

## **OUTLINE FOR PAPERS SUBMITTED TO THE INTERNATIONAL SYMPOSIUM OF THE ANALYTIC HIERARCHY PROCESS**

*\*Note: Do not include the author(s) names and information as this document will be blind reviewed and they will be entered during proposal submission.*

### **ABSTRACT**

Currently Africa is the only country that has people getting lesser access to electricity. That lack of electricity access, attracts energy and electricity generator investors; however, shortages on governance in African countries hampers investors. Therefore, exact and efficient planning is really important for those countries. Forecasting and projection is therefore extremely important for Africa, particularly for Sub-Saharan Region. 5 different countries were considered and for each country, at least 7 forecasts are made. The best result are taken in to account and 5 year long projection is made thereafter. During the study annual observations beginning from 1973 to 2013 are used. Moving Average, Exponential Smoothing, Holt's Method, Linear Regression, Quadratic Regression, ARIMA models including all combinations of p, d, and q changing between 0 to 2. For sure, the data include trend because technology has grown so fast that triggers consumption of electricity. Therefore, almost all time series have trend properties. In the result, ARIMA and Holt's method together is considered the best models in comparison with others as they had lower error rates. Afterwards, by using IIAG index data, a pool data has been generated in order to investigate the governance effects of each country's electricity consumption. Four main categories are determined and panel data analysis is applied. According to results of countries' effect on electricity consumption and countries' next 5 year's projection has taken into account and used as the input data for AHP in order to find the best alternative for energy investors. In the consequences part, results are interpreted by considering both investors and countries future strategies.

Keywords: electrical consumption forecast, panel analysis, AHP.

### **1. Introduction**

I was motivated to that work since next years will be the years of African countries' development and almost all-African countries are aware of that. Therefore, they are trying to improve their administration and economic growth. Overall, my research question was, according to an energy company or investor, in that kind of risky area, to which country make sense to make an investment.

### **2. Literature Review**

That topic does not take place in literature. It is the first, one and only approach.

### **3. Hypotheses/Objectives**

My study's main objective is to provide a different perspective to AHP approach. Rather than using the subjective view, I used specific analysis that mentioned in the abstract and used them as an input for AHP. The topic and approach have not applied in the literature yet.

### **4. Research Design/Methodology**

The model is based on the results of the countries' governance indicators (criteria) effects on electricity consumption of 5 selected countries (alternatives). The effects on consumption are used as an importance level between criteria. The importance between alternatives is provided by converting the forecast levels of electricity consumption. Data is

provided from almost 90 different sources. The goal is to find the high sustainability of electricity demand. Inconsistency is indicated in limitations section.

## 5. Data/Model Analysis

High Sustainability of electricity demand – criteria: Human development / Sustainable economic opportunities / Security and Rule of Law / Participation and Human Rights – alternatives: Algeria / Egypt / Nigeria / South Africa / Zambia. Local weights are the results of panel analysis conversion to importance scale.

## 6. Limitations

Limitations are particularly originated from panel analysis. I omitted some variables and do not add the time invariant variables to model. Besides, on finding the sustainability I used the rate of change of next 3 year’s forecast without adding the price gap and their electricity generation level among countries. If I found more time for preparation, I would definitely add the generation levels of countries when finding the sustainability. According to AHP, when I make the conversion of results to importance level, I assume that no data replace the importance level.

## 7. Conclusions

The results show the country for investment according to my approach. The contribution is not just showing a new approach to AHP, also providing a new way to investors. As a result of that study, practical and data based approach’s probability of bias is less than the subjective approach. In that way, my study draws apart than the others. Following that, I will add some omitted variables and use it as an input. Besides, I will change or make multi goaled approach for investors by using AHP.

## 8. Key References

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## 9. Appendices

5 countries’ African Governance data are given below.

|      | Security and Rule of Law |       |         |           |        | Participation and Human Rights |       |         |           |        | Sustainable Economic Growth |       |         |           |        | Human Development |       |         |           |        |
|------|--------------------------|-------|---------|-----------|--------|--------------------------------|-------|---------|-----------|--------|-----------------------------|-------|---------|-----------|--------|-------------------|-------|---------|-----------|--------|
|      | Algeria                  | Egypt | Nigeria | South Af. | Zambia | Algeria                        | Egypt | Nigeria | South Af. | Zambia | Algeria                     | Egypt | Nigeria | South Af. | Zambia | Algeria           | Egypt | Nigeria | South Af. | Zambia |
| 2000 | 55.18                    | 62.20 | 45.50   | 72.40     | 64.77  | 35.64                          | 26.21 | 47.37   | 74.62     | 50.65  | 46.08                       | 53.23 | 34.98   | 66.08     | 46.73  | 59.94             | 63.88 | 42.72   | 73.46     | 47.43  |
| 2001 | 55.38                    | 61.88 | 44.48   | 71.74     | 64.51  | 35.98                          | 25.59 | 47.26   | 74.70     | 52.02  | 46.48                       | 54.77 | 33.91   | 66.19     | 46.65  | 64.27             | 67.76 | 45.23   | 76.61     | 52.45  |
| 2002 | 55.82                    | 61.82 | 43.92   | 71.61     | 64.51  | 36.13                          | 25.84 | 47.25   | 74.56     | 53.24  | 46.33                       | 53.10 | 33.63   | 66.62     | 45.73  | 64.65             | 67.87 | 45.42   | 76.86     | 52.65  |
| 2003 | 55.91                    | 61.76 | 44.58   | 71.61     | 64.51  | 36.21                          | 25.98 | 45.76   | 74.74     | 53.22  | 47.07                       | 53.21 | 34.26   | 67.97     | 45.74  | 65.03             | 67.63 | 46.02   | 76.75     | 52.99  |
| 2004 | 52.91                    | 62.05 | 39.39   | 71.70     | 63.18  | 37.91                          | 26.82 | 45.89   | 75.25     | 53.49  | 46.06                       | 54.09 | 34.35   | 67.02     | 46.18  | 65.32             | 67.69 | 46.64   | 76.59     | 53.65  |
| 2005 | 52.88                    | 62.79 | 44.44   | 71.83     | 64.01  | 38.96                          | 27.84 | 46.02   | 76.23     | 53.17  | 48.86                       | 53.31 | 34.19   | 68.46     | 48.18  | 66.33             | 67.48 | 47.44   | 76.06     | 54.54  |
| 2006 | 52.70                    | 62.28 | 45.39   | 71.28     | 63.78  | 38.93                          | 28.84 | 45.68   | 75.53     | 56.17  | 49.30                       | 52.83 | 35.26   | 69.73     | 48.56  | 67.42             | 67.45 | 49.05   | 77.58     | 54.72  |
| 2007 | 51.53                    | 64.35 | 46.85   | 70.62     | 64.47  | 38.42                          | 31.01 | 46.01   | 76.44     | 57.16  | 49.80                       | 56.07 | 36.67   | 71.43     | 48.44  | 68.04             | 68.20 | 49.02   | 77.71     | 54.86  |
| 2008 | 51.97                    | 64.65 | 47.94   | 70.46     | 63.18  | 38.51                          | 31.61 | 44.24   | 74.96     | 57.44  | 49.64                       | 57.16 | 36.15   | 71.51     | 45.94  | 69.56             | 68.66 | 49.32   | 77.25     | 57.22  |
| 2009 | 52.78                    | 62.01 | 46.45   | 67.61     | 64.44  | 38.41                          | 32.55 | 43.60   | 74.50     | 57.74  | 47.20                       | 61.57 | 37.90   | 71.32     | 46.52  | 71.27             | 69.10 | 50.91   | 77.12     | 58.03  |
| 2010 | 49.56                    | 58.93 | 46.74   | 67.84     | 64.81  | 39.13                          | 32.78 | 45.52   | 74.30     | 59.48  | 47.64                       | 62.58 | 36.11   | 70.64     | 47.56  | 70.62             | 66.00 | 48.74   | 75.87     | 58.52  |
| 2011 | 48.64                    | 52.84 | 44.26   | 67.62     | 66.58  | 39.55                          | 28.07 | 46.71   | 74.10     | 62.17  | 46.14                       | 57.43 | 36.52   | 69.53     | 50.09  | 71.84             | 64.88 | 48.56   | 76.95     | 57.38  |
| 2012 | 49.65                    | 51.81 | 40.90   | 66.99     | 67.74  | 42.28                          | 39.76 | 48.79   | 73.72     | 61.31  | 44.04                       | 53.59 | 39.06   | 71.81     | 51.16  | 72.21             | 64.70 | 49.24   | 75.46     | 58.79  |
| 2013 | 50.67                    | 41.88 | 39.57   | 66.92     | 66.30  | 42.87                          | 37.07 | 49.83   | 74.14     | 59.98  | 45.77                       | 51.28 | 40.90   | 72.31     | 51.35  | 73.47             | 65.15 | 50.85   | 77.99     | 59.24  |
| 2014 | 50.35                    | 49.81 | 41.75   | 68.42     | 66.68  | 43.59                          | 36.67 | 48.83   | 73.92     | 59.12  | 44.39                       | 53.43 | 36.98   | 72.31     | 50.75  | 73.29             | 65.17 | 51.97   | 77.27     | 61.51  |