

ANALYSING AND FORECASTING ELECTRICITY CONSUMPTION OF GHANA TIME SERIES

ECF GROUP

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- 1 Names
- 2 Introduction
- 3 Description
- 4 Stationarity
- 5 ACF and PACF



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INTRODUCTION

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Total electricity generation almost doubled from 14,068 GWh in 2011 to 22,051 GWh in 2021, representing an annual average growth rate of 11%.

Total electricity consumption increased from 13,036 GWh in 2017 to 18,067 GWh in 2021 representing an annual average growth rate of 8% (according to energy commission of Ghana).



Description

| Min | 1st Quatile | Median | Mean | 3rd Quatile | Max | Var |
|-------|-------------|--------|--------|-------------|--------|----------|
| 86.27 | 281.04 | 328.29 | 322.29 | 372.99 | 523.25 | 6647.897 |

We plotted the electricity consumption(KWh per capita) data against time of their collection, Thus from 1971 to 2022 as shown in Figure6.



PLOT OF THE ELECTRICITY TO TIME

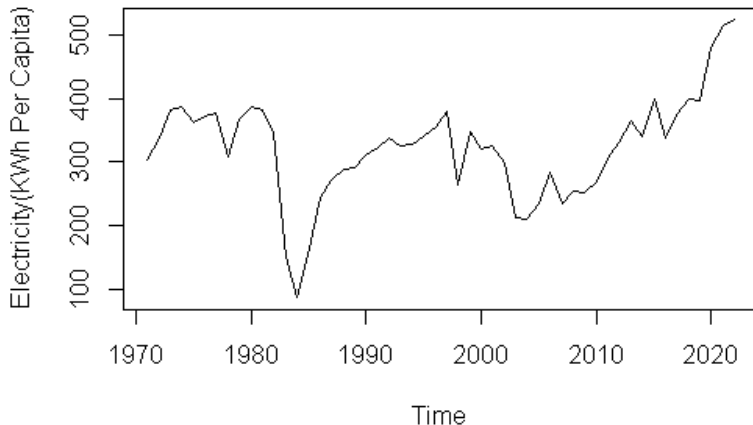


Figure: Plot of Electricity to Time



Testing For Stationarity

There are variety types of stationarity tests but in this paper we are going to use the common ones and they are;

- ADF test with hypothesis
H0:the series is not stationary
H1:the series is statrionary.
- KPSS test with hypothesis
H0:the series is stationary
H1:the series is not statrionary.
- PP test with hypothesis
H0:the series is not stationary
H1:the series is statrionary.



Result After Computation

Augmented Dickey-Fuller Test

data: tsd Dickey-Fuller = -1.6073, Lag order = 3,
p-value = 0.7324 alternative hypothesis: stationary

KPSS Test for Level Stationarity

data: tsd KPSS Level = 0.24024
Truncation lag parameter = 3, p-value = 0.1

Phillips-Perron Unit Root Test

data: tsd Dickey-Fuller $Z(\alpha)$ = -9.3188,
Truncation lag parameter = 3, p-value = 0.5576
alternative hypothesis: stationary



First Difference

Since the series is not stationary we perform 1st differencing in order to achieve stationarity; The figure 4.2 below is a plot after the first differencing .



Plot of First Difference

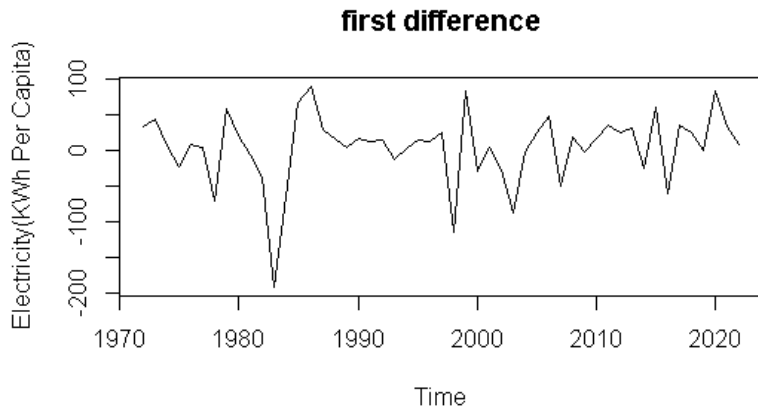


Figure: First difference plot



Stationarity Testing For Differenced Data

Augmented Dickey-Fuller Test

data: diff1 Dickey-Fuller = -4.8579, Lag order = 3, p-value = 0.01
alternative hypothesis: stationary

KPSS Test for Level Stationarity

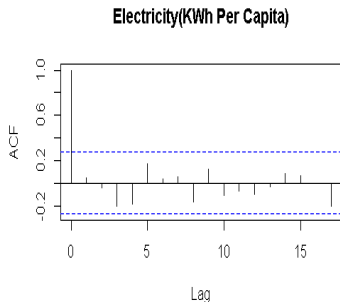
data: diff1 KPSS Level = 0.14346, Truncation lag parameter = 3, p-value = 0.1

Phillips-Perron Unit Root Test

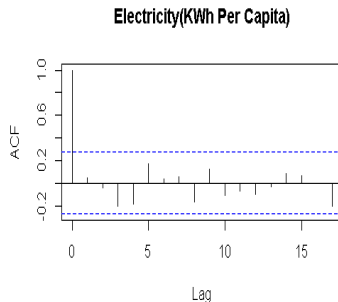
data: diff1 Dickey-Fuller $Z(\alpha)$ = -43.687, Truncation lag parameter = 3, p-value = 0.01 alternative hypothesis: stationary.



ACF and PACF



(a) ACF Plot



(b) PACF Plot

Since none of the spikes are significant, we will use the information criterion