Tikrit Journal of Administration and Economics Sciences, (31/3/2022);Vol. 18, No. 57, Part (2): 471-487
Doi: www.doi.org/10.25130/tjaes.18.57.2.28

Tikrit Journal of Administration and Economics Sciences
مجلة تكريت للعلوم الإدارية والاقتصادية
ISSN: 1813-1719 (Print)

The impact of Some environmental variables on economic growth of United Arab Emirates

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Abstract:

This era is characterized by the interconnectedness and acceleration that threatens the world, in which humans life. This paper inviestigate the impact of renewable electricity consumption (REC), Carbon dioxide emissions (CO_2E), Electricity production from oil sources (EPFO), Gross Domestic Production (GDP), and Renewable electricity output (REO) on economic growth (EG) in the United Arb State. Annual data has been used over the period of 1990-2014, this period was chosen based on data availability. The fuzzy inference system is used to estimate the economic growth, and the regression analysis has done as tools to find the relevance between the input and the output (economic growth). The results have shown that (REC), sources (EPFO), (CO_2E) is significant with an emphasis on that EPFOandCO_2E are inversely proportional with Economic Growth, that, the indicators explain 64.75% of the changes that take place in economic growth and there is no Autocorrelation problem based on Durbin-Watson Test. In addition, VECM model is utilized for finding out the effect of (EPFO, REC) on (EG). The experimental results show that (EPFO, REC) explains 55.97% of the changes that occur in in (EG). Moreover, the experimental results of serial Correlation LM Test and Heteroskedasticity Test is 0.64and 76.61respectively, That is mean model Does not suffer from serial Correlation and ther is no Heteroskedasticity in the residual.

Keywords: renewable electricity consumption, CO2 emissions**,** economic growth**,** fuzzy inference system, regression analysis.

أثر بعض المتغيرات البيئية على النمو الاقتصادي للإمارات العربية المتحدة

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المستخلص:

تميز هذا العصر بالترابط والتسارع الذي يهدد العالم الذي يعيش فيه الإنسان. تتناول هذه الورقة تأثير استهلاك الكهرباء المتجددة (REC)، انبعاثات ثاني أكسيد الكربون (CO2E)، إنتاج

الكهرباء من المصادر النفطية (EPFO)، الناتج المحلي الإجمالي (GDP)، وإنتاج الكهرباء المتجددة (REO) على النمو الاقتصادي (EG) في الامارات العربية المتحدة. استخدمت البيانات السنوية للفترة (1990-2014)، اختيرت هذه الفترة طبقا للبيانات المتوفرة. استخدم نظام الاستدلال المضبب لتقدير النمو الاقتصادي، وتحليل الانحدار كأداة لإيجاد أثر المتغيرات المستقلة على المتغير التابع (النمو الاقتصادي). اظهرت النتائج ان استهلاك الكهرباء المتجددة (REC) وانتاج الكهرباء من مصادر النفط (EPFO) وانبعاثات ثاني اوكسيد الكربون (CO2E) معنوي مع العلم ان انتاج الكهرباء من مصادر النفط وانبعاثات غاز ثاني اوكسيد الكربون تتناسب عكسيا مع النمو الاقتصادي، كذلك فان المؤشرات تفسر 64.75% من التغيرات التي تحدث في النمو الاقتصادي ولا يوجد مشكلة ارتباط ذاتي اعتمادا على اختبار دربن-واتسون. بعد تطبيق نموذج VECM اتضح ان انتاج الكهرباء من المصادر النفطية (EPFO) واستهلاك الكهرباء المتجددة (REC) تفسر 55.97 من التغيرات التي تحدث في النمو الاقتصادي (EG). علاوة على ذلك، فإن النتائج التجريبية لاختبار LM للارتباط التسلسلي واختبار عدم الثبات لتجانس التباين هي 0.64 و 76.61 على التوالي، وهذا يعني أن النموذج لا يعاني من الارتباط التسلسلي ولا يوجد عدم ثبات تجانس التباين

الكلمات المفتاحية: استهلاك الكهرباء المتجددة، انبعاثات ثاني اوكسيد الكربون، النمو الاقتصادي، نظام الاستدلال المضبب، تحليل الانحدار.

1. Introduction:

Energy is the main incentive and the active ingredient for every growth, as it is the basic element for all sectors of the economy and a companion for human life. Recently, renewable energy sources have acquired great importance in the forms of global energy consumption due to the increasing negative effects of climate change (Chen, Pinar et al. 2020). Due to the fact that renewable energy is the vital source of the economic growth (Farhani 2013), the effort to reduce CO2 emissions effectively and mitigate climate change must include the energy sector (Belaid and Youssef 2017). In addition, one of the goals of the 2030 sustainable development plan, which is adopted by the United Nations in September 2015, is considerring the national energy mix for its prominent role in preserving the environment and reducing harmful emissions. As aresult the interesting in generating electricity from renewable energy sources has increased in the world (Zhang, Wang et al. 2017).

The human activities such as extreme smoke emission from factories, combustion of fossil fuels, and depletion of forests have prompted an expansionin concentration of Greenhouse Gases mostly as carbon dioxide (Zhang, Wang et al. 2017). Indeed, Renewable energy systems already reduce Greenhouse gases (GHG's) emissions from the energy sector; in spite of a modest scale (Bilen, Ozyurt et al. 2008). The most discussed and sensitive issue between policy makers and environmental economists over the last three decades was energy consumption along with economic growth and its contribution to CO2 emission (Zhang, Wang et al. 2018).

The rest of the paper is orgnizid as follows:section 2: Literature review, section 3: methodology and data, section 4: conclusion.

Research problem: If we consider the core of the environmental problem is a form of market failure, then the failure in the price mechanism to direct society's resources towards sustainable production can be addressed through appropriate government intervention (Perman, Ma et al. 2003) .

Research Hypothesis: The research assumed two main hypotheses:

A. that there is no a significant difference between the mean of the community and the mean of the sample in corroboration of the study sample.
B. that there is a significant difference between the mean of the community and the mean of the sample in corroboration of the study sample

Research Objective: The aim of the research is to calculate economic growth and know the effect of independent variables on the dependent variable.

Research Model:

In this paper a multivariate approach employed to examine the impact of renewable electricity consumption and CO_2 emissions on economic growth. The fuzzy inference system (FIS) to calculat economic growth, and regression analysis will be utilized in this paper for finding the relationship between the dependent and independent variables as shown in Equations (1) and (2).

$u_{ij} = \exp[-\{u_i - m_i j\}^2 / \sigma^2_{ij}]$……(1)

where u_{ij} represents the membership value within the interval [0,1], m_{ij} and σ_{ij} are respectively the center and the width of the Gaussian membership function of the jth term of the ith input variable x) (Lin, Peng et al. 2011)

$Y = B_0 + B_1X_1 + \ldots + B_NX_N + E$ ……. (2)

Where:

Y = dependent variable

x_t = independent variables

B_t = parameter

E = error

2. Literature review:

Doi: www.doi.org/10.25130/tjaes.18.57.2.28

Throughout recent decades, many studies have been concerned with the relationship between economic growth non-renewable and renewable energies consumption.

A. Renewable electricity output and renewable energy consumption are the causes of economic growth.
B. Renewable electricity output and economic growth are the causes of renewable energy consumption.
C. E growth and renewable energy consumption are not causes of renewable electricity output Moreover, In 2009 Zhang examined the existence and direction of Granger cau sality between energy consumption, carbon emissions, and economic growth in China, over the duration 1960–2007. The Evidences showed that neither energy consumption nor carbon emissions leads to economic growth(Chang 2010).

In 2007, Squalli discussed the relationship between electricity consumption and economic growth for OPEC members in the duration 1980-2003. The bounds test and causality results indicates that economic growth is dependent on electricity consumption in five countries, less dependent in three countries, and independent in three countries of a long-run (Squalli2007).

Odhiambo in 2009 checked the intertemporal causal nexus among economic growth and energy consumption over the duration of 1971–2006 using developed autoregressive distributed lag (ARDL). The results suggested that there is causal flow from electricity consumption to economic growth (Odhiambo 2009).

Moreover, In 2009 Zhang examined the existence and direction of Granger cau sality between energy consumption, carbon emissions, and economic growth in China, over the duration 1960–2007. The Evidences showed that neither energy consumption nor carbon emissions leads to economic growth(Chang 2010).

In 2010, Lean examined the causa nexus between electricity consumption and, carbon dioxide emissions and economic growth for five ASEAN countries over the duration 1980–2006 within a panel vector error correction model. The long-term estimation showed that there is a statistically significant positive association between emissions and electricity consumption. In addition, it showed that there is a non-linear relationship between emissions and real output compatible with the environmental Kuznets curve (Lean and Smyth 2010). In 2010 Apergis and

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Payne examined the relationship between economic growth and renewable energy consumption over the duration (1985-2005) for panel of twenty OECD countries. The Granger causality results indicate bidirectional causality between renewable energy consumption and economic growth in both-long and short-run. (Apergis and Payne 2010).

(Wang, Zhou et al. 2011) investigated causal nexus between energy consumption carbon dioxide emissions, and real economic output for 28 provinces in China over the duration 1995–2007 using panel cointegration and panel vector error correction modeling techniques. The empirical results showed that energy consumption, CO2 emissions, and economic growth have appeared to be cointegrated (Wang, Zhou et al., 2011).

In 2011, Silva et al. analyzed how an increasing share of RES on electricity generation (RES-E) affects carbon dioxide (CO_2) emissions and Gross Domestic Product (GDP) along the period 1960-2004. In this study, the Structural Vector Autoregressive (SVAR) methodology has been utilized. The estimation showed that the increasing RES-E share in Denmark, Portugal and Spain except (USA) has economic costs in terms of GDP per capita and there was also an evident reduction of carbon dioxide (CO_2) emissions per capita (Silva, Soares et al., 2012).

In 2013, Maslyuk and Dharmaratna investigated the dynamics between economic growth of carbon dioxide (CO_2) emissions and the share of renewable electricity in total electricity generation in eleven Asian developing countries.

Structural Vector Autoregression (SVAR) methodology has been used over the period 1980-2010. The results showed that the most of middle-income countries in Asia are likely to face a trade-off between environment sustainability and economic growth (Maslyuk and Dharmaratna 2013).

In 2014, (Al-mulali, Fereidouni et al., 2014) examined the impact of renewable and non-renewable electricity consumption on economic growth over the period 1980-2010 in Eighteen Latin American countries using the Pedroni cointegration test. The results show wed that renewable electricity consumption, non-renewable electricity consumption labor, gross fixed capital formation, and total trade are cointegrated (Al-mulali, Fereidouni et al. 2014).

In 2014 UCAN et al., examined the relationship between renewable and non-renewable energy. The Granger-causality results explained over the duration 1990-2011 for fifteen European Union countrie that there is an

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unidirectional causality between non-renewable energy consumption and economicgrowt (Ucan, Aricioglu et al. 2014). In 2015, Mohammadi and Amin examined The long-run relation and short-run dynamics between consumption of energy (electricity) of seventy nine countries and output of different growth rates over the period 1971-2011, Cointegration test suggests the existence of long-run relation between energy (electricity) consumption and the output in high- and low-growth panels but its absence in the panel with negative growth (Mohammadi and Amin 2015).

In 2017 Ito tested the relationship between economic growth and renewable, non-renewable energy consumption over the period 2002-2011 using panel data of 42 developed countries and found that renewable energy consumption positively contributes to economic growth in the long run non-renewable energy consumption this led to a negative impact on economic growth for developing countries (Ito 2017). In 2019, Hamit Can and Özge Korkmaz used the data for the period 1990-2016 of Bulgaria to investigate the relationship among renewable energy consumption, renewable electricity output and economic growth, by applying the Toda-Yamamoto analysis and Autogressive Distrubuted Lag (ARDL) bound test. Three different results has been obtained: (Can and Korkmaz 2019).

In 2019, Haseeb et al., investigated the impact of renewable energy on economic well-being in Malaysia. Annual data has been used over the period of 1980-2016, this study utilized autoregressive distributed bound testing approach. The results showed renewable energy have significant and positive impact on economic well-being in short-term and long-term (Haseeb, Abidin et al., 2019).

Finally, Azam,Anam et a. in 2021, analyze the impact of renewable electricity consumption on economic growth and CO2 emissions over the period from 1994 to 2015 in newly industrialized countries by applying the possible presence of cross-sectional dependence test, cross-sectional Augmented, and cross-sectional augmented Im-Pesaran-Shin unit root test, and Pooled Mean Group model. The results suggest that renewable electricity consumption is positive but statistically insignificant in explaining GDP while it contributes to mitigating the CO2 emissions in the long run (Azam, Rafiq et al. 2021).

So that all previous studies found different results depending on different methods. Some of these studies indicated a causal relationship between renewable electricity consumption, carbon dioxide emissions, and

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economic growth. On the other hand, other studies indicated a non-linear relationship between CO2 emissions and real production, more over studied that neither energy consumption nor CO2 emissions led to economic growth. However, previous studies had not been shown the amount of the increase or decrease of the independent variables to increase economic growth by one unit. Thus, the fuzzy inferwnce system and a regression analysis have been performed in this study to find out the amount of increase in the consumption of renewable electricity and the amount of decrease in carbon dioxide emissions to increase economic growth by one unit to obtain accurate results for providing more policy implications in the United Arab Emirates.

3. Research Model And Data Description

3-1. Research Model: The fuzzy inference system (FIS) and regression analysis will be utilized in this paper for finding the relationship between the dependent and independent variables. The dependent variable is Economic Growth (EG) that represents the output of the proposed FIS. In addition, the independent variables are Gross Domestic Production (GDP), renewable electricity consumption (REC), Carbon dioxide emissions (CO_2E), Electricity production from oil sources (EPFO) and Renewable electricity output (REO) which will represent the inputs of the proposed FIS that includes of four phases which are explained as below (Basri 2008): (A. Fuzzification, B. Rule Evaluation, C. Aggregation or Inference Engine, D. Defuzzification).

The proposed fuzzy inference system as shown in figure (1), The first layer represents the input variables, the middle layer represents the rules Evaluation and Inference Engine. The last layer represents the output layer.

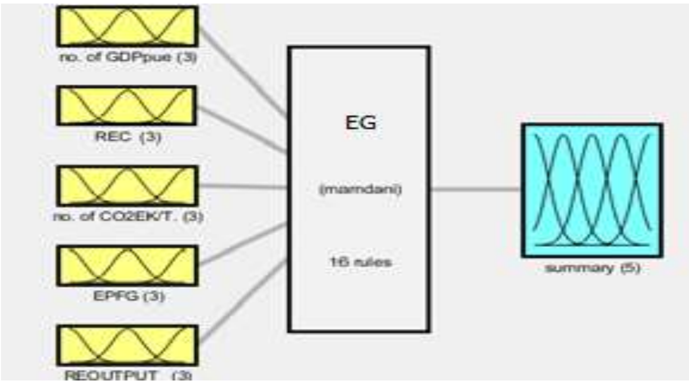

Fig. 1: The proposed FIS

Each input variable includes three fuzzy sets (Low, Mediom, High) which are generated using gaussion membership function to calculate the membership values of each input variables as shown in Equation (1).

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$u_{ij} = \exp[-\{u_i - m_ij\}^2 / \sigma^2_{ij}]$...... (1)

where u_{ij} represents the membership value within the interval [0,1], m_{ij} and σ_{ij} are respectively the center and the width of the Gaussian membership function of the jth term of the ith input variable x) (Lin, Peng et al. 2011), fig.2 shows an example of the used fuzzy sets .

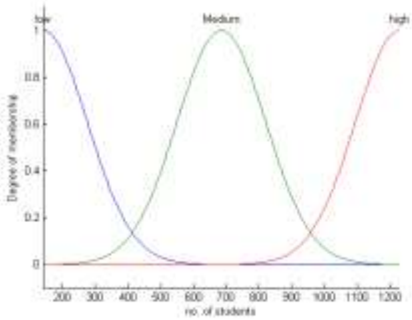

Fig. 2: Example of the fuzzy sets for the input variables

In this study, the general formula of the used fuzzy rules for determining the output consist of two parts which are antecedents (IF part) and consequents (THEN part) (Michael 2005), as shown in the following example:

IF (GDP-IS-Low) & (REC-IS-Low) & (CO2E-IS-Medium) & (EPOF-IS-Medium) & (REO-IS-Low) THEN (EG-IS-Pass).

The defuzzification will be applied on the output variable to convert it from a linguistic variable to a crisp value as using center of gravity method.The output variable is consisting of five fuzzy sets which are pass, medium, good, v.good, excellent. The range of each fuzzy set shown in table.

Table 1: The range of each fuzzy

The name of the fuzzy set	The range
Pass	50-59
medium	60-69
Good	70-79
v. good	80-80
excellent	90-99

In addition, the multivariate regression analysis model has been applied to determine the effects of independent variables on the dependent variable (negative or positive) (Uyanık and Güler 2013) as shown in Equation 2 :

$Y = B_0 + B_1X_1 + \ldots + B_NX_N + E$ .... (2)

Where:

Y =dependent variable, x_t= independent variables, B_t= parameter, E = error

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3-2. Data Analysis and Resluts Discussion: The current research scrutinizes the relationship between development indicators and economic growth (EG). The considered development indicators are Gross Domestic Product (GDP) (present value in US dollars, which equalize dollars at constant 2011 prices per kg of oil equivalent), Renewable energy consumption (REC) (percentage of total final energy consumption), CO2 emissions (kt) (CO2E), Electricity production from oil sources (EPFOS) and Renewable electricity output (REO) (percentage of total final energy consumption) for the 1990-2014 years In the United Arab Emirates . All data are collected from World Development Indicators (World Bank) (albankaldwali 2020). The result of the calculated EG of the proposed FIS approach based on the mentioned indictors as shown in table2 during the years 1990-1997.

Table 2: Data set and the calculated economic growth

No.	years	GDP	Renewable energy consumption (% of total final energy consumption)	CO2E	EPFOS	Renewable electricity output (% of total final energy consumption)	EG (calculated)
1	1990	5.07E+10	0	52009.06	3.706	0	60.75
2	1991	5.16E+10	0	57010.85	3.705	0	60
3	1992	5.42E+10	0.188369	58136.62	3.702	0	68.75
4	1993	5.56E+10	0.150356	65980.33	3.709	0	62
5	1994	5.93E+10	0.120145	73130.98	3.707	0	61.75
6	1995	6.57E+10	0.112604	70641.09	3.106	0	61.25
7	1996	7.36E+10	0.080332	41059.4	3.368	0	62.25
8	1997	7.88E+10	0.076356	41646.12	4.133	0	62.25
9	1998	7.57E+10	0.07247	81495.41	3.650	0	59.5
10	1999	8.44E+10	0.071649	78374.79	3.388	0	59.5
11	2000	1.04E+11	0.076377	112562.2	3.089	0	59
12	2001	1.03E+11	0.064706	101414.6	2.798	0	58.5
13	2002	1.10E+11	0.066608	84704.03	2.763	0	58.75
14	2003	1.24E+11	0.066361	106841.7	2.744	0	58.75
15	2004	1.48E+11	0.100562	113240.6	2.335	0	74.75
16	2005	1.81E+11	0.105395	116148.6	2.135	0	74.75
17	2006	2.22E+11	0.117609	123874.9	2.032	0	74.75
18	2007	2.58E+11	0.114586	135627.7	1.863	0	66.5
19	2008	3.15E+11	0.110343	157354.6	1.705	0	66.5
20	2009	2.54E+11	0.106411	167959.6	1.588	0	67
21	2010	2.90E+11	0.108122	160812.6	1.478	0	66.75
22	2011	3.51E+11	0.10804	165440.4	1.400	0	67.5
23	2012	3.75E+11	0.104985	176386.4	1.379	0	67.5
24	2013	3.90E+11	0.111771	170706.2	1.309	0.094	75

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It has been Observed an increase in the (GDP) index, in 1990, GDP was equal.

To (5.70E+10) then it increased until reached (7.88E+10) in 1997 as shown in fig.(2-a). On the contrary, the percentage of renewable energy consumption has been decreased from (0.188369) to (0.076356) as shown in fig.(2-b). Moreover, the carbon dioxide emissions have been increased from (52009.06) kilotons in1990 to (70641.09) kilotons in1995.Then, it decreased to (41646.12) kilotons in 1997) as shown in fig.(2-c). It has also been noticed that there is an increase in electricity production from oil sources from (3.706089) in 1990 to (4.133803) in 1997 as shown in fig.(2-d).

Also as shown in fig.(2-e), the renewable electricity outputs as a percentage of the final total energy consumption was equals to zero for the period 1990-1997 and those indicators achieved a level of economic growth ranging within the period [60-62] during this period. During the period 1998-2003, the gross domestic product (GDP) ranged between (7.57E + 10) and (1.24E + 11) while CO2E increased during that period from (81,495.41) to (106,841.7), at a time when electricity production from oil decreased from (3.650575) in 1998 to (02.744186) in 2003 with the continued lack of renewable electricity outputs. Thus, economic growth extends between 60-59, and the electricity production from Oil was ranged between (2.34-2.03) for that period with the continued absence of renewable electricity outputs.

As shown in fig.(2-f) During the years 2004, 2005, and 2006, GDP increased to (1.48 E + 11), (1.81E + 11), (2.22E + 11), respectively. In addition, the REC increased from (0.100562) in 2004 to (0.117609) in 2006, and CO2E increased from (113240.6) in 2004 to (123874.9) in 2006. Also, electricity production from oil ranged between (2.34-2.03) for that period with the continued absence of outputs Renewable electricity. The period economic growth reached (good) level which is (74.75) for the three years, then it decreased during the years 2007-2012 to the (medium) level within the period [67-68]. In 2013 and 2014 GDP increased to (3.90E +11) and 4.03E + 11), respectively. The REC rose to (0.111771) in 2013 and (0.145671) in 2014, and CO2E increased to (170706.2) and (211369.5) for the same years. and the electricity production from oil was (1.309) in 2013

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and (1.264)in 2014. The renewable electricity outputs were (0.0941) and (0.258) for the years 2013 and 2014, respectively).

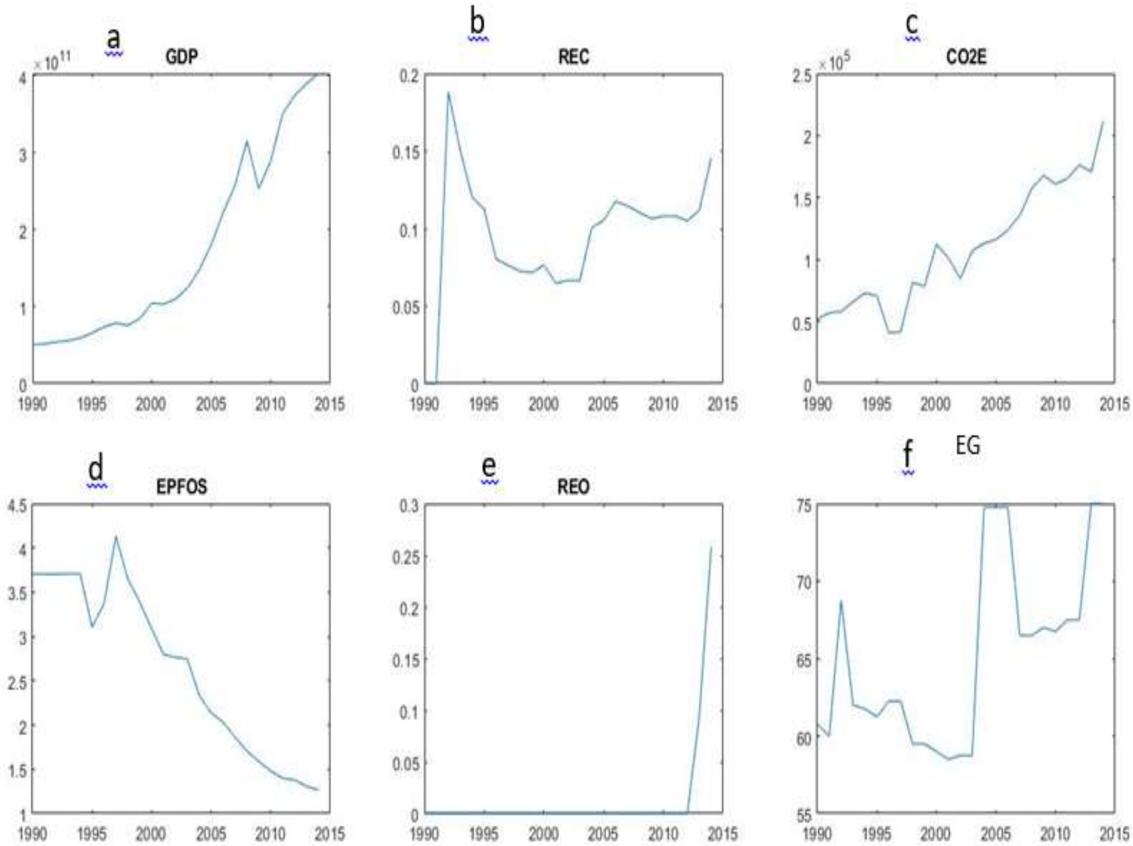

Fig.3: data analysis and economic growth

To show the significance of the obtained results from the proposed FIS approach, multiple linear regression analysis were performd between economic growth and the indicators(GDP pko, REC, CO2E, EPFO, REP) which are shown in Table 3.

Table3: The results of applined regression

Term	T-Value	P-Value
Constant	5.77	0.000
GDPpko	0.59	0.564
REC	2.42	0.026
CO2E(KT)	-1.91	0.072
EPFO	-2.07	0.052
REP	1.65	0.114

As shown in Table 3, REC have significant proportional with economic growth because the calculated p-value is less than 0.05 and the calculated T- value greater than 2.

Also, it can be seen that EPFO has significant inversely proportional with economic growth because the calculated p-value is greater than 0.05and the calculated T- value less than 2. In addition, it can be seen that the GDP, CO2E (KT), and REP are not significant proportional based on calculated p-value.

From the mentioned results in Table3, the null hypothesis (H_0) will be rejected and the alternative hypothesis (H_1) will be accepted, the assuming are:

H_0:$\mu_{1=}\mu_2$

$H_{1:}$ $\mu_{1\neq}\mu_2$

This means that there is a significant difference between the mean of the community and the mean of the sample in corroboration of the study sample.

The multiple linear regression is show in Eq.2:

EG =89.8+0.000000 GDP+51.2 REC-0.000126 CO2E-7.03 EPFOS+32.3 REp (2)

Thus, as shown in Eq.2, if the number of renewable energy consumption units increases by 51.2, EG will increase by one unit. Alsoif the CO2E decreases by 0.000126, Then EG will increase one unit. If the EPFOS decreases by 7.03 unit then EG will increase by one unit,In addittion if the Renewable electricity output increases by 32.3 unit then EG will increase by one unit. From the Equation we can be calculated that the consumption of renewable energy is significant than the production of renewable energy.

Finally, The Coefficient of determination (R-sq) equals to 64.75%; therefore, the indicators are explained 64.75% of the changes that are taken place in economic growth. So 35.25% is explained by other indicators that were n’t included in the equation.

To verify whether there is a Autocorrelation or not between the variables, the Durban-Watson Statistic has been performed. The result was equal to 1.170. Since the number of observations is 25 and the number of variables is 5, then DL equals to 0.953 and DU equals to 1.886. This implies that accept the hypothesis which is no Autocorrelation problem based on Durbin-Watson Test.

Vector Error Correction Model.

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Table 4: result of unit root

variable	Dickey-FULLER				Phillips-Perron			
	LEVELS		First Difference		LEVELS		First Difference	
	No treand	treand	No treand	treand	No treand	treand	No treand	treand
Co2e	-0.55501 (-2.998064) P= 0.8625	-2.801756 (-3.658446) P= 0.2124	-5.051694 (-3.004861) P= 0.0006	-4.955645 (-3.632896) P=0.0034	-0.201988 (-2.998064) P=0.9253	-2.762084 -3.622033)(P=0.2236	-5.810496 (-3.004861) P= 0.0001	-6.325768 (-3.632896) P= 0.0002
rec	-2.690954 (-3.012363) P=0.0922	-2.690954 (-3.012363) P= 0.0922	-5.179800 (-3.004861) P= 0.0004	-5.204007 (-3.632896 P= 0.0020	-3.749481 (-2.998064) P=0.0101	-3.569385 (-3.622033) P=0.0553	-5.201787 (-3.004861) P= 0.0004	-5.188681 (-3.632896) P=0.0021
epfo	-0.256772 (-2.998064) P= 0.9174	-2.795683 (-3.632896) P= 0.2130	-4.907173 (-3.012363) P=0.0009	-4.880461 (-3.644963) P=0.0043	0.439414 (-2.998064) P=0.9803	-2.504480 (-3.622033) P= 0.3230	-6.722210 (-3.004861) P= 0.0000	-7.356247 (-3.632896) P= 0.0000
gdp	1.173724 (-2.998064) P= 0.9969	-1.507853 (-3.622033) P= 0.7969	-4.611575 (-3.004861) P=0.0015	-5.319958 (-3.632896) P=0.0016	2.413437 (-2.998064) P= 0.9999	-1.211318 (-3.622033) P= 0.8840	-4.617514 (-3.004861) P= 0.0015	-11.07750 (-3.632896) P= 0.0000
eg	-1.811825 (-2.998064) P=0.3657	-2.484968 (-3.622033) P= 0.3315	-4.953675 (-3.004861) P=0.0007	-4.844774 (-3.632896) P=0.0043	-1.811502 (-2.998064) P= 0.3658	-2.539552 (-3.622033) P= 0.3080	-4.953136 (-3.004861) P= 0.0007	-4.844926 (-3.632896) P= 0.0043

As shown in Table (4) the two tests which are dickey- Fuller (D.F) and phillip-perron (p.p) have been applied, at levels all variablse are non-stationary but when I convert them to first differenced, then they become stationray because the calcukated value of first difference became more than tabular value. however, Since there was only one observation of the variable REP the unit root is not applied, So it was excluded from the model.

When the variablse are integrated of same order, we can run the johansen test of cointegration.

Thus, the null hypothesis for johansen test of cointegration has beenshown as Null: there is no cointegration among variables.

Table 5: Trace Statistic test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.807876	73.97804	69.81889	0.0224
At most 1	0.549024	37.68653	47.85613	0.3159
At most 2	0.449296	20.16704	29.79707	0.4116
At most 3	0.272974	7.042750	15.49471	0.5727
At most 4	0.001331	0.029302	3.841466	0.8640

Trace Statistic test.

Tikrit Journal of Administration and Economics Sciences, (31/3/2022);Vol. 18, No. 57, Part (2): 471-487
Doi: www.doi.org/10.25130/tjaes.18.57.2.28

As shown in table (5) at none the first value of Trace statisitic is more than Critical value at0.05 thats mean we can reject null hypothesis which none*.

At most 1null: there is one cointegration equation or one error term.

The Trace statistic is less than Critical value, sowe cann't reject null rather we accept null hypothesis that means one error term exist in the model, or all variables have long run associationship.

Table 6: Maxmum Eigen value test

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.807876	36.29151	33.87687	0.0252
At most 1	0.549024	17.51949	27.58434	0.5355
At most 2	9 0.449296	13.12429	21.13162	0.4409
At most 3	0.272974	7.013448	14.26460	0.4876
At most 4	0.001331	0.029302	3.841466	0.8640

Maxmum Eigen value test.

1st Null: there is no conitegrated equation or no error term

As shown in table (6) first Max Eigen value (36.29151) is more than Critical (33.87687) Value at 0.05 so we can reject null or none*.

2nd null hypothesis At most 1: there is one conitegrated modl or no error term.

The Max-Eigen Statistic (17.51949) less than Critical Value (27.58434) that is mean we cann't reject the null meaning that all variables are conitegrated meaning that they have long run associationship, so we can run vector error corriction model because all variables are cointegrated.

Our target model is

D(EG) = C(1)*(EG(-1) + 0.000190827399579*CO2E(-1) + 9.91992685726*EPFOS(-1) - 9.46253161021e-12*GDP(-1) - 143.068216058*REC(-1) - 96.0026811821) + C(2)*D(EG(-1)) + C(3)*D(CO2E(-1)) + C(4)*D(EPFOS(-1)) + C(5)*D(GDP(-1)) + C(6)*D(REC(-1)) + C(7)

The cointegration equation when (EG) is dependent variable (EG(-1) + 0.000190827399579*CO2E(-1) + 9.91992685726*EPFOS(-1) - 9.46253161021e-12*GDP(-1) - 143.068216058*REC(-1) - 96.0026811821

Meaning that the error term is here, meaning that, frome here we can derive the residual of the cointegration equation when EG is the dependent variable.

Table 7: output of estimate model

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.055955	0.305857	0.182945	0.8573
C(2)	0.091868	0.366687	0.250535	0.8056
C(3)	6.55E-05	9.45E-05	0.693309	0.4987
C(4)	0.692491	4.670687	0.148263	0.8841
C(5)	-1.15E-11	4.63E-11	-0.247733	0.8077
C(6)	-41.45424	36.14258	-1.146964	0.2694
C(7)	0.723089	1.417883	0.509978	0.6175
R-squared	0.157793	Mean dependent var		0.681818
Adjusted R-squared	-0.179089	S.D. dependent var		4.891795
S.E. of regression	5.311798	Akaike info criterion		6.431109
Sum squared resid	423.2280	Schwarz criterion		6.778259
Log likelihood	-63.74220	Hannan-Quinn criter.		6.512887
F-statistic	0.468393	Durbin-Watson stat		1.691587
Prob(F-statistic)	0.821170			

as shown in table (7) c(1)is the coefficient of gointegration model, in other word c1= speed adjustment towards long run equilibium, but it must be negative and must be significant, that is mean there is no long run causality from independent variables such as co2E Epfo gdp REC, in other words, the independent variables have no influence on the dependent variable in the long run.

And after dropping the insignificant variables (CO2E, GDP) according to Hendry's method 1995 the value of R-squared Equals to 55.97%, that's mean that the variables (EPFO, REC) explain55.97 of the changes that occur in (EG). from Serial Correlation LM Test p=0.64 that is mean the model Does not suffer from serial Correlation , and the p value of Heteroskedasticity Test is 76.61 that is mean ther is no Heteroskedasticity in the residual.

4. Conclusion:

In this paper, the (FIS) and regression analysis has been applied to find the effect of independent variables (REC, CO_2E, EOFO, GDP, REO) on dependent variable (EG). The experiments are applied on the data that are collected from world bank. The data are included the values of U.A.E. during 1990-2014. From the obtained results, REC have significant proportional with economic growth, EPFO has significant inversely proportional with economic growth and CO2E (KT) is not significant proportional with (EG). Considering that the inverse relationship between CO_2E, EPFO and (EG). Finally with regard to the production of renewable electricity, is not significant due to the lack of production except in the last two years of the study. These indicators interpreted 64.75% of the changes that are taken place in (EG).

On the other hand, 35.25% are represented by other indecators which are not included in the model. The Durban-Watson test was also conducted, and the result was 1.170 when DL = 0.953 and DU = 1.886 and this indicates, that there is no Autocorrelation problem. Moreover, VECM model has been conducted, from obtained results, it can be concluded that (EPFO, REC) explains 55.97% of the changes that occur in in economic growth, and the Serial Corrilation LM Test model has been run, the model Does not suffer from serial Correlation. in addition the obtaind result from Heteroskedasticity Test ther is no Heteroskedasticity in the residual.

For future research, the non-significant variables will be drop and others will be added. The prediction process will be conducted until 2050 to forecasts the future results of the economic growth.

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