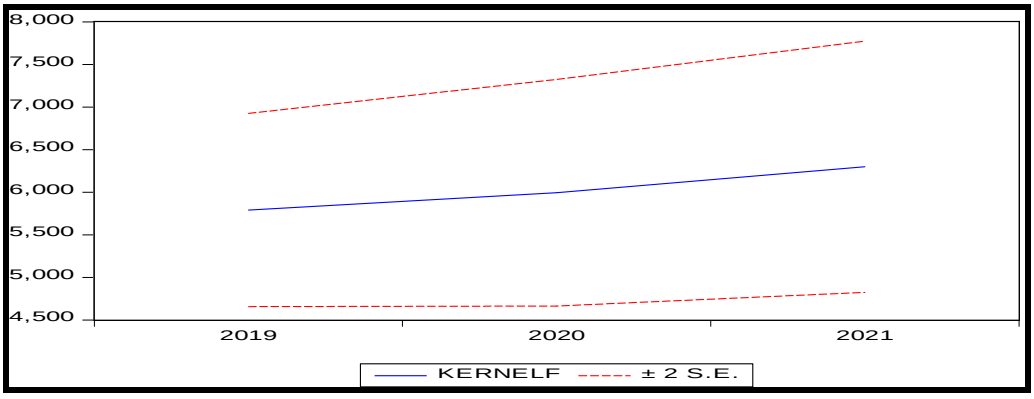


Figure 6 Forecast of Cashew kernel export

Table 4 Forecast of cashew kernel (Rs.Cr.)

Year	**2019**	**2020**	**2021**
Forecast	5790.97	5993.27	6298.51

Based on the past data available for the year 1997 to 2018, we have tried to forecast the export value of cashew kernel for the year 2019 to 2021. It is forecasted that in the year 2019, the export of cashew kernel value will be Rs.5790.97 cr. for the year 2020 predicted as Rs.5993.27 cr. and for the year 2021 forecasted as Rs.6298.51 cr. It shows an increasing trend in export of cashew kernel form India.

V CONCLUSION

Forecasting using ARIMA is an art and not science. It depends upon the researcher analysis ability. There is increasing in trend in export of cashew kernel form India. Initiatives to be taken to improve the technology in cashew kernel processing, value addition in cashew kernel and improving the quality by reducing the cost to overcome Vietnam and recapture the first position in the world cashew kernel market.

REFERENCES

Ansari, H.I. And Ahmed, S.M., 2001, Time series analysis of the prices: An application of ARIMA modeling and co-integration analysis. Journal of Indian Economic 48(3): 49-54.

ISSN:0971-1260

Vol-22-Issue-4-October-December-2019

Prapanna Mondal., Labani Shit., and Saptarsi Goswami., 2014, A Study of Effectiveness of Time Series Modeling (ARIMA) in Forecasting Stock Price. International Journal of Computer Science, Engineering and Application (ARIMA), Vol.4, No.2.

Marilena Aura Din. (2015). ARIMA by Box Jenkins Methodology for Estimation and forecasting Models in Higher Education, ATINER'S Conference Paper Series, No:EMS2015-1846, Athens Institute for Education an Research.

Peter Zhang. G.,2003. Time series forecasting using a hybrid ARIMA and neural network model. https://www.sciencedirect.com/science/article/pii/S0925231201007020

https://towardsdatascience.com/time-series-forecasting-arima-models-7f221e9eee06