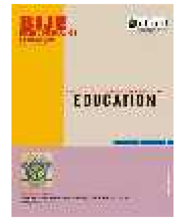
BIJE – Bichi Journal of Education
ISSN(Print): xxxx-xxxx ISSN(Online): 2734-3375
Vol. 10, No.1 2010; pp: 80-92.
Publisher: School of Education, F.C.E (T) Bichi.
URL: https://bijejournal.com/BIJE



DEVELOPMENT OF TIME SERIES MODELS TO FORCAST THE RETAIL PRICES OF FOOD ITEMS IN GOMBE STATE,NIGERIA

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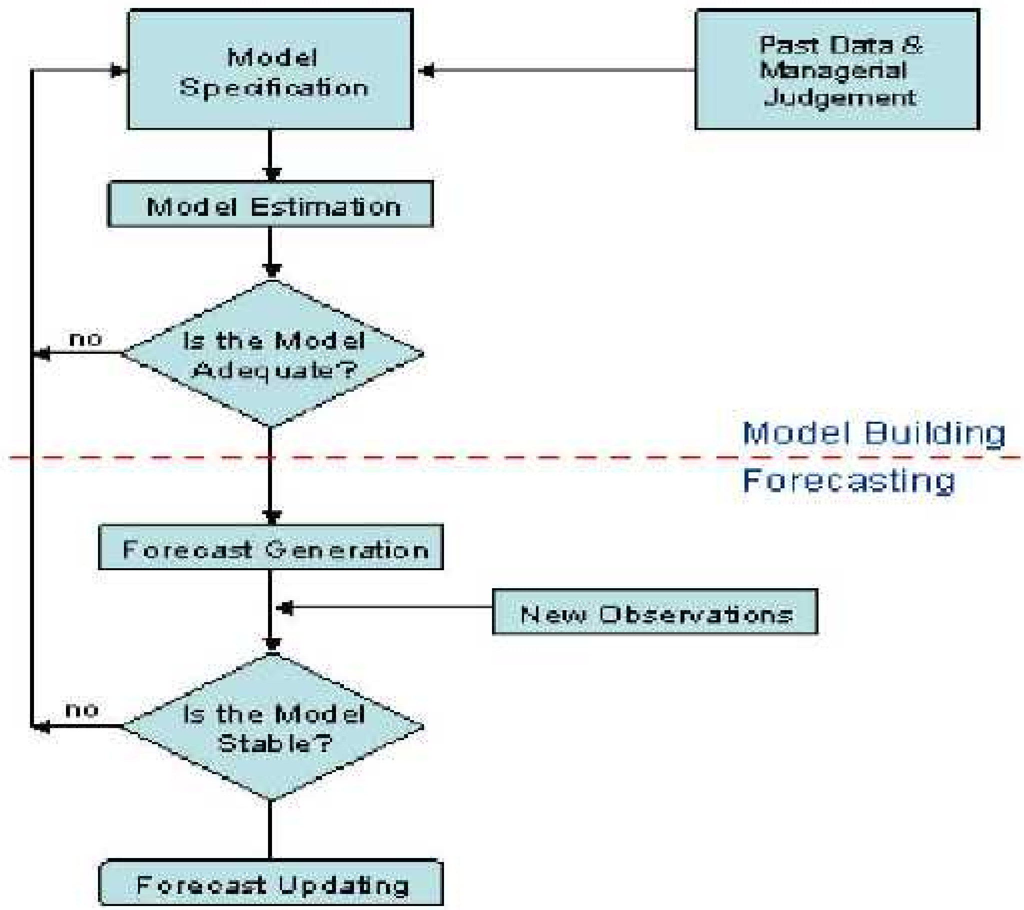
ABSTRACT

Models for both linear and quadratic trends for food items in Gombe state have been obtained. Correlogram and Partial autocorrelation of the time series data are plotted in which the correlogram decays rapidly to zero, indicating that the series is stationary. Also, the partial autocorrelation cuts off after lag 1 suggesting an autoregressive (AR) model of order 2. The models obtained were used in making the forecast. It has been observed that the quadratic trend is a much superior than the linear one. Recommendations are made which include; the Government should ensure the accurate generation of data, storage of same, retrieval and use for proper planning.

INTRODUCTION

The selection and implementation of proper forecast methodology has always been an important planning and control issue for most firms and agencies. Therefore, forecasting is a necessary input to planning whether in business, or government. According to Okafor (2003), forecasting can be defined as a way of making prediction from passed observations using an appropriate time series models. Forecasting can only be achieved using time series data. However, time series can be viewed as a set of observations made sequentially in time (Apinpo, 1991). A time series may be discrete or continuous depending on whether observations were made continuously in time or were made at specific points in time, usually equally spaced. Continuous time series; where we have an observation at every instant of time, e.g. lie detectors, electrocardiograms. We denote this using observation X at time t, X(t). On the other hand, discrete time series is a situation where we have an observation at (usually regularly) spaced intervals. We denote this as Xt. The following flowchart highlights the systematic development of the forecast.



Forecasting System:
The Model-Building and The Forecasting Phases

Fig. 1 **Source** : Box and Jenkins (1976)

The above modeling process is useful to:

- understand the underlying mechanism generating the time series. This includes describing and explaining any variations, seasonality, trend, etc.
- predict the future under "business as usual" condition.
- control the system, which is to perform the "what-if" scenarios.

According to Musa (2004), there are two main approaches to forecasting. Either the estimate of future value is based on an analysis of factors which are believed to influence future values, i.e., the explanatory method, or else the prediction is based on an inferred study of past general data behavior over time (the extrapolation method). For example, the belief that the sale of doll clothing will increase from current levels because of a recent advertising blitz rather than proximity to Sallah/Christmas illustrates the difference between the two philosophies. It is possible that both approaches will lead to the creation of accurate and useful forecasts, but it must be remembered that, even for a modest degree of desired accuracy, the former method is often more difficult to implement and validate than the latter approach. Effort will be made to apply appropriate models on Consumer price index.

CONSUMER PRICE INDEX

Consumer price index (CPI) is designed to measure changes in the level of retail prices paid by consumers (Hawkins,2006). The Bureau for Statistics of Nigeria (BSN) used to compute the composite consumer price index which measures average changes in the level of retail prices of goods and services consumed by households living in all parts of the country. This provided expenditure data from which items weights were derived for urban and rural indices. The changing consumption pattern of households is mirrored in the result of BSN taken at regular intervals which give rise to new market baskets and constitute items weights (Yeye, 2004). With each successive BSN, the CPI usually selects the year in which survey is carried out as the base year for the index based there on. Therefore, consumer price indices are continually being updated and be given new base year.

STATEMENT OF THE PROBLEM

The continuous increase in the price of food items has been a serious problem to the government and a threat to the survival of the common man in Nigeria. Many could not afford three square meal and has no any hope. Government has no base to make any plan so as to alleviate the suffering of its citizens. This study intends to provide time series models for both linear and quadratic from the available data for use to forecast. This will go a long way in providing base for planning in respect of food items.

OBJECTIVEE OF THE STUDY

This study focused on achieving the following objectives:

i) To examine the consumer price indices for the period January, 2003 to December, 2006.

ii) To fit time series models to the consumer price index for food.

iii) To forecast the consumer price index for food.

SCOPE AND SOURCE OF DATA

The data used for this study was collected from the Bureau for Statistics, Gombe, Gombe state. The data covered Gombe Urban centers for a period of four years. The limitation to urban centers is because majority of the consumers were in the urban areas.

TIME PLOT

The observation (price of food items) was plotted against time. The purpose was to bring to light the components of time series models; namely: Trend, Seasonal variations, cyclical variations and Irregular variations.

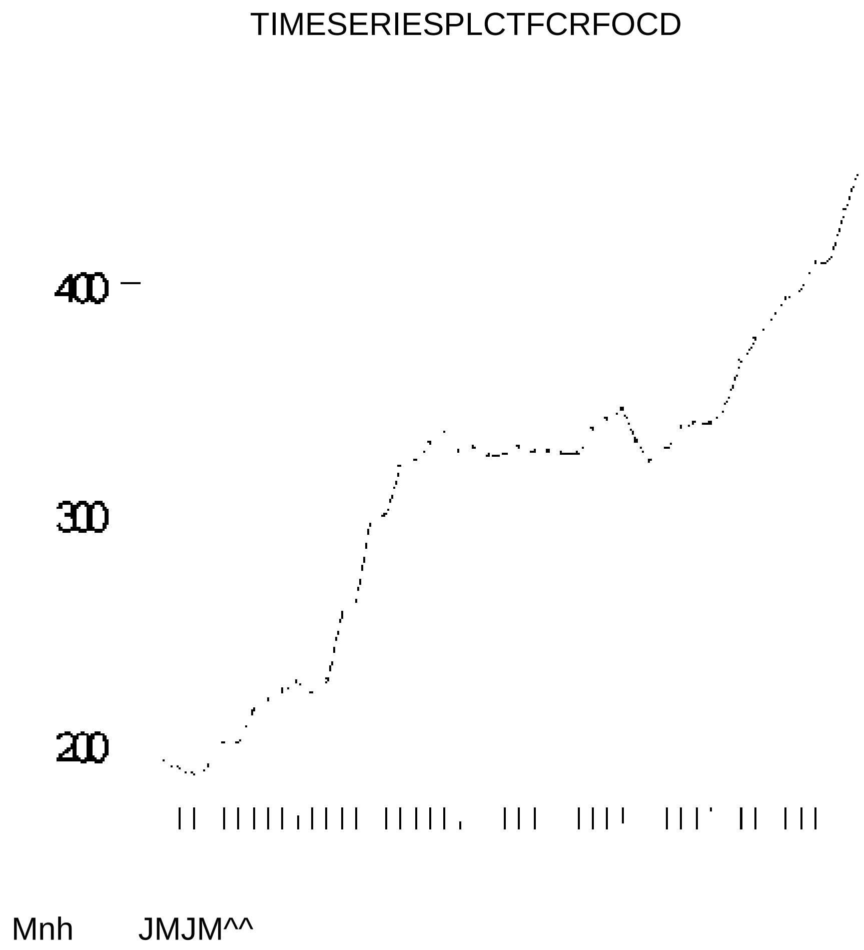


Fig. 2

The series started with minimum value of 191.2 in January 2003 and thereafter shows an upward movement up to September 2004 when the series become stable until in May 2005. From that point it showed another upward movement to attain the maximum value of 449.4 in December 2006.

FORCAST USING TREND ANALYSIS

i) LINEAR

TREND ANALYSIS OF FOOD(LINEAR)

L i near Trend Mode l

Yt = 193.936 + 4.68448*t

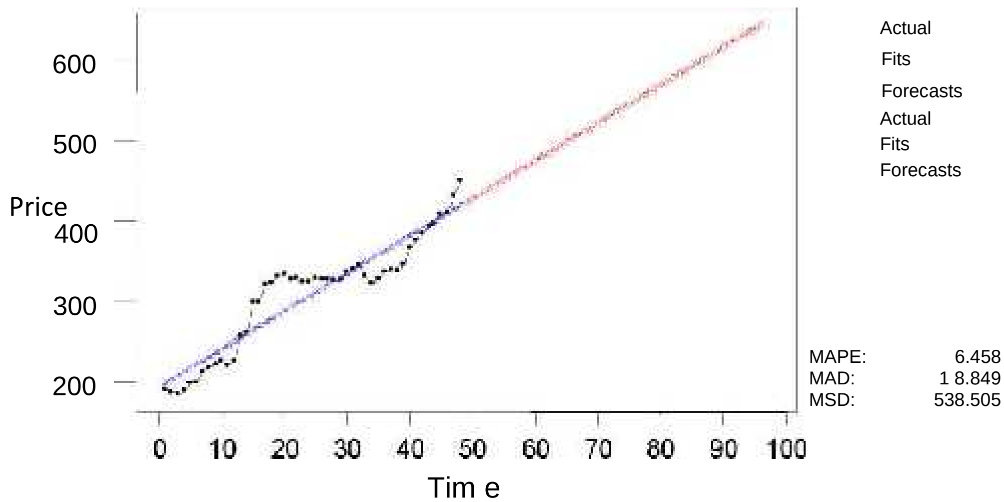


Fig. 3

ii)QUADRATIC

TREND ANALYSIS OF FOOD(LINEAR)

Quadratic Trend Model

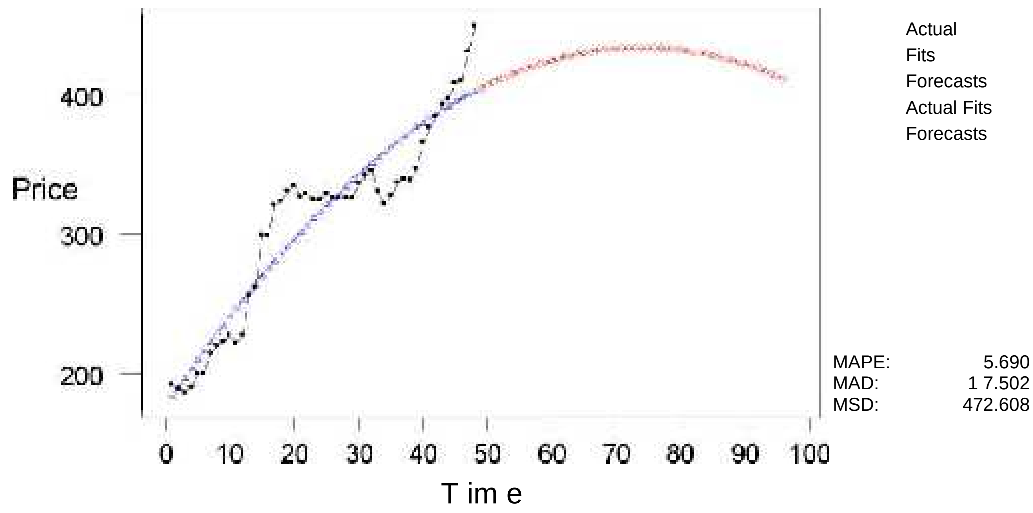


Fig. 4

RESULTS OF THE FORCAST USING TREND ANALYSIS

After obtaining stationarity from the data, the following models were obtained for both linear and quadratic are given below:

i) Yt = 193.936 + 4.6845t -------------Linear

ii) Yt = 174.613 + 7.0033t - 4.73E02 * t **2 ----------- Quadratic

Predicted values using both linear and the quadratic trends are presented in appendix I. The results of the forecasts are obtained for the next 48 months (i.e 4 years). Comparing the predicted values of the two models with the actual data indicates that the quadratic trend is a much superior fit than the linear one.

FITTING TIME SERIES MODELS

It has to be established whether the underlying stochastic process that generated the series can be assumed to be invariant with respect to time (if the process are stationary). To find out the stationary of the process. we should examine the correlogram and plot of partial autocorrelation.

C O R R E LO G RAM F O R F O O D

Corre.

0.9 —
0.8
0.7 —
0.6
0.5 —
0.4
0.3
0.2
0.1
0.0 —

Time

Fig. 5

0 5 10

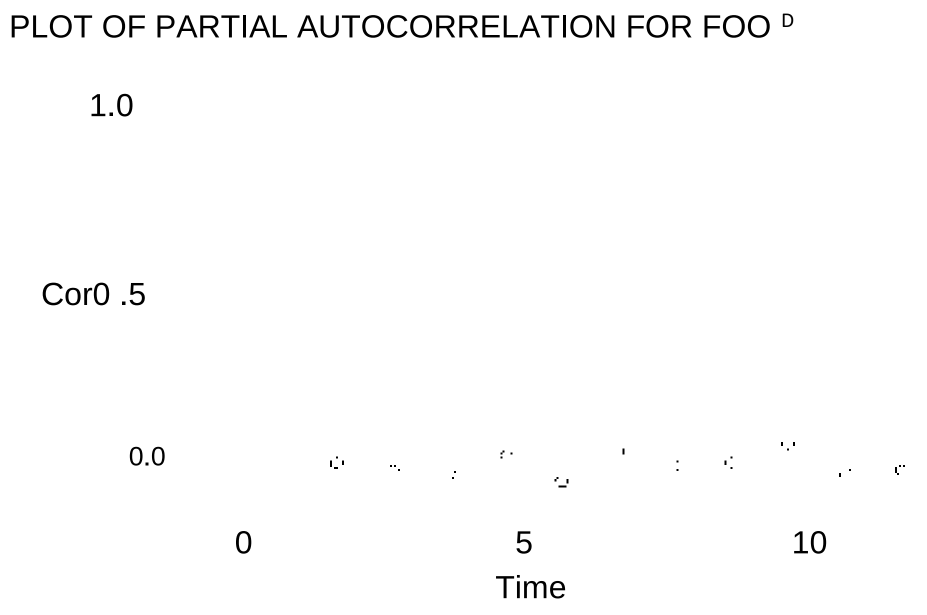


Fig. 6

ANALYSIS OF THE SERIES

The correlogram decays rapidly to zero, indicating that the series is stationary. Also, the partial autocorrelation cuts off after lag 1 suggesting an AR model of order 2. Therefore, the model is used to generate forecast for the next 48 months which is given on appendix 1.

CONCLUSION

Models for both linear and quadratic trends for food have been obtained. Predicted values have also been obtained using both linear and the quadratic trends. The results of the forecasts are obtained for the next 48 months (i.e 4 years). It has been observed that the quadratic trend is a much superior fit than the linear one.

The correlogram decays rapidly to zero, indicating that the series is stationary. Finally, the partial autocorrelation cuts off after lag 1 suggesting an AR model of order 2.

RECOMMEMDATIONS

The following recommendations were made

i) Before fitting any model, stationarity has to be established

ii) Government should ensure accurate generation of data, storage of same, retrieval and

use for proper planning.

iii) Modern silos have to be constructed for food reservation.

iv) Other time series models should be employed to generate forecast.

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APPENDIX I

MONTHS	ACTUALb DATA	LINEAR FORECAST	QUADRATIC FORECAST
1	191.2	423.476	404.153
2	188.1	428.161	406.471
3	185.3	432.845	408.695
4	189.4	437.529	410.824
5	199.2	442.214	412.859
6	199.8	446.898	414.799
7	214	451.583	416.644
8	218.7	456.267	418.394
9	222.4	460.952	420.050
10	226.4	465.636	421.611
11	220.9	470.321	423.078

12	226.6	475.005		424.45
13	255.9	479.690	7	425.72
14	261.5	484.374	0	426.91
15	299.4	489.059	8	427.99
16	298.3	493.743	1	428.99
17	320.5	498.428	0	429.89
18	323.3	503.112	4	430.69
19	330.3	507.797	4	431.40
20	334.7	512.481	8	432.01
21	326.6	517.166	9	432.53
22	328.9	521.850	4	432.96
23	324.6	526.535	5	433.29
24	324.9	531.219	1	433.53
25	328.8	535.904	3	433.67
26	326.3	540.588	0	433.72
27	326.2	545.273	2	433.67
28	326	549.957	0	433.53
29	325.9	554.642	3	433.29
30	336.1	559.326	1	432.96
31	340.8	564.010	5	432.53
32	345	568.695	4	432.01
33	330.4	573.380	8	431.39
34	321.4	578.064	8	430.68
35	327.7	582.748	3	429.88
36	336.8	587.433	4	428.98
37	338.8	592.117	0	427.99
38	338.3	596.802	1	426.90
39	345.9	601.486		425.71

40	365.4 606.171		424.44
41	375.9 610.855	7	423.06
42	383.8 615.540	0	421.60
43	392.8 620.224	8	420.03
44	396.4 624.909	1	418.38
45	408.3 629.593	0	416.63
46	409.6 634.278	4	414.78
47	431 638.962	3	412.84
48	449.4 643.647		410.80