



Constructing geopolitical risk index for Nigeria

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ABSTRACT

We focus on computing the geopolitical risk index (GPRI) for Nigeria, the largest economy in Africa. The country has faced crises, including Boko Haram insurgency, banditry, kidnapping, EndSARS, and regional secession, affecting trade relationships with other countries. Existing GPR indices do not include Africa, hence the need for this effort. The proposed index considers eight prominent Nigerian newspapers and relevant keywords on a daily basis from Jan 1, 2012, to June 19, 2023. We evaluate the predictability of the index by examining its relationship with Nigeria's currency and stock markets. Our findings reveal a remarkable positive relationship between the rising geopolitical tensions and the volatility of the currency and stock markets. Curbing geopolitical tensions in Nigeria is crucial for financial market stability.

Introduction

This paper presents the premiere study on geopolitical risk in Nigeria. Our interest in Nigeria hinges on a plethora of social and political events in this country. The combined insurgent attacks by Boko Haram and the network of Islamic State in Iraq and Syria (ISIS) in the North-East, banditry in the North-West, and farmer-herder conflict in the South-West and Middle Belt/ North-Central have all constituted a heightened socio and geopolitical tension in the country. Similarly, the age-long secession agitation by the Indigenous People of Biafra (IPOB) in the South East and the agitation over resource control by the Movement for the Emancipation of Niger Delta (MEND) in the South-South have never ceased. In fact, hardly is there a region in Nigeria that is not battling some sort of socio-political tension, and the government's attempts to contain these events have occasionally met with unwavering opposition from various regional-based socio-political/interest groups. This is underscored by their deepening distrust in government and its institutions, and the October 2020 'EndSARS' demonstration embarked upon by the Nigerian youths was a fallout of such institutional failure and mistrust. Consequently, these events have been flying a red flag on the country before the international business community, which has found it too hostile for their investments. Akin to the foregoing, the Bank of England has enlisted geopolitical risk as one of the

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‘uncertainty trinity’ – which includes economic and policy uncertainties – that might have severe negative economic repercussions [1], and as such, geopolitical concerns are seen as a major influence on investment choices and stock market dynamics by business owners, market players, and central bank officials [2,3].

Furthermore, Nigeria, the largest democracy in Africa following her triumph over the 1993 election crises and being the country with the longest civilian rule since her return to democracy in 1999, has a mandate to protect and advance democratic rule across the region. This has made her shoulder the responsibility of proffering lasting solutions to any geopolitical crisis endangering democracy in Africa and, in the process, suffering some heat. Thus, beyond the country’s geographical landscape, numerous incidents that culminated in high geopolitical tension around her borders have always heightened the perceived tension in the country. For instance, a complex geopolitical tension has developed in Nigeria as a result of, among other events, the country’s intervention in Niger’s ‘political’ crisis more recently and a growing number of Cameroonian refugees in the country over time. The activities of the Economic Community Cease-Fire Monitoring Group (ECOMOG) led by Nigeria in Liberia and Sierra Leone in 1990 and 1997, respectively, and various peace-making missions across the region have also underscored her leading role in the continent, hence, further attraction for studying geopolitical risk in Nigeria.

This paper develops a daily news-based geopolitical uncertainty index for Nigeria, which is conspicuously missing in the literature despite her vulnerability vulnerabilities to geopolitical tensions, as previously highlighted from within and across Africa. It is pertinent to note that factors influencing economic fundamentals are not only limited to economic and financial factors but also include uncertainty-induced shocks [4], and prominent among these shocks is the geopolitical risk which covers geopolitical tensions, risk of war, military threats and terror attacks [5], all of which result to loss of human life, vandalization of physical capital and rise in military spending among other consequences. Our news items cover most of the prominent newspapers in Nigeria, including The Punch, This Day, The Guardian, Business Day, Daily Trust, Nigerian Tribune, PM news, and Leadership newspapers. Our attraction to these newspapers is underscored by their frequency of publication, integrity, and availability of wide readership/audience. For easy comparison of the results, we employ a number of terms similar to those of Caldara and Iacoviello [2,3]; nonetheless, we include additional keywords that highlight the peculiarities of Nigeria concerning geopolitical risks. For example, keywords such as “Biafra”, “separatist”, “IPOB”, “Indigenous People of Biafra”, “OPC”, “Oodua People’s Congress”, “piracy”, “pirates”, “EndSARS”, and “bandits” are peculiar to Nigeria and ignoring them because they are not captured in Caldara and Iacoviello [2,3] may bias our outcome.

The literature is inundated with various uncertainty indices; for example, (see Davis [6] and Baker et al. [7] on economic policy uncertainty; Caldara and Iacoviello [3] on geopolitical risk; Salisu and Akanni [8] on global fear associated with COVID-19; Baker et al. [9], Narayan et al. [10] on uncertainty due to COVID-19 pandemic; Faccini et al. [11] on climate uncertainty, among others). Thus, we contribute to this line of literature by extending the index relating to political, religious, and ethnic tensions to Africa – Nigeria especially – given her longstanding experience regarding banditry, terrorism and inter-ethnic crises, among others.

Understanding the geopolitical risks in Nigeria is crucial for policymakers and economic analysts to assess the vulnerability of the Nigerian state in times of crises. This information can provide valuable insights on how these crises could impact fundamentals such as stock and foreign exchange markets. The empirical exercise presented in this study can help guide both policymakers and economic analysts in predicting the future path of key fundamentals like inflation, interest rates, and growth. This is particularly important in cases where tensions pose a serious threat to economic activities, including the country’s ability to attract foreign investments. Investors, both local and foreign, also have a vested interest in the regular updates of this index to assess recent trends and determine if the business climate is favourable for investment. Therefore, it is vital to keep this index up-to-date to ensure that policymakers, economic analysts, and investors have access to the most current information.

A cursory look at Fig. 1 shows the plot of our index, which reflects two notable spikes, including October 20, 2020, and October 20, 2021. These distinct periods correspond with the height of the EndSARS protest and its planned memorial protest. One intriguing thing to note in this result lies in the coverage of the events leading to the spikes. Unlike other socio-political tensions in the country (including Boko Haram and IPOB menace), which are regional-based, EndSARS protest involved youths from all the six geopolitical zones and the havoc it wrecked on the country – particularly Lagos State, which takes pride in being the fifth largest economy in Africa. These features, among others, seem to validate the usefulness of the GPR index as a barometer for assessing geopolitical tension in the country. Nonetheless, we offer an empirical exercise in this study to further evaluate the predictive value of the index by examining how it can influence financial markets since there is compelling evidence in the literature that affirms this connection. Our results show that geopolitical tensions in Nigeria have heightened financial market risks, and this outcome is evident in the in-sample and out-of-sample forecast analyses.

Following this introduction, the remainder of this paper is partitioned as follows. Section 2 highlights the procedure involved in the development of the GRP index. We demonstrate and present the findings from the empirical application of the index in the succeeding section, Section 3, using a variety of financial series, including stock price and exchange rate, given their high exposure to systematic and unsystematic risks, to evaluate how these series relate to the GPR index. In Section 4, we conclude the paper.

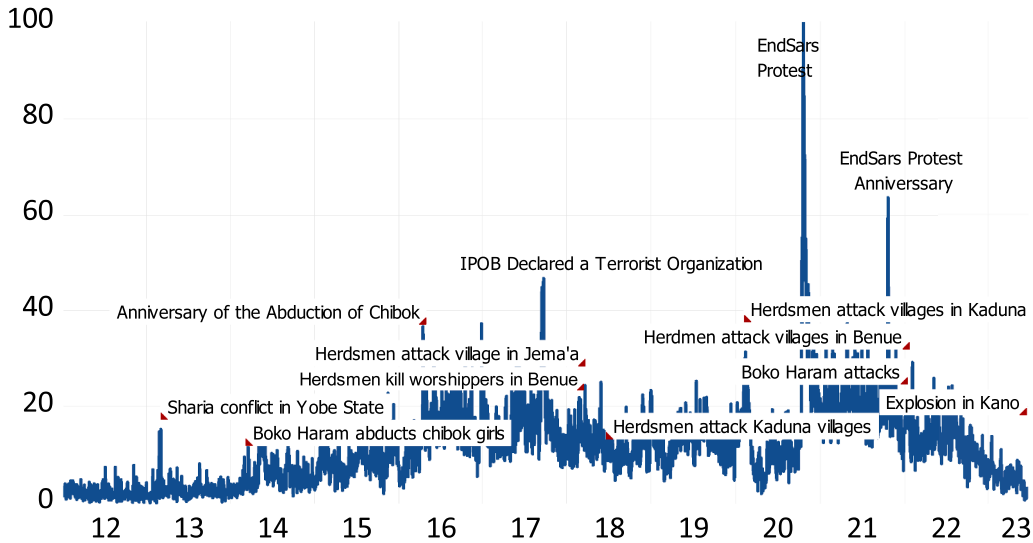


Fig. 1. Trends in the geopolitical risk index for Nigeria.

Methodological procedure for the GRP index

Data collection

The process for developing a text-based index typically starts with selecting appropriate keywords related to the topic, in our instance, the geopolitical risk index in Nigeria. Although many GPR indices are currently available (<https://www.policyuncertainty.com/gpr.html>), these cannot be adopted as each region has its peculiarity, just like Nigeria.¹ Thus, in conducting this study, we identified a list of keywords encompassing a wide range of geopolitical risk factors that could potentially impact Nigeria’s stability, security, and international relations. These keywords were carefully chosen to ensure the collection of relevant information and provide valuable insights into the nation’s geopolitical risks. These search terms are²:

“geopolitical risk”, “geopolitical concern”, “geopolitical tension”, “geopolitical uncertainty”, “Boko haram”, “Islamic State in West Africa”, “ISWA”, “Islamic State’s West Africa Province”, “ISWAP”, “criminal gangs”, “kidnapping”, “insurgence”, “insurgent”, “farmer-herder conflict”, “farmer-herder clash”, “militant”, “militancy”, “Biafra”, “separatist”, “IPOB”, “Indigenous People of Biafra”, “OPC”, “Oodua Peoples Congress”, “piracy”, “pirates”, “Endsars”, “bandits”, “terrorists”, “terrorism”, “secessionists”, “cultism”.

The second step involves downloading all available news articles and extracting relevant news articles containing these keywords from eight notable newspapers in Nigeria. The newspapers are the Punch, ThisDay, The Guardian, Business Day, Daily Trust, Nigerian Tribune, PM news, and Leadership. Table 1 shows the number of newspapers downloaded and those containing at least a keyword. At the end of the procedure, we obtain daily word counts for each keyword over the period of January 1, 2012, to June 19, 2023.

Index construction

We begin the construction of the index by summing the daily word counts for all the keywords previously. We then account for the day-of-the-week effect by using dummy variables to accommodate any possible variation in the five days of the week due to geopolitical risks.³

$$GPR_t = \alpha + \sum_{i=1}^4 \beta_i D_{i,t} + \varepsilon_t; i = 1, 2, 3, 4; t = 1, 2, \dots, T \tag{1}$$

where GPR is the daily sum of word counts; $D_{i,t}$ is for the week-day dummy variables for four days (for a 5-day week) as we exclude one dummy to avoid a dummy trap; α is the intercept and ε_t is the error term. We present the results obtained from Eq. (1) in Table A1 in the appendix, and we note the existence of the day-of-the-week effect judging by the statistical significance of the differential intercept

¹ Some useful references on index construction include but are not limited to Baker et al. [7,9], Davis [6], Narayan et al. [10], Ahir et al. [28], and Salisu et al. [20].

² We have provided in the appendix useful definitions of some keywords that are peculiar to Nigeria.

³ See Drogalas et al. [29], Narayan et al. [10] and Salisu et al. [20], among others, for some useful explanations of accounting for possible differing effects during the days of the week.

Table 1
Some useful highlights of the GPR index for Nigeria.

	PUNCH	TRIBUNE	PM NEWS	THIS DAY	THE GUARDIAN	BUSINESS DAY	DAILY TRUST	LEADERSHIP
No. of news articles downloaded	362,840	199,569	235,860	230,639	39,725	14,908	444,697	4,178
No. of news articles containing at least a keyword	36,377	24,699	25,104	24,313	32,105	10,351	43,652	2,861

coefficients. Consequently, we adjust the GPR for this effect, $GPR_t^{adj} = \hat{\alpha} + \hat{\epsilon}_t$. Finally, we compute the index as follows:

$$GPR_t^{adj} \text{ index} = \left(\frac{GPR_t^{adj} - \min(GPR_t^{adj})}{\max(GPR_t^{adj}) - \min(GPR_t^{adj})} \right) * 100 \tag{2}$$

Some empirical analyses

Some preliminary analyses

Our GPR index essentially covers January 02, 2012, to June 19, 2023, and Fig. 1 presents a time series plot of the index. We noticed spikes around the EndSARS protest in October 2020 and its first anniversary. Other spikes reflect events like the proscription of the IPOB in the South East and its consequential designation as a terrorist organization, the frequent farmer-herder clashes in the North-West and North Central, and the Boko Haram terrorist attacks predominant in the North-East region of the country. The 2014 abduction of 276 Chibok girls by the terrorist group was also reflected.

We provide some descriptive statistics and graphical representations of the index, and two, we complement these with some data analyses that attempt to connect the index with the predictability of relevant financial variables, such as exchange rates and stock prices, that are assumed to respond to uncertainties which relate to geopolitical tension. We present the descriptive statistics in Table 2 for different frequencies involving daily, weekly, and monthly frequencies. Expectedly, we show that the dispersion of the index declines with lower frequency judging by both standard deviation and coefficient of variation. Even the formal tests for serial correlation and conditional heteroscedasticity in Table 3 show larger values of the test statistics for a higher (daily) frequency than a relatively lower (monthly) frequency.

In-sample and out-of-sample predictability of the geopolitical risk index

The predictive model

The predictive model relates the daily exchange rate and stock return volatilities to the GPR_t^{adj} index. A number of studies have established a strong connection between geopolitical risk and stock returns on the one hand (see, for example, [12–15]) and geopolitical risks and exchange rate on the other (see, [16–18]). Our formulation follows the intuition that if the GPR occurrence today is higher than the immediately preceding period, we would expect a rise in financial market volatility (whether it relates to the stock market or foreign exchange market). We also account for the day-of-the-week effect in the estimation as this feature is typical of most financial markets where average returns and, by extension, volatilities tend to vary significantly during the week based on the available information set. Some studies have demonstrated the importance of accounting for this effect in predictability analyses if it exists (see [19,20], among others). Consequently, we formulate the predictive model as follows:

$$RV_t = \alpha + \rho RV_{t-1} + \beta(GPRI_t^{adj} - GPRI_{t-1}^{adj}) + \sum_{i=1}^4 \delta_i DUM_{i,t} + \epsilon_t \tag{3}$$

where RV_t is a 22-day⁴ realized volatility of Nigeria’s exchange rate/stock returns computed at period t ; $GPRI_t^{adj}$ is the geopolitical risks index for Nigeria at the time t ; $DUM_{i,t}$ is the i^{th} day-of-the-week dummy; α is the intercept; β is the predictability coefficient; δ_i is the coefficient for the day-of-the-week dummy; ϵ_t is a zero mean idiosyncratic error term. In line with Westerlund and Narayan [21,22], we pre-weight Eq. (3) with the inverse of the standard deviation of the residual terms to account for any inherent conditional heteroscedasticity effect, as observed in Table 3. We also extend Eq. (3) to include an important control variable (which is oil price) as there is compelling evidence to control for this variable in a predictive model for stock returns (see [23–25]) and exchange rate (see [8]). Thus, the extended model is formulated as follows:

$$RV_t = \alpha + \rho RV_{t-1} + \beta_1(GPRI_t^{adj} - GPRI_{t-1}^{adj}) + \beta_2(OILRV_t - OILRV_{t-1}) + \sum_{i=1}^4 \delta_i DUM_{i,t} + \epsilon_t \tag{4}$$

We use the oil market price volatility ($OILRV$) as financial markets tend to respond more to the swings in oil prices rather than the

⁴ This is usually the minimum time frame for any risk-averse investor to make informed decisions on investment.

Table 2
Descriptive statistics of the GPR index [02/01/2012–19/06/2023].

	Daily	Weekly	Monthly
Mean	11.226	11.191	11.181
Std. Dev.	8.246	7.7769	7.117
CoV	0.735	0.695	0.637
Observations	2984	599	138

Note: CoV is the Coefficient of Variation computed as the ratio of standard deviation to mean.

Table 3
Formal tests of the GPR index.

	Daily	Weekly	Monthly
Q-stat [5]	236.29***	13.521***	5.8901
Q-stat [10]	254.08***	17.680***	20.211**
Q ² -stat [5]	397.88***	137.55***	0.3596
Q ² -stat [10]	437.19***	137.79***	1.0381
ARCH-LM [5]	54.92***	34.85***	0.062
ARCH-LM [10]	27.81***	17.184***	0.079
Observations	2984	599	138

Note: The Q-stat is for serial correlation, while the ARCH-LM test is for the conditional heteroscedasticity test. ***, **, and * indicate statistical significance at the 1 %, 5 % and 10 % levels, respectively.

level prices. We hypothesize that oil market risk can raise financial market risks since the former measures global economic instability. In other words, as the global economy becomes unstable due to incessant swings in the oil price, this often creates some negative sentiments in the financial markets and may cause delays in future investment.

Finally, in order to test the effectiveness of our GPR index, we compare its forecast accuracy to that of the random walk model, which is the standard benchmark model used to evaluate the performance of all factor-based predictive models. The aim is to demonstrate that incorporating such a factor into the predictive model results in better out-of-sample forecasts across multiple forecast horizons, providing greater robustness. Consequently, we use the Clark and West [26] [Clark-West] test to evaluate the forecast performance where a statistically significant positive value implies the outperformance of the GPR_t^{adj} -based model over the benchmark model and vice versa for a statistically significant negative value. We utilize a 75:25 data split, respectively, for both the in-sample predictability and out-of-sample forecast evaluation. In the out-of-sample period, we consider 40-, 80- and 120- (daily) periods ahead of forecast horizons under a rolling window framework that allows for some time variation.

Results and discussion

Our analysis takes root from Eq. (3), a model that accounts for estimating the geopolitical risk index (GPRI) without any additional variable. Essentially, GPRI is used separately as a predictor for both the exchange rate and stock price volatilities. In the alternative model, as specified in Eq. (4), oil price volatility is added as a control variable. While various studies have emphasized the connection between exchange rate and oil price (see, for example, [8,27]), literature on stock returns and oil price is equally well documented (see

Table 4
In-sample predictability results for the geopolitical risk index (without control).

Variable	Coefficient (Std Error) Exchange rate Volatility	Stock Volatility
α	5.8620** [2.7985]	-0.2217 [0.4376]
ρ	0.5380*** [0.0537]	1.1317*** [0.0105]
β	7.5988*** [0.2942]	0.2177*** [0.0278]
δ_1	96.5153*** [2.8153]	2.0941*** [0.4876]
δ_2	-0.1064 [4.8841]	4.7225*** [0.4594]
δ_3	39.5573*** [5.9209]	4.7367*** [0.4462]
δ_4	17.9500*** [4.5618]	5.0533*** [0.4532]

Note: "Without control" implies that Eq. (3) is estimated without any additional variable. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table 5
In-sample predictability results for the geopolitical risk index (With control).

Variable	Coefficient [Std Error] Exchange rate Volatility	Stock Volatility
α	5.0014** [2.4707]	-0.0687 [0.4260]
ρ	0.4660*** [0.0476]	1.1283*** [0.0102]
β_1	6.2792*** [0.2752]	0.1848*** [0.0272]
β_2	5.1752*** [0.3595]	0.1594*** [0.0192]
δ_1	81.3760*** [2.6982]	1.8685*** [0.4756]
δ_2	4.4044 [4.3232]	4.7556*** [0.4462]
δ_3	43.2789*** [5.2271]	4.7041*** [0.4335]
δ_4	45.3487*** [4.4487]	4.3476*** [0.4485]

Note: "With control" denotes the estimation of Eq. (4) with an additional (control) variable, which is oil return volatility in this case. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively. The standard errors are in square brackets.

[23–25]). Hence, the inclusion of oil price as an additional variable in this case is well justified. As specified in the model, we adjust for the day-of-the-week effect using dummy variables. Table 4, however, presents the predictability coefficient of the GPR index for exchange rate and stock returns volatility when there is no control variable and additionally accounts for coefficients of the included dummy variables. In Table 5, the alternative model is presented, which essentially takes cognizance of the role of oil price volatility in explaining exchange rate or stock returns as documented in the literature.

We use a full data sample to establish the nexus among the specified variables. We thereafter employ 75 % of the same data for forecast analysis in the in-sample estimation and the remaining for the out-of-sample. As indicated in the results (see Table 4), the GPR index significantly traces the behaviour of exchange rate and the stock returns for the Nigerian economy. As the GPR rises, the risks associated with the forex and the stock markets become heightened, which in particular suggests its essential role in the country's economic activities. The day-of-the-week effects are also significant for the exchange rate and stock returns volatility, save the second day of the week for exchange rate volatility, which is not significant. The clue from here is that the activities that result in risk in this country are often frequent, especially in the stock market. By further implication, higher tension in the country generally scares investors, both the direct and the portfolio investors, from investing in the country, reducing funds' inflows. When the tension downsides, the investors form new opinions as regards the economy. These unstable scenarios potentially generate higher volatility in the exchange rate movement. The volatility of stock returns concerning the constructed risk in the country also shares a similar explanation.

$$RV_t = \alpha + \rho RV_{t-1} + \beta(GPRI_t^{adj} - GPRI_{t-1}^{adj}) + \sum_{i=1}^4 \delta_i DUM_{i,t} + \epsilon_t.$$

In the alternative model, as presented in Table 5, the implication for when the model is not controlled equally holds in the second model. Rising GPR risk is found to heighten both currency and stock markets. Additionally, given the connection between the selected financial variables and the oil price, the impact is positive and significant, which indicates that volatile market conditions in the crude oil market can further raise the level of volatility in the exchange rate and stock returns for the Nigerian economy. As a form of additional analysis, we conduct separate out-of-sample analyses for the GPR-based model relative to a benchmark model. As previously

Table 6
Daily out-of-sample predictability results for the GPR index [Using Clark and West [26] test].

Exchange rate volatility	40-days	80-days	120-days
Without control	1827.88 ***	1819.59***	1839.65***
With control	1884.72***	1883.01***	1907.92***
Stock return volatility	40-days	80-days	120-days
Without control	0.0000***	0.0000***	0.0000***
With control	0.0000***	0.0000***	0.0000***

Note: A significantly positive test statistic of the Clark and West [26] test implies the superior performance of the GPR index-based model over the benchmark model, while the reverse holds if the test statistic is not different from zero. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively. The standard errors are in square brackets.

mentioned, the random walk is widely accepted as a benchmark model for forecasting economic and financial variables. Studies have shown that it is challenging to outperform this model because it effectively utilizes the information content of the predicted variable. As a result, comparing any factor-based model with this benchmark model has become the norm when evaluating its out-of-sample performance. The analysis is particularly done with control and without control variables (see Table 6) for both exchange rate and stock return volatilities. Consistently and based on our observations, the GPR index model performs better than the benchmark model, given the significance of all the parameters in Table 6. As explained earlier, frequent ethnic/regional crises in Nigeria often results in investor switching opinions regarding investing in the country, which in all terms, generate volatile market conditions in both currency and stock markets.

$$RV_t = \alpha + \rho RV_{t-1} + \beta_1 (GPR_t^{adj} - GPR_{t-1}^{adj}) + \beta_2 (OILRV_t - OILRV_{t-1}) + \sum_{i=1}^4 \delta_i DUM_{i,t} + \varepsilon_t.$$

Conclusion

We are motivated to compute an index of geopolitical risk for Nigeria. The country, the largest economy in the African continent, has been waging war against a series of ethnic crises, which hitherto has some element of international forces. Incidences such as the Boko-haram crisis, banditry, ENDSARS, kidnapping and regional secessionist agitations are some of the geopolitical challenges the country is currently battling with. However, despite the availability of a series of indices to measure this phenomenon for many advanced countries to gauge their impacts and prescribe policy implications, such a measure is conspicuously missing for Nigeria and other African countries. Our effort is to fill this gap and possibly extend the index computation to other parts of the continents in the nearest future time. This proposed index will provide the basis for informed investment and policy decisions.

Our GPR index is in-text based, where its computation takes root from eight (8) prominent newspapers in Nigeria. To evaluate its practical use in empirical research, we test its predictability for some financial variables in the country, mainly exchange rate and stock return. In this testing, we account for the prominent role of oil prices in this nexus. While our in-sample analysis indicates a positive connection between the index and the behaviour of the selected variables, the out-of-sample estimation further suggests the out-performance of the index-based estimation over the benchmark model. In a way, a rising GPR index is found to heighten the market condition for both exchange rate and stock returns, which signifies its potential to dampen these markets. The outcome agrees with the extant literature on the connection between geopolitical risk and economic and financial variables. Hence, our proposed index will be much more relevant for different stakeholders for policy making, review, and future actions.

CRedit authorship contribution statement

Afees Salisu: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft, Writing – review & editing. **Sulaiman Salisu:** Conceptualization, Software, Writing – original draft, Writing – review & editing. **Subair Salisu:** Conceptualization, Software, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Definition of some keywords

Biafra: Biafra was a secessionist state proclaimed in southeastern Nigeria in 1967.

Separatist: This is a group that advocates for the separation or secession of a specific region or community from a larger political entity or country to establish an independent or autonomous state.

There are several separatist movements in Nigeria that seek to achieve state secession. But the two major ones are:

IPOB: The Indigenous People of Biafra (IPOB), an Igbo separatist in the southeastern part of Nigeria

OPC: The Oodua People's Congress (OPC), is a Yoruba secessionist movement in southwestern Nigeria.

ENDSARS: This is a hashtag (#EndSARS) created by young Nigerians to protest and create awareness of police brutality and extortion and to demand the disbandment of a rogue police unit known as the Special Anti-Robbery Squad (SARS). The protest gained international attention and sparked widespread protests and demands for police reform in Nigeria in October 2020.

Table A1

: The regression results for the adjusted GPR index (GPR_t^{adj}).

Variable	Coefficient
C	121.0151*** (4.9637)
Monday	2.9130 (2.7309)
Tuesday	17.3765*** (3.1993)
Wednesday	10.3725*** (2.7772)
Thursday	9.1271*** (2.5077)
F-statistic	2.7384***

Note: The weekdays are captured in the regression analyses as dummy variables, while the Friday dummy is excluded to avoid a dummy trap. The regression analyses involve the Heteroscedasticity and Autocorrelation Consistent OLS estimator to accommodate the inherent statistical effects in the GPR data as observed in the preliminary analyses.

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