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RESULTS & DISCUSSION

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RECOMMENDATIONS/SUGGESTIONS

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FORECASTING FOOD GRAINS PRODUCTION USING ARIMA AND REGRESSION MODEL

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ABSTRACT

The Time series is a sequence of values arranged in a specific order of time. Prediction and analysis of food grains are an essential portion in agricultural statistics. Food grain production is a conspicuous portion in Indian agriculture. Agriculture shows the robust part in the Indian economy. The growth rate of agriculture production is usually decided by the show of food grains and non-food grain production. The present research work focused on production of food grains in India using time series data ranging from 1990- 91 to 2018-19. In this paper, Autoregressive Integrated Moving Average Model (ARIMA) and linear regression model for predicting food grain production of India were compared. And also Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were compared. The results were displayed numerically and graphically.

KEYWORDS

food grains. food grains production forecasting.

JEL CODE

Q10

INTRODUCTION

Time series analysis involves methods for analyzing time series data. Crop and land use statistics from the support of the Agricultural Statistics System. Crop production contains grains, cotton, tobacco, fruits, vegetables, nuts and plants. Different crops grow in different areas of the country. LI et.al (2011) predicted air quality using Auto regressive moving average and multiple linear regression (MLR) models. Indian government policies and planning has always given considerable importance to *the production* of food grains due to which India has been achieving the continued growth all the same many restrictions. The free market play has adversely affected the production of food grains and the rate of growth of food *grain* production declined after the introduction of *the New Economic Policy* (NEP) in India. Osman Hegazy et.al (2013) proposed least square support vector machine (LS-SVM) to predict stock market price. Selvin et.al (2017) used an artificial neural network to identify an essential trend from a data. Box et.al (2015) employed Auto regression, moving average method in air quality predictions. Jayanthi Balaji et.al(2018) predicted stock price movement. Hiransha et. al (2018) used four types of deep learning architectures namely, Multilayer Perceptron (MLP), Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM) and Convolutional Neural Network (CNN) for predicting the stock price of a company based on the historical prices available. Athira et.al (2018) predicted pollution and meteorological time series AirNet data using Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), and Gated Recurrent Unit (GRU). Menon et.al (2016) applied linear models like Auto Regressive (AR), Auto Regressive Moving Average model (ARMA) and Auto Regressive Integrated Moving Average model (ARIMA) have been used for stock market forecasting. Rout et.al (2015) predicted stock market using recurrent neural network. Roman et.al (2016) used Back propagation and Recurrent Neural Network (RNN) for predicting multiple stock market return. Sushant Kumar Pandey et. *al* (2018) employed software bug prediction becomes the vital activity during software development and maintenance. In this paper, Autoregressive Integrated Moving Average Model *(*ARIMA) and Regression model were used for food grains production prediction in India during 1991 to 2019. The performance of these different models was evaluated using the forecasting accuracy criteria namely, the Mean Absolute Error (MAE) and Root Mean Square Error (RMSE).

OBJECTIVES OF THE STUDY

1. To know about the trend lines.
2. To know what the yield will be in the coming seasons.

INTRODUCTION TO TIME SERIES

Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to forecast future events based on known past events to predict data points before they are measured.

REGRESSION MODEL

The term regression was used by biometrician Sir Francis Galton. Regression is the measures of the average relationship between two or more variables in terms of the original units of the data.

Simple Linear Regression

A simple linear regression is carried out to estimate the relationship between a dependent variable, Y and a single explanatory variable, x given a set of data that includes observations for both of these variables for a particular population.

The model is

$$y = \beta_0 + \beta_1 x + \varepsilon \quad \ldots(1)$$

Where y is a dependent variable
x is a independent variable

β_0 is intercept

β_1 is slope

ε is stochastic error term

Autoregressive (AR) Model

The model $(Y_t - \delta)$ is

$$(Y_t - \delta) = \alpha_1 (Y_{t-1} - \delta) + \alpha_2 (Y_{t-2} - \delta) + \ldots + \alpha_p (Y_{t-p} - \delta) + u_t \quad \ldots(2)$$

Where δ is the mean of Y and u_t is an uncorrelated random error term with zero mean and constant variance σ^2 (i.e., it is white noise),then we say that Y_t is a pth - order autoregressive, or AR(p) process.

Moving Average (MA) Model

The moving average process is simply a linear combination of white noise error terms.

The model Y_t is as follows,

$$Y_t = \mu + \beta_0 u_t + \beta_1 u_{t-1} + \beta_2 u_{t-2} + \ldots + \beta_q u_{t-q} \quad \ldots (3)$$

is an MA(q) process. Where μ is a constant and u is the white noise stochastic error term. Here Y at time t is equal to a constant plus a moving average of the current and past error terms.

Autoregressive Moving Average (ARMA) Model

The process has characteristics of both AR and MA and is therefore ARMA. Thus, Y_t follows an ARMA (1,1) process if it can be written as,

$$Y_t = \theta + \alpha_1 Y_{t-1} + \beta_0 u_t + \beta_1 u_{t-1} \quad \ldots (4)$$

Because there is one autoregressive and one moving average term. θ Represents a constant term.
In general, in an ARMA (p, q) process, there will be p autoregressive and q moving average terms.

$$Y_t = \theta + \alpha_1 Y_{t-1} + \beta_0 u_t + \beta_1 u_{t-1} + \alpha_2 Y_{t-2} + \beta_2 u_{t-2} + \cdots + \alpha_p Y_{t-p} + \beta_q u_{t-q} \quad \ldots (5)$$

Autoregressive Integrated Moving Average Model

Autoregressive Integrated Moving Average Model (p, d, q), where p is Autoregressive and q is the Moving Average Model and d is the differencing. If d =0, the data exhibits stationary and the order is denoted as (p, q), which is called ARMA process. If the data does not exhibit stationary, the first order differencing is carried out for converting it into stationary, hence the model is denoted as (p, d, q).

FOUR STAGES OF ARIMA MODELING

Model Identification

This stage involves achieving variance and level stationary, and identifying tentative patterns using graphs, statistics, auto correlation coefficient function (ACF), partial auto correlation co-efficient function (PACF), etc.

Estimation

Determining of model parameters by software applications form this stage and it has to be ensured that the estimation procedure converges as Melard procedure is iterative.

Diagnostic Checking

Bayesian Information criteria (BIC), residual squared error (RSE) provides diagnostics for model fitting. The parameters must be significant and the residuals need to be white noise and normal and Model should be technically defendable.

Forecasting

Forecasts are made after confirming insignificant ACF / PACF's, of the ARIMA process random and normal errors validates model. All the four stages require considerable care and work and they themselves are not exhaustive.

SELECTION OF MODEL CRITERION

Model selection can be made based on the values of certain criteria like log likelihood (log L), Akaike Information Criteria (AIC)/Bayesian Information Criteria (BIC)/ Schwarz-Bayesian Information Criteria (SBC). SBC is used which is given by

SBC=logσ^2+ (m logn)/n. ...(6)

RESIDUAL ANALYSIS

Residuals are differences between the one-step-predicted output from the model and the measured output from the validation data set. Thus, residuals represent the portion of the validation data not explained by the model. Different types of error measurement namely

1. Mean Absolute Error (MAE)
2. Root Mean Square Error (RMSE)

Mean Absolute Error (MAE)

It is the difference between the measured value and "true" value. The **Mean Absolute Error** (MAE) is the average of all absolute errors. The formula is:

$$MAE = \frac{1}{n}\sum_{t=1}^{n}|u_t| \quad \ldots (7)$$

Where n is the number of errors and $|u_t| = y_t - \hat{y}_t$.

Root Mean Square Error (RMSE)

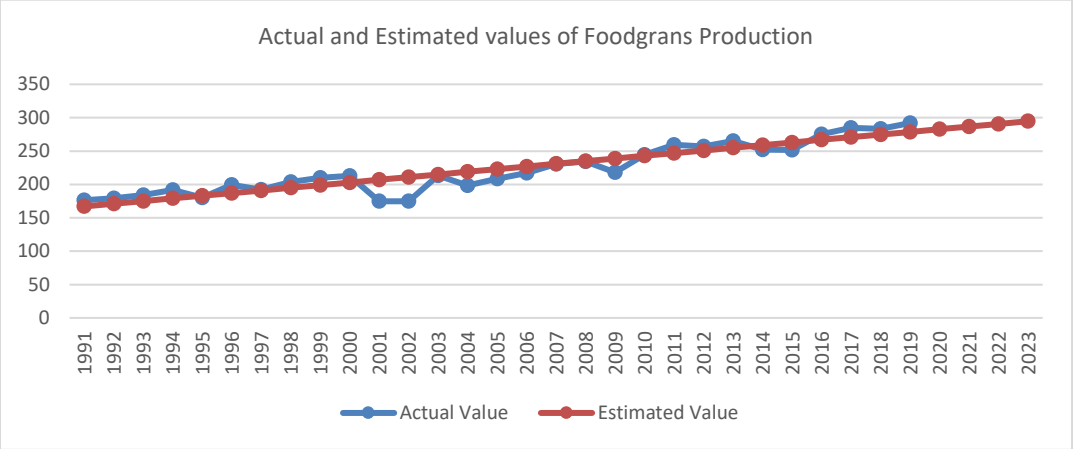
Root Mean Square Error (RMSE) measures how much error there is between two data sets.

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(y_t - \hat{y}_t)^2}{n}} \quad \ldots (8)$$

RESULTS AND DISCUSSION

For the analysis data from 1991 - 2019 is considered. The data consist of the food grains production of India. In this work we have considered food grains production of prediction for ARIMA and regression models. The data is taken from www.Agricoop.co.nic.in. The results obtained are as follows:

FIGURE 1: ACTUAL AND ESTIMATED VALUES OF FOOD GRAINS PRODUCTION USING REGRESSION MODEL



In figure 1 shows that actual and estimated values of food grains production using Regression model.

ANALYSIS OF FOOD GRAINS PRODUCTION USING ARIMA

Here the ARIMA model seems to be the best fit and also forecasting has been done. The Non-stationary of the data is viewed from the following line graph.

FIGURE 2: LINE GRAPH OF FOOD GRAINS PRODUCTION

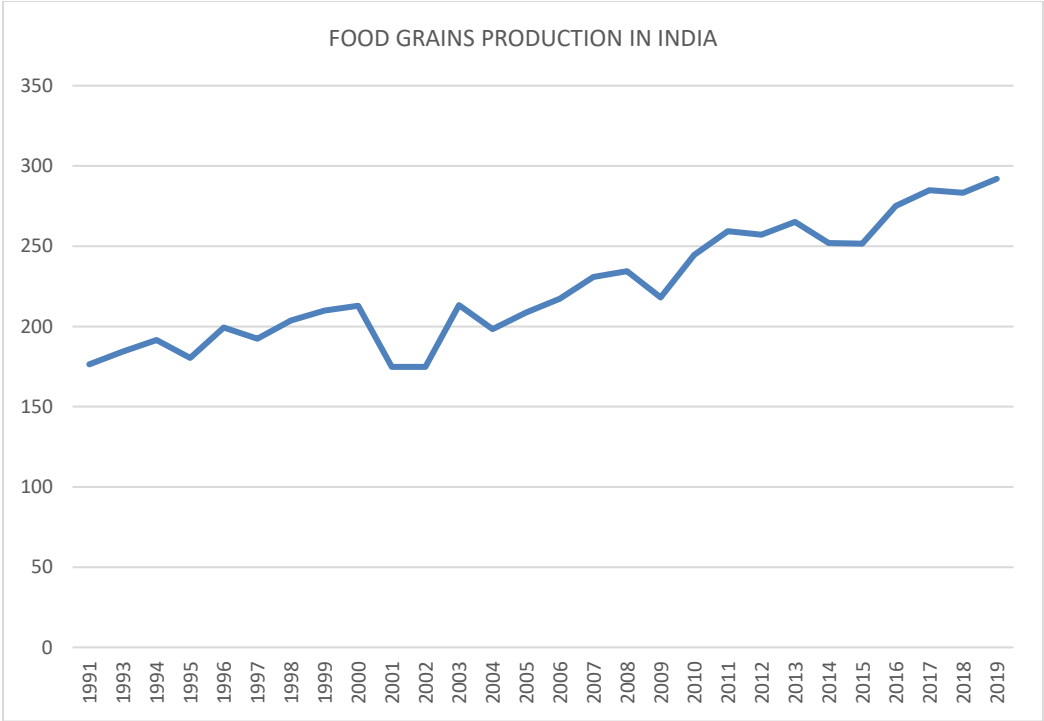


TABLE 1: ACF AND PACF OF FOOD GRAINS PRODUCTION

Autocorrelation Functions of Food grains Production					
			Box-Ljung Statistic		
Lag	Autocorrelation	Std. Error[a]	Value	df	Sig.[b]
1	-.242	.179	1.827	1	.176
2	-.312	.176	4.971	2	.083
3	.098	.173	5.291	3	.152
4	.014	.169	5.298	4	.258
5	.042	.165	5.363	5	.373
6	-.124	.162	5.950	6	.429
7	.136	.158	6.691	7	.462
8	.017	.154	6.703	8	.569
9	-.073	.150	6.941	9	.643
10	-.030	.146	6.982	10	.727
11	-.038	.142	7.055	11	.795
12	-.043	.138	7.152	12	.847
13	.139	.134	8.229	13	.828
14	.157	.129	9.715	14	.783
15	-.218	.124	12.797	15	.618
16	-.076	.120	13.204	16	.658

Table 1 shows that the Q value is 13.204 for k=16. We compare this to the Chi square distribution with 16-2=14 degrees of freedom. Here the calculated value is less than the table value, i.e., 13.204 < 23.68. It concluded that Q is not significant. The residuals can consider as a white noise series.

ACF AND PACF FOOD GRAINS PRODUCTION

In order to make the points stationary, first order differencing carried out. Below the graphs give the details on the first order differencing.

FIGURE 3: AUTOCORRELATION AND PARTIAL AUTOCORRELATION GRAPH FOR FIRST ORDER DIFFERENCING

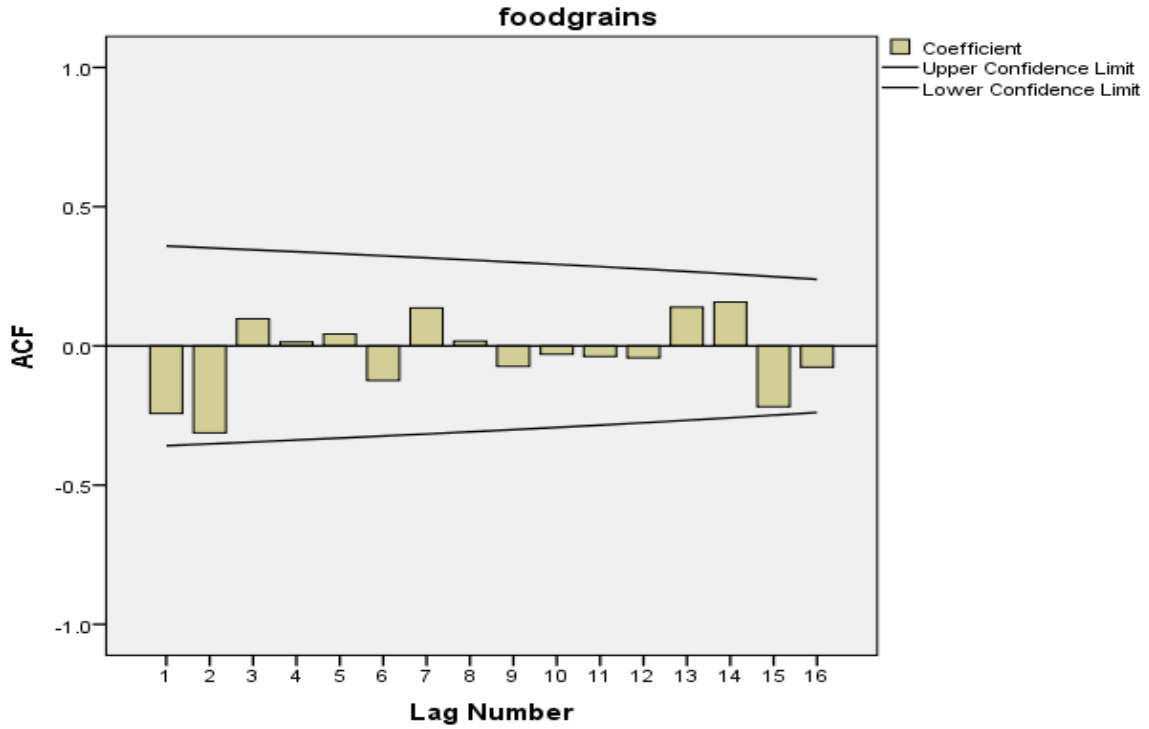


FIGURE 4

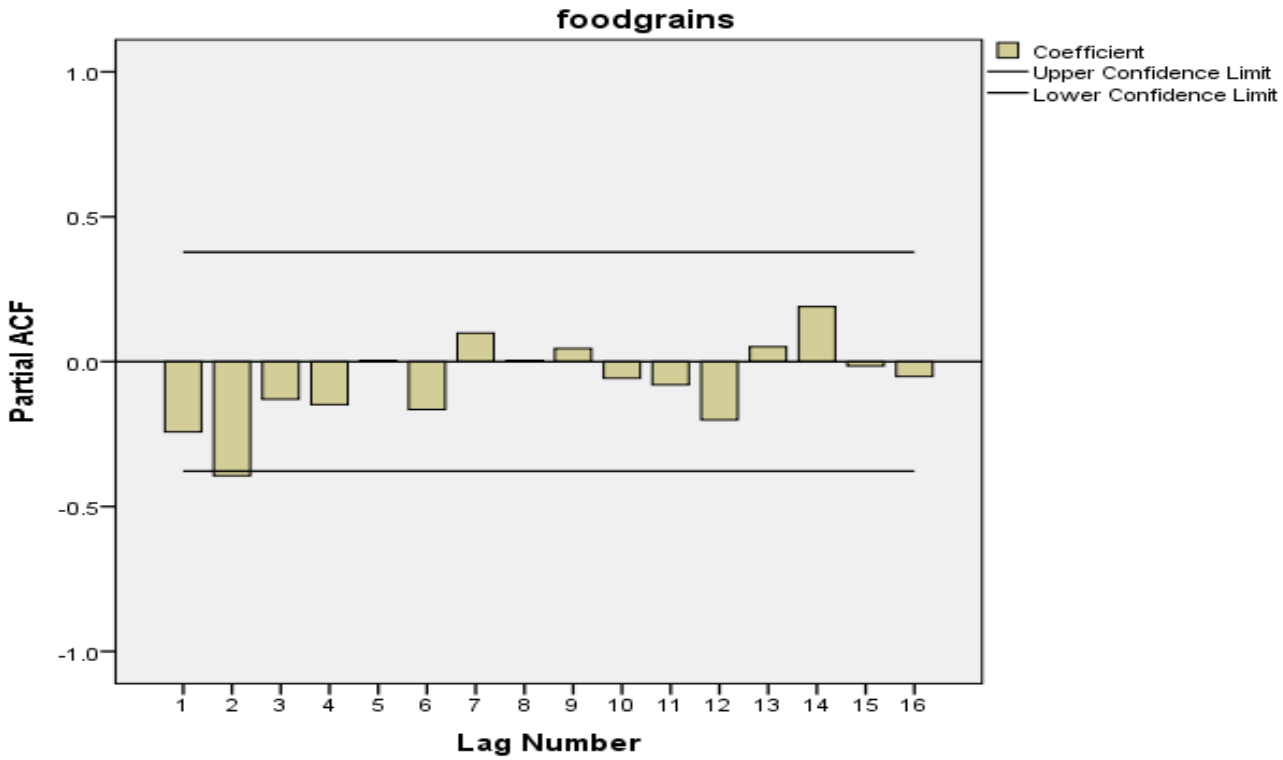


TABLE 2: BIC VALUES OF ARIMA (p, d, q)

ARIMA (p,d,q)	Normalized BIC
ARIMA(1,1,0)	5.759
ARIMA(0,1,1,)	**5.463**
ARIMA(1,1,1)	5.579
ARIMA(2,1,0)	5.725
ARIMA(0,1,2)	5.548

When comparing with other models, *the smaller BIC statistic value* indicates the better fitting model. The specified order is *an ARIMA* (0,1,1) and hence the model is fitted and the forecasting is done.

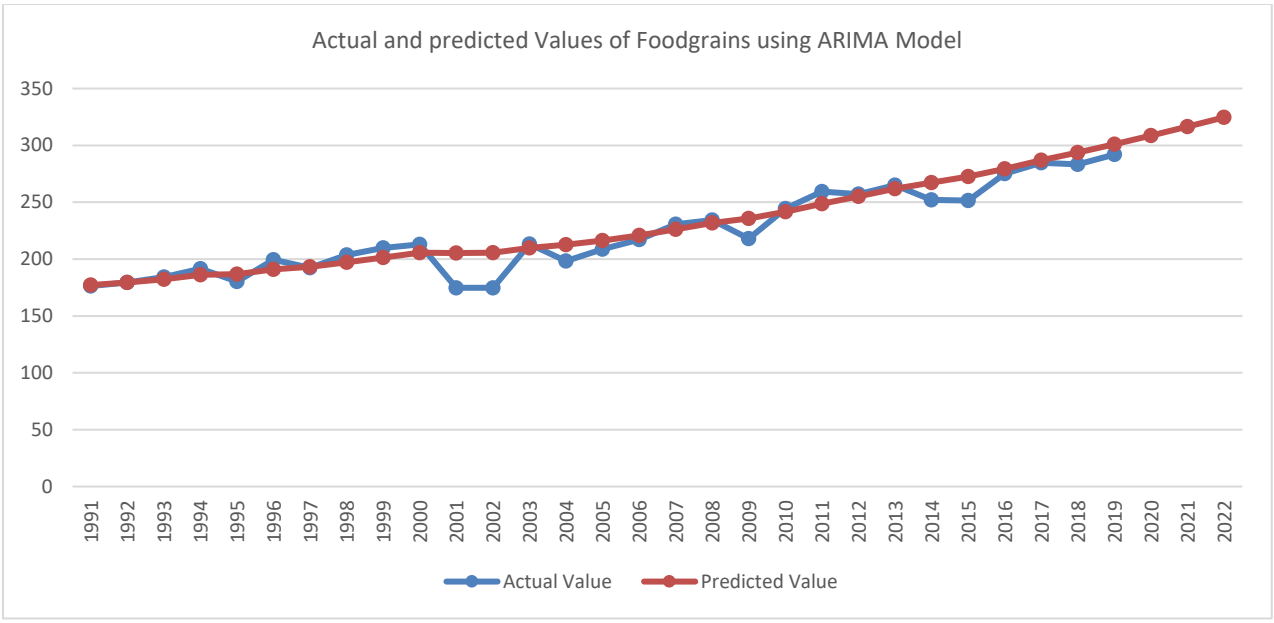
FORECASTED VALUES OF ARIMA (0,1,1)

The table given below shows the details of the forecasted values using the ARIMA (0, 1, 1) model. The range, i.e., the Upper Control Limit (UCL) and the Lower Control Limit (LCL) are also given.

TABLE 3: FORECASTED VALUES, LCL AND UCL

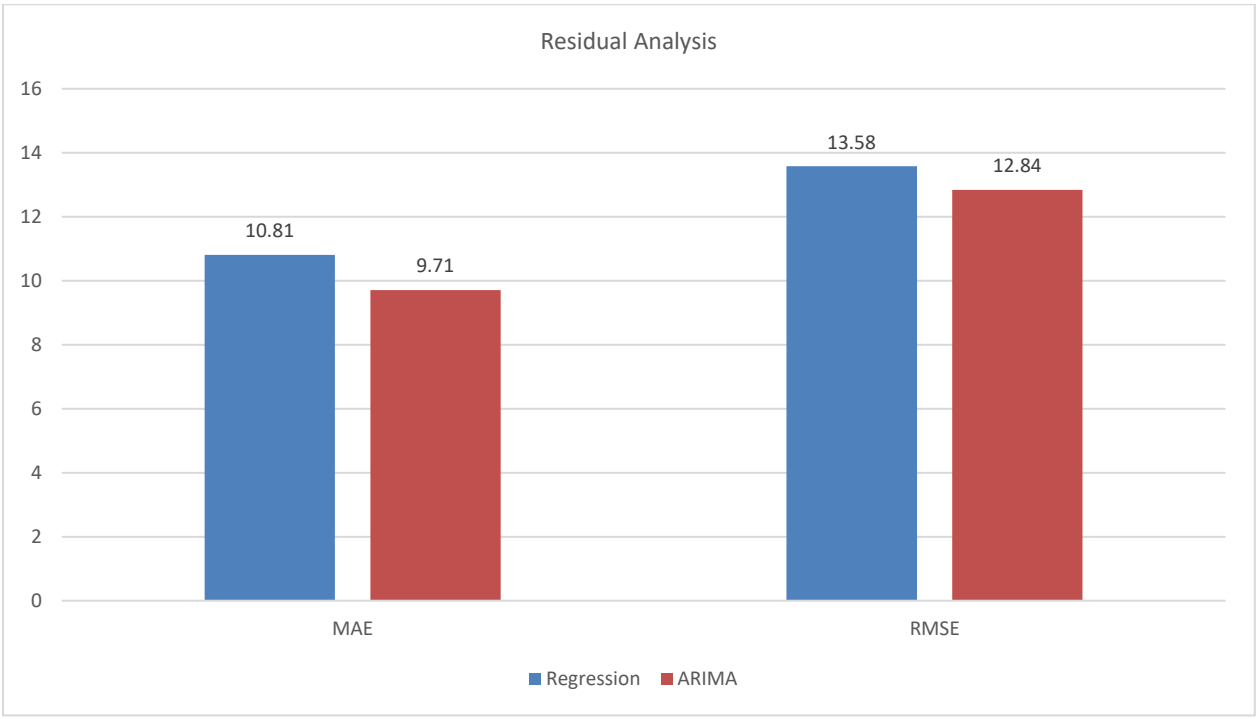
		2020	2021	2022	2023
Food grains production	Forecast	301.00	308.65	316.53	324.66
	UCL	327.02	334.75	342.72	350.92
	LCL	274.98	282.55	290.35	298.39

FIGURE 5: ACTUAL AND PREDICTED VALUES OF FOOD GRAINS USING ARIMA MODEL



In figure 5 shows that actual and predicted values of food grains using ARIMA model

FIGURE 6: RESIDUAL ANALYSIS OF FOOD GRAINS PRODUCTION USING ARIMA AND REGRESSION MODEL



In figure 6 shows that mean absolute error and root mean square error is minimum in ARIMA model when compared to the regression model.

CONCLUSION

Inferences based on the Regression model and Autoregressive Integrated Moving Average (ARIMA) model for the food grains production are given below. From the residual analysis mean absolute error and root mean square error is minimum in ARIMA model when compared to the regression model. So, ARIMA model is best for prediction of food grains production of India. The best model that fit was the ARIMA model and also forecasted. The corresponding Upper limit and the Lower limits are also given for the respective years. The model, ARIMA (0,1,1) was found as the best fit for the food grains with BIC =5.463, when considering the forecasted values, there is an increasing trend pattern from 2020 to 2023 years. The food grains have increased from 301.00 to 324.66.

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A COMPARATIVE ANALYSIS OF SELECTED MUTUAL FUND SCHEMES IN BANKING SECTOR

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ABSTRACT

Indian banking sector is vast and provides various investment category, mutual fund is one of those many investments. This paper aims to evaluate, analyze, compare and rank small cap direct growth scheme of four selected banks (Axis Small Cap fund direct Growth option, Kotak Small Cap Fund Direct Growth Option, ICICI Prudential Small Cap Fund Direct Growth option and HDFC Small Cap fund Direct Growth Option) on basis of their financial performance. For which secondary data was extracted from the fact sheets of the company, for period of 3 years (1st April 2018- 31st March 2021). To fulfill the purpose of the study the daily NAVs of the mutual funds has been analyzed through Sharpe's Ratio and Treynor's Ratio. The results revealed that Kotak Mahindra small cap direct option growth plan was found to be top ranker in Treynor Ratio while the ranking of Sharpe ratio kept on changing year by year.

KEYWORDS

banks, mutual fund.

JEL CODE

G11

1. INTRODUCTION

Mutual fund history in India started in the year 1963 with the formation of company named Union Trust of India (UTI). This was a joint initiative between the Government of India and Reserve bank of India. The objective behind the formation of the company was to guide the small investors who aimed to buy shares, debentures and other financial products in large companies. The first ever Mutual fund Scheme launched by UTI in the country was in 1964 known as the Unit Scheme 1964.

IMPACT OF COVID -19 ON MUTUAL FUND INDUSTRY

The extra-ordinary progress of Indian mutual fund industry can be seen in the growth of its Asset Under Management (AUM) from Rs.25 crores in 1964 to Rs.22.26 lakh crores in March 2020. But the outbreak of the pandemic COVID-19 has affected the mutual fund industry.

It was observed that the New Fund offers (NFO) has decreased insignificantly after the outbreak. The number of NFOs was six in February 2020, which further dropped to just one in March 2020 and nil in April 2020. This decline was due to weak market sentiments and declining investor confidence.

The overall industry AUM has decreased by 6.91% in April 2020 compared to April 2019 and Individual investors hold 52.1% of industry assets in April 2020 compared to 54.7% in April 2019.The value of assets held by individual investors has decreased by 11.35% in April 2020 compared to April 2019. Much of the damage was because of outflows in the debt segment that saw the highest outflows in the Indian Debt Mutual Fund segment in a single financial year. Equity investment base managed by Mutual Funds also got cut by a quarter. Nevertheless, the Indian mutual fund industry has the spirit to overcome the situation.

MUTUAL FUND

Mutual Fund is a trust that collects money from a number of investors who share a common investment objective and then this gathered money is invested by the fund manager into specific securities i.e., stocks or bonds or any other financial instrument. The fund thus pooled is managed by a professional fund manager, who is not only responsible for implementing a fund's investing strategy but also managing its portfolio trading activities. Each investor in the mutual fund participates in the gain or loss of the fund based upon the number of shares owned by him.

Mutual fund schemes provide excellent opportunities to people to invest a small amount which will ultimately grow like anything in the period of 15 to 20 years of their investments. The value of a share of the mutual fund is known as the net asset value per share (NAV) which is calculated daily based on the total value of the fund divided by the number of shares currently issued and outstanding by the company.

TYPES OF MUTUAL FUND

Equity funds: Also Known as Growth funds, these funds allow the investor to participate in stock markets. The primary objective of this fund is wealth creation or capital appreciation. They have the potential to generate higher return and are best for long term investments.

Debt Funds: These invest in Fixed Income Securities, like Government Securities or Bonds, Commercial Papers and Debentures, Bank Certificates of Deposits and Money Market instruments like Treasury Bills, Commercial Paper, etc. Debt funds are relatively safer investments and are suitable for Income Generation.

Hybrid Funds: These invest in both Equities and Fixed Income, thus offering the best of both, Growth Potential as well as Income Generation.

QUANTITATIVE MEASURES USED TO EVALUATE MUTUAL FUNDS

Net Asset Value: NAV refers to the actual value of a unit in a mutual fund scheme on a particular day. NAV of a scheme tells how much each unit is worth. It is considered as the simplest measure of performance of a mutual fund. It is calculated as;

Risk Free Rate of Return (Rf): It represents those securities which provides a minimum guaranteed return with no risk.

Market Index: Market index is considered as the benchmark of any mutual fund scheme. If the market index of a scheme is less than the NAV, than it is said that the scheme is selling at a discount whereas if the market index is more than the NAV, scheme is said to be selling at a premium.

Standard Deviation: Standard deviation of a mutual fund scheme explains the deviation of actual return from expected return. It measures the overall risk associated with the schemes.

NAV = (Value of securities – Liabilities)/Number of unit Outstanding

The higher the standard deviation the more risk the fund holds and it explains the historic volatility of the scheme. It is calculated as;

$$\sigma = \sqrt{\frac{\sum(x_i - u)2}{N}}$$

Beta: Beta represents the price changes of a fund in comparison with its benchmark. It explains the funds volatility to its benchmark. The beta measure assumes that the fund will move as its benchmark.

R-Squared: R-Squared or Ex-Mark indicates the extent to which the return of a mutual fund can be explained by the benchmark. The acceptable range of R-squared of equity mutual fund scheme lies between 80-90 percent. If the R-squared lies below 80% it indicates that the benchmark to which beta is compared is less reliable,

Sharpe Ratio: Sharpe ratio, also known as Reward to Variability ratio, measures the risk premium of a mutual fund scheme to the total amount of risk of the scheme. It helps in summarizing the risk return of the scheme in a single measure that compares the performance of different mutual fund schemes. It is calculated as;

$$\textbf{Sharpe Ratio} = \frac{R_m - R_f}{\sigma}$$

Treynor Ratio: Treynor ratio, also known as Reward to Volatility Ratio, measures the risk premium of a mutual fund scheme to the amount of systematic risk present in the index. It is calculated as;

$$\textbf{Treynor Ratio} = \frac{R_m - R_f}{\beta}$$

2. REVIEW LITERATURE

Anuja Magdum, CA. Girish A. Samant (2019). In this paper the researcher made an attempt to analyze twenty-one equity mutual fund schemes of both public and private banks for the period of five years from 2013 to 2018. To analyze these schemes, capital asset pricing model was used and the results indicated that private sector banks are better performing, that is, more rewarding and moderately risky than public sector banks.

R. Kumar Gandhi Dr.R. Peruma (2015). This study aimed to compare financial performance of equity diversified schemes and equity mid-cap schemes among four selected banks. The researcher used statistical tools like Standard Deviation, Beta, Sharpe Ratio, Treynor Ratio, Jenson Ratio, and Information Ratio. The results of the study revealed that among the selected mutual fund schemes Canara Robeco Equity Diversified growth scheme is most suited in equity diversified mutual fund scheme and HDFC Capital Builder growth scheme in equity mid-cap mutual fund scheme.

Pradeep K. Gupta and M. S. Annapoorna (2013). The main objective of the paper was to compare financial performance of mutual fund schemes ranked by CRISIL with SBI domestic term deposit rates for the period 2008 to 2013. The tools used included average and return rates, the results revealed that most of the selected mutual fund provided less return than SBI domestic tern deposits.

3. CONCEPTUAL FRAMEWORK

This study has taken one mutual fund scheme of four different banks (Axis Small Cap fund direct Growth option, Kotak Small Cap Fund Direct Growth Option, ICICI Prudential Small Cap Fund Direct Growth option and HDFC Small Cap fund Direct Growth Option) as sample. The aim of the paper is to evaluate, analyze, compare and rank the scheme on basis of their financial performance. All the data has been collected from secondary sources like fact sheets of the company, journals, research papers, published sources. The data used for analysis has been taken for period of 3 years (1st April 2018- 31st March 2021). For the purpose of this study the daily NAVs of the mutual funds has been taken and Sharpe's Ratio and Treynor's Ratio are used to rank and analyze the mean returns of the company. For the value of risk-free rate of return the study has taken three-year 91 days treasury bills issued by the government of India and the beta measure assumes that the fund will move as its benchmark and thus it is taken as;

1. In this study NIFTY SMALL CAP 100 TR has been considered benchmark for all four selected small cap mutual fund schemes.

Note: "Small Cap" funds that invest in small sized companies.

4. OBJECTIVES OF THE STUDY

1. To evaluate the performance of selected small cap direct growth mutual fund schemes.
2. To compare the performance of selected small cap direct growth mutual fund schemes.
3. To analyze the performance of selected mutual funds scheme using Sharpe model and Treynor's model.

5. RESEARCH METHODOLOGY

HYPOTHESIS

H01: The difference of mean returns among the selected Small Cap Direct Plan Growth Option is equal to zero.

HA1: The difference of mean returns among the selected Small Cap Direct Plan Growth Option is different from zero.

H02: The difference of Sharpe's Ratio among the selected Small Cap Direct Plan Growth Option is equal to zero.

HA2: The difference of Sharpe Ratio's among the selected Small Cap Direct Plan Growth Option is different from zero.

H03: The difference of Treynor's Ratio among the selected Small Cap Direct Plan Growth Option is equal to zero.

HA3: The difference of Treynor's Ratio among the selected Small Cap Direct Plan Growth Option is different from zero.

Research Design: This study is exploratory and comparative in nature. It focuses on comparing the performance of selected mutual fund schemes for the period of three years from 2018-2021.

Data Source: This study is based on the secondary data extracted from the website of Association of Mutual Funds in India.

***Sample Design*:** The sample consists of 3 years of data of selected mutual fund small cap direct growth scheme from financial year 2018-19 to 2020-21.

***Statistical Tools*:** For the fulfilment of the objective, this study has taken daily NAV of all the four selected mutual fund schemes of 3years, from 1st April 2018 to 31st March 2021 and for the hypothesis testing the collected data has been analyzed by different tools like; Simple Mean, Standard Deviation, Sharpe Model and Treynor's Model.

6. DATA ANALYSIS AND INTERPRETATION

TABLE 1: ANALYSIS OF DATA FOR YEAR 2018-19

Schemes	Mean NAV	Rf	Standard Deviation	Sharpe Ratio	Rank	Treynor Ratio	Rank
Kotak Mahindra	77.29125911	6.19	5.46611237	13.0076468	III	71.10125911	I
Axis Bank	28.25591093	6.19	0.991624622	22.25228221	I	22.06591093	III
HDFC	46.18668016	6.19	2.104655926	19.00390447	II	39.99668016	II
ICICI Prudential	25.43995918	6.19	2.191343532	8.784546515	IV	19.24995918	IV

Source: Compiled by the authors

From Table 1 it can interpret that by comparing the selected different small cap direct growth schemes, it can be stated that in the financial year 2018-19, in terms of NAV with 77.29125911 and with Treynor Ratio of 71.10125911 Kotak Mahindra was the best performing mutual fund amongst the selected schemes, whereas from the view point of Sharpe ratio i.e., on analyzing the return along with the total risk the performance of Axis Bank was leading, followed by HDFC, Kotak Mahindra and ICICI prudential.

TABLE 2: ANALYSIS OF DATA FOR YEAR 2019-20

Schemes	Mean NAV	Rf	Standard Deviation	Sharpe Ratio	Rank	Treynor Ratio	Rank
Kotak Mahindra	76.38392245	4.36	6.192544341	11.63074796	I	72.02392245	I
Axis Bank	32.13028571	4.36	2.813177044	9.87150303	III	27.77028571	III
HDFC	42.1748	4.36	3.885416036	9.732497021	IV	37.8148	II
ICICI Prudential	25.92069388	4.36	2.003384413	10.76213518	II	21.56069388	IV

Source: Compiled by the authors

From Table 2, it can be stated that in the financial year 2019-20, performance of Kotak Mahindra was the best in all of the performance measures of NAV, Sharpe ratio and Treynor Ratio.

TABLE 3: ANALYSIS OF DATA FOR YEAR 2019-20

Schemes	Mean NAV	Rf	Standard Deviation	Sharpe Ratio	Rank	Treynor Ratio	Rank
Kotak Mahindra	90.711852	3.18	22.67563669	3.860171743	IV	87.531852	I
Axis Bank	36.67822581	3.18	6.604416882	5.072094389	I	33.49822581	III
HDFC	42.53575403	3.18	9.037174459	4.354873773	II	39.35575403	II
ICICI Prudential	28.11040323	3.18	6.42034354	3.883032593	III	24.93040323	IV

Source: Compiled by the authors

From Table 3, of comparison among the selected different small cap direct growth scheme it can be stated that in the financial year 2018-19, in terms of NAV with 90.711852 and with Treynor Ratio of 87.531852, Kotak Mahindra was the best performing mutual fund amongst the selected schemes, whereas from the view point of Sharpe ratio performance of Kotak Mahindra was the least and Axis Bank was leading, followed by HDFC, and ICICI prudential.

7. RESULTS AND FINDINGS

1. For the period from 2018-19 to 2020-21, all the four small cap direct growth mutual fund schemes have shown a positive return and at a growth rate except HDFC small cap direct growth mutual fund scheme which has shown a decreasing trend in between 2018-19 and 2019- 20.
2. Axis bank small fund direct growth scheme is the most well performed scheme on the basis of risk-return measure in three-year period.
3. Although Kotak Mahindra small cap mutual fund has shown the highest mean return and Treynor Ratio, but the standard deviation of this scheme is very high in all three years, representing the volatility of the scheme, so only risk taker investors are suggested to invest in this scheme.
4. ICICI prudential small cap direct growth scheme has been ranked last in all three years on the basis of Treynor Ratio but this scheme has shown a slow but consistent growth over the period.

8. CONCLUSION

Mutual fund provides a wide variety of schemes among different categories, depending upon the risk-return portfolio. The four selected schemes in small cap category were ranked among top schemes by CSRIL rating. All the selected scheme has a positive and growing trend over the period. On evaluating their performance, it was revealed that Kotak Mahindra small cap direct option growth plan was found to be top ranker in Treynor Ratio while the ranking of Sharpe ratio kept on changing year by year the major reason between the rank of these two ratios were due to the consideration of standard deviation, which explains the deviation of daily return from the mean return. This study has used various methods and techniques to evaluate the performance as well as risk and return of selected schemes that will help the investors to invest their capital in a rational way and gain effectively. Further, this study will also attract other researchers to work in this area of study with other schemes and plans of mutual fund companies.

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