Full Length Research Article

TIME SERIES DATA MODELING AND PREDICTION OF LIQUID PETROLEUM GAS

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ARTICLE INFO	ABSTRACT

Time series modeling and prediction has ultimate meaning to various practical domains. Thus a lot of research works are going on in this subject during several years. Many significant models have been suggested in various literature for improving the precision and effectiveness of time series modeling and prediction. The goal of this article is to present a brief sketch of popular time series prediction models used in practice. We have described here important classes of time series models. We have also discussed about the basic issues related to time series modeling. Here we have collected historical data of Liquid Petroleum Gas (LPG) Domestic consumption from year 2008 to 2014 of every month's data. We also discussed about various time series models is maintained by giving the experimental prediction results, implemented on time series datasets. While fit a model to a dataset, special care is taken to select and the most ungenerous one. To evaluate prediction precision models fitted to a time series. We have shown the found prediction diagram, which graphically represents the intimacy between the original and prediction observations.

INTRODUCTION

Time series modeling is a dynamic research area, which has attracted attentions of researchers. The main goal of time series modeling is to collect and meticulously study the past observations of a time series to improve a suitable model, which designates the important structure of the series. This model is generated for future values of the series, i.e. to make predictions. Time series prediction thus can be called as the act of prediction the future by thoughtful the past. Due to the indispensable importance of time series prediction in several useful fields such as business, economics, finance, science and engineering, to fit an adequate model to the underlying time series data. The time series prediction depends on a suitable model fitting. Over the several years, the researchers try to develop effective models to progress the prediction correctness. As a result, various important time series prediction models have been evolved in literature. The most popular and frequently used time series models are the Liner Regression models. The basic assumption made to implement in this model. In practice a suitable model is fitted to a given time series and the corresponding parameters are estimated using the known data values.

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The process of fitting a time series to a suitable model is termed as Time Series Analysis. Time series prediction has important applications in various fields. Often valuable strategic decisions and precautionary measures are taken based on the prediction results. Thus making a good predict, i.e. fitting an adequate model to a time series very important.

Time Series Model

The simplest Time Series model is certainly the white noise. A first generalization of the white noise is the moving average.

Definition: (The MA(q) process) the process $\{X_t, t \in Z\}$ is said to be a moving average of order *q* if

$X_t = Z_t + \theta_1 Z_{t-1} + \ldots + \theta_q Z_{t-q}$, $\{Z_t\} \sim WN(0, \sigma^2)$ Where $\theta_1, \ldots \theta_q$ are constants. We will now extend MA(q) processes to linear processes.

Definition: (Linear processes) the process $\{X_t, t \in Z\}$ is said to be a linear process if it has the representation

$\{Z_t\} \sim WN(0, \sigma^2)$, where $\sum |\psi_j| < \infty$

Analysis and observation

We have presented the prediction results of the experiments done by us. From the performance measures obtained for

historical dataset, one can have a relative idea about the effectiveness and accuracy of the fitted models. The time series datasets, we have considered are taken from non-confidential sources and each of them is freely available for analysis. We have collected data from 2008 to 2014 monthly LPG Domestic Consumption (in Metric Ton) from Odisha. In this Figure (Fig 7) we can observe the LPG Domestic

Consumption trend gradually increased, but in fluctuated mode from January 2008 to December 2014. The graph shows that, LPG consumption suddenly increased from 22 Metric Ton to 26 Metric ton in September 2014, after that suddenly the consumption coming down in December 2014 at 22 Metric Ton.
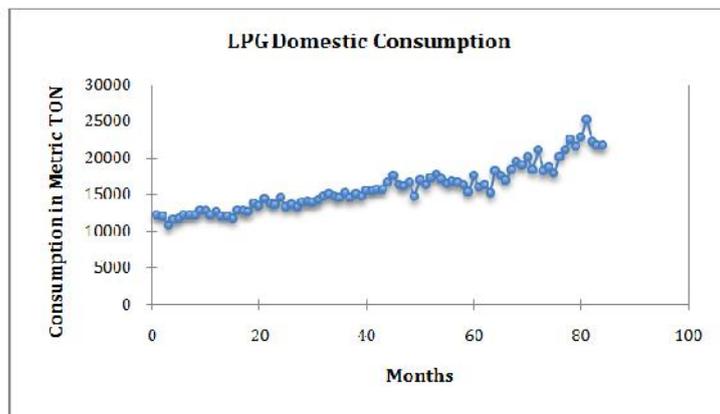
LPG Domestic Consumption month wise from 2008 – 2014

Fig. 1. *LPG Domestic Consumption in Odisha*

Summary Statistics (Quantitativedata)

Table 1. Summary Statistics

Variable	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
LPG	84	0	84	10896.0	25350.0	15953.08	3123.723
Months	84	0	84	1.000	84.000	42.500	24.393

Correlation matrix

Table 2. Correlation matrix

	Months	LPG
Months	1	0.934
LPG	0.934	1

Goodness of fit statistics of LPG

Table 3. *Regression of variable*

Observations	84.000
Sum of weights	84.000
DF	82.000
R²	0.872
Adjusted R²	0.870
MSE	1263811.638
RMSE	1124.194
MAPE	4.683
DW	0.944
Cp	2.000
AIC	1182.146
SBC	1187.007
PC	0.134

Analysis of variance

Table 4. *Analysis of variance*

Source	DF	Sum of squares	Mean squares	F	Pr> F
Model	1	706252002.141	706252002.14	558.827	< 0.0001
Corrected Total	83	809884556.417			

Computed against model Y=Mean(Y)

**Model parameters**

Table 5. *Model parameters of LPG*

Source	Value	Standard error	t	Pr> |t|	Lower bound (95%)	Upper bound (95%)
Intercept	10870.65	247.526	43.917	< 0.0001	10378.247	11363.063
Months	119.587	5.059	23.640	< 0.0001	109.523	129.650

Standardized coefficients of LPG
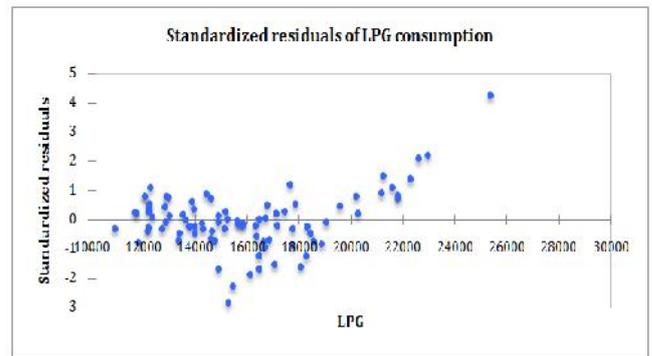
Table 6. *Standardized coefficients*

Source	Value	Standard error	t	Pr> |t|	Lower bound (95%)	Upper bound (95%)
Months	0.934	0.040	23.640	< 0.0001	0.855	1.012

Standardized coefficients of LPG Consumption
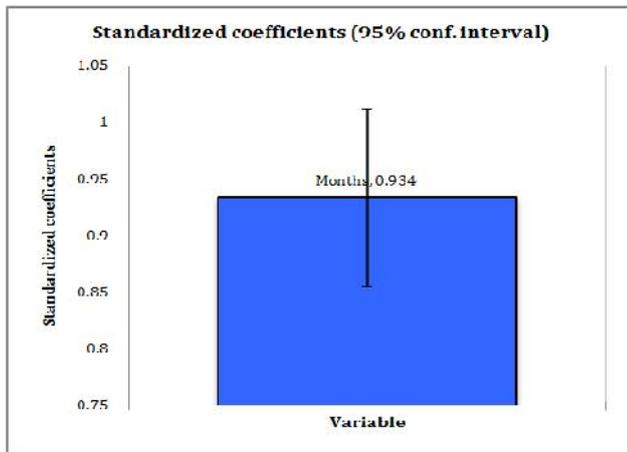
Fig. 2. *Standardized Coefficients*

Regression Model of LPG Consumption

Fig. 3. Regression Model of LPG Domestic Sale in Odisha

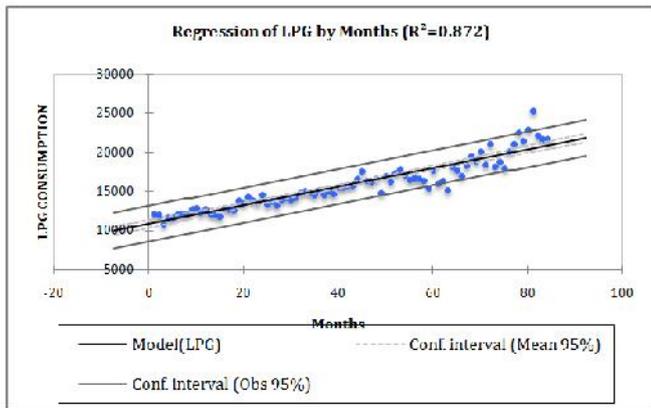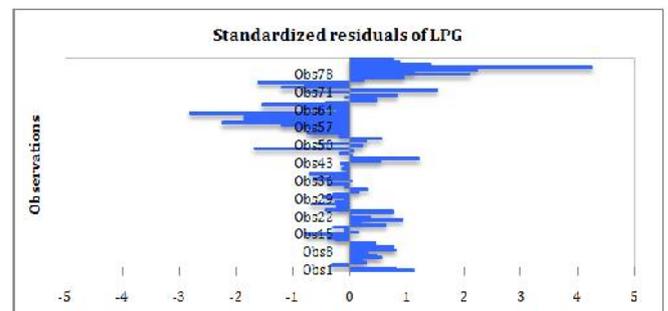**Standardized residuals months of LPG Consumption**

Fig. 4. *Standardized residualsmonths*

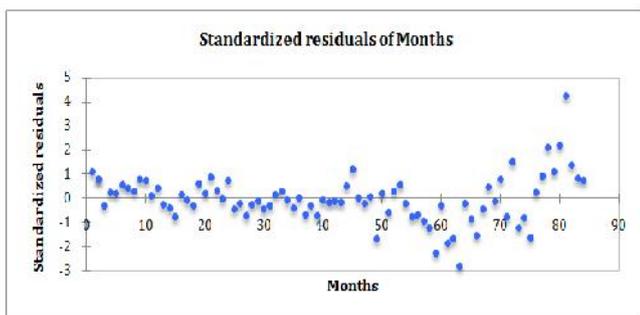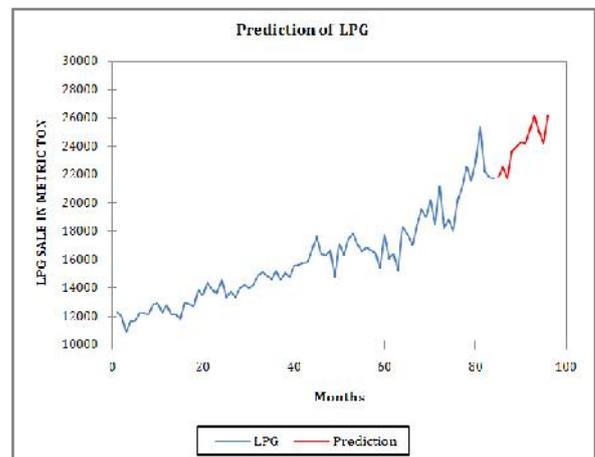**Standardized residuals of LPG Consumption**

Fig. 5. *Standardized residuals of LPG Domestic Consumption in Odisha*

Standardized residuals Observation

Fig. 6. *Standardized residuals Observation*

Prediction of LPG Domestic Consumption in Odisha

Fig. 7. *Prediction of LPG Domestic Consumption in Odisha*

Basically the consumption of LPG trend is increases in a fluctuated manner. Ourprediction model of LPG consumption foryear 2015 is showing in this Figure (Fig. 7), which is increased as a same manner from 22 Metric Ton to 27 Metric Ton. In this article we are analyzed the LPG Domestic consumption rates for seven years between 2008 and 2014, and predicted the same for year 2015. It can be seen from this Figure that the data are heavily jagged and the accuracy of the prediction is better and robust. The Figure 1 shows the LPG Domestic Consumption for year 2015 and other Figures are showing different types of analysis like Figure 2 is showing standardized coefficients, Figure 3 showing Regression model, Figure 4, 5, and Figure 6 are showing different standardize residuals.

Conclusions

Prediction of time series data is a difficult problem. In this article we used data series with LPG monthly consumption starting from 2008 to 2014in Odisha, provided by the National Petroleum Analysis. Our model is developed with time series data of LPG consumption in Odisha. The research is, to develop the model of time series data with the help of Linear Regression, which is showing in Figure 3. In this model the confidence interval mean is 95% and the confidence interval observation also is 95%. So our prediction model for said consumption is accurate and the result also shows that the said model has done in good method for predicting the time series data.

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