Two Quantitative Variables for the Evaluation of Political Stability

Introduction

This paper addresses whether the degree of political stability of a particular country can be determined or forecasted in terms of predictability in electoral results and regularity of protests. Political systems are complex systems, in that they are determined by the interaction between the actors in it, such as between authority and general population; as well, in that political systems are self-organized, they adapt accordingly to its own states, for example a policy can make people lose their jobs so people adapt to it to not lose their jobs by creating a labor union which in turn can reorganize the state of the political system; and in that it only makes sense as a whole, meaning that they are non-reducible to their parts or their parts coming together cannot make the same political system, for instance not reducible only to authority or only to the people. An important property of these systems is political stability which is a result of the interactions between the many actors in it. Moreover, political stability also interacts with properties such as democracy and economic growth within a political system (Feng, 1997). Then, the purpose of this paper is to determine under two types of data if this property can be measured and forecasted in terms of them.

For the sake of clarity, the state of political stability is defined as the state of the behavior of a country, in terms of the quantity of present and recent conflicts, for instance, whether there are armed conflicts and violence against civilians, or the existence of an uprising against the state, a *coup d'état*, or of a civil war. As well, in this study we only consider two degrees of stability, low and high. Political stability is low when the number of conflicts and violence is high in the context of a particular point in time.

We hypothesize that a country whose variability of electoral results is high, or it presents high diversity of results, will demonstrate high political stability. As well, that a country whose population participates in collectively recurrent protests has higher political stability.

Our study found that political stability has the potential to be studied in terms of the regularity of protests and in the degree of the predictability in presidential elections within a country. Specifically, regularity, expressed as in the recurrence of protests and their features: location, topic of the protest, and degree of violence against civilians. Predictability, expressed as how variable is the electoral victory of different political parties in a country, for example, if it was expected that party A would win the elections at time X.

Data

The data collected in general is about two countries. Country 1, Lesalia, and Country 2, Gallione.

An important piece of data is the one provided by Fake-Author, which is of a quantitative type. This data is about political stability measured in relation to other countries. It shows that Lesalia in comparison to Gallione shows significantly higher political stability after the point in time of the last presidential elections of each these countries (Fake-Author, 2022).

The rest of the data are six times series, three for each country, which are about protests. As well, we have two time series, which are records of projections of a political party winning the presidential elections if it would happen the next day to the point of time where each element of the sample from the projection would take place in.

Details of the Time Series

For analyzing the variability of electoral results, we collected one time series for each country which consists of projections of electoral results for the government. The projections about the results of presidential elections in a country, these are generated from surveys to the population, asking them to what political party they would vote for if elections would happen the next day, "tomorrow". The data was collected from the population of both countries every six months. It is worth noting that in both countries, elections are held every 4 years, then, the data taken starts from the fifth most recent election until the most recent, that is, we have collected data from the past 20 years, and we have 40 data points for each time series, because as mentioned, the data was recorded every six months. Every data entry is a political party mapped to a unique number. The party with the highest percentage is recorded, for example if the political party Fascist and Furious, mapped to number 3, would be projected to win the elections at 18 months from the first recorded point, then at row number 4 would be recorded 3 in the time series of the corresponding country.

Every row that is a factor for a multiple of 4 is the result of an actual election. It is worth noting also that all the projections made for these presidential elections were correct. However, the confidence rate is 95% and the accuracy rate is 70%. The entire projection used is Fake Projection (Fake-Author, 1999).

To study the recurrence of protests, we collected three types of time series for each country, namely, location where a protest took place in, topic of the protest, and the degree of violence against civilians from state affiliated entities recorded in that protest, state entities such as the police, or an entity related to the ruling party, (e.g., paramilitary groups). These three properties are of a single protest. All the values recorded are integer numbers that map from a singular value. For example, a specific location in Lesalia, such as the city Gridania would be mapped to a unique integer, say 6, in that time series; a topic such as "environment" would be mapped to, say integer 1; and degree of violence is a number from 0 to 9 where 0 is the absence of violence, and 9 represents extreme violence such as torture and assassinations. Then every row for a country, records the three properties of a single protest. The protests recorded are the last 50 protests, up until the last government election of each country. In both cases, all these protest account for the last 2 electoral terms, last 8 years.

Methods

Entropy Analysis

Entropy Analysis is relevant because we are interested in the predictability or variability of the electoral projections, also, because we don't have any statistical assumption about that data.

The entropy analysis we use is SampEn because it helps us capture the rate at which new information is generated across the time series, the rate in which parties are projected to be elected (Richman & Moorman, 2000). As well, SampEn is suitable because the data collected for electoral results is simple and repetitive such that the same existing parties of the countries can win elections at different points in time, data points can match precisely in value.

Recurrence Quantification Analysis

We want to study the degree of recurrence of the qualities of a protest in a country in that the results can be quantified and compared to the results of other countries, then Recurrence Quantification Analysis supplies a convenient model for this purpose (Wallot et al., 2016).

A recurrence quantification analysis is used for our data about protests, specifically, we use Multidimensional Recurrence Quantification Analysis (MdRQA), whose purpose is to find recurrent patterns in multiple times series (Wallot et al., 2016). MdRQA is used because we are interested in

learning whether the collective patterns of recurrence of our three time series about the qualities of protests of each country can help us differentiate degrees of political stability, when being compared to the recurrence value from contrasting countries.

Analyses

SampEn

We perform an entropy analysis on the time series using the Sample Entropy (SampEn) algorithm, with parameters m = 1, because the sequences are of length 1, and r = 0.15, just because this threshold value is default, and we are dealing only with integers. In general, we use these parameters because the data is discrete, values differ between less than five assignments while still being significative. Therefore, the parameters selected are sufficient to generate a quantification of the repetitiveness of the patterns found, in fact, the patterns being only about the integers isolated.

MdRQA

About the parameters, we set the dimension to 3 for the three time series for each country, also we set the radius to 0.001 because our data is discrete because the distances for matching don't present any precision error, and finally, we have no a priori reason to enable phase space reconstruction, then we set delay and embedding dimension to 1, i.e. we just need single matches, then, selecting an embedding higher than one is unnecessary. Every row of three values represents a single protest, then the values are in line and no delay higher than 1 is required. In general, the current phase space of our unprocessed data is appropriate and is shaped ready for the analysis.

Results

The SampEn results of the electoral projections entropy for Country 1, Lesalia, return a value of 0.99383, while for Country 2, Gallione, the value 0.28874. A contrast of this result is pictured in Figure 3. Figure 1, and 2, show the time series without being processed, just as a signal. The time series from Lesalia show greater irregularity in comparison to the ones of Gallion, and since we know that Lesalia has higher political stability (Fake-Author, 2022) we can assert that this result supports our first hypothesis, that "a country whose variability of electoral results is high, or it presents high diversity of results, will demonstrate high political stability". Therefore, the degree of variability or entropy in electoral projections has the potential to be a convenient quantified measure or predictor for political stability.

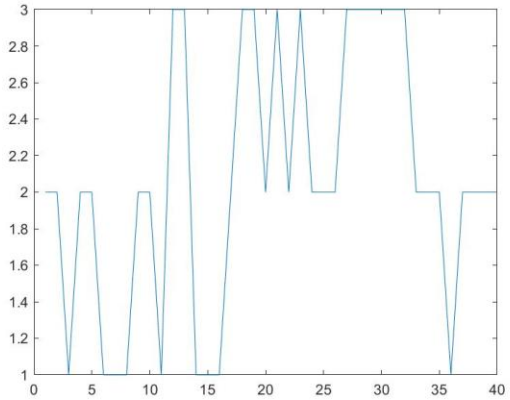

Figure 1. Lesalia, electoral results time series plotted as a signal.

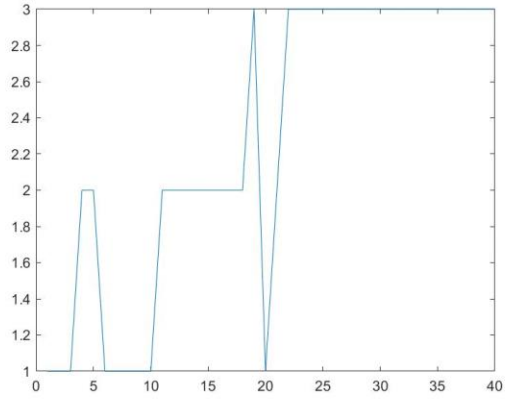

Figure 2. Gallione, electoral results time series plotted as a signal.

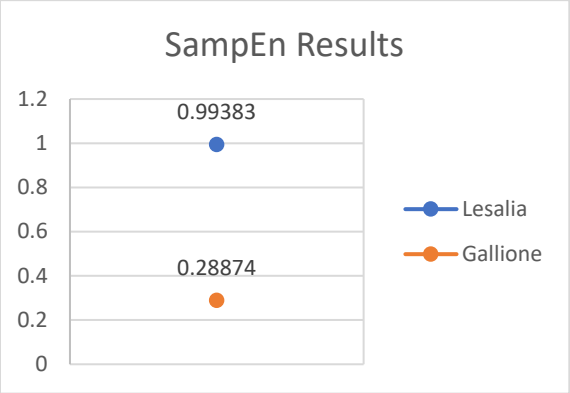

Figure 3. SampEn values. Comparison between Lesalia's and Gallione's entropy values.

Regarding the recurrence analysis, MdRQA, as pictured in Figures 4, and 5, Country 1 presents higher recurrence and determinacy rate than Country 2. Lesalia having a percentage of recurrence of 4.72% and a determinacy percentage of 10.17%, meanwhile Gallione a percentage of recurrence of 2% and a determinacy percentage of 0%. The results of the analysis contrasted with the data that shows that Lesalia has higher political stability (Fake-Author, 2022) create supporting evidence for the second hypothesis, that "a country whose population participates in collectively recurrent protests has higher political stability". This implies that collective patterns of recurrence in protests can be a suitable quantified measure or predictor for political stability. Also, MdRQA shows us the entropy of how much disorder there is in the sequences, for both sets of time series the level of disorder is non-significant. This is because from certain periods in both sets of the time series the data is likely to repeat itself.

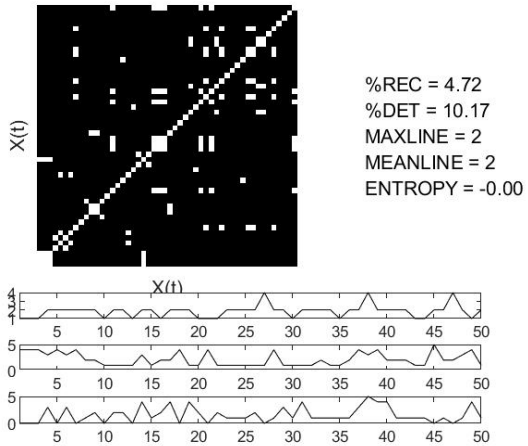

Figure 4. Country 1, Lesalia MdRQA Matrix and Time Series Signals. The diagonal line in white is the LOI, where points are identical with themselves at lag 0. At the bottom, the three-time series used for the matrix are plotted: location, topic, and violence degree.

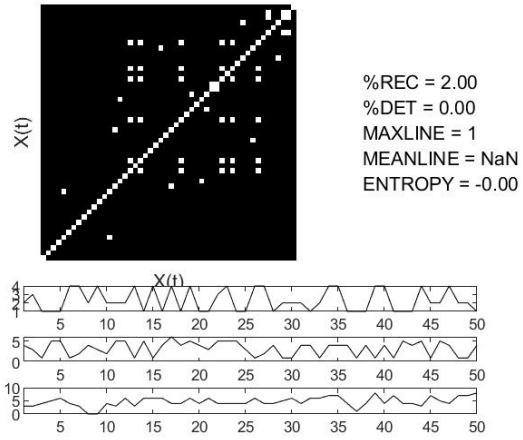

Figure 5. Country 2, Gallione MdRQA Matrix and Time Series Signals. The diagonal line in white is the LOI, where points are identical with themselves at lag 0. At the bottom, the three-time series used for the matrix are plotted: location, topic, and violence degree.

Discussion, Implications, and Future Directions

These variables could be used as an output type for predictors of the degree of violence and intensity of future conflicts, meaning, if a predictor is a time series that shows high recurrence rate, we could be more confident that soon from a selected point in time there will be less chances of having a conflict where high degrees of violence are present.

The results are relevant to democratization studies, because if some ruling entity has the absolute right to accumulate political power it can easily commit abuses or become tyrannical, therefore generating political instability. Then, Entropy Analysis may help us to determine both the risk and degrees of tyranny. As well, these measures may also help to make predictions about population displacement.

Nevertheless, this study does not distinguish in any way the influence of nonviolent protests in comparison to violent protests. Neither considers the amount of people that take part in them. Moreover, these measures are limited if we consider external intervention, in that these don't account for intervention from other countries. A future direction for this would be to separate internal political stability with political stability in the context of international relations with other countries. Another limitation of the study is that parties can be reformed with different names, can collide, or change their directions completely, so data collection of electoral projections should be adapted or translated in a way that the matches can be more accurate, in this sense preprocessing this type of data is ideal.

Conclusion

We found that political stability has the potential to be studied quantitatively with the degree of regularity of protests and with the degree of predictability in presidential elections within a country. Our results show that between countries that have low and high political stability the comparison is clear with the use of SampEn for Entropy Analysis and MdRQA for Recurrence Quantification Analysis.

References and Citations

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