where $F_{1,n-2}^{1-\alpha}$ is the $(1-\alpha)100$ percentile of the F – distribution (Neter, Wasserman, & Kutner, 1983).

2.2 Autogressive Time Series Model

Non-inclusion of one or several key variables and systematic coverage errors in the dependent variable time series, which errors are possibly positively correlated over time lead to autocorrelation in the error terms (Neter, Wasserman, & Kutner, 1983; Gujarati & Porter, 2009). Autocorrelation leads to serious setbacks of the Ordinary Least Square procedures because the minimum variance property does not hold even if the estimates are unbiased. In the same way, the non-inclusion of other key independent random variables in the time series model thus regressing the time series data on its one-step lagged variable may lead to a situation where the time series data and its one-step lagged value are autocorrelated (Gujarati & Porter, 2009).

The autoregressive model is given as

$$y_t = \alpha + \beta y_{t-1} + e_t \quad (3)$$

where y_t is a time ordered dependent variable, α and β are regression parameters, y_{t-1} is a one period lag of the dependent variable and e_t is the residual /error associated with the estimation of y_t (Neter, Wasserman, & Kutner, 1983; Gujarati & Porter, 2009).

y_t and y_{t-1} are stochastic. This violates the assumption of non-stochastic independent variables in classical least squares theory. Now,

$$e_t = \rho e_{t-1} + \mu_t \quad (4)$$

The h statistic given as

$$h = \underline{\hat{\rho}}\sqrt{\frac{n}{1-n[var(\rho)]}} \quad (5)$$

which exists within the interval $0 < n[var(\rho)] < 1$; where $\underline{\hat{\rho}}$ is the estimate of first-order serial correlation $\underline{\rho}$, n is the sample size and $var(\rho)$ is the variance of the coefficient of the lagged variable y_{t-1}; is used to detect first-order serial correlation in Equation 2.3.8 because the traditional Durbin-Watson d statistic may yield a d value that usually tends to 2, the value of d expected in a truly random sequence (Gujarati & Porter, 2009).

Where the sample size is large, under the null hypothesis that $\underline{\rho} = 0$,

$$h \sim N(0,1) \qquad (6)$$

More so, $\underline{\rho}$ may be estimated as

$$\underline{\hat{\rho}} \approx 1 - \frac{d}{2} \qquad (7)$$

(Gujarati & Porter, 2009), where d is the Durbin-Watson d statistic.

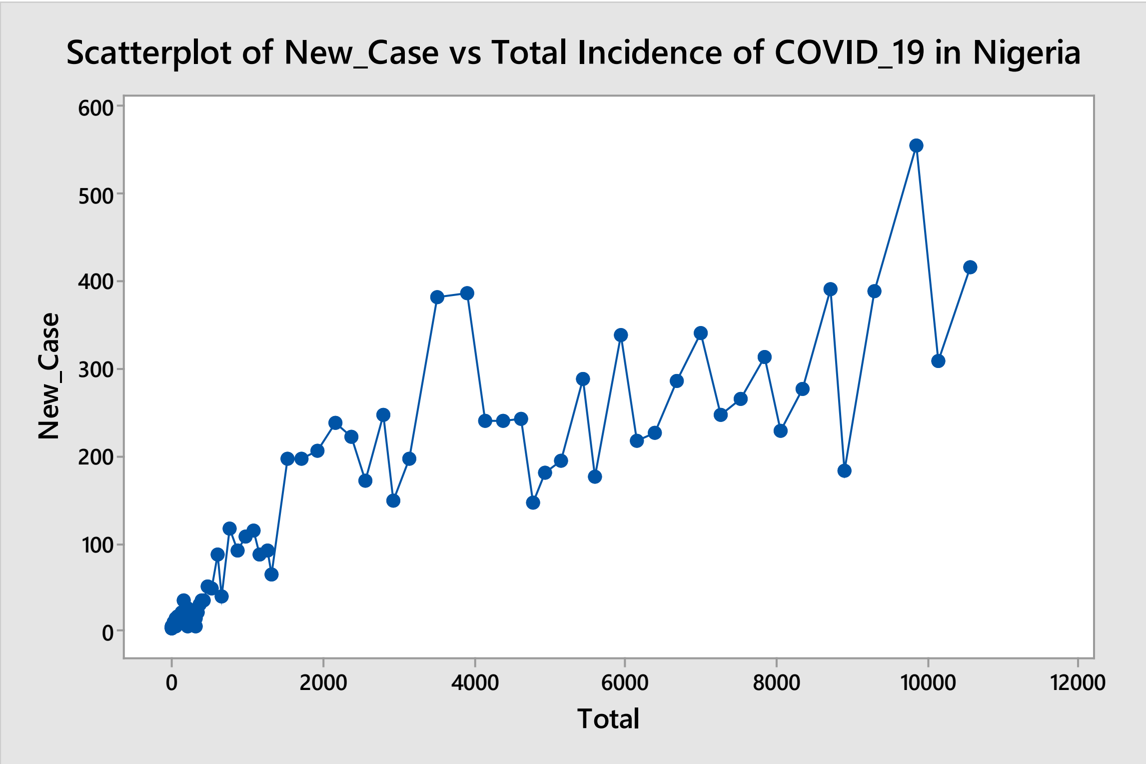

Figure 1: A relationship between New Cases and Current Totals of COVID – 19 in Nigeria.

Figure 1 shows the relationship between current totals and new cases of the virus in which there is a visible direct relationship between the two variables.

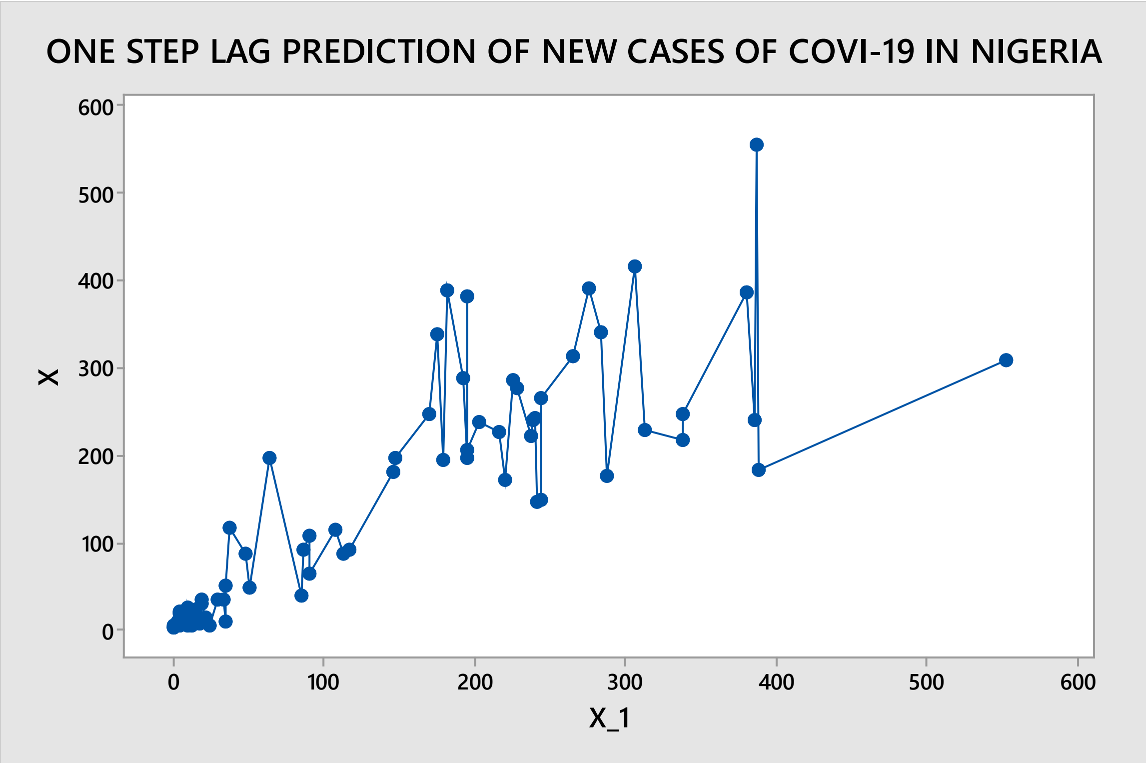

Figure 2: One Step Lag relationship for new cases of COVID-19.

Figure 2 above shows a direct relationship between current cases and its one step lag.

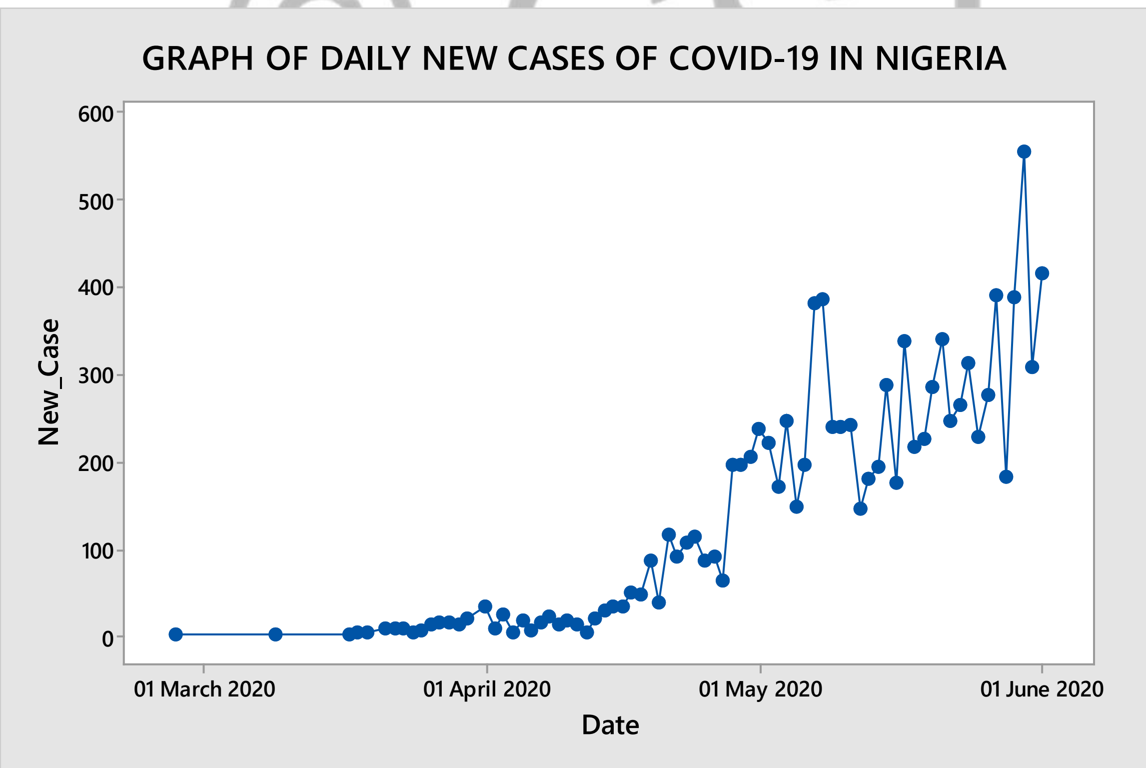

Figure 3: Time Trend of New Cases of COVID – 19 from March to June 2020

The trend shows an upward relationship between New Cases and Time.

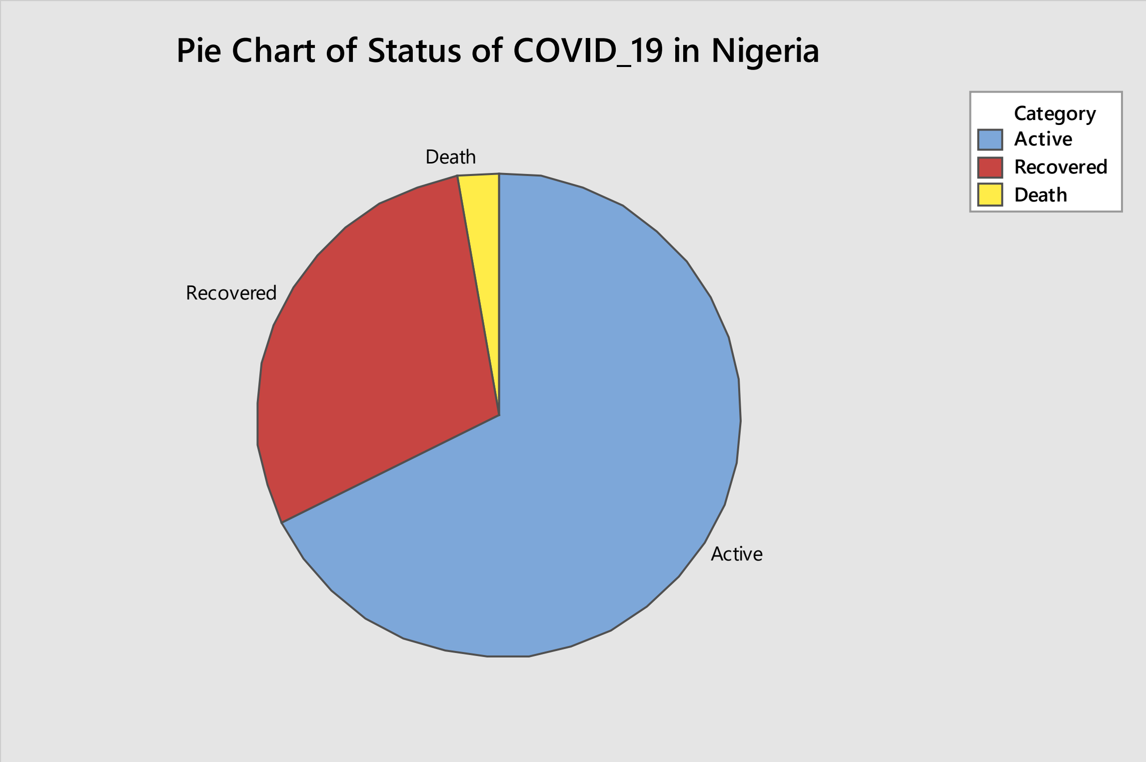

Figure 4: Pie Chart of COVID-19 status in Nigeria

The chart above shows Actives Cases to be the highest followed by Recovered and Death.

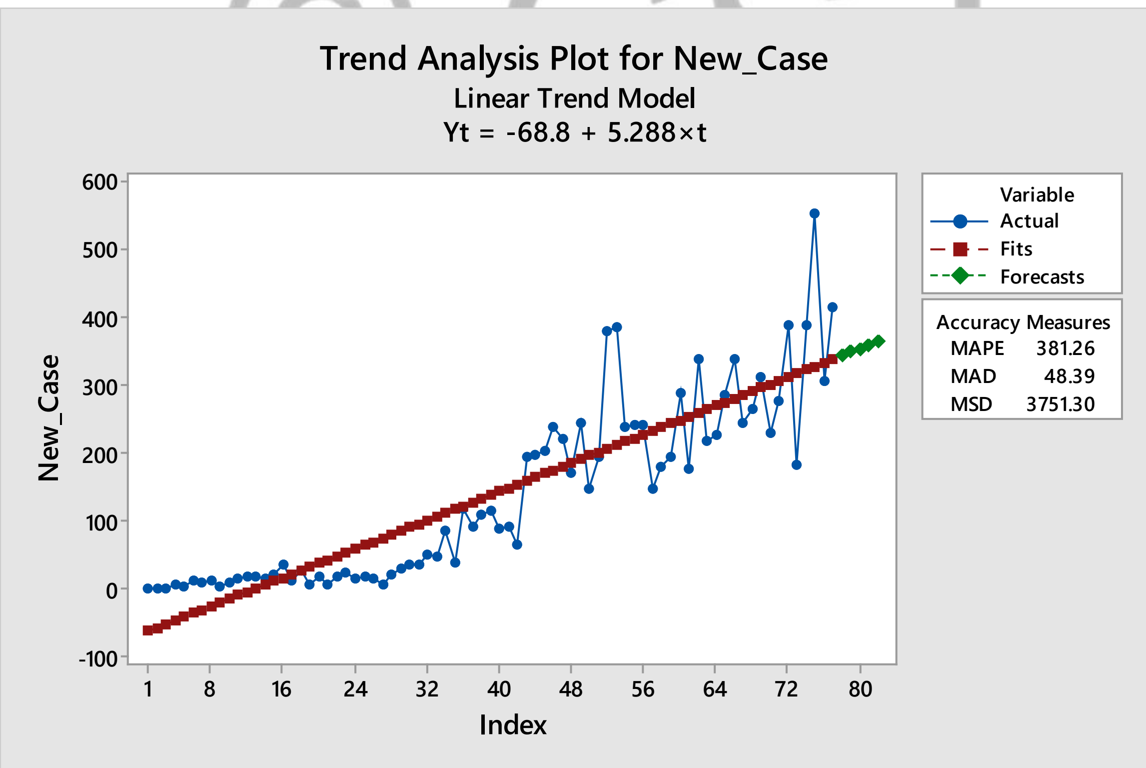

Figure 5: Linear Trend of New Cases of COVID – 19 in Nigeria.

The Linear Trend is

$$y_t = -68.8 + 5.288t \quad (8)$$

The trend forecasted new cases for five periods as 344, 349, 354, 359 and 365. All the five forecasts are less than the last observed value showing infection rate was already dropping.

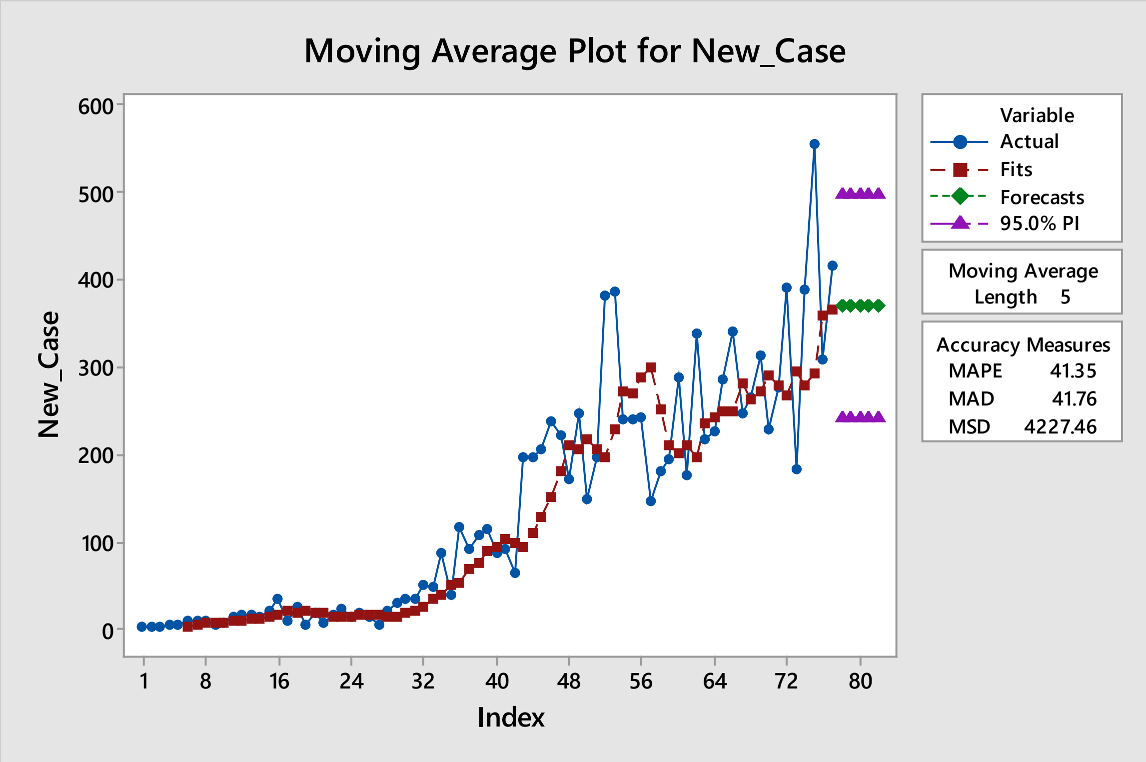

Figure 6: Five Period Moving Average of New Cases of COVID – 19 in Nigeria

The five period moving average forecast is constant at 369 for the next five periods. This is actually less than the last observed New Case showing a drop in future cases.

The Simple Linear Regression Model

The simple linear regression model for the relationship between New Cases and Total reported cases is

$$New\ Case_i = 36.64 + 0.03669 \times Total_i + e_i \qquad (9)$$

An F – value of 248.29 and a P – value of 0.00 show that the regression parameter is significant implying that the model is a good-fit for the data at 0.05 level of significance.

The Autogressive Model:

The autoregressive model was estimated as

$$X_t = 23.6 + 0.8642X_{t-1} + e_t \qquad (10)$$

while the autocorrelation model for the error term was estimated as

$$e_t = -0.29 - 0.354e_{t-1} + \mu_t \qquad (11)$$

The Durbin Statistic was estimated as

$$h = -3.7109$$

At 0.5% level of significance, the null hypothesis of insignificance of the autocorrelation coefficient was rejected showing that autocorrelation exists between the error terms.

Proportional Incidence Analysis

Kogi State recorded a total of 2 cases, 2 active cases, no recovery, and no death giving a 1.00 proportion of active cases in the state. Zamfara State recorded a total of 76 cases, 0 active cases, 1 recovered cases and 5 deaths giving 0.00 proportion of active cases, 0.9342 of recovery and 0.06578 of deaths. Bauchi recorded a total of 240 cases, 11 active cases, 221 recovered cases and 8 deaths giving 0.04583 proportion of active cases, 0.92083 cases recovery and 0.08333 of deaths. Finally, Ondo State recorded a total of 28 cases, 3 active cases, 21 recovered cases and 4 cases yielding 0.10714 proportion of active cases, 0.75 of recovery and 0.1429 proportion of deaths. It then implies that Kogi State has the highest state specific recovery rate followed by Zamfara and Bauchi states while Ondo State has the highest state specific proportion of deaths.

CONCLUSION/RECOMMENDATIONS

It is therefore apt to conclude that the daily new cases of COVID-19 in Nigeria was increasing monotonously within the studied period; the Linear Regression between daily new cases and total existing cases, the Time Series Trend Analysis of daily new Cases, the Autoregressive Time Series Model and the Five Year moving Average Model all forecasted a reduction in the daily New Cases pointing to a future reduction of Daily New Cases of COVID-19 in Nigeria. Analysis of Proportions has shown that Kogi State has the highest state specific recovery rate followed by Zamfara and Bauchi states while Ondo State has the highest state specific proportion of deaths. It is also obvious that the preventive measures in the country are paying off. Hence, it would be recommended that the current preventive measures should be sustained if not improved upon, citizens should continue to observe the preventive measures and the anxiety and fear associated with the coronavirus should be doused since all the predictive models point to a reduction in future occurrence of the virus.

References

Frieman, C. M. (2014). Coronavirus: important emerging human pathogens. *Journal of viroogy, 88*, 5209 - 5212.

Gujarati, N. D., & Porter, C. D. (2009). *BAsic Econometrics.* Singapore: McGraw Hill.

Kenneth, K. J. (2005, November). History and Recent Advances in Coronavirus Discovery. *The Pediatric Infectious Disease Journal*, S223 -S227. doi:10.1097/01.inf.0000188166.17324.60

Neter, J., Wasserman, W., & Kutner, M. H. (1983). *Applied Linear Regression Models.* Illinois: Richard D. Irwin, INC.

WHO. (2020). *COVID-2019: Question and Answers.* Switzerland: World Health Organization. Retrieved June 4, 2020

WHO. (2020). *There is a current outbreak of coronavirus (COVID-19) disease.* Switzerland: World Health Organization. Retrieved June 4, 2020