Proceedings of the International Conference on Industrial Engineering and Operations Management
Bangkok, Thailand, March 5-7, 2019

Identification of Countries that Have Similarities with Indonesia in the Context of Rice Crisis Using Multidimensional Scaling

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Abstract

Years 2007-2008 was recorded as the world rice crisis (FAO, 2008). This was marked by the price of rice on the world market which experienced a drastic increase of 2,852 times in the range of October 2007 to May 2008 (FAO, 2010). Not a few countries in Asia and Africa were affected by the 2008 rice crisis, including Indonesia. The purpose of this research is to obtain a population consisting of countries that have similarities with Indonesia based on 3 characteristics, namely the atmosphere of democracy, rice consumption and restlessness. Using a multidimensional scaling method, a number of countries have similarities with Indonesia based on these 3 variables. The context of this study is the study of national level crisis indicators. Therefore the results of the research are input in the process of testing the strength of an indicator in detecting the existence of a rice crisis.

Keywords:

The atmosphere of democracy, rice consumption, restlessness, similarity, multidimensional scaling.

1. Introduction

In 2007-2008 was recorded as the world rice crisis (FAO, 2008). This was marked by the price of rice in the world market which experienced a dramatic increase which reached 2,852 times in the range of October 2007 until May 2008 (FAO, 2010). Countries not a few in Asia and Africa were affected by the 2008 rice crisis, including some of Indonesia's neighboring countries, for example the Philippines, Bangladesh and others. The Indonesian government should be responsive to the situation that befell neighboring countries, because the rice crisis that hit these countries could also hit Indonesia. This is because the majority of the Indonesian population consumes rice as one of the staple foods. The Indonesian government needs a predictor to see the potential for a rice crisis in Indonesia in the future. Yuyun Hidayat conducted research on the strength and predictive ability of the indicators. Unprecentented Restlessness (UR) to detect a rice crisis. The purpose of this study is to obtain a population of countries that have

similarities with Indonesia based on 3 characteristics, namely the atmosphere of democracy, consumption of rice and restlessness. The limitation in this study is that countries that consume rice as one of the staple foods and based on the completeness of the data, there are 38 countries which are the objects of this research. The context of this research is a study of national level rice crisis indicators. Therefore the results of the research are input into the process of testing the strength of an indicator in detecting the existence of a rice crisis.

2. Literature review

2.1 Characteristic similarities

2.2.1 Atmosphere of Democracy

Further research on Polity IV Project always develops coding to determine the characteristics of the authority of a country in the world system for the purpose of comparison so that it can be analyzed quantitatively described by the Polity score. The Polity score or score produced by the research project has been proven by researchers from year to year. This score is a measure of the level of democracy of a government in a country. The size scale for the Polity score is ranging from -10 to +10, of which -10 represents a highly autocratic or authoritarian government and +10 score describes a highly democratic government [10].

2.2.2 Percent Rice Consumption (Rice consumption)

Rice is a staple food for almost half of the world's population. In addition, more than 90% of rice is consumed as staple food in Asia. In the graph below, it can be seen that per capita growth in world rice consumption is in line with more than double population growth [12]. This Percent Rice Consumption is a proportion between rice consumption and total staple food consumption in a country [7].

$$\%C = \frac{Rc}{Tc}\ 100\% \tag{1}$$

with,
$\%C$ = *Percent Rice Consumption (% consumption of rice)*; Rc= Rice consumption (kg /capita); Tc= Total Basic Food Consumption (kg /capita).

2.2.3 Restlessness

This characteristic is measured by the ability or purchasing power of rice per capita in a country. The purchasing power of rice can also be measured by using the size for the restlessness variable, with the following formula [7]:

$$R = \frac{P}{I}\ C \tag{2}$$

with,
R= *Restlessness*; P= Rice Prices (US$/ kg); C= Rice consumption (kg / capita);
I= Per capita income (US$/capita)

2.2 Multidimensional Scaling

Mapping is an illustration of an object presented in two or more dimensions. provide a description of the space regarding the relationship between objects observed, this method of making can be done using multidimensional scaling (Hair Anderson, 1998). Multidimensional Scaling (MDS) known as perceptual mapping, is a procedural procedure to obtain a relative picture of a collection of objects Multidimensional scaling is the purpose of transforming equations or choice of judgments made by consumers into distances represented in multidimensional spaces (HairAnderson, 1998). Multidimensional scaling is based on comparison of objects (product, service, image, aroma). Multidimensional scaling maps a number of objects into a multidimensional space so that the relationship or distance between the position of object objects shows the level of difference / similarity of the object in the object. In a multidimensional procedure the metric arranges the geometry of objects as close as possible through the input distance given, so basically changing the input distance or metric into geometric form as output. The work process

of the multidimensional scaling metric method starts from the dimensionless data matrix of inequality (nxn) written as matrix **D**. This matrix has zero diagonal and symmetry and nonnegative, the distance in the matrix is Euclidean distance, then calculates matrix **B** which is the square of each element in matrix **D**.

$$b_{ij} = -\frac{1}{2}(d_{ij}^2 - d_i^2 - d_j^2 + d_{..}^2)$$

$$d_{i.}^2 = \frac{1}{n}\sum_j d_{ij}^2$$

$$d_{.j}^2 = \frac{1}{n}\sum_i d_{ij}^2$$

$$d_{..}^2 = \frac{1}{n^2}\sum_{i,j} d_{ij}^2$$

To obtain the coordinates of each object, an eigenvalue and eigenvector analysis of the matrix **B**. Disputeists are used to measure the level of inaccuracy in the configuration of object objects in a certain dimension with inequality data input. The level of inaccuracy is called stress which is calculated through the formula:

$$S = \left[\frac{\sum_{i \neq j}^{n} (d_{ij} - \hat{d}_{ij})^2}{\sum_{i \neq j}^{n} d_{ij}^2} \right]$$

The criteria for determining how well the perception map is formed is R Square (RSQ) stating the proportion of variance in input data that can be explained by multidimensional scaling models. There are several criteria for determining how well the perception map is formed, there are:

1. R Square (RSQ)
   R Square states the proportion of variance in input data which can be explained by multidimensional scaling models. The greater the RSQ value, the better the multidimensional scaling model. According to Maholtra, the multidimensional scaling model is good, if the RSQ value is .6.
2. Stress
   Stress is the opposite of RSQ, which states the proportion of disparity that is not explained by the model, the smaller the stress value, the better the multidimensional scaling model produced.
   According to Kruskal, measures of stress values are as follows:

Stress	Goodness of fit
20 %	Poor
10 %	Fair
5 %	Good
2.5 %	Excellent
0 %	Perfect

2.3 Standarisasi Variabel

Data standardization is done to overcome variables that have different units of measurement. In this study there are 3 variables that have different units (units) so it is necessary to standardize variables, namely using the standard standard score Z. The most common form used in standardizing data is to convert each variable to a standard score (Z score) with subtract the average and divide the standard deviation of each variable. The general form of standardization is a function of distance normalization [2].

$$Z = \frac{(X - \mu)}{\sigma}$$

Z: Standard default score
X: Value of observation data
μ: Population average
σ: Population standard deviation

2.4 Evaluation of Grouping Results

After the grouping process using multidimensional scaling analysis, it is necessary to evaluate the results of grouping countries that have similarities with Indonesia. The purpose of this evaluation is that the population or group obtained is in accordance with the objectives of this study. The terms and criteria for the success of grouping namely groups or populations of countries that have similarities with Indonesia are as follows [7]:

a. In groups there are objects of the Indonesian state
   The existence of an Indonesian country in a group is very important for the criteria of success, this is done because countries that have similarities with Indonesia of course Indonesia must be in that group.
b. Within the group there were countries experiencing the rice crisis in 2008 and countries that did not experience the rice crisis in 2008.
c. The group is the group that has the most members of the country. The more countries that belong to a group of countries that have similarities with Indonesia, the better the implementation of research testing for indicators of Unprecented Restlessness (UR) as an indicator of rice crisis.

3. Research Methods

3.1 Data dan Variabel Penelitian

The data used in this study is secondary data from 38 countries obtained by taking state which consumes rice as one of its staple foods, and rice is a staple food that cannot be substituted with other foods [7]. The research variables are as follows:
X_1: Atmosfer Demokrasi
X_2: *Percent Rice Consumtion* (Rice consumption)
X_3: *Restlessness*

Tabel 3.1 Kerangka Data Penelitian

No	Negara	*Polity*	*% Rice Consumption* (%)	*Restlessness*
1	Bangladesh	6	76.9031	0.0399934482524908
2	Brazil	8	21.7572	0.00173088466516339
3	Cambodia	2	79.6210	0.0572555778572883
…	…	…	…	…
38	Vietnam	-7	82.0934	0.0361490469875234

4. Results and Discussion

Based on the results of data analysis using the multidimensional scaling method, obtained a grouping map of countries that have similarities with Indonesia based on 3 characteristics, namely the atmosphere of democracy, consumption of rice, restlessness. RSQ value = 0.91056 means that 91.056% two-dimensional maps formed based on multidimensional scaling methods can explain the real data. The results of grouping countries that have similarities with Indonesia are as follows:

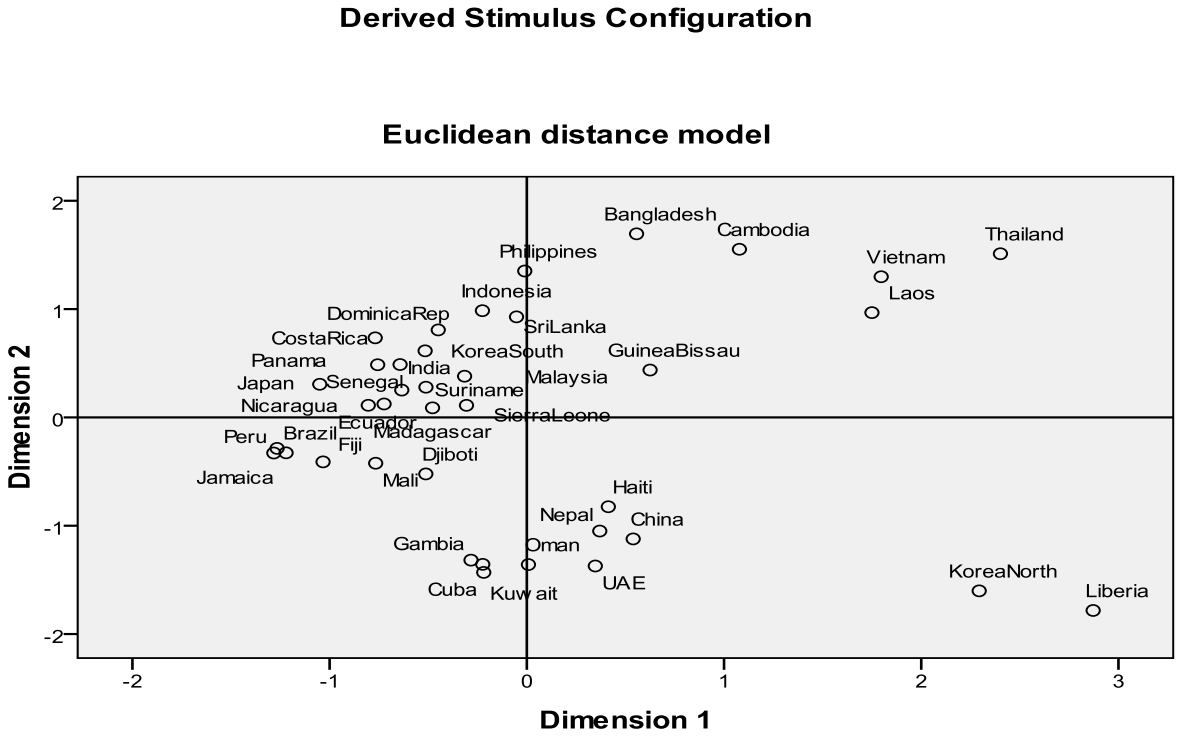

Figure 1. Derived stimulus configuration euclidean distance model

Group 1: consists of Countries Philippines, Indonesia, Sri Lanka, Guinea Bissau, Malaysia, Korea South, Sierra Leone, Dominican Republic, India, Suriname, Madagascar, Djibouti, Mali, Fiji, Ecuador, Jamaica, Peru, Nicaragua, Senegal, Japan, Panama, Costa Rica and Brazil. Group 2: consists of countries in Bangladesh, Cambodia, Vietnam, Laos and Thailand. Group 3: consists of Nepal, Haiti, China, UAE, Oman, Gambia, Cuba and Kuwait. Group 4: consists of North Korea State and Liberia. Countries experiencing the rice crisis in 2008 were as follows: Brazil (The Real News, 28 April 2008), Guinea-Bissau (FAO, 2008). India (Julian Borgen, 2008), Senegal (IRIN, 31 March 2008) and Sierra Leone (FAO, 2008).

5. Conclusion

Based on the results of the analysis, it can be concluded that there are 22 countries that have similarities with Indonesia based on 3 characteristics, namely the atmosphere of democracy (polity), purchasing power (restlessness), and % rice consumption are countries of the Philippines, Srilanka, Guinea Bissau, Malaysia, KoreaSouth, Sierra Leone, Dominican Republic, India, Suriname, Madagascar, Djibouti, Mali, Fiji, Ecuador, Jamaica, Peru, Nicaragua, Senegal, Japan, Panama, Costa Rica and Brazil.

Acknowledgements

Acknowledgments are conveyed to the Rector, Director of Directorate of Research, Community Involvement and Innovation, and the Dean of Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, with whomthe

Internal Grant Program of Universitas Padjadjaran was made possible to fund this research.The grant is a means of enhancing research and publication activities for researchers at Universitas Padjadjaran.

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