Determinants of Sustainable Development in Egypt During the Period of (1977-2019)

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Abstract

This study investigated the main determinants of sustainable development in Egypt using annual data for Egypt for the period of 1977 to 2019. The study used the autoregressive distributed lag model (ARDL) for the analysis and the bounds test for cointegration to test whether a long run relationship exists between the study variables - Economic Growth (EG), Unemployment Rate (UNR), Trade Openness (TO), Population Growth (POPG). The main result from the study was that a long and short run relationship exists between the variables, there is a long-run co-integration relationship between the dependent variable Sustainable Development(SD), and the independent

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variables: Trade Openness, Real GDP Per-Capita, Population Growth, Unemployment Rate (UNR) included in the study, and they have a significant effect on sustainable development. Secondly, the estimated coefficients of Economic Growth (EG) and Trade Openness (TO) both positively impacts sustainable development in the long run, while Unemployment Rate (UNR) and Population Growth (POPG) both negatively influence sustainable development in long run. In the short run all variables of the study Economic Growth (EG), Trade Openness (TO), Unemployment Rate (UNR), and Population Growth (POPG) negatively-inversely- influence sustainable development. The results also showed that there were no econometrics problems in the model. The results suggest that developing the economy while stimulating trade and promoting policies to decrease Unemployment Rate (UNR) and Population Growth (POPG) will promote sustainable development in Egypt.

Keywords: Sustainable Development, Egypt, Determinants, ARDL.

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محددات التنمية المستدامة في مصر خلال الفترة (1977-2019)

ملخص الدراسة

تهدف هذه الدراسة الي تحليل وقياس اهم المحددات الرئيسية للتنمية المستدامة في مصر باستخدام البيانات السنوية لمصر للفترة من 1977 إلى 2019. استخدمت الدراسة نموذج الانحدار الذاتي الإبطاء الموزع (ARDL) لتحليل واختبار حدود التكامل المشترك لاختبار ما إذا كانت هناك علاقة طويلة المدى بين متغيرات الدراسة ـ النمو الاقتصادي، معدل البطالة، الانفتاح التجاري النمو السكاني. وكانت النتيجة الرئيسية هي وجود علاقة طويلة وقصيرة المدى بين المتغيرات، وهناك علاقة تكامل مشترك طويلة المدى بين المتغير التابع (التنمية المستدامة)، والمتغيرات المستقلة: النمو الاقتصادي، معدل البطالة، الانفتاح التجاري، النمو السكاني للدراسة، وان متغيرات الدراسة لها تأثير معنوي على التنمية المستدامة. ثانيًا، تؤثر المعاملات المقدرة للنمو الاقتصادي والانفتاح التجاري بشكل إيجابي على التنمية المستدامة على المدى الطويل، بينما يؤثر كل من معدل البطالة والنمو السكاني سلبًا على التنمية المستدامة على المدى الطويل. وعلى المدى القصير، تؤثر جميع متغيرات الدراسة النمو الاقتصادي، والانفتاح التجاري، ومعدل البطالة، والنمو السكاني سلبًا ـ عكسيا ـ على التنمية المستدامة، واظهرت النتائج ايضا عدم وجود مشاكل في النموذج القياسي. تشير النتائج إلى أن تطوير الاقتصاد مع تحفيز التجارة وتعزيز السياسات لخفض معدل البطالة والنمو السكاني سيعزز التنمية المستدامة في مصر.

الكلمات المفتاحية: التنمية المستدامة، مصر، المحددات، ARDL.

1- Introduction:

Sustainable development is one of the most important contemporary issues facing Egypt, the Arab countries and even the whole world. There is a global paradigm shift to sustainable development as a solution to various problems facing regions and countries. These problems vary from country to country and region to region, but they all have a common theme development with access to limited resources for an improved livelihood. Sustainable development is one of the fundamental goals that all developed and developing countries alike strive to achieve. The concept of sustainability was formally pronounced in 1987 following a report dubbed "Our common future" written by the World Commission on Environment and Development, also referred to as the Brundtland Commission, where they defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). However, this concept was presented more than 25 years ago and is still yet to be captured by most countries in their development plans.

The Egyptian government launched on Saturday 14/3/2015 the "sustainable development strategy Egypt's vision "2030". The strategy targets three main goals, namely; economic development, competitiveness of markets and human capital.(Egypt vision 2030, 2015). It is the first formulated strategy in accordance with the methodology of long-term strategic participatory planning. The strategy is particularly important in the circumstances prevailing in Egypt, which require revision of development goals in order to keep up with current and future needs and to develop better solutions to deal with them. Egypt Vision 2030 takes into consideration the challenges facing the process of development in Egypt. These challenges are represented in the scarcity of natural resources such as energy, land, and water (in addition to environmental degradation); human development resources including population, health, and education; the inadequacy of the governance system; and the absence of systems that foster creativity and innovation. In addition, the strategy adopts a number of goals and targets, in order to transform these elements into incentives for development, instead of being

major challenges. Under the new strategy, the government will be committed to achieving a growth rate of 7%, increasing investment rates, raising the contribution of services to GDP to about 7%, increasing exports and reducing unemployment rates to about 5%. Through the 2030 strategy, the Egyptian government seeks to maximize the use of local energy sources - traditional or renewable - and the development of the productive capacity of the energy sector to be more effective in boosting the economy and adapt to the ever-growing changes in the field of energy.

The strategy also aims to promote human resources through two main axes; education and health, so that Egypt becomes one of the top 30 countries in the quality of basic education indicator as well as bringing the illiteracy rate to the default zero, and the ratio of total enrollment for kindergarten children (4-6 years) to 80%. The strategy includes reducing the mortality rate of newborns, infants, and children under 5 years old by 50 % and reducing the maternal mortality rate by 60 %.

It also includes fair access to the basic health interventions for all citizens by up to 80 % and ensuring 100 percent coverage of vaccinations nationwide. It also stipulates placing Egypt among

top 40 countries in reducing waste in government spending, and to be among the top 20 least corrupt countries in the world.

The strategy also includes major reforms in the fields of telecommunications and information technology, industry and investment, women empowerment, and gender equality, in addition to legislative and institutional reforms.

Thus, the aim of this study is to determine the main determinants of Sustainable development that promotes economic growth, environmental sustainability, and social development in Egypt. Since sustainable development is a challenge, Egypt is taken as an example to try to find the factors that affect sustainability in its economy.

2- The Problem of the Study:

The problem of the study is there is a debate in economic thought and applied studies about the main determinants of sustainable development and thus in Egypt, as follows: Some studies investigate that main determinant of sustainable development are:(household consumption per capita, unemployment rate, resource productivity, energy efficiency, real gross domestic product per capita and terms of trade),while

others investigate(inflation rate, financial development, per capita income and minerals exports), and others (GDP through inflation, unemployment, poverty, education, and exports), (unemployment, export, import, average salaries and CPI as a measure for inflation). Egypt can be seen to lag behind in its achievement of sustainable development. And despite efforts it's made to raise sustainable development rate in, it's remained low compared to efforts made. In our study we will examine and investigate the main determinants of sustainable development which affect positively or negatively on accelerating the achievement of sustainable development in Egypt.

3- The Hypothesis of the Study:

The hypothesis of the study is that the main determinants of sustainable development in Egypt during the period of (1977-2019) are: Economic Growth (EG) measured by Real GDP per capita, Trade Openness (TO), Population Growth Rate (POPG), unemployment rate (UNR).

4- Objectives of the study:

The main objective of this study is to test and examine the validity of the study hypothesis to investigate the main determinants of sustainable development in Egypt during the period (1977-2019) in the short and long run and the relationship between each determinant (whether; it is positive(+) or negative(-) relationship). Through achieving the following:

1- To investigate the main determinants of sustainable development in Egypt.

2- To assess to what extent Economic Growth (EG) measured by Real GDP per capita, Trade Openness (TO), Population Growth Rate (POPG), unemployment rate (UNR) can be used to determine sustainable development in Egypt.

3- To estimate to what extent those determinants affect Egypt's economy in the short and long run and their direct and indirect impact.

4- Suggesting policies to accelerate the achievement of sustainable development goals in Egypt.

5- Significance and Scope of Study:

Assessing and determining significant predictors of sustainable development in Egypt will aid in informing policymakers on effective policies, given these predictors, which can be implemented to pursue a development pathway that is both progressive and sustainable. Economic, social, and environmental pressures need to constantly be reviewed against sustainability for the country to enjoy prosperity that is distributed equally in a preserved environment. The need to mainstream the agenda of sustainable development has never been more important as it is today, especially so for Egypt against its development plan, Vision 2030. Hence, this begs for accurate identification of determinants of sustainable development empirically evaluated to produce valid and reliable findings that will inform policies and institutions. This research is confined to Egypt and the period from 1997 to 2019 evaluating the annual data on social, environmental, economic, and sustainable development variables.

6- Research Methodology:

The study used the deduction methodology, to test the hypothesis of the study by searching in the result of the

literature review and last studies and applied that in the Egyptian economy depends on the time series data of the period (1977-2019). The study used the Autoregressive Distributed Lag (ARDL) econometrics model to test the hypotheses of the study. To investigate the determinants of sustainable development, the study uses empirical literature from Kaimuri, and George (2017), Abazi-Alili, Blerta, Agron, and Hristina (2017), Pardi, Salleh & Nawi (2015), Aslam and Akbar(2015), Mokhtar & Deng (2015), Phimphanthavong (2014), ELAGAL, and NOAL.SH, (2014), Knezovid and Uğur(2012), Tchouassi (2012), study of Boos, A (2011), Krzysztof Adam Firlej (2009), and Iqbal, and Zahid (1998) to specify the economic model below. Sustainable development (SD) is influenced by the following variables specified in the economic model under the following equation:

$SD_t = F (EG_t, TO_t, UNR_t, POPG_t),$

7- Literature Review:

There is an argument in the literature review, applied and last studies about the main determinants of sustainable development as follows:

› The study of Kaimuri, and George (2017): "**Determinants of Sustainable Development in Kenya**". Investigated the determinants of sustainable development in Kenya using annual data for Kenya from the period of (1991 to 2014). Adjusted net savings rate (ANSR) was used as a proxy sustainable development.

The study used the autoregressive distributed lag model (ARDL) for the analysis and the bounds test for cointegration to test whether a long-run relationship exists between the study variables - household consumption per capita, unemployment rate, resource productivity, energy efficiency, real gross domestic product per capita and terms of trade.

The main result of the study was that a long- run relationship exists between the variables. The estimated coefficients of household consumption per capita negatively impact sustainable development in the long-run while the

unemployment rate and energy efficiency both negatively influence sustainable development in the short run. Resource productivity, real gross domestic product per capita and terms of trade are insignificant in determining sustainable development.

› The study of Abazi-Alili, Blerta, Agron, and Hristina (2017): "**Identifying factors that influence sustainable development: the case of Macedonia**" evaluated the econometric model by linear regression (OLS), where it determined GDP through inflation, unemployment, poverty, education, and exports.

This study investigates that inflation and poverty are statistically insignificant. Considering education and exports, these two variables are foreseeable and came out with the predicted mark. The most unusual finding is the coefficient of unemployment, which has a positive and statistically significant impact on economic growth.

And also the study concludes to have a sustainable development requires economic growth, which leads to

increased productivity, increased employment, reduced poverty, inflation stability, the boost of education, environmental cultivation, and rapid technological progress. The general conclusion of the study is that Macedonia should undergo some serious economic reforms that should be accompanied by a social component. So that the achieved economic growth is also sustainable, i.e. to achieve sustainable development, Macedonia should also undertake some environmental activities.

> The study of Pardi, Salleh & Nawi (2015): "**Determinants of Sustainable Development in Malaysia: A VECM Approach of Short-Run and Long-Run Relationships**" carried out an econometric analysis of determinants of sustainable development in Malaysia by using Adjusted Net Saving (ANS) rate as a proxy for sustainable development. Using ANS rate, adjusted for GDP and net national saving, as they assumed that it is a true measure of the rate of saving of a country. They assessed several variables; inflation rate, financial development, per capita income, and minerals exports share using a vector error correction model (VECM).

From their study, they found that in the short run, one-year lagged values of all the variables except minerals export share have a substantial effect on sustainable development and in the long run, all variables including minerals export share have a substantial effect on sustainable development.

› The study of Younis, Aslam and Akbar(2015): "**Pattern of Development and Sustainable Economic Growth in Pakistan: A Descriptive Analysis**" examined the pattern of development and its sustainability in case of Pakistan by analyzing all major macroeconomic, social, and environmental variables, using data from 1950 to 2013.

Literature shows that low savings and investment rates, budget deficit, institutional shortcomings, lack of human development and environmental degradation remain some of the major issues faced by the country. These factors together along with bad governance are considered as the major cause of unsustainable development.

The literature reveals that the most important determinants of a country's prosperity are physical and human capital,

trade openness, macroeconomic stability, technological progress, institutions, and geography.

To achieve sustainable development Pakistan has to improve both economic and social infrastructure. The study reveals that to achieve sustainable development Pakistan has to improve both economic and social infrastructure so that some of the major issues facing by the country can be tackled including human capital in the form of health and education, insufficient energy supply, low agriculture growth rate, deteriorating terms of trade, budget deficit and environmental degradation e.g. deforestation, pollution, and water scarcity, etc.

› The study of Mokhtar & Deng (2015): "**Identification of Key Forces Influencing Sustainable Development in Taiwan**" carried out a political, economic, social, technological (PEST) analysis to analyze the key forces that influence sustainable development in Taiwan. Mokhtar & Deng analyzed 11 reports published by the National Council of Sustainable Development between 2003 and 2013 and found that 9, 8, 10 and 5 key forces in the political,

economic, social, and technological environment respectively influence sustainable development.

They further recommended that involvement by key stakeholder groups from the central government, local governments, private sectors, non-governmental organizations, and civil society is critical to achieving sustainable development in Taiwan.

> The study of Phimphanthavong (2014): "**The Determinants of Sustainable Development in Laos**" investigated determinants of sustainable development in Laos by employing a regression analysis on various variables such as GDP, poverty reduction, income inequality, air pollution and deforestation to obtain a sustainable development degree, a ratio of sustainable development to GDP. Also, it investigates, that Sustainable development based on three factors of development and sustainability of Laos. Each factor highlighted its advantages and drawbacks, underlining the fact that no indicator is perfect, and no one can give a comprehensive view of sustainable development. Therefore, the study of a single factor is insufficient for sustainable

development, for example focusing only on the analysis of sustained growth without considering the sustainability of the society and environment.

Phimphanthavong concluded that sustainable development is a combination of economic growth, social development, and environmental protection and further stated that progress is achieved once economic growth is distributed to all citizens via poverty reduction strategies that aim to minimize inequality in the society and at the same time maintaining a suitable condition for the environment and protection of natural resources.

> The study of ELAGAL, and NOAL.SH, (2014): "**The determinants and challenges of sustainable development**" showed the obstacles and challenges facing societies in their path to meet their needs and develop sustainable development programs, and also aims to reveal economic, environmental, and social determinants of sustainable development. Also, use theoretical studies through the dialectic relationship between economic growth and sustainable development.

The study has enabled us to highlight a number of critical points, particularly those related to environmental threats and the importance of the environmental dimension in achieving the Sustainable Development Goals in all their dimensions.

The results of the study showed the role of natural capital in the formation of social capital as well as the role of human beings as a key player in the process of sustainable development.

The study led us to the conclusion that development cannot be confined to the narrow limits of economic growth and the concept of development is an expanded concept that accommodates social, political, environmental, and technological dimensions, in addition to the economic dimension. Development is a process of human emancipation that includes the liberation of the individual from oppression, poverty, exploitation, and restriction of freedoms. (Amarti San).

› The study of Knezovid and Uğur(2012): "**Macroeconomic determinants of Sustainable Development in Bosnia and Herzegovina**" showed the degree of correlation between sustainable development and five macroeconomic determinants: unemployment, export, import, average salaries, and CPI as a measure for inflation.

The study provides information about the importance of the economy in this process, and it explains all variables that are used.

It is based on a period of five consecutive years (2007-2011). Research for all five variables was conducted on a monthly basis for this period.

Also, it studies unemployment, as one of the biggest and growing problems in the country, is a dependent variable and the study tries to prove relationships among this variable and the others.

The results show that the main reason for unemployment, among the variables, is trade. A huge trade deficit is among the leading reason why this country stagnates in sustainable development. On the other hand, economic research show

that the relationship between unemployment and import is strongly negative.

› The study of Tchouassi (2012): "**Does Gender Equality work for Sustainable Development in Central Africa Countries**" analyzed the relationship between gender equality and sustainable development across 11 countries in Central Africa in 2010 by use of cross-sectional analysis and found a positive correlation between gender equality and sustainable development.

The study showed that when the multidimensional poverty index increases, environmental problems reduce highlighting the positive role of gender equality in sustainable development.

› The study of Boos, A (2011): "**The impact of resource-dependence and governance on sustainable development**" investigated the impact of resource-dependence and governance on sustainable development. The study examined the relationship between resource extraction, institutional quality, armed violence, and

sustainable development; using panel data of 108 developing countries for a period of 24 years.

The results finding highlights a negative relationship between resource extractions and ANS per capita, a different approach from previous authors.

The findings showed that armed conflict has a negative impact on ANS rate per capita. Armed conflict, as measured by homicide rate; negatively impacted ANS. Another important variable, which is the population growth, tends to have a negative correlation with ANS rate per capita, the growing population would eventually decrease the level of saving in ANS, thus reducing sustaining development.

> The study of Krzysztof Adam Firlej (2009): "**Foreign Direct Investments as Stimulants and Determinants of Sustainable Development of Malopolska Province**" provided the stimulating factors that determine the sustainable development of the Małopolska province, related to the inflow into its territory of foreign direct investment (FDI) in the years 1989-2008.

The thesis characterizes the impact of FDI on economic aspects such as levels of employment, diversification of the regional economy and diversification of its economic development level.

Foreign Direct Investments in Malopolska province significantly affect the diversification of its economy, making it less vulnerable to periodic fluctuations of individual sectors and industries.

› The study of Iqbal, and Zahid (1998): "**Macroeconomic Determinants of Economic Growth in Pakistan"** examined the impact of some important macroeconomic variables on the economic growth of Pakistan on the period of 1956-1996. Multiple regression analysis is utilized for that purpose. Simple growth equations are used and the variables which are included follow regressions of Easterly (1993), and Barro (1991).

Empirical results show that primary education, physical capital, and trade openness has a positive impact on economic growth whereas budget deficit and external debt

has a negative impact on economic growth. Furthermore, it is suggested that long-run growth-oriented policies are needed for sustainable growth.

The study shows the need for the development of human and physical capital, as well as the mobilization of domestic resources to achieve sustainable development.

› **This study**: The literature suggests that for sustainable development to be embedded in a country policies and strategies, then it needs to be understood from a theoretical and empirical approach. It is not enough to know what sustainable development is but measuring it and benchmarking the country against it is. This study contributes to literature by identifying, measuring, and determining the main determinants of sustainable development in Egypt which in turn will inform development plans and policies needed for a pathway to sustainable development and identify the most important obstacles that impede its application.

8- Source of Data, and Study variables:

8-1- Source of Data:

› The variables used as determinants in this model were determined based on the existing literature on the topic, availability of data, economic theory and whether they fit well in the model in statistical terms.

› The annual data on Sustainable Development, Economic growth, Trade Openness, population growth, Unemployment rate used for this study were collected from World Development Indicators (WDI, 2019), for the period of (1977-2019).

https://data.worldbank.org/country/egypt-arab-rep

https://data.worldbank.org/country/Egypt?view=chart .

› The data were analyzed by using EViews software program.

8-2- Study variables:

8-2-1 The dependent variable:

- (SD_t) Sustainable Development,

8-2-2 The independent variables:

- (EG_t) is Economic growth measured by the real GDP per capita (RGDP) and is used as a measure of economic growth to reduce poverty.

 (Word Development Indicators (WDI, 2019).

- (TO) is Trade Openness is used as a measure of Export and Import % of GDP, the sum of a country's exports and imports as a share of that country's GDP (in %). (Word Development Indicators (WDI, 2019).

- (POPG) is population growth Annual population growth rate. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. (Word Development Indicators (WDI, 2019).

- (UNR) is Unemployment rate refers to the share of the labour force that is without work but available for and seeking employment. Unemployment rate is the ratio of unemployed people to the labour force. that is used as a measure of labour as a factor of productivity, and social

indictor for combating poverty. (Word Development Indicators (WDI, 2019).

9- The Results and Discussion:

9-1 ARDL Model:

The ARDL Autoregressive Distributed lag Model is used to formulate the relationship between economic variables in time series equation. The importance of this model also stems from the fact that the integration of Nonstationary is equalized by the error correction (EC) process, the ARDL model has a correction in the EC, 1987 (Engle and Granger (Hassler and Wolters, 2006) error-correction model) and the existence of a long cointegration relationship and the term can be tested depending on the error correction model. The bound test is used to draw a final conclusion without the need to know which of the variables are integrated of zero degree and unit degree (Pesaran, Shin, and Smith, 2001).

Multiple tests were performed regarding time series to get good estimation results, several stages of statistical testing are needed:

(1) unit root test (stationary) to ensure that the data used has a stable trend;

(2) the selection of the optimum lag criteria to give meaning to the dynamics of the variables in the model equation;

(3) cointegration test to see the long-run equilibrium relationship between independent variables which, although individually, are not stationary;

(4) Error correction formula estimation of ARDL-ECM model.

(5) Diagnostic tests to ensure the quality of the model used in the analysis.

(6) ARDL-ECM structural stability test.

9-2   Investigate the Data Stability:

The first step in implementing any time-series econometric model is to check the stability through several tests, from which the researcher chose the augmented *Dickey-Fuller test*.

From the results in the below table, we notice that some variables were stable in the case of the level, and the others are stable in the first difference, so we find that there is a difference in the level of stability of the variables, and then we can determine the optimal model here and it is Autoregressive

Distributed Lag Model (ARDL), We can implement the model as follows:

Table (1):

Model variables	
Sustainable Development (SD)	Dependent Variables
Unemployment Rate (UNR)	Independent Variables
Population Growth (POP),	Independent Variables
(EG): Economic Growth measure by Real GDP Per-Capita	Independent Variables
Trade Openness (TO)	Independent Variables

Table (2):

Results of Unit root test -(ADF) Test

	Level	First Difference	Order

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Variables	Lag Length	t-statistic	p-value	Lag Length	t-statistic	p-value	of Integration
SD	0	-2.356	0.396	0	-5.165	0.0007***	I (1)
EG	2	-5.352	0.0004	2	-3.392	0.0672**	I (0)
TO	3	-4.204	0.011	0	-4.848	0.0018***	I (1)
UR	3	-2.554	0.302	0	-4.422	0.0064***	I (1)
POPG	3	-2.592	0.286	6	-3.679	0.037***	I (1)

Source: Prepared by the researcher.

Notes:

- Augmented Dickey-fuller (ADF) test is used with constant and trend.
- Lag length has been chosen based on Schwarz Information Criterion (SIC).
- Critical values follow MacKinnon (1996).
- ***, **, and * represent the significance level at 1%, and 5%. respectively.

Results of Unit root-test (ADF) Test:

The ADF Test was used to test whether the study variables were stationary or not and to determine the degree of their integration. Table (4) illustrate the ADF Test results at level and the first differences with an intercept, trend, and intercept and none at the significance level of 1%, 5%, and 10%.

Table (3):

Unit root test Results

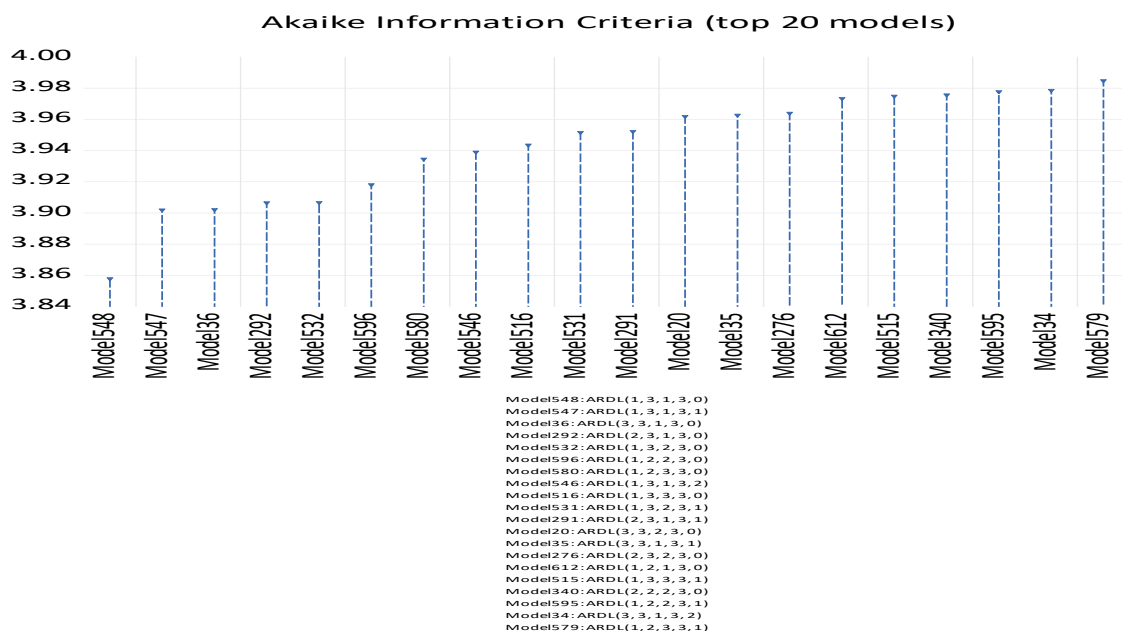| Level I (0) |
| --- |
| **SD**:   Constant and Linear Trend. |
| **EG:** Constant and Linear Trend. |
| **TO**: Constant and Linear Trend. |
| **UR**: Constant and Linear Trend. |
| **First Difference I (1)** |
| **SD**: Has a unit root, and Constant and Linear Trend. |
| **EG**: Has a unit root, and Constant and Linear Trend. And sustainable development. |
| **TO**: Has a unit root, and Constant and Linear Trend. And sustainable development. |
| **UR:** Has a unit root, and Constant and Linear Trend. And |

sustainable development.

POPG: Has a unit root, and Constant and Linear Trend. And sustainable development.

9-3   The boundary test for Co-integration Results:
9-3-1 Lag Order Selection Criteria:

Before moving on to the Co-integration test between the studied variables, we have to determine the optimal time lag period for those variables of the ARDL model, based on the (AIC) Akaike information criteria. And we found in our study that the optimal model is (1,3,1,3,0) ARDL, which was determined at the lowest value of the (AIC) criterion.

Figure.**(1):** *Akaike's* **Information Criterion** *(AIC) Values for the 20 top Models*

Akaike Information Criteria (top 20 models)

Model548:ARDL(1,3,1,3,0)
Model547:ARDL(1,3,1,3,1)
Model36:ARDL(3,3,1,3,0)
Model292:ARDL(2,3,1,3,0)
Model532:ARDL(1,3,2,3,0)
Model596:ARDL(1,2,2,3,0)
Model580:ARDL(1,2,3,3,0)
Model546:ARDL(1,3,1,3,2)
Model516:ARDL(1,3,3,3,0)
Model531:ARDL(1,3,2,3,1)
Model291:ARDL(2,3,1,3,1)
Model20:ARDL(3,3,2,3,0)
Model35:ARDL(3,3,1,3,1)
Model276:ARDL(2,3,2,3,0)
Model612:ARDL(1,2,1,3,0)
Model515:ARDL(1,3,3,3,1)
Model340:ARDL(2,2,2,3,0)
Model595:ARDL(1,2,2,3,1)
Model34:ARDL(3,3,1,3,2)
Model579:ARDL(1,2,3,3,1)

We use Akaike's Information Criteria (AIC) to identify the most suitable ARDL model. As seen from Figure.(1), among the top 20 models at the lowest AIC values, optimum model is (1,3,1,3,0) ARDL, which was determined at the lowest value of the (AIC) criterion, which was.

After determining the optimal time lag period for the model variables of the ARDL model (1,3,1,3,0), we move to verify the existence of co-integration between the variables by applying the Bounds test and using Model (UECM).

Table (4): Results of ARDL Bounds Test for Cointegration

Variables	F-statistic	Lag	Decision
Model: FSD (SD/TO, UR, POPG, EG)	13.1000***	4	Cointegration
Critical Values			
Significance Level	Lower Bounds [I (0)]	Upper Bounds [I(I)]	
1%	4.4	5.72	
5%	3.47	4.57	
10%	3.03	4.06	

Source: Prepared by the researcher using.

⇨ **Notes:**

⇨ *** represent the significance level at 1%.

⇨ **Source:** Results of Research, 2022.

The bound test is a test in which we can identify the existence of co-integration between the independent variables and the

dependent variable through the value of the F-test and it is compared with the level I(0) and the level I(1).

If the value of the test parameter is greater than the maximum limit, this indicates the existence of a co-integration relationship between the independent variables and the dependent variable.

Looking at the above table, we conclude that there is a long-run co-integration relationship between the dependent variable, Sustainable Development, and the independent variables: Trade Openness, Real GDP Per-Capita, Population Growth (POP) , Unemployment Rate (UNR) included in the study.

9-4 Estimated Long Run Coefficients Based on the ARDL:

Table (5): Results of Long-Run Coefficients Cointegration Based on the ARDL Model (1, 3, 1, 3, 0)

Dependent Variable: SD		
Independent Variables	**Estimated Coefficient**	**p-value**
EG	48.3007	0.0056
POPG	-8.356	0.0242
TO	0.2608	0.0000
UR	-1.4120	0.0013

Source: Prepared by the researcher.

SD f =(EG, POPG, TO, UR).

SD – (48.3007*LYPC -8.356*POPG+ 0.2608*TO-1.4120*UR)

1. From the above table we notice that :

   The variable Economic Growth (EG) has a significant effect, as the value of the probability was 0.0056 less than the 5% level of significance chosen by the researcher, and this means that the change in (EG) has an impact on (**SD**) directly. That is, the more the change in (EG) by one unit directly increasing the value of (**SD**) by 48.3007 in the long run.

2. From the above table we notice that the variable Population Growth (POPG) has a significant effect, as the value of the probability was 0.0242 less than the 5% level of significance chosen by the researcher, and this means that the change in (POPG) has an impact on (**SD**) inversely. That is, the more the change in (POPG) by one unit decreasing the value of (**SD**) by 8.356 in the long run.

3. From the above table we notice that the variable Trade Openness (TO) has a significant effect, as the value of the probability was 0.0000 less than the 5% level of significance chosen by the researcher, and this means that the change in (TO) has an impact on (**SD**) directly. that is, the more the change in (TO) by one unit directly increasing the value of (**SD**) by 0.2608 in the long run.

4. From the above table we notice that the variable Unemployment Rate (UR) has a significant effect, as the value of the probability was 0.0013 less than the 5% level of significance chosen by the researcher, and this means that the change in (UR) has an impact on (**SD**) inversely.

That is, the more the change in (UR) by one unit decreasing the value of (**SD**) by 1.4120 in the long run.

9-5 Estimated short-Run Coefficients Based on the ARDL Model -Error Correction Model (ECM) Results:

The error correction model is used to measure the short-run relationship among variables. ((SD) Sustainable Development, Unemployment Rate (UNR), Population Growth (POP), (EG): Economic Growth measure measured by (Real GDP Per-Capita), Trade Openness (TO)) in Egypt).

Table (6) : Estimated Error Correction Model Based on the ARDL Model (1, 3, 1, 3, 0)

Dependent Variable: ΔSD		
Independent Variables	**Estimated Coefficient**	**p-value**
C	-417.7061	0.0000
@TREND	-1.177048	0.0000
D(EG)	-83.08391	0.0001
D(EG (-1))	-87.16400	0.0013
D(EG (-2))	-44.44423	0.0533
D(POPG)	-83.24654	0.0000
D(TO)	-0.135238	0.0091
D(TO (-1))	-0.384511	0.0000
D(TO(-2))	-0.274822	0.0003
DUM11	-0.934863	0.3308
ECM_{t-1}	-0.973551	0.0000
Constant		
R^2= 0.8598	**F-statistic (p-value)**	15.336(0.000000)
$\overline{R^2}$ =0.80377	**DW**	2.198

Source: Prepared by the researcher.

1. From the above table we notice that the variable D(EG) has a significant effect, as the value of the probability was 0.0001 less than the 5% level of significance chosen by the researcher, and this means that the change in D(EG) has an impact on (**SD**) inversely. That is, the more the change in D(EG) by one unit decreasing the value of (**SD**) by 83.08391 in the short run.

2. From the above table we notice that the variable D(EG (-1))has a significant effect, as the value of the probability was 0.0013 less than the 5% level of significance chosen by the researcher, and this means that the change in D(EG (-1)) in last year has an impact on (**SD**) in current year inversely. That is, the more the change in D(EG (-1))by one unit decreasing the value of (**SD**) by 87.16400 in the short run.

3. From the above table we notice that the variable D (POPG) has a significant effect, as the value of the probability was 0.0000 less than the 5% level of significance chosen by the researcher, and this means that the change in D (POPG) has an impact on (**SD**) inversely. That is, the more the change in D(POPG) by one unit decreasing the value of (**SD**) by 83.24654 in the short run.

4. From the above table we notice that the variable D(TO) has a significant effect, as the value of the probability was 0.0091 less than the 5% level of significance chosen by the researcher, and this means that the change in D(TO) has an impact on (**SD**) inversely. That is, the more the change in D(TO) by one unit decreasing the value of (**SD**) by 0.135238 in the short run.

5. From the above table we notice that the variable D(TO (-1))has a significant effect, as the value of the probability was 0.0000 less than the 5% level of significance chosen by the researcher, and this means that the change in D(TO (-1)) in last year has an impact on (**SD**) in current year inversely. That is, the more the change in D(TO (-1)) by one unit decreasing the value of (**SD**) by 0.384511in the short run.

6. From the above table we notice that the variable D(TO(-2)) has a significant effect, as the value of the probability was 0.0003 less than the 5% level of significance chosen by the researcher, and this means that the change in D(TO(-2)) in the year before the year has an impact on (**SD**) in current year inversely. That is, the more the change in D(TO(-2))

by one unit decreasing the value of (**SD**) by 0.274822in the short run.

7. The value of the correction error coefficient $\overline{ECM_{t-1}}$ was significant where the probability value was 0.000 and the value of the correction error coefficient was a negative value and less than the one by 0.973551 this means that if the model was shocked, the model will correct itself. which is meaning that the model will correct about 97% of the errors during the unit time (one year in that model) This means that the model will regain its balance and stability within approximately 13 months years.

8. 1-The total significance of the model can be tested using the ratio of explained variance to unexplained variance. This distribution F with degree of freedom by (k-1 or n-k). If the test ratio exceeds 5%, the model becomes insignificant and if it is less than 5%, the model becomes significant, from the previous table the test (F) that the probability value (p-value) is .000 which is less than significance level 5%, therefore we reject the null hypothesis that the regression model is insignificant and accept the alternative hypothesis

that the model is significant, and the F. test coefficient is 15.336.

9. The explanatory power of the regression model is determined by the adj R.SQ. It indicates the percentage that can be explained by the total change in the "y" variable in terms of the independent variables included in the model and is used as a measure of goodness of fit the model. Which includes the final results of the model and includes the results of the coefficient of determination, we find that the coefficient of determination is equal to 0.80377 where it means that approximately 80% of the changes in the dependent variable (profitability) are depending on the values of the independent variables (Activity Based Costing) that were included in the previous model and the residuals 20% related to other factors not included in the regression, which if included in the model it will increase the explanatory power of the model.

The determination coefficient ratio denotes the efficiency of the model in interpreting the changes of the dependent variable.

This latter can be seen through the representation of the estimated series (Fitted) and compared with its real data. We note in Figure (2), the semi-conformity between the curves of the real series and the estimated series.

Figure (2).

Actual/Fitted/Residuals Graph (graph confirms stability of the model)
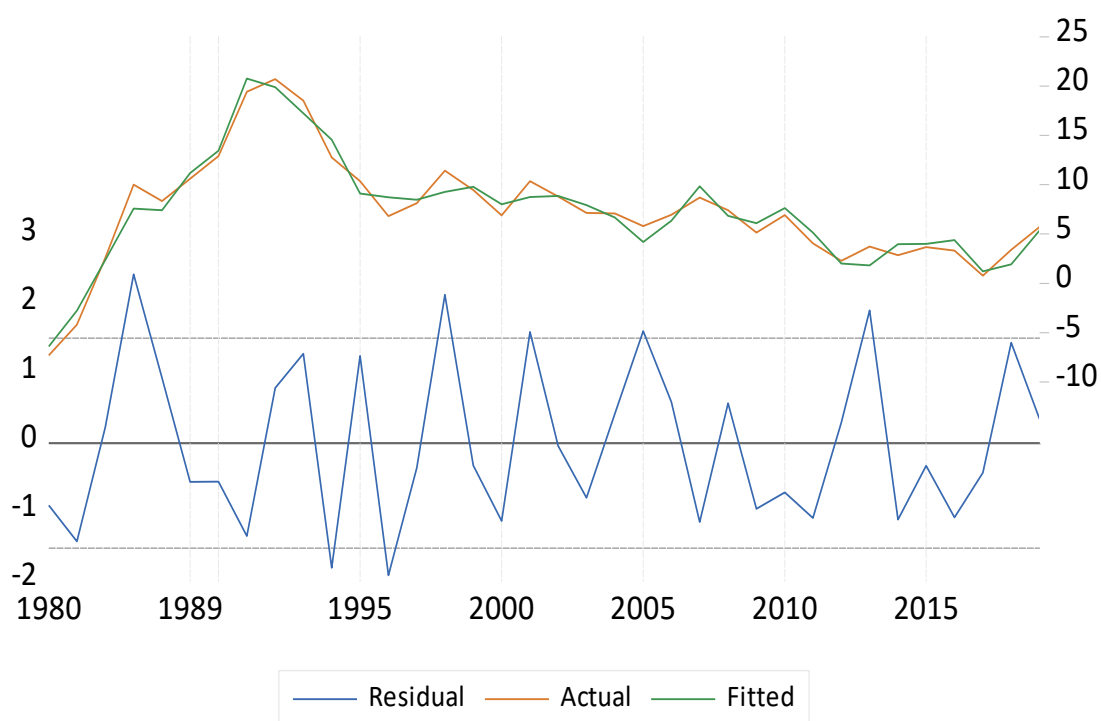
9-6　　Results of Diagnostics Tests :

Diagnostic tests are conducted to ensure the quality of the model used in the analysis is free from standard problems, including serial correlation, functional form misspecification, and heteroscedasticity.

Table (7): Results of Diagnostics Tests for Estimated Error Correction Model Based on the ARDL Model (1, 3, 1, 3, 0)

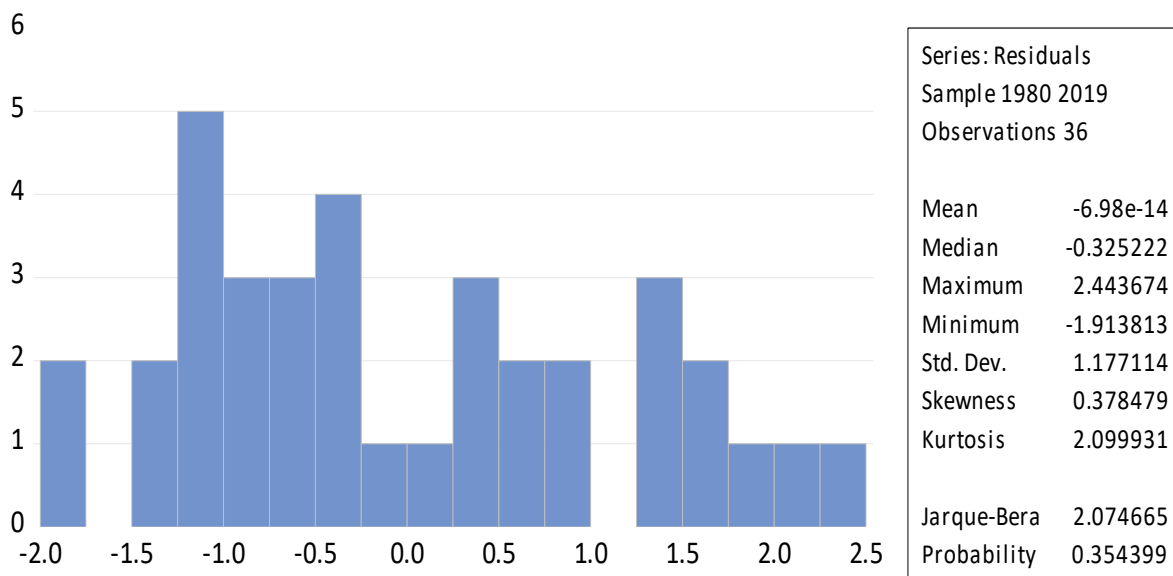| Econometric Problem	Test Name	F-statistic	p-value
Serial Correlation	Breusch-Godfrey	2.527	0.106
Heteroscedasticity	Breusch-Pagan-Godfrey	1.094	0.415
Normality	Jarque-Bera4	2.075	0.354
Model Misspecification	Ramsey RESET Test	2.087	0.164

Tables (7) shows that the model is free from serial correlation, functional form misspecification and heteroscedasticity. P-

Normal distribution [4]

Value ≤ 0.05 for all the tests; therefore, the model is devoid of standard problems.

Figure (3).

Normality Test of the Residuals with Jarque-Bera Test

Series: Residuals	
Sample 1980 2019	
Observations 36	
Mean	-6.98e-14
Median	-0.325222
Maximum	2.443674
Minimum	-1.913813
Std. Dev.	1.177114
Skewness	0.378479
Kurtosis	2.099931
Jarque-Bera	2.074665
Probability	0.354399

9-6-1 Normality test:

This can be tested by the Jark-Pierra test, from the table above and the graph the probability value was **0.354,** we found that it was greater than 5%, which means that the data are subject to a normal distribution.

9-6-2 Serial correlation test:

This problem arises from the absence of a relationship between a random variable in one time period and a random variable in another time period. Here, the existence of autocorrelation between errors is tested from the serial correlation LM test. Looking at the test probability value, we found that it was 0.106, that is, it was greater than the 5% level of significance, and then there is no autocorrelation between the values of the random variable.

9-6-3 Heteroskedasticity test:

This problem occurs because of the presence of different categories of sample, that is, they are divided into heterogeneous categories and may occur due to an increase in time. This problem is discovered through Breusch-Pagan-Godfrey test. Based on the above table, we find that the result of pro chi square was **0.415**, which is greater than 5%, i.e. which is indicate the absence of the problem of variance stability.

9-6-4 Model Misspecification:

The validity of the functional form is checked through the Ramsey test by examining the probability of the value of the F

test, and whenever the probability value of **0.164** is greater than 5%, this means the validity of the functional form used in the model and the stability of the function to the model, we can indicate that the model is stable, its variables have been accurately described, and it can be relied upon for long-term forecasting.

## 9-7   The Results of structural stability test of ARDL:

Structural Stability Test: is used to test the absence of any structural changes in the data used in this study over time. It is done using the Cumulative Sum of Recursive Residual (CUSUM) and Cumulative Sum of Square Recursive Residual (CUSUMQS). The structural stability of the estimated parameters in the CUSUM and CUSUMQS formula is achieved if the CUSUM and CUSUMQS statistic graph falls within the critical limits at the 5% level of significance. Figure (3) shows that the estimated coefficients of the ARDL model used are structurally stable over the study period it can be said that the ARDL model that we propose is a good model and has no econometric problems, which confirms the existence of stability of the study variables.

Figure (4).

Cumulative Sum of Recursive Residua (CUSUM)
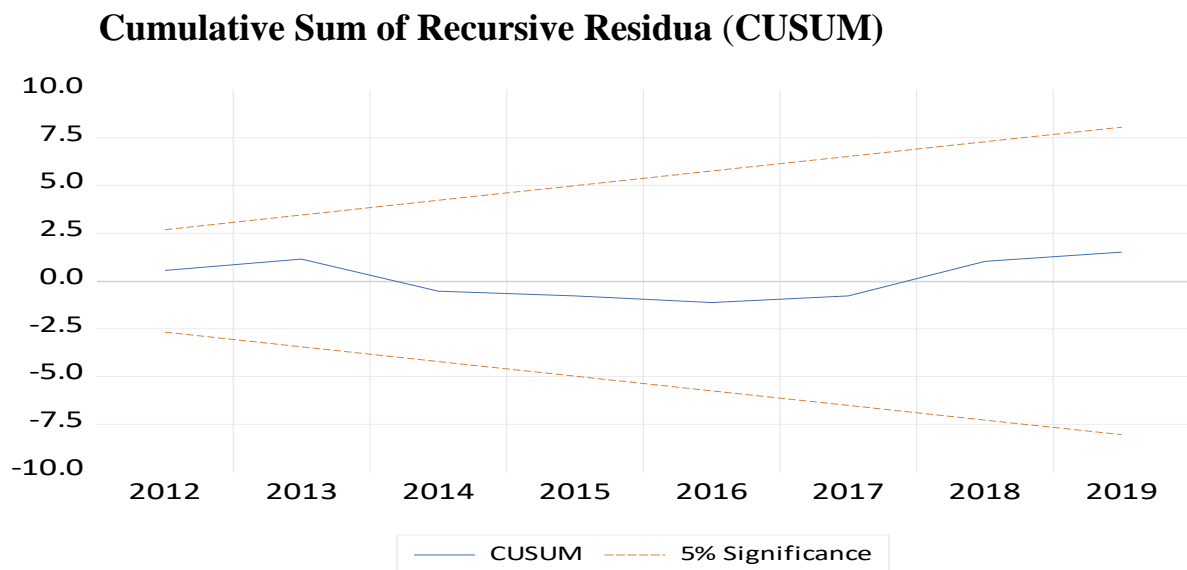
Figure(5):

Cumulative Sum of Square Recursive Residual

(CUSUMQS)
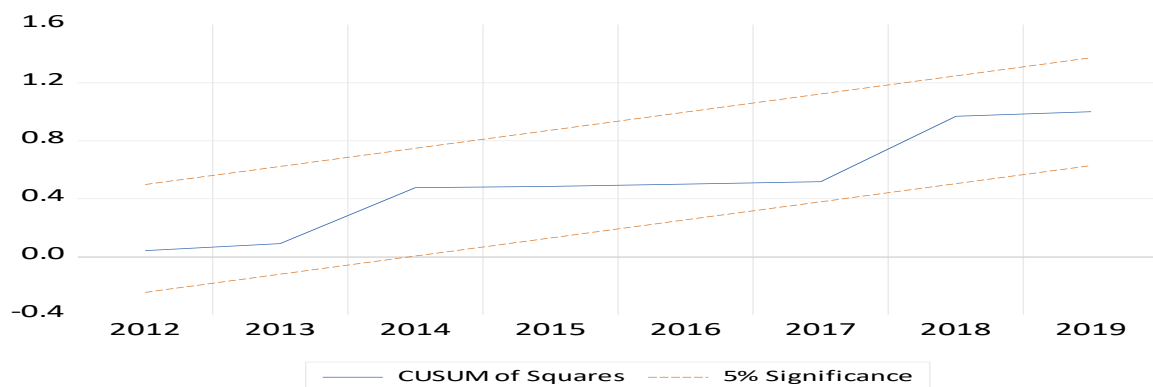
Based on the above figure and the presence of values between the limits, which express the random walk of independent observations, subject to a normal distribution, which indicates the stability of the regression coefficients, the stability of the model and its predictive ability.

10-   Conclusion and Policy Recommendations:

The objective of this study is to identify and investigate the main determinants of sustainable development in Egypt; and the specific objectives were to; investigate assess to what extent Economic Growth (EG), Unemployment Rate (UNR), Trade Openness (TO), Population Growth (POPG) can be used to determine sustainable development in Egypt; and observe the direction and magnitude of sustainable development in relation to variations in Economic Growth (EG), Unemployment Rate (UNR), Trade Openness (TO), Population Growth (POPG).

The study applied an autoregressive distributed lag (ARDL) model on annual data for the period 1977 to 2019 to test the study hypothesis. The result showed a stable model that did not suffer from serial correlation nor heteroscedasticity indicating that a long run cointegrating equation exists. Thus, ARDL (1,3,1,3,0) was modelled using Akaike's Information Criteria (AIC) with restricted constant of the form of one dummy variable to explain 2011 revolution in Egypt with trend.

The F-bounds test confirmed existence of the long-run cointegrating equation.

And Cumulative Sum of Recursive Residua (CUSUM) and Cumulative Sum of Square Recursive Residual (CUSUMQS) confirmed stability of the coefficient estimates. More so, ARDL (1,3,1,3,0) was found not to suffer from serial correlation nor heteroscedasticity thus leading to the modelling of short run vector ECM. The results showed that Economic Growth (EG), Unemployment Rate (UNR), Trade Openness (TO), Population

Growth (POPG) significantly affects sustainable development in the long-run, and also indicate that there is a long-term co-integration relationship between the dependent variable, Sustainable Development, and the independent variables: Trade Openness, Real GDP Per-Capita, Population Growth (POP) , Unemployment Rate (UNR) included in the study.

The results indicate that all the estimated long-run regression coefficients are statistically significant in the long-run. And Economic Growth -real GDP per capita growth- and Trade Openness positively affect sustainable development, while Unemployment Rate and Population Growth and negatively affects sustainable development. This shows that Economic Growth (EG), Unemployment Rate (UNR), Trade Openness (TO), Population Growth (POPG) determines sustainable development in the long run in Egypt.

All variables of the study have a significant impact on (**SD**) inversely in the short run.

The value of the correction error coefficient $\overline{ECM_{t-1}}$ was significant where the probability value was 0.000 and the value of the correction error coefficient was a negative value and less than the one by 0.973551 this means that if the model was shocked, the model will correct itself.

The coefficient of adj R.SQ. determination is equal to 0.80377 where it means that approximately 80% of the changes in the dependent variable (profitability) are depending on the values

of the independent variables that were included in the previous model and the residuals 20% related to other factors not included in the regression, which if included in the model it will increase the explanatory power of the model.

The Results of Diagnostics Tests and Structural Stability Test showed that the estimated coefficients of the ARDL model used are structurally stable over the study period, its variables have been accurately described, and it can be relied upon for long-term forecasting, and also that the ARDL model has no econometric problems, which confirms the existence of stability of the study variables.

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