International Journal of Economics and Business Administration
Vol. 6, No. 3, 2020, pp. 97-106
http://www.aiscience.org/journal/ijeba
ISSN: 2381-7356 (Print); ISSN: 2381-7364 (Online)

A Mining Pattern for the Cost of Domestic Energy in Developing Countries

Sara Nada[1, *], Mohamed Hamed[2]

[1]Department of Economics, Faculty of Economics & Political Sciences, Cairo University, Cairo, Egypt
[2]Department of Electrical Engineering, Faculty of Engineering, Port Said University, Port Said, Egypt

Abstract

This paper treats the hidden meanings through the internal processing intervals of original populations to find out the important hidden conclusions. The title of domestic energy consumption is selected to simulate the aimed operation while Cairo (the capital of Egypt) is considered to represent the developing countries. The designated model contains 15 ideal samples of customers, starting in January 1992 and ending at January 2018, where the energy consumption is analyzed. The corresponding cost is estimated according to the history of energy tariff in Egypt and then the internal vision for the cost and relations with energy is instructed for analysis. The calculation of energy cost is based on the occupied houses strategy where the original data must be transformed to be corresponding for the occupation state. The yearly initial values are introduced for all evaluations to extract the hidden characteristics for the planning and forecasting categories. The energy cost dependency is studied in more details so that the new vision for planning and design may be reached. Both trend and envelope are tailored for explanation since valuable endorsements may be executed while the envelope margin is estimated and debated. It is concluded that, trend and envelope parameters are useful for forecasting processes since a summer pattern is essential for planning procedures in hot countries. Thus, the envelope margin is a good guide for the evaluation of future energy consumption not only in developing countries but also in advanced ones.

Keywords

Mining Vision, Economic Processing, Domestic Energy Cost, Winter/Summer Seasons, Developing Countries

Received: July 20, 2020 / Accepted: August 5, 2020 / Published online: August 26, 2020

@ 2020 The Authors. Published by American Institute of Science. This Open Access article is under the CC BY license.
http://creativecommons.org/licenses/by/4.0/

1. Introduction

Recently, the development of energy consumption becomes the today title because the traditional energy is going towards the less, globally [1-4]. The use of machine learning techniques in energy forecasting is gaining popularity due to their ability to solve complex non-linear problems, however this is predominately seen in both residential and commercial sectors [5].

Besides, the forecasting of future energy profile is necessary to establish a baseline because a business-as-usual reference scenario is purely a market-driven. Thus, no energy efficiency incentives will be given while the adoption of energy efficient equipment becomes a major selection including the explanatory factors [6, 7].

So, new energy sources have been created such as the natural type of solar and wind performances although newer chemical and bioenergy may be the next replacement for not only the traditional energy but also the renewable types [2, 3, 8]. Thus, the energy utilization, in the current time and future, would depend on an efficient saving system for the consumption despite its negative effect on economics. Therefore, a rationalization strategy should be inserted to support the infra-structure so that it will be widespread field

* Corresponding author
E-mail address: sara.nada@feps.edu.eg (S. Nada)

of works as a major concept to cover the ascribed requirements [9-11].

Otherwise, this subject is treated in a lot of works and researches around the world although several procedures are given for planning and forecasting [4]. Originally, recommendations depend on original populations if the development and design are the target. Contrary, the present work deals with the hidden conclusions inside the data (population) where an excavating base will be the way to find out the non-extracted results by programs. This is a main goal for the investigation to be proved for importance because the neglection of such idea may bring a loss in deduction [12].

Furthermore, if the use of artificial neural networks (ANN) provides forecasted building energy profiles for the identification of spikes in energy consumption, an undesirable and considerable cost in the manufacturing sector, (and the predication of manufacturing conditions for monitoring of sensitive production environments) will be important. Coupling simulation techniques with machine learning algorithms for ANN allow a low processing cost [5].

Initially, the cost development represents a vital problem for the future studies since the overall development can be characterized through various bands. Thus, the investigation of forecasting subjects may be tailored into subproblems individually to reduce the corresponding computational effort and time so that the analysis may take a main role for future subjects [12]. The industrial and building sectors demand the largest proportion of global energy since adopting energy efficiency related strategies, optimization techniques and management are an important step towards global energy reduction in the world [5].

2. Energy Data

Firstly, the data input would be an interesting item where the chosen one will be the domestic energy consumption besides its consistent cost [3, 4]. Then, the place is necessary to present the developing countries so that Cairo (the capital of Egypt) may be reflected [11]. Originally, the tariff history of domestic energy in Egypt (PT/kWh) is implanted in Table 1 where the local Egyptian PT equals (1/100) LE [3].

Table 1. The tariff history of domestic energy in Egypt (PT/kWh).

Range (kWh)	1/80	1/90	7/92	7/93	7/01	2/13	2/15	2/16	2/17	2/18	2/19	2/20
0-50	1.8	1.8	4.	5.	5.	7.5	7.5	7.5	11	13	22	30
51-100	1.8	1.8	6.5	8.3	13	14.5	14.5	14.5	19.	22.	30.	40.
101-200	2.4	3.	6.5	8.3	13.	16.						
0-200							16.	16.	21.	27.	36.	50.
201-300	2.86	3.8	6.5	8.3	19	24	29	35	42	55	70	82
301-350	3.2	4.2	8	11	19	24	29	35	42	55	70	82
351-400	3.2	4.2	11	15	29	34	39	44	55	75	90	100
401-500	3.48	4.6	11	15	29	34	39	44	55	75	90	100
501-650	5.29	5.29	11	15	29	34	39	44	55	75	90	100
651-800	5.29	5.29	17	21	53	60	68	71	95	125	135	140
801-1k	5.29	5.29	18	21	53	60	78	71	95	125	135	140
›1k	7.6	7.6	20	25			78	81	95	135	145	145

Source: Ministry of Electricity of Egypt

Then, the original data of domestic energy consumption consists of 15 customers (C1-C15), as an ideal model for north Cairo, while the data are treated in two steps: first is the occupied houses stipulation and secondly, cost accounting is realized with the history of tariff as listed in Table 1 [3, 4].

3. Individual Month Characteristics

Primarily, two months will be inserted if the months must be chosen to indicate diversion in the behavior of energy consumption. They are January for cold times and August for hot times where the accounted data of energy cost terminates to a vital remark. During January, the customers C10, C13, C14, and C15 have the higher costs while lower costs remain to others. In August, the customer C14 individually has the maximum cost of 1321.85 LE/month. It is noted that, average cost (Av_c) of the year and winter cost (W_c) can be derived while summer cost (S_c) is based on the cost summation of months (M_c) according to the formula:

$$Av_c = \sum_{p=1}^{12}(M_c) \quad (1)$$

The cost characteristics for both individual months are printed in Figure 1.

Figure 1 says that; the August domestic energy cost is sharply increasing relative to January case although their average costs are overlapped within the periods 1994-1998, and 2003-2006. This means a close average for both within a long time during the period of study. The maximum costs of January and August are reached the values 82.8775 LE, and

197.259 LE. at the year 2017, respectively.

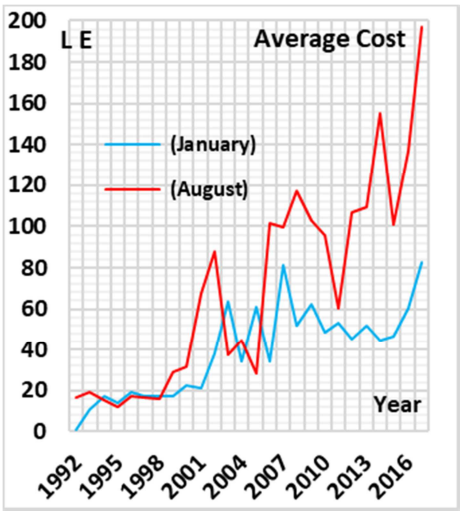

Figure 1. The average cost of months.

4. Season Performance

Nevertheless, a cup of seasons should be extracted for analysis where summer and winter are introduced for analysis. They are representing the cold time and the hot one, but the summer will be accounted for the three months (June, July, and August). Also, the data of winter should be deduced for three months as February, March and April although the total energy consumption (and total energy cost) in each three months must be transformed into average of energy (and cost) for yearly summer (June, July, and August months) and yearly winter (February, March, and April months). The cost of winter (W_c) can be intended by the expression:

$$W_c = \frac{\sum_{p=2}^{4}(M_c)}{3} \tag{2}$$

Similarly, the summer cost (S_c) may be formulated as

$$S_c = \frac{\sum_{p=6}^{8}(M_c)}{3} \tag{3}$$

In summertime, consumers C9 and C14 have the maximum costs as 993.05 LE/month and 553.42 LE/month during June, respectively, but the customer C9 remains alone as the peak of 1390.65 LE/month and 1321.85 LE/month value of cost in July and August, respectively. Thus, the average cost of seasons is plotted in Figure 2.

It can be seen from curves of Figure 2 that; the summer is gradually leading the winter relative to the domestic energy costs although both average costs were virtually close together till the year 1998.

5. Cost Addiction

Nowadays, it is significant to schedule smart appliances and charging/discharging of electric vehicles optimally to mitigate energy costs [13]. For rapid growing of electricity demand, utility planners need to be informed on the energy consumption to implement energy efficiency measures. This is required to manage sustainable load growth as well as to avoid the high costs of increasing apparent generation capacities [6].

Whatsoever, an energy storage system for efficient energy utilization may be a good solution for the smart grid depending on renewable resources. So, a smart home may interact with the smart grid to make autonomous decisions for electricity utilization to alleviate the electricity cost [13]. Mainly, the specific nature of an approach may be the convergence checking of series not only for equal time lapses but also the starting point of energy intensity reduction, practically [14].

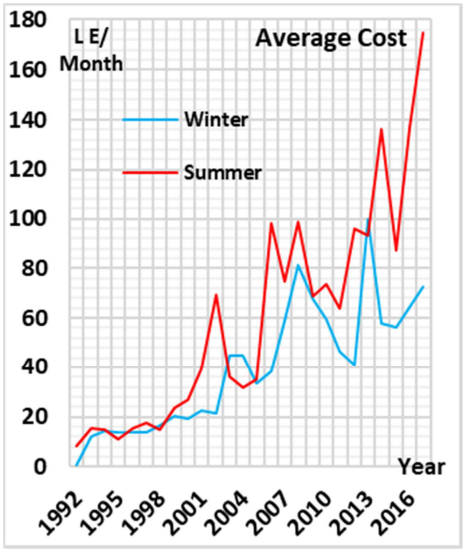

Figure 2. The average yearly cost/month.

5.1. Cost Rise

Primarily, the future studies tend to reach the amount growth for a treated item although the exact values would be expected though ANN, programs, and procedures in concern. Additionally, the nowadays subject is the energy saving which can be conserved as the mirror parameter for the energy consumption. Thus, the cost rise determination would be an easy way to reach the target. It should be mentioned that, the year 1992 is a starting time for the inserted model for investigation so that the occupied houses may be not occurred. Then, the rise ratio must be initiated with the year 1993 since the first ratio will be for the year 1994 as showed in Figure 3. The accounted mean value of average cost for all years of study (26 Years) is 60.0635 LE/year for summertime. The sequential cost rise ($Rise_c$) is computed as:

$$Rise_c = \frac{M_c}{M}, \qquad p = c + 1 \tag{4}$$

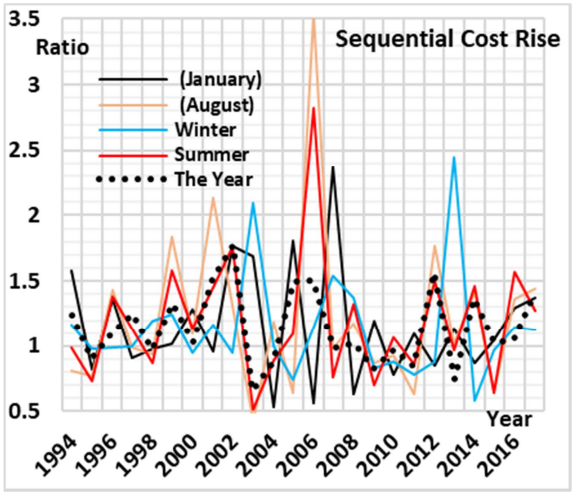

Figure 3. The sequential cost rises.

Nevertheless, the cost rise of domestic energy produces that the summer domestic costs of customers C9, C13, and C10 are determined as 491.4 LE, 382 LE, and 357.6 LE, respectively. They are greater than the wintertime for customers C10, C9, and C13 (having 245 LE, 133 LE, and 122.5 LE), respectively. Also, the maximum costs of year are appeared for customers C9, C10, and C13 are 385 LE, 370 LE, and 193.25 LE, respectively but the mean value of winter energy cost rise is 42.448 LE for each year.

5.2. Cost Rise Rate

Chiefly, the rate of cost rise expresses the performance progress for the cost rise because it may be referred, mathematically, to the second differentiation of the variation function. This leads to the importance of study the characteristics of cost rise because this value determines the global future vision. However, the cost rise rate may be defined as the sequential rise rate as yearly rise relative to the previous where it is estimated for the overall period of 26 years. The mean value of the 25 values of sequential rise rate is derived as listed in Table 2 where the cost rise rate (ΔW_c) for the duration T (T = 26 years) would be defined as

$$\Delta W_c = \frac{\sum_{p=1}^{26}(Rise_c)}{T} \quad (5)$$

Table 2. The average rise rate of cost (L E/Year).

Time	Rate	Time	Rate	Time	Rate
Summer	5.1346	August	5.3654	year	15.8462
Winter	2.8846	Jan	2.3846		

Thus, the rise rate of cost dependency for the consumers is graphed in Figure 4 where it is given for each customer in the model of analysis.

Primarily, the monthly year rate gives the middle function between the other two curves since the others are defined for winter and summertime. The summertime takes mostly the higher monthly cost rise except for customers C14 and C15 despite their high level of energy consumption according to original populations [3]. So, the consumer C3 presents, roughly, a steady value of cost rise rate in both seasons. Also, Figure 4 illustrates that the customer C9 has the peak value of average monthly cost rise rate in summer and the year as 18.8923 LE/Year and 14.8077 LE/Year, correspondingly but the consumer C10 has the winter peak of 9.4231 LE/Year. Contrary, the minimum consumption appears to customer C1 for all seasons at the value 0.3115 LE.

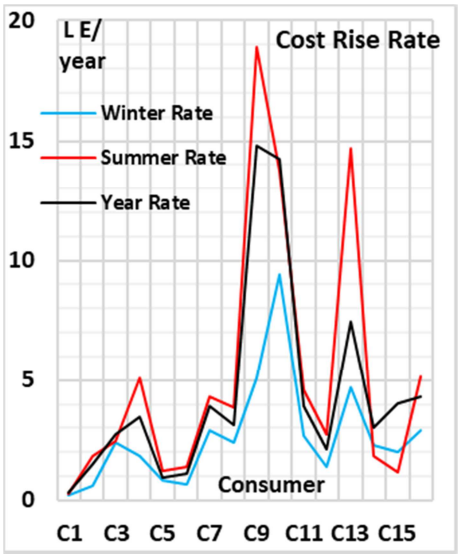

Figure 4. The dependency of cost rise rate.

6. Cost Development

Globally, the trend method may be successfully applied for forecasting energy consumption in economically developed regions, whereas the use of additional forecasting tools is useful for assessing the energy intensity of developing economies [14]. Cost trend analysis incorporates various efforts for a corporation spearheads to monitor to find how much it spends overall, identify units that bleed money and those that post rosy returns, and foresee internal resentments over budgeting unfairness that could be fester over time.

Originally, the cost depends mostly on the energy so that energy bringing must be a major requirement. Therefore, the chosen seasons (winter and summer) as well as the individual months (January and August) are introduced for energy evaluations while the statistical values for these decided seasons are estimated as drawn in Figure 1 and Figure 2.

6.1. Energy Characteristics

However, it is vital to define the base data so that the shape of development may be derived. So, the original population data could be called to the present item although it is the energy data. Thus, the energy data will be treated to the coressponding titles of investigation while the next step

would be the relationship with cost performance. Therefore, the statistical energy limits can be evaluated where accounted results are graphed in Figure 5.

It should be noted that, these energy limits {the mean value (Av), maximum (Max) and minimum (Min)}must be treated for the interested seasons and selected months since summer and winter times are plotted in Figure 5. The energy readings (S_e) of summer are intended according to the formula:

$$S_e = \frac{\sum_{p=6}^{8}(S_e)}{3} \quad (6)$$

Similarly, the winter energy (W_e) takes the expression

$$W_e = \frac{\sum_{p=2}^{4}(W_e)}{3} \quad (7)$$

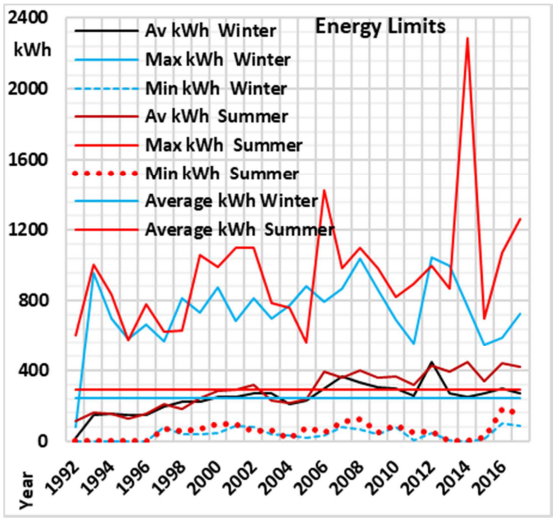

Figure 5. The energy boundaries.

It is remarked through derivations that, the energy dependency differs from the cost characteristics because the tariff is varied with time (Table 1) and energy consumption level. Also, the overall average monthly energy is determined as 292.1884 kWh for summer and 246.2402 kWh for winter to prove the higher energy consumption for summertime. Otherwise, the maximum characteristics illustrate that, summer has the highest value (with a peak of 2286.667 kWh at 2014) except the years 1998 and 2012, but it is accounted in a small step according to the general average of 292.1884 kWh for summer. This may be ensured due to the approximate overlapping of both curves for minimum energy consumption.

Otherwise, the statistical limits for selected individual months are inserted for investigation. Since the August month has the highest month consumption during summertime, its function will be very close to that of summer. This may be referred to the highest effect so that the peak point for the sum of consumers (August) of 259.1 kWh is occurred as at 2014. This peak becomes 111.3 kWh for January at 2007, but all other characteristics are the same for both summer and winter.

Consequentially, the (summer/August) average ratio of energy consumption is introduced for investigation when the average ratio of summer consumption to the month August is 0.9235. Also, it oscillates between 2.1162 and 0.5336 corresponding to customers C11 and C2, respectively. Then, the sequential rise rate is computed as graphed in Figure 6 while the summer is still higher even with rise rate. The reason may be referred to the effect of August month as shown in Figure 6.

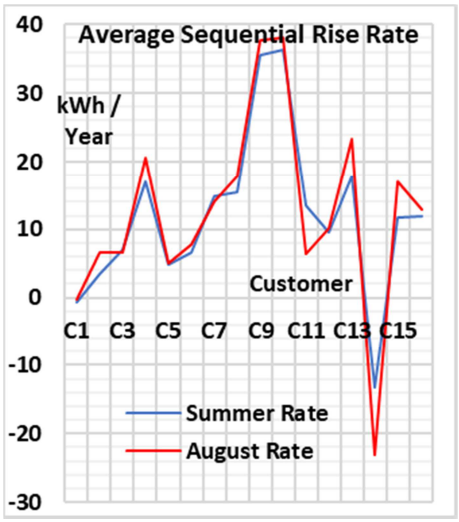

Figure 6. The average of sequential rise rate (kWh/year).

6.2. Season Cost

Mostly, analysis of the current state and forecasting the future vision of the energy sector is some of the key components of forming a long-term policy for sustainable economic development while the nexus of energy consumption, economic growth, and environmental protection are important factors. Both simulation and forecasting of the world energy sector essentially have different methods. Others have analyzed some concepts of energy consumption for different families of models [14].

The four main groups of models (optimization, imitation, electric energy market, qualitative and aggregate models) are widely used as a key related to the modern energy policy in advanced countries despite several other good procedures. These distinctions may be blurred, and the patterns may have features of all approaches, depending on the context of studies conducted and the degree of particularization of different aspects of economic analysis [14].

However, the cost trend is usually used to anticipate the total costs of a project at several points of time during its implementation. The tool is based on the milestone plan analysis which focuses on the time needed to terminate work.

Whatever, the cost analysis is the current target of study if the above energy handling is considered as the base work for investigation. Limits parameters of a statistical procedure may be utilized to be processed. Therefore, the boundaries of cost for both winter and summertime should be reported if the development analysis for energy consumption is aimed.

So, the envelope may be defined by the boundaries of maximum and minimum limits of a function while the mean value is needed for study as a reference. The results of cost estimations are plotted in Figure 7 in a clear form where the summer leads the cost either for maximum or average. Thus, the maximum summer cost appeared as 1139.25 LE at 2014 although it is 364.817 LE for winter at 2014.

Contrary, the minimum values of cost for both summer and winter are close while the average of summer is higher a little than that of winter as viewed in Figure 7.

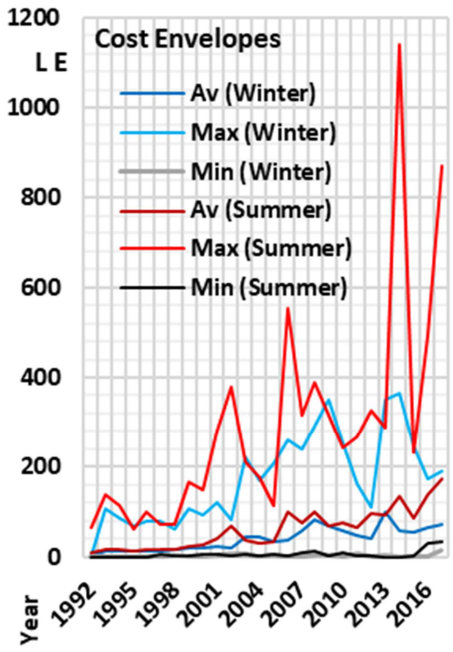

Figure 7. The limit curves of cost.

Also, the nonlinear autoregressive distributed lag bounds concept has been applied to examine the asymmetric cointegration between variables. An asymmetric causality test can be also employed to examine the causal association between parameters while a neutral effect exists between the labor force and economic growth [15]. The energy rise rate is defined mathematically as

$$Rate_e = \frac{\sum_{p=1}^{26}(Rise_e)}{\mathrm{T}} \quad (8)$$

Nevertheless, the average of both sequential yearly cost rise and yearly cost trend is derived as tabulated in Table 3 but the energy limit values (the maximum *Max (Jan)* and minimum *Min (Jan)* for January month) are accounted as 7.4065 and 1.765 (kWh/Year), respectively. Also, minimum value for August is determined as 2.8442 (kWh/Year).

Table 3. The deduced average values (L E/Year).

Time unit	Rise kWh	Trend kWh/year	Time unit	Rise kWh	Trend kWh/year
(S)	0.0030	5.1115	(Jan)	-0.0038	5.6615
(W)	8.88e-4	2.7577	(Aug)	0.0026	2.2712
(Year)	-0.0017				

Thus, the yearly initial values are introduced for processing to find the hidden characteristics for the planning and forecasting in general. The boundary factors for the envelopes of cost and energy are tailored but the ratio of cost to the corresponding energy is added to Table 4, too.

Table 4. Envelope of Cost to Energy Ratio (L E/kWh).

Item	Energy	Cost	Ratio
Unit	*(kWh/Year)*	*(L E/Year)*	*(L E /kWh)*
Av (W)	7.5423	2.7608	0.3660
Max (W)	6.6131	0.3481	0.0526
Min (W)	1.3978	0.1546	0.1106
Av (S)	12.0204	5.1096	0.4251
Max (S)	18.6708	21.2185	1.1365
Min (S)	2.8481	0.5673	0.1992
Av (Aug)	12.9277	0.0026	2.0231
Av (Jan)	5.3885	0.0038	7.1378

This means that, the real price of domestic energy in the duration of study diverges from the actual prices (tabulated in Table 1). Otherwise, the given case represents the envelope condition of this cost because the envelope can be evaluated by the boundaries (as the statistical maximum and minimum limits).

6.3. Margin Study

Therefore, an envelope can be expressed through the margin which equal the distance between maximum and minimum of each point. The accounted values of margin for the envelope of winter and summer time are illustrated in Figure 8 while the average value for the margin function during the studied duration for either winter or summer is allocated in Figure 8, too. The winter margin can be formulated as:

$$W_{Margin} = W(Max)_e - W(Min)_e \quad (9)$$

Similarly, the summer margin is derived by

$$S_{Margin} = S(Max)_e - S(Min)_e \quad (10)$$

Also, the mean value of the margin can be accounted using the Equation

$$Av_{Margin} = \frac{\sum_{p=1}^{26}(\text{Year Margin})}{\mathrm{T}} \quad (11)$$

These last 3 equations are valid for either season or month selection or even for the overall year where the starting

values are yearly determined.

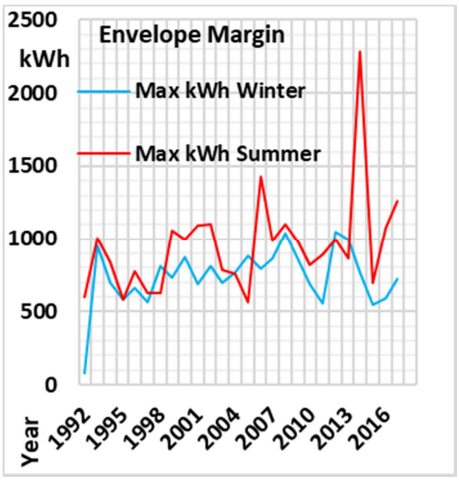

Figure 8. The envelope margin for energy.

Since summer has a larger margin along the investigated duration, the ratio of summer to winter margins may be defined arithmetically to get a clearer vision for the margin dependency. The ratio of margins for both winter and summer may be expressed by

$$(Ratio)_{Margin} = \frac{S_{Margin}}{W_{Magin}} \qquad (12)$$

However, the maximum margin is appeared as 2284.307 kWh at 2014 although the summer margin is gradually increased as shown in Figure 9. Contrary, the winter margin is practically oscillating between 997.0 and 486.3333 kWh.

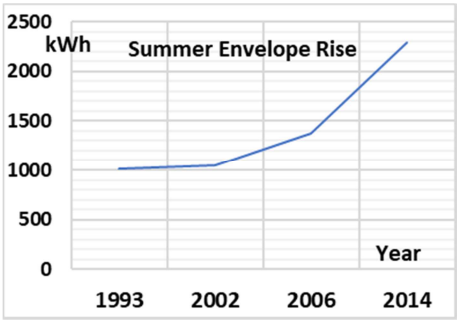

Figure 9. The envelope of energy maximum margin.

Consequentially, the reached results of computations are summarized in Figure 10 where the mean value for this ratio would be allocated.

It is seen from Figure 10 that, the summer to winter ratio is increasing with time since its trend lies between 1.01 and 1.53 with a rise of 0.52 at an average yearly rise rate of 2%. Also, the absolute average for the studied period is 1.2686 as indicated in Figure 10 while the year 2014 brings the maximum increase of the ratio at the value 2.9966. The increase ratio begins with the value of 1.4245 as drawn in Figure 11. Sequentially, energy trends of the margins of both summer and winter would be deduced as printed in Table 5.

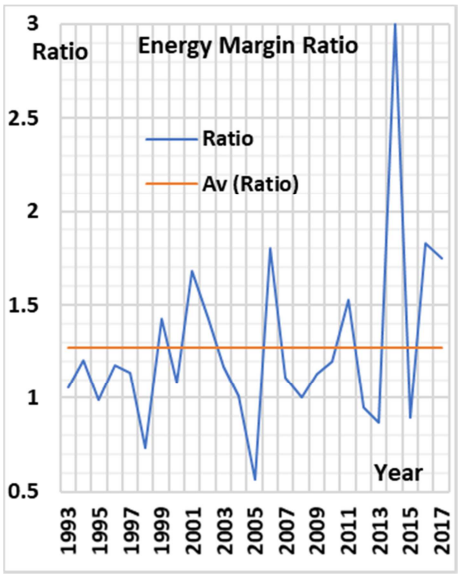

Figure 10. Margin Ratio of Energy.

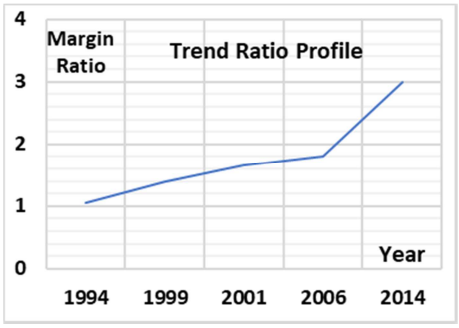

Figure 11. Maximum trend of margin ratio of energy.

Table 5. (Summer / Winter) Energy Ratio.

Item	Rate	Av	Item	Rate	Av
Unit	(kWh/year)	(kWh)	Unit	(kWh/year)	(kWh)
Summer	15.819	896.348	Ratio	2.2799	1.2681
Winter	6.938	706.87			

Statistically, the aimed margin represents the standard deviation if the rate of rise or trend evaluates the deviation by time. Then, the ratio of margins clarifies the actual spreading relative to winter so that its differential with time may express the concrete rise for summer more than winter parameters. Thus, the trend performance for energy margin ratio is estimated and then, the average of rise within the investigated duration is performed as 2.0115 kWh/year.

Thus, the doubling or more for the ratio of summer consumption leads to the significance of preparing the stable operation of electric networks (reliability condition) to receive such values of consumption because this conclusion comes from the mining through the forecasting approaches. Then, mean values for the average of both winter and summer as a fundamental base is accounted as tabulated in Table 6 while the corresponding average for the rise ratio is

inserted in Table 6.

Table 6. Mean values for winter and summer.

item	Rise rate	Av	item	Rise rate	Av
unit	(kWh/year)	(kWh)	unit	(kWh/year)	(kWh)
Summer	15.8192	896.3477	Av	11.3788	801.60865
Winter	6.9385	706.8696			

It is seen from Table 6 that; the average consumption of the year is less than that of summer energy so that the design of electric network must be organized on the summer peaks (not the overall peak of the year). This means that, the pattern of summer takes an essential part in the planning procedure although prediction methods go to the overall readings (not the hidden meaning).

Mainly, the comparison between summer and winter relative to the energy consumption and its cost illustrates the community characteristics (society performance) in a country although the same comparison may lead to the opposite extraction in other countries. This chiefly depends on the climate of each country where it is cold in Canada and Russia and hot in Egypt and Nigeria, for example. If hot regions are considered, the received higher performance ratio may be illuminated by the vector diagram of Figure 12.

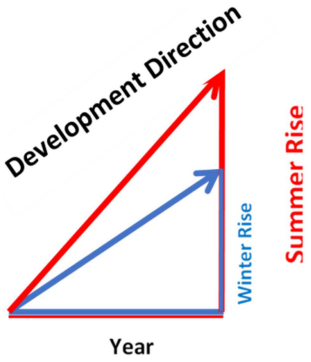

Figure 12. The average energy development.

7. Discussion

However, the major goal for this paper may be concluded in the behavior characteristics of the domestic energy in developing countries although the attention usually goes to the final performance of energy development and consequentially the cost rise effect in future time. So, the results deduced in this work represent the input actual data for the discussion to catch the executed conclusions. Firstly, the fundamental variable would be the energy consumption and secondly the cost of this energy comes for important analysis. The parameters of energy cost, as a function with time, are introduced while two seasons (summer and winter), for each year within the period of study, are selected.

It is remarked that, the cost performance for both summer season and August month is the same according to Figure 1 and Figure 2 because August is one on the summer months besides its high effectiveness in the overall style of summer. It is the peak month in Egypt for the summer weathers. Contrary, January has a divergence in performance with winter season since it is out of the winter months. It should be indicated that, the bill of January is issued for the energy consumption in December month. So, the diverseness appeared is a normal case.

Consequentially, the second point of cost rise rate represents the differential position for the studied cost so that this rate can be classified into two portions such as sequential rise rate and overall rise rate within the studied duration. Thus, both means the differential operation based on the mathematical vision.

Therefore, the growth strategy may be inserted as the envelope which has boundaries derived through the statistical limit factors as given in Figure 3 and Figure 4 for the cost condition and in Figure 5 and Figure 6 for the energy case. However, envelope trends record the second differentiation of a function based on the mathematical meaning (Figure 8 for cost) where the tested energy and cost for the envelope margin (Figure 10) and its rise would present the same effect.

Whatever, the average of rise rate for the margin ratio of energy is determined as 2.0115 kWh/year which emerged to be very close to the extracted average ratio (Table 5), which is 2.2799 kWh/year.

Generally, the consideration of summer performance may be urgent for hot countries because the overall maximum or average for the energy consumption, or its cost, may give values less than that of the summer corresponding values. Contrary, the cold weather may introduce the winter characteristics instead for the study and analysis. This may be proved by the results listed in Table 4, Table 5, and Table 6 besides the curves plotted in Figure 8, Figure 10, and Figure 12.

The extrapolation base can be implemented for more future excused factors where the main shape has been estimated as explained in this paper. This may be significant for the mining concept for the treated data since the hidden conclusion can be uncovered. Then, the proposed concept will be more active for different fields, especially for the design purpose.

The mining requirements can be inserted with the treatment of data for the input of the ANN approaches through the learning phase (training category) to reach the high accuracy besides the important factors.

8. Conclusion

According to the results of the present paper, it can be concluded that:

1. The pattern of either trend or envelope application for the cost forecasting process is valid as a major guide to reduce the computational effort and time.
2. Since the summer energy is higher than winter consumption, the design of stations must be based mainly on the peaks of summer in countries with a hot weather.
3. The margin of envelope is a good tool for the evaluation of energy consumption growth as well as for energy cost.
4. The domestic energy cost is a sensitive device for the overall measurement of cost increase within future economics.
5. The summer pattern is essential for planning procedures in hot countries so that it may be a chief factor for energy prediction. Similarly, the winter pattern of energy in cold climate is an important factor for the exact prediction.
6. The arithmetical theorems (as interpolation and extrapolation) can be useful for a deep investigation for the mining results to go forward to best conclusions.

References

[1] David Dreyfus, Anand Nair & Claudia Rosales (2019): The impact of planning and communication on unplanned costs in surgical episodes of care: Implications for reducing waste in hospital operating rooms, J. of Operations Management, First published: 28 November 2019, Handling Editors: Lawrence Fredendall, Anand Nair, Jeffery Smith and Anita Tucker, https://doi.org/10.1002/joom.1070 https://onlinelibrary.wiley.com/doi/full/10.1002/joom.1070

[2] Sara Nada & M. Hamed (2018): Economic Service of Electric Energy in Developing Countries: An Egyptian Sample, International Journal of Economics and Business Administration, Vol. 4, No. 2 (21-51), Jun. 2018, Pub. Date: May 28, 2018, ISSN: 2381-7356 (Print); ISSN: 2381-7364 (Online), Paper No. 70220060_20180320, http://www.aiscience.org/journal/ijeba http://www.aiscience.org/journal/paperInfo/ijeba?paperId=3821

[3] Mohammad Reza Heidari, Gholamreza Heravi Asghar & Nezhadpour Esmaeeli (2020): Integrating life-cycle assessment and life-cycle cost analysis to select sustainable pavement: A probabilistic model using managerial flexibilities, J. of Cleaner Production, Vol. 254, 1 May 2020, 120046, https://doi.org/10.1016/j.jclepro.2020.120046 https://www.sciencedirect.com/science/article/pii/S0959652620300937

[4] Sara Nada & M. Hamed (2019): Growth Analysis for the Electric Energy Curves of Domestic Consumption in North Cairo Zone, Public Science Framework, International Journal of Economics and Business Administration, Vol. 5, No. 1 (1-22), Mar. 2019, Pub. Date: Mar. 5, 2019, ISSN: 2381-7356 (Print); ISSN: 2381-7364 (Online), http://www.aiscience.org/journal/ijeba http://www.aiscience.org/journal/allissues/ijeba.html?issueId=70220501

[5] Victoria Jayne, Mawson Ben & Richard Hughes (2020): Deep learning techniques for energy forecasting and condition monitoring in the manufacturing sector, Energy & Buildings J., Vol. 217, 15 June 2020, 109966. https://doi.org/10.1016/j.enbuild.2020.109966 https://www.sciencedirect.com/science/article/abs/pii/S0378778819332104

[6] Turki Alajmi and Patrick Phelan (2020): Modeling and Forecasting End-Use Energy Consumption for Residential Buildings in Kuwait Using a Bottom-Up Approach, Energies J., Vol. 13, No. 8, 1981. https://doi.org/10.3390/en13081981 https://www.mdpi.com/1996-1073/13/8/1981

[7] Omar Swei: Forecasting Infidelity (2020): Why Current Methods for Predicting Costs Miss the Mark, Journal of Construction Engineering and Management, Vol. 146, No. 2, February 2020. https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29CO.1943-7862.0001756

[8] Roman R. Chugumbaev, Gilyan V. Fedotova, Yulia N. Nesterenko, Nina Chugumbaeva & Vladimir I. Barilenko (2020): Strategic Control as a Tool of Effective Management of Region's Economy, Part of the Lecture Notes in Networks and Systems book series (LNNS, Vol. 73), Growth Poles of the Global Economy: Emergence, Changes and Future Perspectives (25-36), https://link.springer.com/chapter/10.1007/978-3-030-15160-7_3

[9] Harald Vacika, Mikko Kurttilab, Teppo Hujalac, Chiranjeewee Khadkaad, Arto Haarabe, Jouni Pykäläinenf, Päivi Honkakoskie, Bernhard Wolfslehnerag & Jukka Tikkanenef (2014): Evaluating collaborative planning methods supporting program-based planning in natural resource management, J of Environmental Management, Vol. 144, 1 (304-315), November 2014, https://doi.org/10.1016/j.jenvman.2014.05.029 https://www.sciencedirect.com/science/article/pii/S0301479714002710

[10] Dongsu Kima, Heejin Choa, Jaeyoon Kohb & Piljae Imc (2020): Net-zero energy building design and life-cycle cost analysis with air-source variable refrigerant flow and distributed photovoltaic systems, Renewable and Sustainable Energy Reviews, Vol. 118, February 2020, 109508, https://doi.org/10.1016/j.rser.2019.109508 https://www.sciencedirect.com/science/article/abs/pii/S1364032119307166

[11] Sara Nada & M. Hamed (2019): Grouping Analysis for the Energy Consumption of Domestic Loads in the Distribution Network at North Cairo Zone, International Journal of Economics and Business Administration,, Public Science Framework, paper No. 70220078_20190306, Vol. 5, No. 2 (85-97), ISSN: 2381-7356 (Print); ISSN: 2381-7364 (Online), http://www.aiscience.org/journal/ijeba http://www.aiscience.org/journal/paperInfo/ijeba?paperId=4454

[12] Anirban Basuab (2020): A welfare-theoretic model consistent with the practice of cost-effectiveness analysis and its implications, Journal of Health Economics, Vol. 70, March 2020, 102287, https://doi.org/10.1016/j.jhealeco.2020.102287 https://www.sciencedirect.com/science/article/abs/pii/S0167629619307374

[13] Sheraz Aslamab. Adia Khalidb & Nadeem Javaidb (2020): Towards efficient energy management in smart grids considering microgrids with day-ahead energy forecasting, Electric Power Systems Research J., Vol. 182, May 2020, 106232. https://doi.org/10.1016/j.epsr.2020.106232 https://www.sciencedirect.com/science/article/abs/pii/S0378779620300390

[14] Leontiy Eder & Irina Provornaya (2018): Analysis of energy intensity trend as a tool for long-term forecasting of energy consumption, Energy Efficiency, Vol. 11 (1971–1997), Published: 14 April 2018, https://link.springer.com/article/10.1007/s12053-018-9656-2

[15] Shahbaz, Muhammad and Hoang, Thi Hong Van and Kumar, Mantu and Roubaud, David (2017): Energy Consumption, Financial Development and Economic Growth in India: New Evidence from a Nonlinear and Asymmetric Analysis. https://ideas.repec.org/p/pra/mprapa/76527.html