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Foundations of Data Science: Final Project

**Nigerian Regional Peace Index**

*Introduction*

With the emergence of a stable democratic process, long-standing petroleum reserves, and a healthy, viable workforce, Nigeria has the foundation to emerge as one of the larger economies on a global scale. As it stands, Nigeria constitutes Africa’s largest economy, with annual GDP topping one trillion dollars[[1]](#footnote-1). Despite the enormous potential of the country as a whole, many impediments block the processes that are necessary to develop a diversified, stable economy for Nigeria as a whole.

One such impediment is the seemingly constant specter of Boko Haram throughout the country. Not only has Boko Haram directly caused the internal displacement of over two million citizens[[2]](#footnote-2), but has also dissuaded critical foreign investment that would bring new sources of wealth and prosperity to the country. The question then becomes this: How can Nigerians stem the tide of attacks by the paramilitary group?

What I have developed with data gathered by the Partners for Peace in the Niger Delta NGO is a monthly forecast for attacks by Boko Haram. The P4P project has managed to map out recorded instances of Boko Haram activity throughout the country, and has made their findings available publicly (a link to the peace map is provided at the bottom). With this data, I sought to map out patterns that could be used to predict areas and months where violence was more likely to occur.

*Coding Process*

I went about this through a few easily-replicable processes. Firstly, I downloaded annual incident tables for crimes characterized as insurgency/counter-insurgency in Microsoft Excel. Then, I used conditional formatting to highlight all incident reports that named Boko Haram specifically. I then ordered all incidents by the color of the highlighted cells, and deleted all instances not dealing with Boko Haram. I then highlighted duplicate geographic coordinates and incident descriptions, and deleted any entries recorded twice or more. I should note that instances occurring over multiple LGA’s were tallied as separate instances in order to get accurate counts for each given LGA. Once duplicate instances were eliminated, I ordered all entries by date and state. For this project, I focused on Borno State, as it has some of the most frequent attacks by Boko Haram. With these annual tables, I created a new spreadsheet detailing the month and year in one column, and the count of Boko Haram incidents in another column. The dates for this spreadsheet are in chronological order. I then read that CSV into RStudio.

Using the “forecast” package, I converted the CSV into a time-series object, with frequency set to 12, for a monthly forecast. I then used the auto.arima( ) command to ascertain that the most accurate model would be ARIMA(0,1,0)(0,0,1), and used this model to derive 95% and 80% confidence intervals for the following year’s (2015) crime occurrences. I then read in another CSV structured the same as the other CSV I read in earlier, but with 2015’s actual crime figures added. Lastly, I used the plot.ts( ) command with plot.type = c(“single”) to plot the actual figures against the predicted, in order to get show significant similarity between the actual results and the projected results. In this graph, the top line represents the actual figures, with the bottom line representing my projections. I then went ahead and repeated the forecasting process with 2016’s tally input.

*Policy Recommendations*

The data collected generally suggests that the last November, December, and January of each calendar year tend to be less violent than others in the year. If the projections hold, this suggests that November through January would be the safest months to commission short term infrastructure projects, such as road repair or electrical grid maintenance. This recommendation would also apply to short/intermediate term relief efforts in Borno. Additionally, this time window coincides with Borno State’s dry season, which lends itself well to infrastructure projects[[3]](#footnote-3). I would recommend this information being shared with any future developers within the state.

Also, with the exception of June 2014, there seems to be a persistent drop in violence during the month of June. With this information, it appears that the month of June would be best to host community events, national/international conferences, and other short term endeavors within Borno State. Were the state to seek to develop tourism infrastructure, any proposed future tourism events would be well timed in June. There’s consistent summer weather and June coincides with the end of what is usually a two-month span of rainy weather in April and May.

The last policy recommendation would be to use this information to stagger the presence of security forces throughout the state and country. For instance, it may prove more efficient to use security forces in a relief capacity in June following the rainy season. This would allow the maximum benefit to parties damaged by the weather, while still maintaining a sizeable enough fighting force to cope with Boko Haram throughout the month.

I would seriously recommend that the last policy consideration be implemented first. Any type of investment or development project requires basic access to people and pre-existing infrastructure that may be difficult following the rainy season. This, combined with optimal security presence to ensure the safety of residents/workers in the area, is key to developing further infrastructure in the area.

*Further Research*

In terms of continuing the project, there remains much to be done. For one, these figures could easily be staggered by the LGA in which the crime is occurring, to get an even more in-depth look at where and when Boko Haram is attacking in Borno State. Also, previous years’ data can definitely be added to the forecasting process to draw from a larger sample size, and hopefully get even more accurate projections. Because this data is so well documented by the P4P in the Niger Delta organization, other states could be forecasted for as well. I see this research as especially pertinent to investors and developers interested in making the safest, most informed decision about when and where to undertake projects throughout the country. These figures constitute only the beginning of the research that can be done. I fully intend to pursue further research on the subject to create more meaningful, precise forecasts.

\*As an aside, I will be sending my finding to the Partners for Peace in the Niger Delta NGO to see if they would find any use in my continuing to forecast Boko Haram attacks.

Partners for Peace in the Niger Delta Peace Map: <http://www.tgpcloud.org/p4p/index.php?m=p4p>

Partners for Peace in the Niger Delta Organization:

<http://www.p4p-nigerdelta.org/>

1. https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html [↑](#footnote-ref-1)
2. https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html [↑](#footnote-ref-2)
3. https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,Maiduguri,Nigeria [↑](#footnote-ref-3)